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**SUMMARY INFORMATION ON WHALE SHARK AND CETACEAN INTERACTIONS IN THE
TROPICAL WCPFC PURSE SEINE FISHERY**

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Paper prepared by SPC-OFP

1. Introduction

The Sixth Regular Session of the WCPFC Technical and Compliance Meeting (TCC6), held in Pohnpei, FSM 30 September–5 October) was informed that a proposal to prohibit purse seine sets associated with whale sharks (*Rhincodon typus*) may be presented to the Seventh Regular Session of the WCPFC in December 2010; the reference to this proposal in the draft TCC6 report is included below:

“202. The Marshall Islands spoke on behalf of the PNA regarding conservation and management measures the PNA adopted with regard to setting on whale sharks by purse-seine vessels. At the 30th Special Meeting, the PNA adopted a measure to be applied through amendment to the PNA 3rd Implementing Arrangement that prohibits sets associated with whale sharks, stipulating that no purse seine vessel shall engage in fishing or related activity in order to catch tuna associated with whale sharks (Rhincodon typus). The measure will take effect 1 January 2011. The PNA indicated their intent to table a proposal at WCPFC7 so that the Commission can introduce compatible measures”

In order to provide delegations with background information, the WCPFC Secretariat requested the SPC-OFP to prepare a brief paper summarising available information on whale shark and other large animals (cetaceans) that form associations with tuna schools in the tropical purse seine fishery in the WCPFC Convention Area.

2. Data sources and definitions

The data used in this paper comprise operational-level logsheet and observer data for the period 2007-2009¹ for purse seiners operating in the tropical (20°N-20°S) purse seine fishery. The domestic fisheries of Indonesia and the Philippines are excluded as key data are not available. It is assumed in the analyses that the observer data, representing 16% coverage of fishing days over the 2007-2009 period, are representative of overall purse seine fishing operations during this period.

Sets are classified as “whale” or “whale shark” by the purse seine operator and likewise by the observer if the tuna aggregation being set upon is considered to have been associated with these animals at the time that the aggregation was located. The classification is not dependent on whether or not the associated animals are ultimately encircled by the set. The whale-associated set type is primarily associations with baleen whales (suborder *Mysticeti* – filter-feeding whales) and occasionally the sperm whale (*Physeter macrocephalus*), but not the other toothed cetaceans (suborder *Odontoceti*), which are smaller and faster (e.g. dolphins and porpoises). Interactions with the smaller toothed cetaceans do occur in the purse seine fishery, although they do not appear to maintain persistent associations with tuna in the WCPFC Convention Area in the same way that they do with yellowfin tuna in the eastern Pacific Ocean (Bailey et al. 1996). Therefore, there is not a separate set type classification for toothed cetaceans in the regional purse seine logsheet or observer data forms.

The term “interaction” is used in this paper to describe situations where an animal interacts with the fishing gear. In the purse seine fishery, an interaction is understood to be an observation that an animal is fully or partially encircled in the net, even if it escapes before the net is completely closed. An interaction is

¹ The years 2007-2009 were selected because observer coverage is higher in this period than in previous years and observers have more experience in recording large animal interactions and identifying marine mammals to the species level in more recent years.

therefore distinct to “a sighting” which is an observation of an animal that is not encircled or directly affected by the purse seine net.

3. Observations and Discussion

3.1 *Animal-Associated set types and interactions*

Table 1 provides a comparison of the proportion of purse seine sets by set type in the WCPFC tropical purse seine fishery for logsheet and observer data for the period 2007-2009. Observer data suggest that the numbers of whale- and whale shark-associated sets are severely under-reported on logsheets – observers report whale-associated and whale shark-associated sets about 20 times and 13 times, respectively, more frequently than are reported on logsheets.

According to logsheet and observer data, the frequency of **tuna schools associated with “whales”** (i.e. whale-associated sets) is clearly higher than the frequency of whale shark-associated sets. Specifically, the number of whale-associated sets was about three times the frequency of whale shark-associated sets (Table 1 for both logsheets and observer data). However, the observer-reported **interactions** of whale sharks (Table 2: 186 individuals) in the net were more than seven times higher than interactions of baleen whales (Table 2: 25 individuals). One of the reasons for this situation may be that vessels tend to report the presence of either whales or whale sharks in association with tuna schools as “whale-associated” instead of differentiating between the two distinct animal-association categories.

3.2 *Whale shark interactions and mortalities*

Observers recorded 186 whale shark interactions in 146 sets (Table 2) from throughout the fishery (Figure 1). The available information on interactions by set type (Table 3) suggests that the proportion of whale-shark associated sets should be higher than that reported by observers. This is because more than two-thirds (72%) of the sets where whale sharks were encountered in the net (i.e. “interactions”) were not recorded as a “whale shark-associated” set type. One of the main reasons for this is that the whale shark may be not visible at the time of setting and so the set is recorded as another set type (e.g. “unassociated, feeding on baitfish”). Subsequently, the observer discovers the animal in the net during the brailing process, and records it as an interaction.

Typically, whale shark interactions were of solitary animals, although several cases of multiple whale sharks in single sets are recorded in the observer data. Whale sharks are relatively slow-moving animals and rarely escape unassisted before the net is closed and typically require crew intervention to be released. The mortality rate of interactions is estimated (based on observer data) at 12% (Table 2). The observed interaction and mortality rates would imply a total whale shark mortality in the purse seine fishery in 2009 of approximately 60 animals.

3.3 *Baleen whale interactions and mortalities*

Observers reported 25 baleen whale interactions in 22 sets, mostly of solitary animals the majority (21 individuals in 18 sets) of which were the humpback whale (*Megaptera novaeangliae*) (Table 2). Whale-associated set types were recorded widely throughout the fishery, although observed interactions have occurred mainly in the western part of the region (Figure 2). Baleen whales are more frequently sighted at the time of setting than whale sharks and are therefore more likely to be assigned to the correct set type (Table 3).

Observers report that whales often escape before the net is completely closed and at least larger whales are also known to punch holes through the net when closed. The observed mortality rate (4%, based on a single observed mortality of a Bryde's whale) is therefore much lower than for whale sharks. The observed interaction and mortality rates infer a total mortality of baleen whales in 2009 of 3 animals, although this estimate is obviously highly uncertain.

3.4 *Toothed cetacean interactions and mortalities*

Observers reported interactions with thirteen different species of toothed cetacean during the period 2007–2009, with false killer whales and several dolphin species (bottlenose, common, spinner and rough-toothed dolphins) the most frequently encountered (Table 2). Interactions occurred across all of the common purse seine set types (Table 3), but were more common in the associated set types (drifting and anchored FADs and logs). False killer whale (Figure 3) and dolphin (Figure 4) interactions have been observed widely throughout the WCPFC tropical purse seine fishery.

Overall, 770 toothed cetacean interactions were observed from 125 sets (Table 2). Mortality rates were generally high (66% of interactions), with some reports indicating that they were not detected in the net early enough for release to be effected and had drowned. These interaction and mortality rates infer a total mortality of toothed cetaceans in the purse seine fishery in 2009 of 1,323 animals (Table 2).

4. Conclusion

It is clear that purse seine sets on whale sharks are a combination of both targeted sets and inadvertent capture. Interactions with toothed whales appear to be mainly incidental, rather than the result of sets specifically targeted at these animals. On the other hand, most sets on baleen whales do appear to be targeting a specific interaction, even if temporary, between the whales and tuna.

Any mitigation measure prohibiting the setting in the vicinity of whale sharks and marine mammals will need to consider that the animal may not be detected until the setting operation is at an advanced stage, particularly for whale sharks. There may also be a need for the development and dissemination of best-practice guidelines for releasing encircled animals.

5. References

Bailey, K.N., P.G. Williams & D.G. Itano. 1996. By-catch and discards in the western Pacific tuna fisheries: A review of SPC Data Holdings and Literature. Oceanic Fisheries Programme Technical Report 34. South Pacific Commission, Noumea, New Caledonia.

Table 1. Proportion of sets by set type and source of data for the WCPFC tropical purse seine fishery, 2007-2009 (excludes sets “not specified”)

Set type	LOGSHEETS		OBSERVER	
	Sets	%	Sets	%
Unassociated	54,013	54.60%	8,521	53.48%
Natural Log	15,693	15.86%	1,403	8.81%
Drifting FAD	22,188	22.43%	3,044	19.10%
Anchored FAD	6,864	6.94%	2,458	15.43%
Whale (Marine Mammal)	123	0.12%	397	2.49%
Whale shark	45	0.05%	111	0.70%

Table 2. Baleen whale, whale shark and toothed cetacean interactions in the WCPFC tropical purse seine fishery, 2007-2009 (Source: Observer data; total sets observed = 16,858 sets)

Species common name	Scientific name	Sets	% sets encountered	Number	Encounter rate (no. / 1,000 sets)	% Dead	Mortality rate (no. / 1,000 sets)	Estimated Mortality in 2009
BALEEN WHALES								
BRYDE'S WHALE	Balaenoptera Edeni	2	0.010%	2	0.12	50%	0.06	3
HUMPBACK WHALE	Megaptera novaeangliae	18	0.110%	21	1.25	0%	0.00	0
SEI WHALE	Balaenoptera borealis	2	0.010%	2	0.12	0%	0.00	0
BALEEN WHALES		22	0.131%	25	1.48	4%	0.06	3
WHALE SHARK								
WHALE SHARK	Rhincodon typus	146	0.870%	186	11.03	12%	1.36	60
TOOTHED CETACEANS								
DOLPHIN, BOTTLENOSE	Tursiops truncatus	17	0.100%	107	6.35	61%	3.86	169
DOLPHIN, COMMON	Delphinus delphis	8	0.050%	61	3.62	95%	3.44	151
DOLPHIN, INDO-PACIFIC BOTTLENOSE	Tursiops aduncus	14	0.080%	131	7.77	71%	5.52	242
DOLPHIN, LONG-BEAKED COMMON	Delphinus capensis	2	0.010%	40	2.37	8%	0.18	8
DOLPHIN, RISSO'S	Grampus griseus	8	0.050%	37	2.19	100%	2.19	96
DOLPHIN, ROUGH-TOOTHED	Steno bredanensis	14	0.080%	90	5.34	77%	4.09	180
DOLPHIN, SPINNER	Stenella longirostris	13	0.080%	68	4.03	82%	3.32	146
DOLPHIN, SPOTTED	Stenella attenuata	1	0.010%	6	0.36	100%	0.36	16
DOLPHIN, STRIPED	Stenella coeruleoalba	2	0.010%	8	0.47	100%	0.47	21
DOLPHINS / PORPOISES (UNIDENTIFIED)	Delphinidae	1	0.010%	1	0.06	100%	0.06	3
FALSE KILLER WHALE	Pseudorca crassidens	38	0.230%	212	12.58	51%	6.41	281
MELON-HEADED WHALE	Peponocephala electra	1	0.010%	1	0.06	0%	0.00	0
PYGMY KILLER WHALE	Feresa attenuata	1	0.010%	1	0.06	100%	0.06	3
SHORT-FINNED PILOT WHALE	Globicephala macrorhynchus	5	0.030%	7	0.42	43%	0.18	8
TOOTHED CETACEANS		125	0.741%	770	45.68	66%	30.13	1,323

1. At this stage, “*Estimated Mortality in 2009*” has been determined by applying the mortality rate (observers) to the total number of sets undertaken during 2009.

Table 3. Whale shark, baleen whale and toothed cetacean interactions in the WCPFC tropical purse seine fishery by set type, 2007-2009 (Source: Observer data)

Set type	Whale Shark			Baleen Whales			Toothed Cetaceans		
	Sets	Number	%	Sets	Number	%	Sets	Number	%
Unassociated	79	123	60%	5	5	20%	22	113	15%
Natural Log	0	0	0%	0	0	0%	22	154	20%
Drifting FAD	9	11	5%	0	0	0%	27	122	16%
Anchored FAD	2	2	1%	0	0	0%	38	293	38%
Whale (Marine Mammal)	9	10	5%	17	20	80%	8	26	3%
Whale shark	43	55	27%	0	0	0%	0	0	0%
(Not specified)	4	4	2%	0	0	0%	5	62	8%

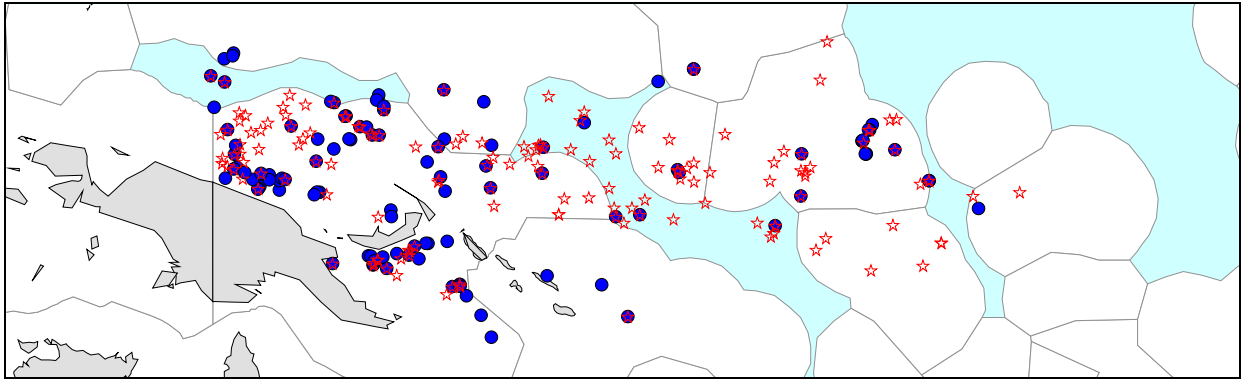


Figure 1. Locations of observed whale shark interactions (red stars) and whale shark-associated sets (blue circles) in the WCPFC tropical purse seine fishery, 2007-2009 (Source: Observer data)

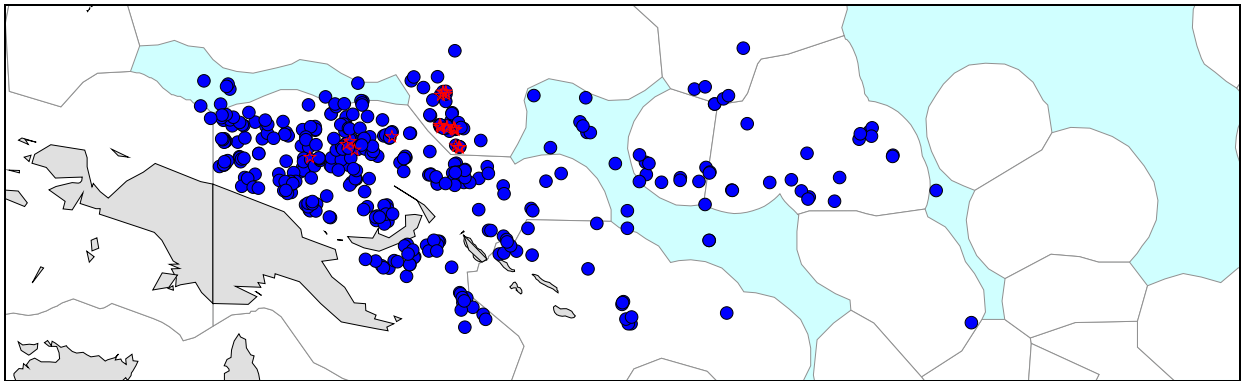


Figure 2. Locations of observed baleen whale interactions (red stars) and baleen whale-associated sets (blue circles) in the WCPFC tropical purse seine fishery, 2007-2009 (Source: Observer data)

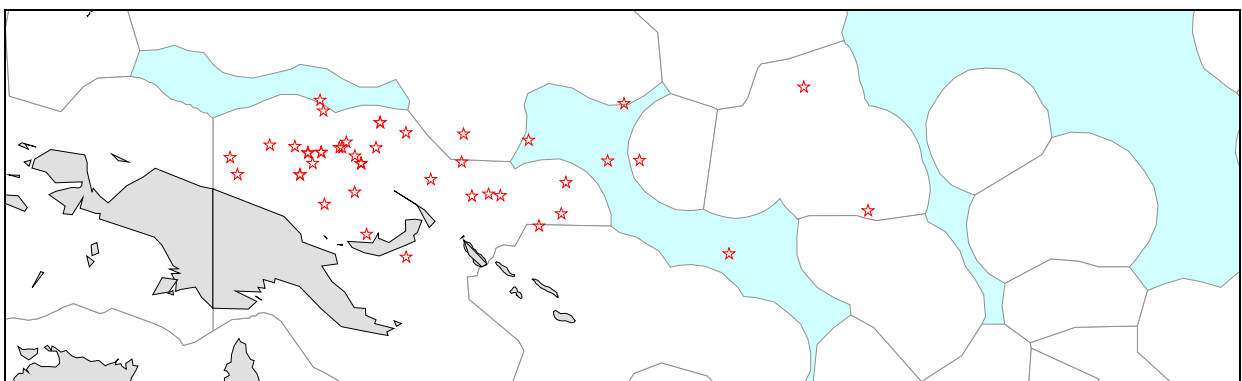


Figure 3. Locations of observed false killer whale interactions (red stars) in the WCPFC tropical purse seine fishery, 2007-2009 (Source: Observer data)

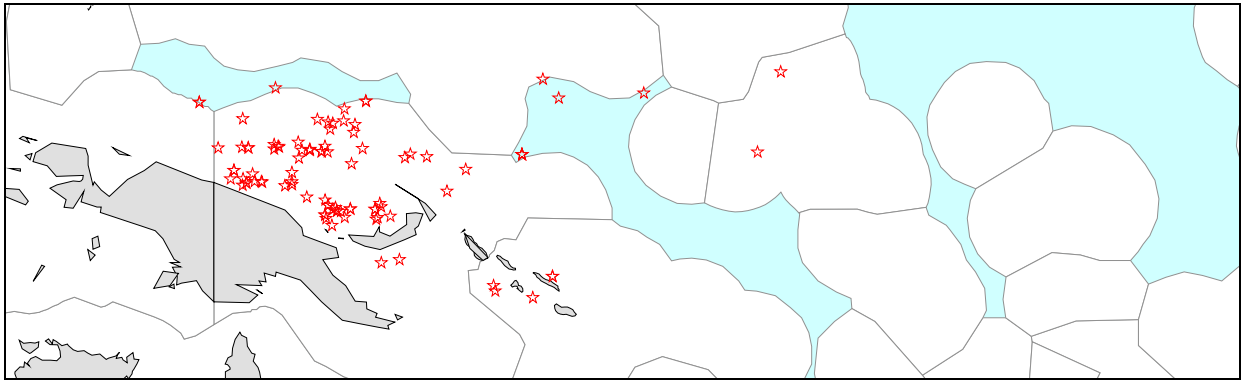


Figure 4. Locations of observed dolphin species interactions (red stars) in the WCPFC tropical purse seine fishery, 2007-2009 (Source: Observer data)