

Status of Whale Sharks Around Seychelles

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G. Meekan, Ivan R. Lawler, Corey J.A. Bradshaw*

Rowat et al. 2009. Aerial survey as a tool to estimate whale shark abundance trends
JEMBE, v368, 1-8

Rowat et al. In press. Population abundance and apparent survival estimates of the
Seychelles whale shark aggregation. Oryx tba





Status of Seychelles Whale Sharks

Context



- Found globally in all warm tropical seas
- Only a few areas have regular (annual) occurrence
- IUCN Status as ‘Vulnerable’ to exploitation
- Listed on CITES & CMS Appendix II
- Protected in only a few countries



Status of Seychelles Whale Sharks

Targeted Fisheries

- Principally for flesh for Taiwanese market as 'Tofu Shark' though fins have very high trophy value
- Taiwan: 1980-2007 (max 280 p.a.; only 113 in 2001)
- Philippines: 1990-2002 (max 800 p.a.; only 160 in 2000)
- India: 1995-2001 (max 1000 p.a.; only 201 in 2000)
- All fisheries now officially closed but still some demersal take





Status of Seychelles Whale Sharks

Data Collection

- Intensive monitoring during peak season (August – November)
- Daily a.m. aerial survey (strip transect) around Mahe
- Daily p.m. in-water identification programme for tagging & photo ID, biopsies etc.
- Daily pm CTD and plankton tows in areas where sharks found (controls in areas with no sharks)
- Weekly plankton tows all year at one location





Status of Seychelles Whale Sharks

Analysis

- In-water identification (marker tags & photo ID): demographics and estimation of population size (CMR)
- Long range movements from various tracking devices
- Aerial surveys: short term temporal changes in distribution and abundance

Planned Outputs

Publish results and liaise with local, regional and international authorities to develop appropriate conservation and management measures





Status of Seychelles Whale Sharks

Current Findings: Aerial Census

Distribution varied temporally and spatially both within and between years

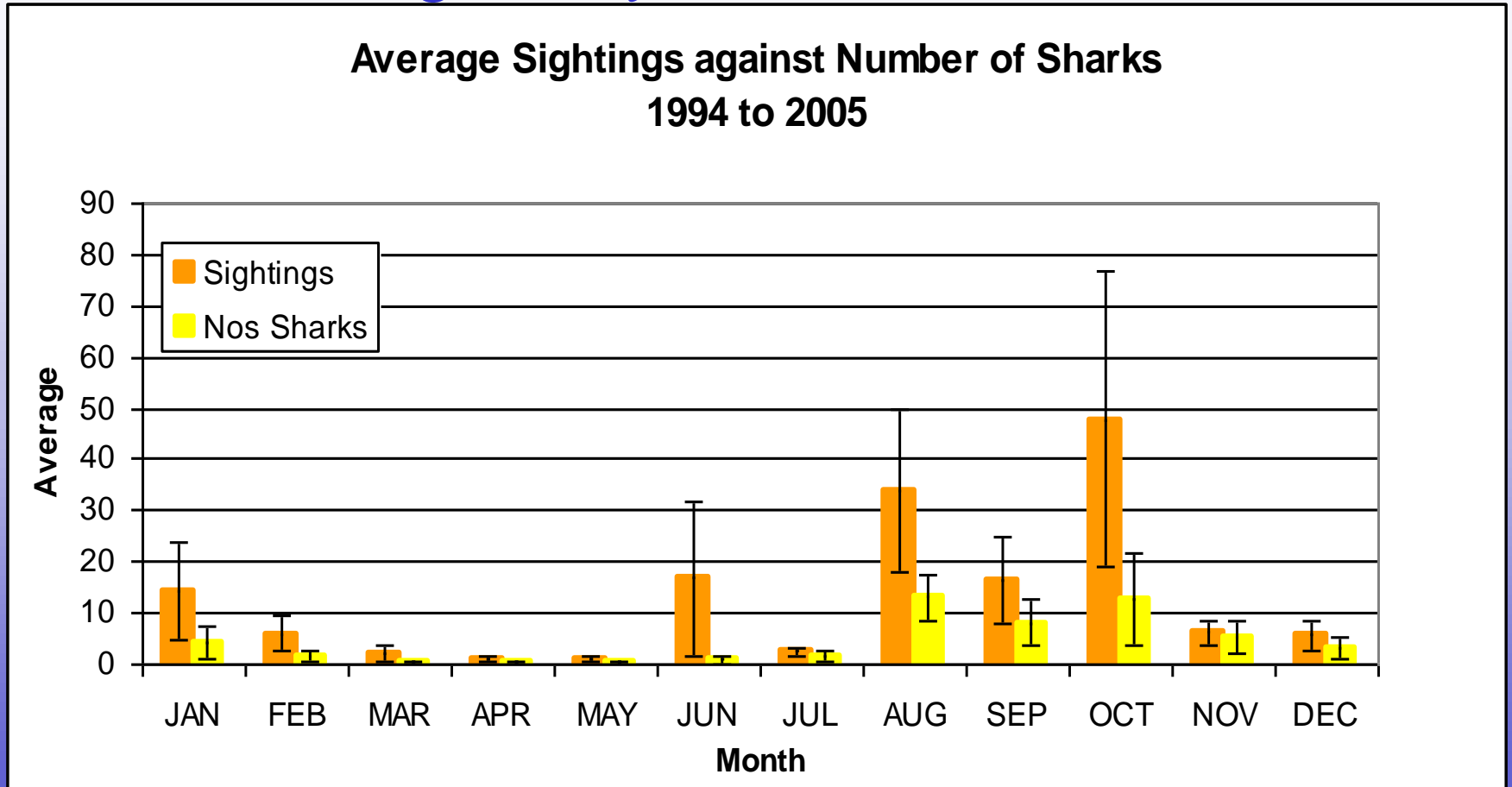


	2001	2002	2003	2004	2005	2006	2007	2008
Position, Jul-Aug	N & W	S & SW	S & SW	S & SW	N & W	NW & S	S & SW	SW
Position, Sep-Oct	S & SW	S & SW	N & SW	S & SW	S & SW	S & SW	N & SW	NW
Number of hours	69:00	151:22	106:26	152:10	139:22	81:20	92:17	71.20
Nos. of sightings	208	498	632	414	873	842	191	94
Average / hr	3.0	3.2	6.2	3.2	7.3	10.4	2.9	0.6
Maximum / flight	11	46	18	26	43	37	16	8



Status of Seychelles Whale Sharks

Current Findings: Temporal Occurrence



Opportunistic aerial sightings; error bars denote Standard Error



Status of Seychelles Whale Sharks

Current Findings: Tags & Sightings

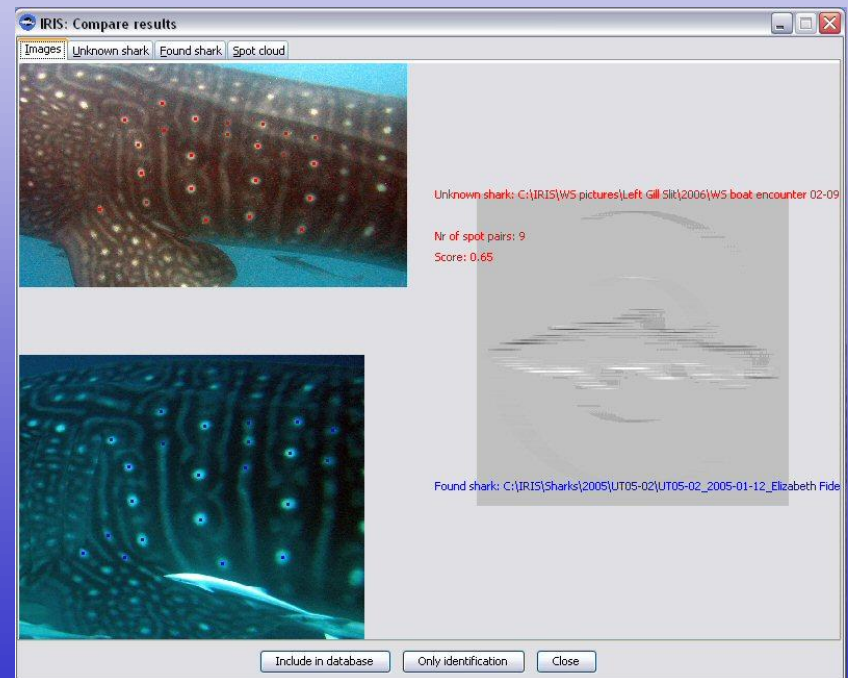
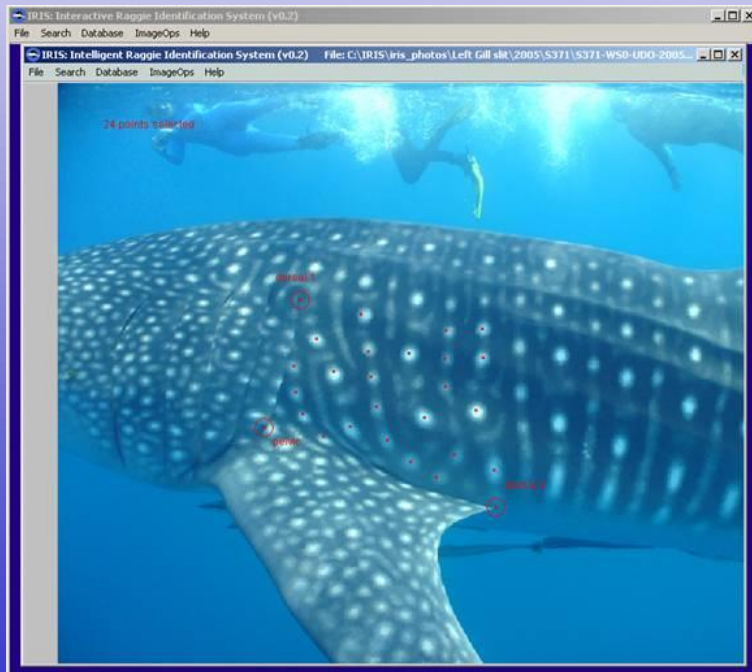
Sightings	2001	2002	2003	2004	2005	2006	2007	2008
Total no. sightings	133	126	466	207	620	620	511	TBC
In Water Encounters	114	112	362	195	540	513	321	139
New Tags	35	21	57	42	24	32	0	0
Tag resightings	--	4	11	0	10	11	0	0
Sharks sexed	58	28	71	47	198	276	77	60
Male	55	28	63	38	172	218	63	46
Female	3	0	8	9	26	58	14	14
Av. size	5.2m	5.9m	6.78m	7.2m	6.4m	5.8m	5.7m	TBC



Status of Seychelles Whale Sharks

Current Findings: Photo-Identification

	2001	2002	2003	2004	2005	2006	2007	2008
New Left ID	12	0	15	12	92	110	46	TBC
New Right ID	5	0	11	11	64	102	47	TBC
New Individ	15	0	19	20	108	147	51	38
Matched	--	0	2	1	8	31	37	28





Status of Seychelles Whale Sharks

Current Findings: Population Size

- Pattern matching software has identified 360 individual sharks between 2001-2007
- Photo identification & marker tag data was used to estimate population size for 2004-2007 with mark-recapture models
- Test for closure of population failed
- Open population models estimated a population of 348 to 488 (95% C.I); >33% of which are site faithful sharks the remainder being itinerants (from WIO regional population?)

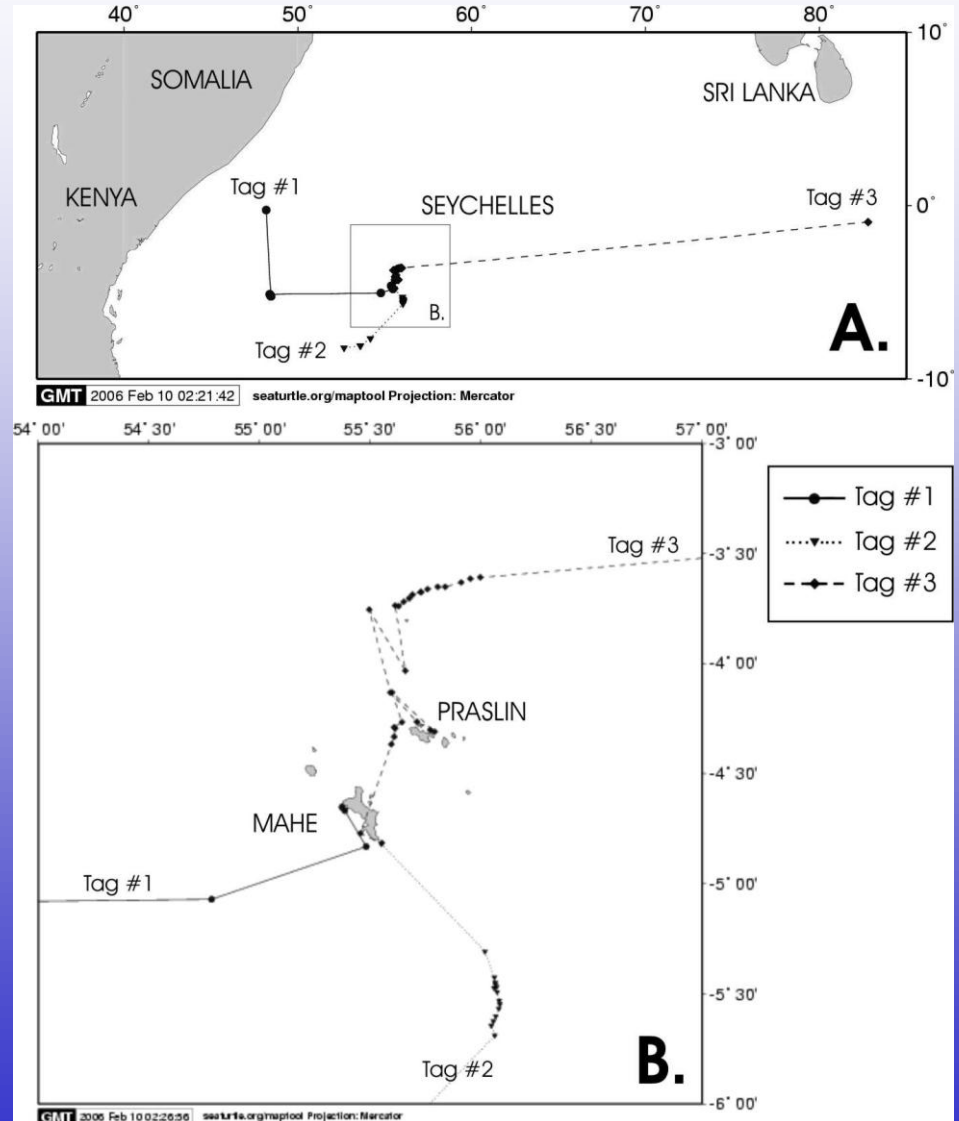




Status of Seychelles Whale Sharks

Current Findings: Dispersal

- Tag #1 went south west then west towards Kenya (1422 km)
- Tag #2 went south east then south west into the Mozambique channel (502 km)
- Tag #3 went north east to the edge of the Seychelles plateau and then due east towards Sri Lanka (3383 km)

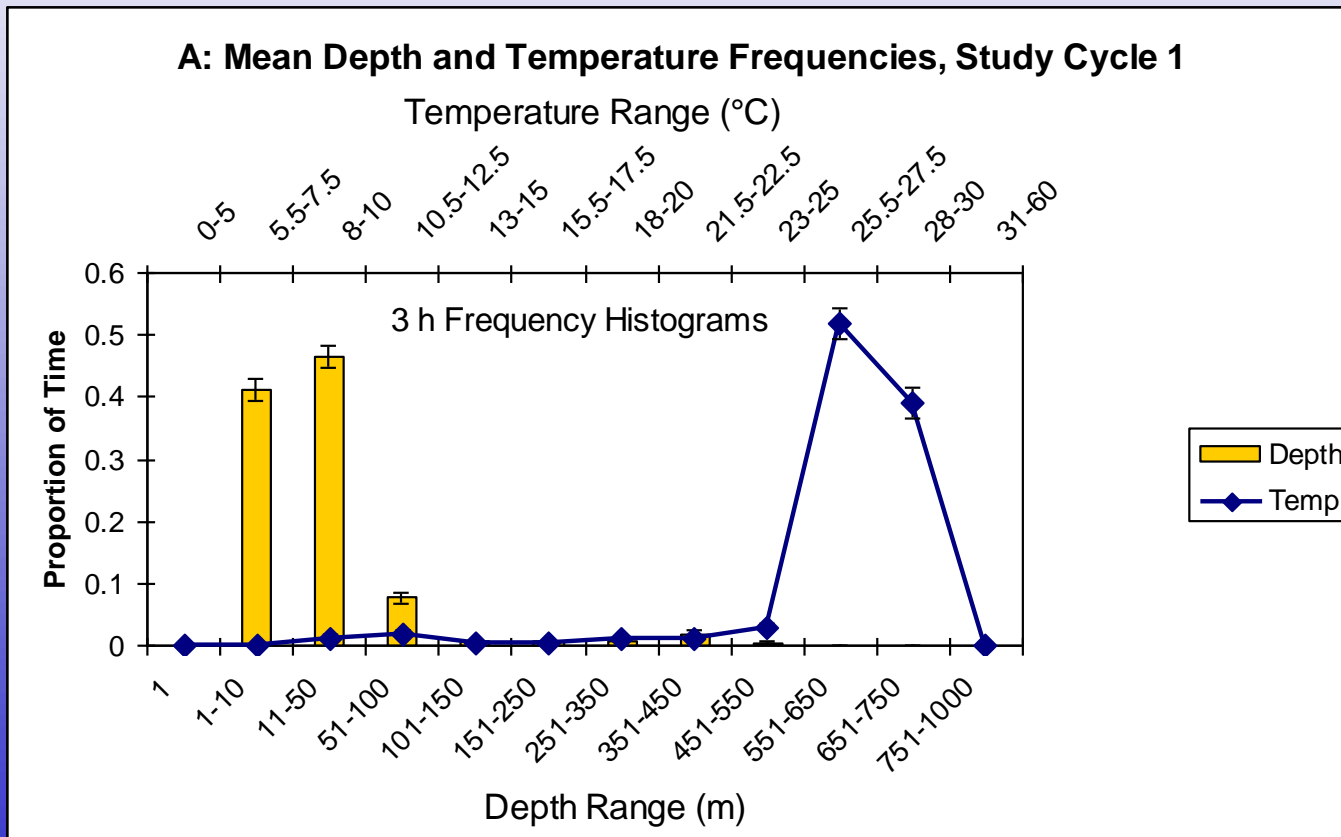




Status of Seychelles Whale Sharks

Current Findings: Behavioural Preferences

- 40% of time < 10m from the surface, 92% in the top 50 m but deepest dive > 1000 m
- 94.5% of the time was spent in water between 25° - 35°C

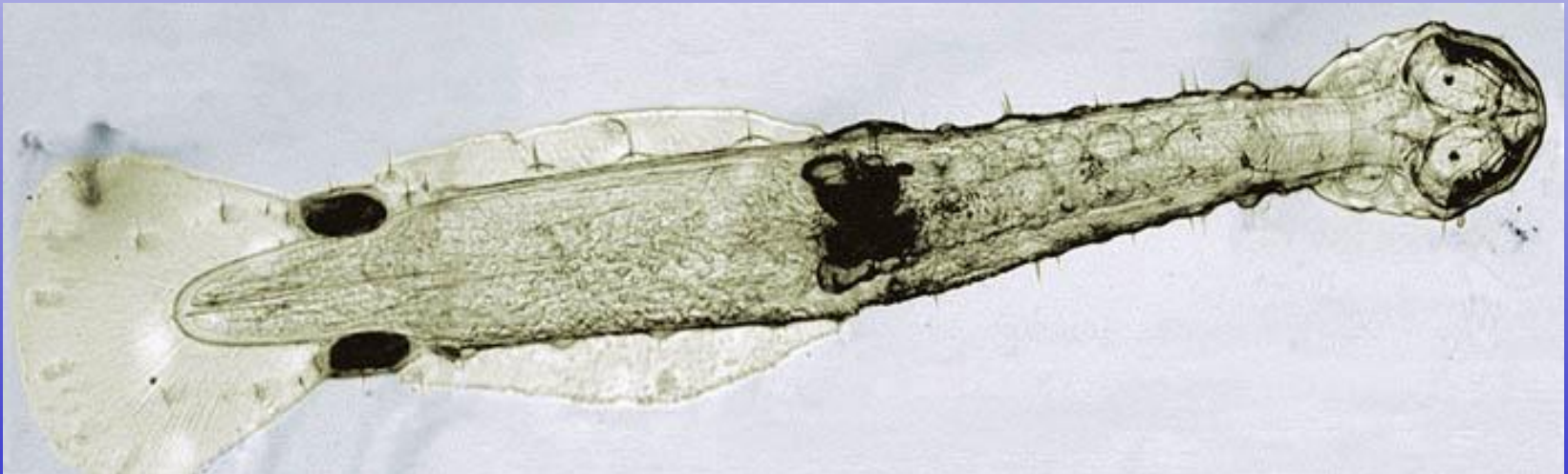




Status of Seychelles Whale Sharks

Current Findings: Environmental Effects

- General Linear Models were ranked according to Akaike's Information Criterion
- Random selection of 50% of the abundance estimates removed serial autocorrelation: repeated 1000 times and the models ranked accordingly for each iteration.
- SST & wind speed negatively affected population numbers
- Despite apparent relation, after removal of autocorrelation density of plankton showed no effect on shark numbers





Status of Seychelles Whale Sharks

Status Summary

- Whale sharks are slow growing and late maturing (>8m +/- 21 years old)
- Ovoviviparous (>300 embryos) but development is delayed and pups are birthed individually
- Populations are vulnerable to targeted fisheries and due to the range of migrations, local fisheries may impact regional populations
- Do declines in sighting rates in Seychelles indicate a change in distribution or a major population decline?

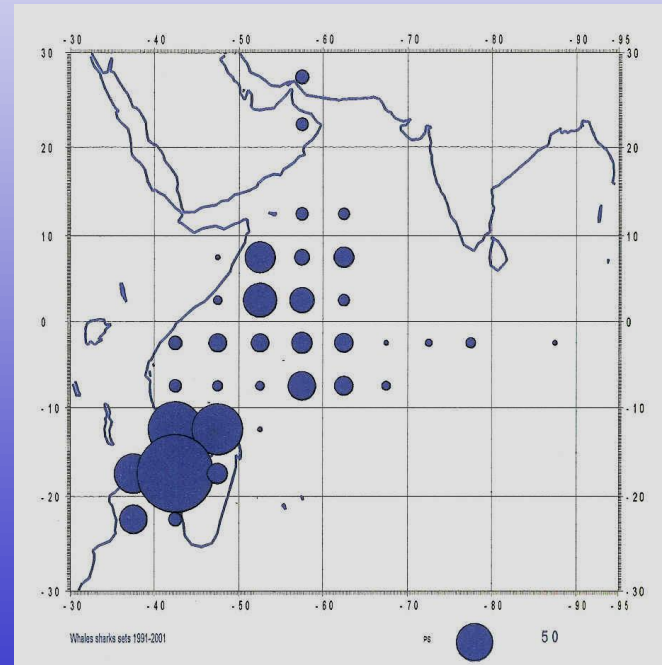




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Future / On-going Activities

- Daily aerial & identification monitoring will continue during the peak season
- Fine-scale environmental monitoring (CTD / ADCP)
- Satellite tracking will continue using new tags & attachments to enable longer deployment times
- Regional collaboration sharing identification data will help show movement and population ranges
- Logbook data from IOTC is now being examined to provide information on pelagic occurrence





Thank you for your attention!