Whale sharks (*Rhincodon typus*) of Ningaloo Reef, Western Australia, 2005: Telemetry tag deployments, 28 April-7 May 2005

by

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We conducted field research at Ningaloo Reef, Western Australia, from 28 April through 7 May 2005 to attach satellite-linked telemetry tags to whale sharks (*Rhincodon typus*).. This campaign was a continuation of a collaborative study by Dr. Brent S. Stewart and Dr. Steven G. Wilson (Hubbs-SeaWorld Research Institute), Dr. Jeffrey J. Polovina (U.S. NOAA Fisheries), Dr. Mark Meekan (Australian Institute of Marine Sciences) and Dr. John Stevens (CSIRO, Tasmania) that we initiated in 2003 to document the movements and behavior of whale sharks that aggregate seasonally to feed at Ningaloo Reef, Western Australia (Stewart et al. 2003; Wilson et. al. 2004a). We previously attached pop-up archival tags (PAT tags) to four whale sharks at Ningaloo Reef in 2003 and to 15 whale sharks in 2004 (Stewart et al. 2003, Wilson et al. 2004a, 2004b, 2005) using several different anchor designs and implantation techniques.

We attached PATs (Microwave Telemetry, Inc.) to another nine whale sharks at Ningaloo Reef from 28 April through 7 May (Table 1). We also attached SPLASH tags (Wildlife Computers) to six whale sharks, including three of those sharks that were tagged with PATs (Table 1). The sharks were located with the assistance of a dedicated single engine, high wing aircraft. Once a shark was spotted, the aircraft directed a shore-based charter vessel (*Osso Blue*) to position snorkelers ahead of the approaching shark for tag deployment. We made incidental observations of encounters with other whale sharks (Table 2) and also photographed them to facilitate long-term identification using spot patterns and scars.

Flat titanium sub-dermal anchors were attached to the PATs with short tethers (ca 15-20 cm) made of nylon coated stainless steel leader. The anchors were inserted (ca 10-12 cm depth) within the sub-dermal adipose layer at the distal edge of the base of the first

dorsal fin (Figure 1) using a Hawaiian-sling (gidgy) pole-spear handle. Full insertion of the subdermal anchor was achieved on all but two or three of PATs. The PATs are programmed to detach from the sharks about five to eight months after they were attached (Table 1). Once they detach, they will float to the sea-surface and transmit all stored data (ambient light, depth and water temperature measurements measured and stored once an hour) to earth-orbiting satellites for several days or more until their batteries expire.

We attached the SPLASH tags (embedded in a buoyant, hydrodynamic housing) to a nylon coated stainless steel tether that was anchored to the side of a plastic and neoprene collar (Figure 1) was fitted around the base of the first dorsal fin using a modified stainless steel pistol (RAMSET) that was secured with a pin that was inserted through the dorsal fin. The modifications to the pistol were engineered and fabricated by M. Horsham (CSIRO, Tasmania). We programmed the SPLASH tags to sample and store, in electronic memory, measurements of hydrostatic pressure (water depth, m), water temperature, and ambient light level every 60 seconds, and to transmit summary histogram data on maximum dive depth (m), dive duration (min), time-at-depth, and time-at-temperature (Appendix 1) to earth-orbiting ARGOS satellites every ca 45 seconds when the transmitter float was at the sea-surface.

We did not encounter any problems during the deployments. Three PATs detached prematurely, one around 15 May and the other two (both attached to whale shark with SPLASH tag 57210) around 30 June. One SPLASH tag 57213 also detached and was found on the beach along the Exmouth peninsula around 15 May. We expect to monitor the movements and dive behaviors of the other sharks outfitted with PATs until

September (PAT 57012), October (PAT 11617), November (PATs 57015, 57016), or December (PATs 4220, 11618). Three whale sharks equipped with SPLASH tags traveled north through mid-July while the other two remained relatively close to Ningaloo Reef in offshore waters to the northeast aned southwest (Figure 2). We expect to monitor their movements for another for 1 to 2 years (SPLASH tags 57210, 57214, 57209, 57211, 57212). Geographic locations of the tagged whale sharks will be determined by iterative solution of latitude and longitude from ambient light levels stored and transmitted after release by the PATs and directly by Doppler-shift calculations made by the ARGOS Data Collection and Location Service whenever 2 or more signals are received by an ARGOS satellite from a SPLASH tag at the surface during a satellite pass. We will use depth and temperature measurements from the tags to construct vertical thermal structure profiles and sea-surface temperature patterns for comparisons with remotely sensed data along migratory routes to correlate shark habitat use with physical and biological characteristics of habitats of varying biological productivity.

Acknowledgments. We thank C. McLean, M. Horsham, G. Taylor and T. Maxwell for assistance in the field and M. Horsham for his redesign and modification of the SPLASH tag applicator pistol. We also thank the R. Mau and the Western Australian Department of Conservation and Land Management (CALM) for their logistic assistance and T. Maxwell for excellent support from his vessel *Osso Blue*. This research was supported by funding from BHP Billiton Ltd., Woodside Energy Ltd., Chevron, U.S. NOAA Fisheries, CALM, Hubbs-SeaWorld Research Institute and the Australian Institute of Marine Science.

References

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Figure 1. Towed SPLASH satellite transmitter attached to leading edge of first dorsal fin and two pop-up archival tags (PATs) attached to left and right sides of a whale shark at NIngaloo Reef in 2005.

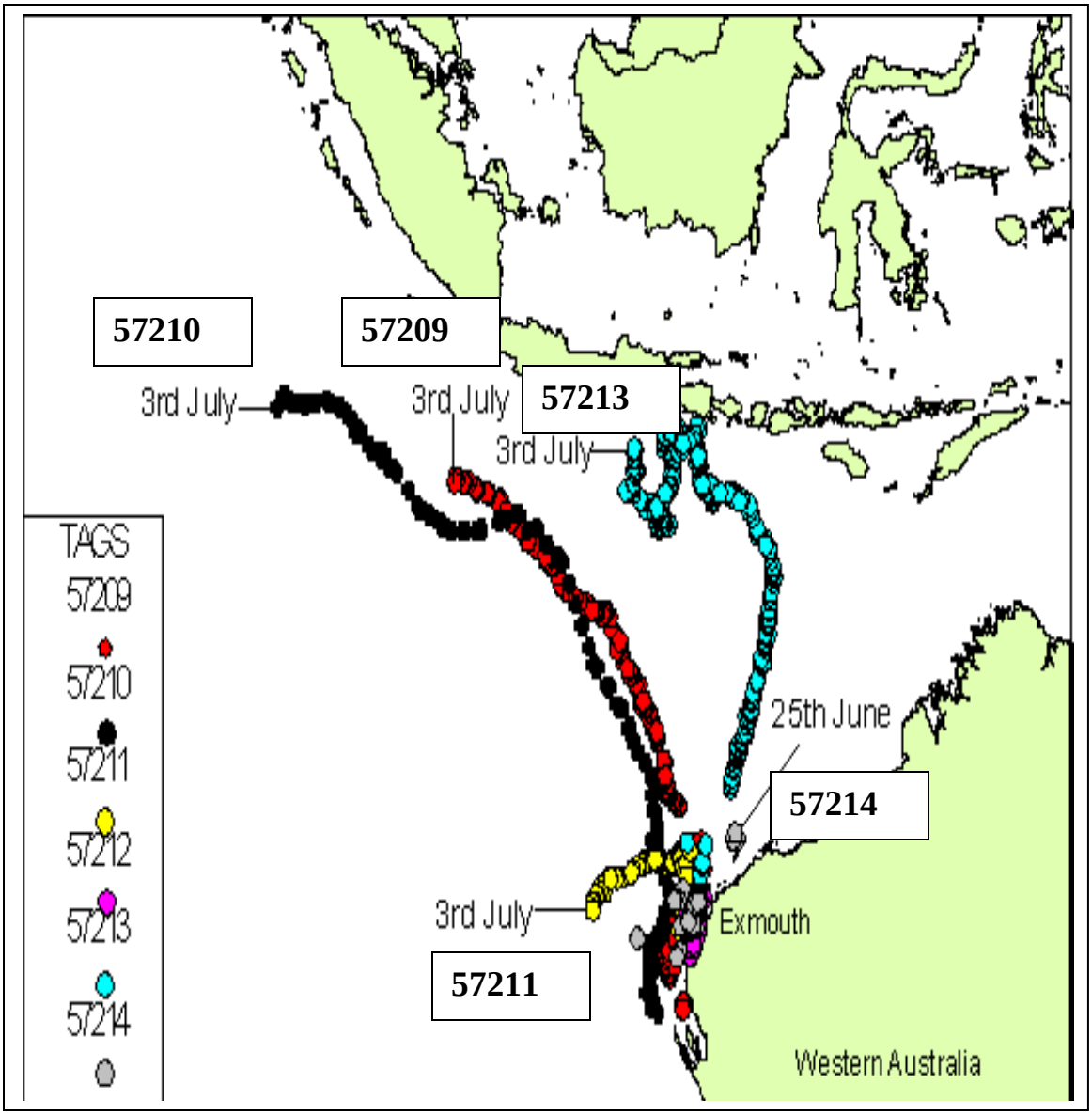

Figure 2. Early movements of satellite-tagged (SPLASH tags) whale sharks from Ningaloo Reef (PAT attached to shark with SPLASH tag 57214 detached ca 15 May; SPLASH tag 57013 detached ca 15 May; two PATs attached to shark with SPLASH tag 57210 detached ca 30 June).

Table 1. Telemetry tags attached to eleven whale sharks at Ningaloo Reef, Western Australia from 28 April through 7 May 2005.Appendix 1. Setup protocols for SPLASH tags deployed on whale sharks at Ningaloo Reef, 28 April through 7 May 2005.

Shark number	PTT ID	Tag type	PAT Serial no,	Release date	Deploy date	Deploy time	Latitude (N)	Longitude (E)	Shark length est.	Shark Length measured	Sex	Tag location
1	4220	PAT	7356	+8 months	28-Apr-05	1055	22°39.432’	113°34.206’	4-5 m		Female	Right side, dorsal fin base
2	57012	PAT	7834	+5 months	28-Apr-05	1225	22°395.176’	113°34.437’	4-5 m	4.4 m	Female	Right side, dorsal fin base
3	11616[1]	PAT	7839	+6 months	5-May-05	1105	22°39.766’	113°35.593’	4-4.5 m		Male	Right side, dorsal fin base
3	57014[2]	PAT	7836	+7 months	5-May-05	1030	22°39.044’	113°35.90’	4-4.5 m		Male	Left side, dorsal fin base
3	57210	SPLASH	n/a	n/a	5-May-05	1045	22°39.044’	113°35.90’	4-4.5 m		Male	Dorsal fin, L side
4	57013[3]	PAT	7835	+5 months	5-May-05	1210	22°44.559’	113°34.20’	7-8 m		?	Left side, dorsal fin base
4	57214	SPLASH	n/a	n/a	5-May-05	1210	22°44.559’	113°34.20’	7-8 m		?	Dorsal fin, L side
5	57015	PAT	7837	+7 months	5-May-05	1355	22°44.439'	113°36.740’	~8 m		Male	Left side, dorsal fin base
6	57016	PAT	7838	+7 months	6-May-05	1225	22°43.165’	113°36.730’	4-4.5 m		Female	Right side, dorsal fin base
6	57209	SPLASH	n/a	n/a	6-May-05	1225	22°43.165’	113°36.730’	4-4.5 m		Female	Dorsal fin
7	11617	PAT	7840	+6 months	7-May-05	1035	22°42.175’	113°34.617’	6-7 m		Female	Right side, dorsal fin base
8	11618	PAT	7841	+8 months	7-May-05	1045	22°41.764’	113°35.032’	5-6 m		?	
9	57211	SPLASH	n/a	n/a	1-May-05	1345	22°42.015’	113°35.578’	(small)		?	Dorsal fin, L side
10	57212	SPLASH	n/a	n/a	5-May-05	1345	22°42.569’	113°37.182’	4-5 m		?	Dorsal fin
11	57213[4]	SPLASH	n/a	n/a	6-May-05	1045	22°35.667’	113°37.449’	~4 m		Female	Dorsal fin

[1] Tag detached ca 30 June.
[2] Tag detached ca 30 June.
[3] Tag detached ca 15 May.
[4] Tag detached ca 15 May

Table 2. Additional sightings of whale sharks at Ningaloo Reef 27 April through 7 May 2005.

Date	Time	Latitude (S)	Longitude (E)	Length (m)	Sex
4 May	1215	22 41.27’	113 33.594’	large	
4 May	1215	22 37.386’	113 35.368’	small	
5 May	1420	22 44.758’	113 36.511’	5.2[5]	M
6 May	1025	22 35.051’	113 36.987’	5	
6 May	1240	22 44.307’	113 37.316’	7-8	
6May	1425	22 43.731’	113 34.606’	7-8	
7 May	1045	22 41.764’	113 35.082’		
7 May	1150	22 42.849’	113 35.579’		
7 May	1205	22 42.972’	113 35.160’	4	M
7 May	1215	22 42.402’	113 35.681’	4	M
7 May	1230	22 42.179’	113 35.170’		
7 May	1235	22 41.996’	113 35.587’		
7 May	**1305**	**22 45.379’**	**113 37.049’**	**Large**	**M[6]**
7 May	1315	22 45.415’	113 37.520’		
7 May	1320	22 45.533’	113 37.657’	9.2	M[7]
7 May	**1335**	**22 45.807’**	**113 37.576’**		**M**
7 May	1345	22 46.395	113 38.086’	4.8[8]	
7 May	1405	22 45.900’	113 37.943’		
7 May	1415	22 46.130’	113 37.851’		
7 May	1425	22 46.069’	113 37.547’		
7 May	**1450**	**22 45.875’**	**113 37.978’**	**10.3**	**M**
7 May	1515	22 45.767’	113 37.669’	small[9]	
7 May	1530	22 45.961’	113 37.818	medium[10]	

[5] Estimated at 4-5 m, measured at 5.2m; 1st dorsal = 39 cm
[6] With apparent rip or scrape and healed (?) hole scar on first dorsal fin; perhaps a towed tag attachment from past years (?).
[7] With a PAT on left side as only tag.
[8] Measuered; also 1st dorsal fin height = 38 cm
[9] Dorsal fin sliced off about 1/3 down from tip; tiger shark following.
[10] PAT on left side.

SPLASH PTT ID 57209

Host Settings	
SplashHost version	1.00.0017
User Name	Bstewart
Time And Date Settings	
PC Date	05 May 2005 at 16:15:00
Tag Date	05 May 2005 at 23:14:05
General Settings	
Tag's Serial Number	04L0137
Password	SPLASH
User's Identifier	...
Argos Ptt number	57209 (49ACE98 Hex) Uplink / LUT id: 4715:152
Repitition Intervals	42s (at-sea); 87s (haulout)
Tagware version	1.00h
Hardware version	
Owner	John Stevens / Barry Bruce CSIRO Marine Research Castray Esplanade Hobart, Tasmania 7000 Australia Tel: 03 6232 5222
Data to Archive Settings	
Depth	60 seconds
Temperature	60 seconds
Light Level	60 seconds
Battery Voltage	60 seconds
Wet/Dry Sensor	60 seconds
Sampling Mode	Archive samples when tag is wet or dry
Wet/Dry Threshold	Dynamic
Stabilization Time	3ms
Sampling Duration	Time till 15 MByte memory is filled is 1092 days
Data to Transmit Settings	
Histogram Data sampling interval	60 seconds
Dive Maximum Depth (m),	15, 25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 500,

14 bins	1000, >1000
Dive Duration (sec), 12 bins	300, 600, 900, 1200, 1800, 2400, 3000, 3600, 5400, 7200, 9000, >9000
Time-at-Temperature (C), 14 bins	4, 8, 12, 16, 20, 22, 23, 24, 25, 26, 27, 28, 29, >29
Time-at-Depth (m), 14 bins	15, 25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 500, 1000, >1000
Hourly % time-line	Enabled
Histogram Collection	
Hours of data summarized in each histogram	6
Histograms start at GMT	00:00
Dive & Timeline Definition	
Depth reading to determine start and end of dive	15m
Ignore dives shallower than	2m
Depth threshold for timelines	10m
Haulout Definition	
A minute is "dry" if Wet/Dry sensor is dry for any ***value*** seconds in a minute	60
Enter haulout state after ***value*** consecutive dry minutes	120
Exit haulout state if wet for any ***value*** seconds in a minute	5
Transmission Control	
Transmit data collected over these last days	2
Pause transmissions if haulout exceeds	12 hours
Transmit every eighth day if transmissions are paused	Enabled
When to Transmit Settings	
Transmit for the first 24 hours regardless of settings	Enabled

below	
Transmit hours	0 - 23
Transmit days	
January	1 - 31
February	1 - 28
March	1 - 31
April	1 - 30
May	1 - 31
June	1 - 30
July	1 - 31
August	1 - 31
September	1 - 30
October	1 - 31
November	1 - 30
December	1 - 31
Daily Transmit Allowance	
January	500 [Accumulate, Optimize for battery life]
February	500 [Accumulate, Optimize for battery life]
March	500 [Accumulate, Optimize for battery life]
April	500 [Accumulate, Optimize for battery life]
May	500 [Accumulate, Optimize for battery life]
June	500 [Accumulate, Optimize for battery life]
July	500 [Accumulate, Optimize for battery life]
August	500 [Accumulate, Optimize for battery life]
September	500 [Accumulate, Optimize for battery life]
October	500 [Accumulate, Optimize for battery life]
November	500 [Accumulate, Optimize for battery life]
December	500 [Accumulate, Optimize for battery life]
Channel Settings	
Depth	Channel: 0; Range: -40m to 1000m; Resolution: 0.5m
Correction factors	0.0e0, 0.0, 0.0 0.0e0, 0.0, 0.0 0.0e0, 0.0, 0.0
Errors	None
Compensation factors	-1.512e-8, 4.937e-5, -0.0754, 56.75
Errors	None
Temperature	Channel: 1; Range: -40C to 60C; Resolution: 0.05C

Correction factors	-9.719e-4, 1.0427, -0.11 0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0
Errors	None
Light Level	Channel: 2; Range: 0 to 0; Resolution: 0.25
Correction factors	0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0
Errors	None
Compensation factors	0.0e0, 0.0e0, 0.0, 0.
Errors	None
Battery Voltage	Channel: 6; Range: 0V to 0V; Resolution: 0.0049V
Correction factors	0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0
Errors	None
Wet/Dry Sensor	Channel: 7; Range: 0 to 255; Resolution: 1
Correction factors	0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0
Errors	None

Messages:

SPLASH PTT ID 57210

Host Settings	
SplashHost version	1.00.0017
User Name	Bstewart
Time And Date Settings	
PC Date	01 May 2005 at 16:39:48
Tag Date	01 May 2005 at 23:37:26
General Settings	
Tag's Serial Number	04L0138
Password	SPLASH
User's Identifier	SUE
Argos Ptt number	57210 (49ACEAD Hex) Uplink / LUT id: 4715:173
Repitition Intervals	43s (at-sea); 88s (haulout)
Tagware version	1.00h
Hardware version	
Owner	John Stevens / Barry Bruce CSIRO Marine Research Castray Esplanade Hobart, Tasmania 7000 Australia Tel: 03 6232 5222
Data to Archive Settings	
Depth	60 seconds
Temperature	60 seconds
Light Level	60 seconds
Battery Voltage	60 seconds
Wet/Dry Sensor	60 seconds
Sampling Mode	Archive samples when tag is wet or dry
Wet/Dry Threshold	Dynamic
Stabilization Time	3ms
Sampling Duration	Time till 15 MByte memory is filled is 1092 days
Data to Transmit Settings	
Histogram Data sampling	60 seconds

interval	
Dive Maximum Depth (m), 14 bins	15, 25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 500, 1000, >1000
Dive Duration (sec), 12 bins	300, 600, 900, 1200, 1800, 2400, 3000, 3600, 5400, 7200, 9000, >9000
Time-at-Temperature (C), 14 bins	4, 8, 12, 16, 20, 22, 23, 24, 25, 26, 27, 28, 29, >29
Time-at-Depth (m), 14 bins	15, 25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 500, 1000, >1000
Hourly % time-line	Enabled
Histogram Collection	
Hours of data summarized in each histogram	6
Histograms start at GMT	00:00
Dive & Timeline Definition	
Depth reading to determine start and end of dive	15m
Ignore dives shallower than	2m
Depth threshold for timelines	10m
Haulout Definition	
A minute is "dry" if Wet/Dry sensor is dry for any ***value*** seconds in a minute	60
Enter haulout state after ***value*** consecutive dry minutes	120
Exit haulout state if wet for any ***value*** seconds in a minute	5
Transmission Control	
Transmit data collected over these last days	2
Pause transmissions if haulout exceeds	12 hours
Transmit every eighth day if transmissions are paused	Enabled
When to Transmit Settings	

Transmit for the first 24 hours regardless of settings below	Enabled
Transmit hours	0 - 23
Transmit days	
January	1 - 31
February	1 - 28
March	1 - 31
April	1 - 30
May	1 - 31
June	1 - 30
July	1 - 31
August	1 - 31
September	1 - 30
October	1 - 31
November	1 - 30
December	1 - 31
Daily Transmit Allowance	
January	500 [Accumulate, Optimize for battery life]
February	500 [Accumulate, Optimize for battery life]
March	500 [Accumulate, Optimize for battery life]
April	500 [Accumulate, Optimize for battery life]
May	500 [Accumulate, Optimize for battery life]
June	500 [Accumulate, Optimize for battery life]
July	500 [Accumulate, Optimize for battery life]
August	500 [Accumulate, Optimize for battery life]
September	500 [Accumulate, Optimize for battery life]
October	500 [Accumulate, Optimize for battery life]
November	500 [Accumulate, Optimize for battery life]
December	500 [Accumulate, Optimize for battery life]
Channel Settings	
Depth	Channel: 0; Range: -40m to 1000m; Resolution: 0.5m
Correction factors	0.0e0, 0.0, 0.0 0.0e0, 0.0, 0.0 0.0e0, 0.0, 0.0
Errors	None
Compensation factors	1.729e-8, -6.727e-5, 0.0649, -0.36

Errors	None
Temperature	Channel: 1; Range: -40C to 60C; Resolution: 0.05C
Correction factors	-1.014e-3, 1.0454, -0.147 0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0
Errors	None
Light Level	Channel: 2; Range: 0 to 0; Resolution: 0.25
Correction factors	0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0
Errors	None
Compensation factors	0.0e0, 0.0e0, 0.0, 0.
Errors	None
Battery Voltage	Channel: 6; Range: 0V to 0V; Resolution: 0.0049V
Correction factors	0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0
Errors	None
Wet/Dry Sensor	Channel: 7; Range: 0 to 255; Resolution: 1
Correction factors	0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0
Errors	None

Messages:

SPLASH PTT ID 57211

Host Settings	
SplashHost version	1.00.0017
User Name	Bstewart
Time And Date Settings	
PC Date	28 Apr 2005 at 02:34:27
Tag Date	28 Apr 2005 at 09:32:15
General Settings	
Tag's Serial Number	04L0146
Password	SPLASH
User's Identifier	HUE
Argos Ptt number	57211 (49ACEBE Hex) Uplink / LUT id: 4715:190
Repitition Intervals	44s (at-sea); 89s (haulout)
Tagware version	1.00h
Hardware version	
Owner	John Stevens / Barry Bruce CSIRO Marine Research Castray Esplanade Hobart, Tasmania 7000 Australia Tel: 03 6232 5222
Data to Archive Settings	
Depth	60 seconds
Temperature	60 seconds
Light Level	60 seconds
Battery Voltage	60 seconds
Wet/Dry Sensor	60 seconds
Sampling Mode	Archive samples when tag is wet or dry
Wet/Dry Threshold	Dynamic
Stabilization Time	3ms
Sampling Duration	Time till 15 MByte memory is filled is 1092 days
Data to Transmit Settings	
Histogram Data sampling interval	60 seconds

Dive Maximum Depth (m), 14 bins	15, 25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 500, 1000, >1000
Dive Duration (sec), 12 bins	300, 600, 900, 1200, 1800, 2400, 3000, 3600, 5400, 7200, 9000, >9000
Time-at-Temperature (C), 14 bins	4, 8, 12, 16, 20, 22, 23, 24, 25, 26, 27, 28, 29, >29
Time-at-Depth (m), 14 bins	15, 25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 500, 1000, >1000
Hourly % time-line	Enabled
Histogram Collection	
Hours of data summarized in each histogram	6
Histograms start at GMT	00:00
Dive & Timeline Definition	
Depth reading to determine start and end of dive	15m
Ignore dives shallower than	2m
Depth threshold for timelines	10m
Haulout Definition	
A minute is "dry" if Wet/Dry sensor is dry for any ***value*** seconds in a minute	60
Enter haulout state after ***value*** consecutive dry minutes	120
Exit haulout state if wet for any ***value*** seconds in a minute	5
Transmission Control	
Transmit data collected over these last days	2
Pause transmissions if haulout exceeds	12 hours
Transmit every eighth day if transmissions are paused	Enabled
When to Transmit Settings	
Transmit for the first 24	Enabled

hours regardless of settings below	
Transmit hours	0 - 23
Transmit days	
January	1 - 31
February	1 - 28
March	1 - 31
April	1 - 30
May	1 - 31
June	1 - 30
July	1 - 31
August	1 - 31
September	1 - 30
October	1 - 31
November	1 - 30
December	1 - 31
Daily Transmit Allowance	
January	500 [Accumulate, Optimize for battery life]
February	500 [Accumulate, Optimize for battery life]
March	500 [Accumulate, Optimize for battery life]
April	500 [Accumulate, Optimize for battery life]
May	500 [Accumulate, Optimize for battery life]
June	500 [Accumulate, Optimize for battery life]
July	500 [Accumulate, Optimize for battery life]
August	500 [Accumulate, Optimize for battery life]
September	500 [Accumulate, Optimize for battery life]
October	500 [Accumulate, Optimize for battery life]
November	500 [Accumulate, Optimize for battery life]
December	500 [Accumulate, Optimize for battery life]
Channel Settings	
Depth	Channel: 0; Range: -40m to 1000m; Resolution: 0.5m
Correction factors	0.0e0, 1.0, -208.0 -1.713e-6, 0.8599, 15.51 0.0e0, 1.0, 0.0
Errors	None
Compensation factors	-4.639e-9, 3.488e-6, 0.0033, 12.53
Errors	None

Temperature	Channel: 1; Range: -40C to 60C; Resolution: 0.05C
Correction factors	-9.761e-4, 1.0432, -0.136 0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0
Errors	None
Light Level	Channel: 2; Range: 0 to 256; Resolution: 0.25
Correction factors	0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0
Errors	None
Compensation factors	0.0e0, 0.0e0, 0.0, 0.
Errors	None
Battery Voltage	Channel: 6; Range: 0V to 5V; Resolution: 0.0049V
Correction factors	0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0
Errors	None
Wet/Dry Sensor	Channel: 7; Range: 0 to 255; Resolution: 1
Correction factors	0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0
Errors	None

Messages:

SPLASH PTT ID 57212

Host Settings	
SplashHost version	1.00.0017
User Name	Bstewart
Time And Date Settings	
PC Date	01 May 2005 at 16:20:55
Tag Date	01 May 2005 at 23:19:57
General Settings	
Tag's Serial Number	04L0140
Password	SPLASH
User's Identifier	...
Argos Ptt number	57212 (49ACEC7 Hex) Uplink / LUT id: 4715:199
Repitition Intervals	45s (at-sea); 90s (haulout)
Tagware version	1.00h
Hardware version	
Owner	John Stevens / Barry Bruce CSIRO Marine Research Castray Esplanade Hobart, Tasmania 7000 Australia Tel: 03 6232 5222
Data to Archive Settings	
Depth	60 seconds
Temperature	60 seconds
Light Level	60 seconds
Battery Voltage	60 seconds
Wet/Dry Sensor	60 seconds
Sampling Mode	Archive samples when tag is wet or dry
Wet/Dry Threshold	Dynamic
Stabilization Time	3ms
Sampling Duration	Time till 15 MByte memory is filled is 1092 days
Data to Transmit Settings	
Histogram Data sampling interval	60 seconds

Dive Maximum Depth (m), 14 bins	15, 25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 500, 1000, >1000
Dive Duration (sec), 12 bins	300, 600, 900, 1200, 1800, 2400, 3000, 3600, 5400, 7200, 9000, >9000
Time-at-Temperature (C), 14 bins	4, 8, 12, 16, 20, 22, 23, 24, 25, 26, 27, 28, 29, >29
Time-at-Depth (m), 14 bins	15, 25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 500, 1000, >1000
Hourly % time-line	Enabled
Histogram Collection	
Hours of data summarized in each histogram	6
Histograms start at GMT	00:00
Dive & Timeline Definition	
Depth reading to determine start and end of dive	15m
Ignore dives shallower than	2m
Depth threshold for timelines	10m
Haulout Definition	
A minute is "dry" if Wet/Dry sensor is dry for any ***value*** seconds in a minute	60
Enter haulout state after ***value*** consecutive dry minutes	120
Exit haulout state if wet for any ***value*** seconds in a minute	5
Transmission Control	
Transmit data collected over these last days	2
Pause transmissions if haulout exceeds	12 hours
Transmit every eighth day if transmissions are paused	Enabled
When to Transmit Settings	
Transmit for the first 24	Enabled

hours regardless of settings below	
Transmit hours	0 - 23
Transmit days	
January	1 - 31
February	1 - 28
March	1 - 31
April	1 - 30
May	1 - 31
June	1 - 30
July	1 - 31
August	1 - 31
September	1 - 30
October	1 - 31
November	1 - 30
December	1 - 31
Daily Transmit Allowance	
January	500 [Accumulate, Optimize for battery life]
February	500 [Accumulate, Optimize for battery life]
March	500 [Accumulate, Optimize for battery life]
April	500 [Accumulate, Optimize for battery life]
May	500 [Accumulate, Optimize for battery life]
June	500 [Accumulate, Optimize for battery life]
July	500 [Accumulate, Optimize for battery life]
August	500 [Accumulate, Optimize for battery life]
September	500 [Accumulate, Optimize for battery life]
October	500 [Accumulate, Optimize for battery life]
November	500 [Accumulate, Optimize for battery life]
December	500 [Accumulate, Optimize for battery life]
Channel Settings	
Depth	Channel: 0; Range: -40m to 1000m; Resolution: 0.5m
Correction factors	0.0e0, 1.0, -200.0 -1.593e-7, 0.931, 60.63 0.0e0, 1.0, 0.0
Errors	None
Compensation factors	7.152e-9, -3.079e-5, 0.0419, 25.94
Errors	None

Temperature	Channel: 1; Range: -40C to 60C; Resolution: 0.05C
Correction factors	-9.873e-4, 1.0439, -0.157 0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0
Errors	None
Light Level	Channel: 2; Range: 0 to 256; Resolution: 0.25
Correction factors	0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0
Errors	None
Compensation factors	0.0e0, 0.0e0, 0.0, 0.
Errors	None
Battery Voltage	Channel: 6; Range: 0V to 5V; Resolution: 0.0049V
Correction factors	0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0
Errors	None
Wet/Dry Sensor	Channel: 7; Range: 0 to 255; Resolution: 1
Correction factors	0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0
Errors	None

Messages:

SPLASH PTT ID 57213

Host Settings	
SplashHost version	1.00.0017
User Name	Bstewart
Time And Date Settings	
PC Date	05 May 2005 at 16:19:57
Tag Date	05 May 2005 at 23:17:28
General Settings	
Tag's Serial Number	04L0141
Password	SPLASH
User's Identifier	Henry
Argos Ptt number	57213 (49ACED4 Hex) Uplink / LUT id: 4715:212
Repitition Intervals	46s (at-sea); 91s (haulout)
Tagware version	1.00h
Hardware version	
Owner	John Stevens / Barry Bruce CSIRO Marine Research Castray Esplanade Hobart, Tasmania 7000 Australia Tel: 03 6232 5222
Data to Archive Settings	
Depth	60 seconds
Temperature	60 seconds
Light Level	60 seconds
Battery Voltage	60 seconds
Wet/Dry Sensor	60 seconds
Sampling Mode	Archive samples when tag is wet or dry
Wet/Dry Threshold	Dynamic
Stabilization Time	3ms
Sampling Duration	Time till 15 MByte memory is filled is 1092 days
Data to Transmit Settings	
Histogram Data sampling interval	60 seconds

Dive Maximum Depth (m), 14 bins	15, 25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 500, 1000, >1000
Dive Duration (sec), 12 bins	300, 600, 900, 1200, 1800, 2400, 3000, 3600, 5400, 7200, 9000, >9000
Time-at-Temperature (C), 14 bins	4, 8, 12, 16, 20, 22, 23, 24, 25, 26, 27, 28, 29, >29
Time-at-Depth (m), 14 bins	15, 25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 500, 1000, >1000
Hourly % time-line	Enabled
Histogram Collection	
Hours of data summarized in each histogram	6
Histograms start at GMT	00:00
Dive & Timeline Definition	
Depth reading to determine start and end of dive	15m
Ignore dives shallower than	2m
Depth threshold for timelines	10m
Haulout Definition	
A minute is "dry" if Wet/Dry sensor is dry for any ***value*** seconds in a minute	60
Enter haulout state after ***value*** consecutive dry minutes	120
Exit haulout state if wet for any ***value*** seconds in a minute	5
Transmission Control	
Transmit data collected over these last days	2
Pause transmissions if haulout exceeds	12 hours
Transmit every eighth day if transmissions are paused	Enabled
When to Transmit Settings	
Transmit for the first 24	Enabled

hours regardless of settings below	
Transmit hours	0 - 23
Transmit days	
January	1 - 31
February	1 - 28
March	1 - 31
April	1 - 30
May	1 - 31
June	1 - 30
July	1 - 31
August	1 - 31
September	1 - 30
October	1 - 31
November	1 - 30
December	1 - 31
Daily Transmit Allowance	
January	500 [Accumulate, Optimize for battery life]
February	500 [Accumulate, Optimize for battery life]
March	500 [Accumulate, Optimize for battery life]
April	500 [Accumulate, Optimize for battery life]
May	500 [Accumulate, Optimize for battery life]
June	500 [Accumulate, Optimize for battery life]
July	500 [Accumulate, Optimize for battery life]
August	500 [Accumulate, Optimize for battery life]
September	500 [Accumulate, Optimize for battery life]
October	500 [Accumulate, Optimize for battery life]
November	500 [Accumulate, Optimize for battery life]
December	500 [Accumulate, Optimize for battery life]
Channel Settings	
Depth	Channel: 0; Range: -40m to 1000m; Resolution: 0.5m
Correction factors	0.0e0, 1.0, -156.0 3.44e-6, 0.8818, 9.867 0.0e0, 1.0, 0.0
Errors	None
Compensation factors	-6.535e-9, 4.53e-6, 0.0284, -15.44
Errors	None

Temperature	Channel: 1; Range: -40C to 60C; Resolution: 0.05C
Correction factors	-9.476e-4, 1.042, -0.158 0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0
Errors	None
Light Level	Channel: 2; Range: 0 to 256; Resolution: 0.25
Correction factors	0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0
Errors	None
Compensation factors	0.0e0, 0.0e0, 0.0, 0.
Errors	None
Battery Voltage	Channel: 6; Range: 0V to 5V; Resolution: 0.0049V
Correction factors	0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0
Errors	None
Wet/Dry Sensor	Channel: 7; Range: 0 to 255; Resolution: 1
Correction factors	0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0
Errors	None

Messages:

SPLASH PTT ID 57214

Host Settings	
SplashHost version	1.00.0017
User Name	Bstewart
Time And Date Settings	
PC Date	01 May 2005 at 16:08:08
Tag Date	01 May 2005 at 23:07:05
General Settings	
Tag's Serial Number	04L0142
Password	SPLASH
User's Identifier	...
Argos Ptt number	57214 (49ACEE1 Hex) Uplink / LUT id: 4715:225
Repitition Intervals	47s (at-sea); 92s (haulout)
Tagware version	1.00h
Hardware version	
Owner	John Stevens / Barry Bruce CSIRO Marine Research Castray Esplanade Hobart, Tasmania 7000 Australia Tel: 03 6232 5222
Data to Archive Settings	
Depth	60 seconds
Temperature	60 seconds
Light Level	60 seconds
Battery Voltage	60 seconds
Wet/Dry Sensor	60 seconds
Sampling Mode	Archive samples when tag is wet or dry
Wet/Dry Threshold	Dynamic
Stabilization Time	3ms
Sampling Duration	Time till 15 MByte memory is filled is 1092 days
Data to Transmit Settings	
Histogram Data sampling interval	60 seconds

Dive Maximum Depth (m), 14 bins	15, 25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 500, 1000, >1000
Dive Duration (sec), 12 bins	300, 600, 900, 1200, 1800, 2400, 3000, 3600, 5400, 7200, 9000, >9000
Time-at-Temperature (C), 14 bins	4, 8, 12, 16, 20, 22, 23, 24, 25, 26, 27, 28, 29, >29
Time-at-Depth (m), 14 bins	15, 25, 50, 75, 100, 125, 150, 175, 200, 250, 300, 500, 1000, >1000
Hourly % time-line	Enabled
Histogram Collection	
Hours of data summarized in each histogram	6
Histograms start at GMT	00:00
Dive & Timeline Definition	
Depth reading to determine start and end of dive	15m
Ignore dives shallower than	2m
Depth threshold for timelines	10m
Haulout Definition	
A minute is "dry" if Wet/Dry sensor is dry for any ***value*** seconds in a minute	60
Enter haulout state after ***value*** consecutive dry minutes	120
Exit haulout state if wet for any ***value*** seconds in a minute	5
Transmission Control	
Transmit data collected over these last days	2
Pause transmissions if haulout exceeds	12 hours
Transmit every eighth day if transmissions are paused	Enabled
When to Transmit Settings	
Transmit for the first 24	Enabled

hours regardless of settings below	
Transmit hours	0 - 23
Transmit days	
January	1 - 31
February	1 - 28
March	1 - 31
April	1 - 30
May	1 - 31
June	1 - 30
July	1 - 31
August	1 - 31
September	1 - 30
October	1 - 31
November	1 - 30
December	1 - 31
Daily Transmit Allowance	
January	500 [Accumulate, Optimize for battery life]
February	500 [Accumulate, Optimize for battery life]
March	500 [Accumulate, Optimize for battery life]
April	500 [Accumulate, Optimize for battery life]
May	500 [Accumulate, Optimize for battery life]
June	500 [Accumulate, Optimize for battery life]
July	500 [Accumulate, Optimize for battery life]
August	500 [Accumulate, Optimize for battery life]
September	500 [Accumulate, Optimize for battery life]
October	500 [Accumulate, Optimize for battery life]
November	500 [Accumulate, Optimize for battery life]
December	500 [Accumulate, Optimize for battery life]
Channel Settings	
Depth	Channel: 0; Range: -40m to 1000m; Resolution: 0.5m
Correction factors	0.0e0, 1.0, -200.0 -1.593e-7, 0.931, 60.63 0.0e0, 1.0, 0.0
Errors	None
Compensation factors	-8.643e-9, 1.98e-5, -0.0217, 16.59
Errors	None

Temperature	Channel: 1; Range: -40C to 60C; Resolution: 0.05C
Correction factors	-1.035e-3, 1.0463, -0.194 0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0
Errors	None
Light Level	Channel: 2; Range: 0 to 256; Resolution: 0.25
Correction factors	0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0
Errors	None
Compensation factors	0.0e0, 0.0e0, 0.0, 0.
Errors	None
Battery Voltage	Channel: 6; Range: 0V to 5V; Resolution: 0.0049V
Correction factors	0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0
Errors	None
Wet/Dry Sensor	Channel: 7; Range: 0 to 255; Resolution: 1
Correction factors	0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0 0.0e0, 1.0, 0.0
Errors	None

Messages: