



# Data from the Whale Sharks at Ningaloo

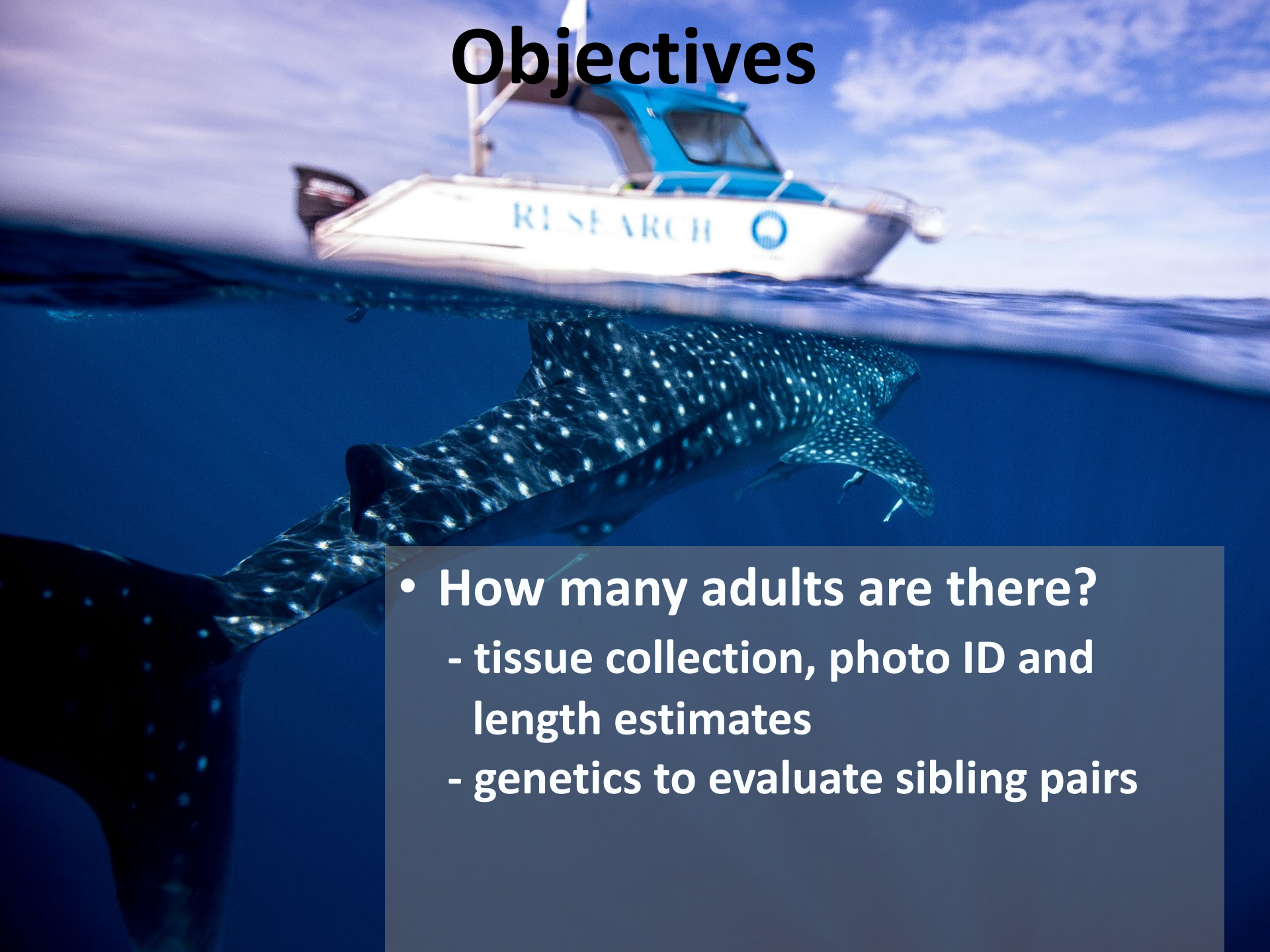
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ENVIRONMENT  
[www.csiro.au](http://www.csiro.au)

*Ningaloo Outlook is a Woodside -CSIRO Industry-Science Marine Research Partnership investing A\$7.5 million over five years to gather new knowledge on the Ningaloo reef and its important ecological values*



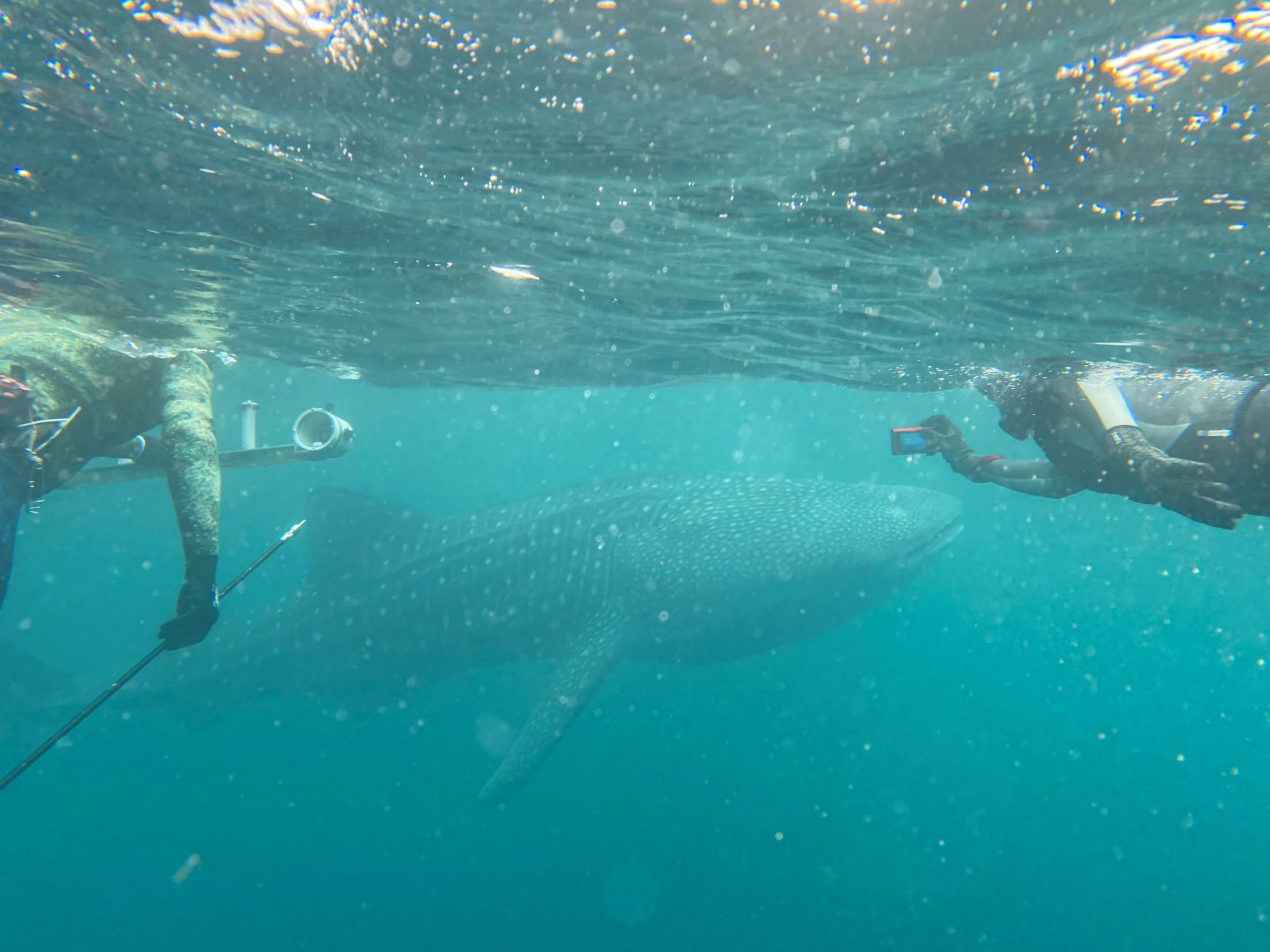
# Objectives

- 
- A composite image showing a research boat on the surface of the ocean and a whale shark swimming underwater. The boat is white with a blue stripe and has the word "RESEARCH" and a logo on its side. The whale shark is large and spotted, swimming in the deep blue water.
- **How many adults are there?**
    - tissue collection, photo ID and length estimates
    - genetics to evaluate sibling pairs

# Information collected

- Photograph of left and right side flank for identification of individuals
- Stereo video of entire shark to determine length of individual
- Biopsy sample for genetic analysis

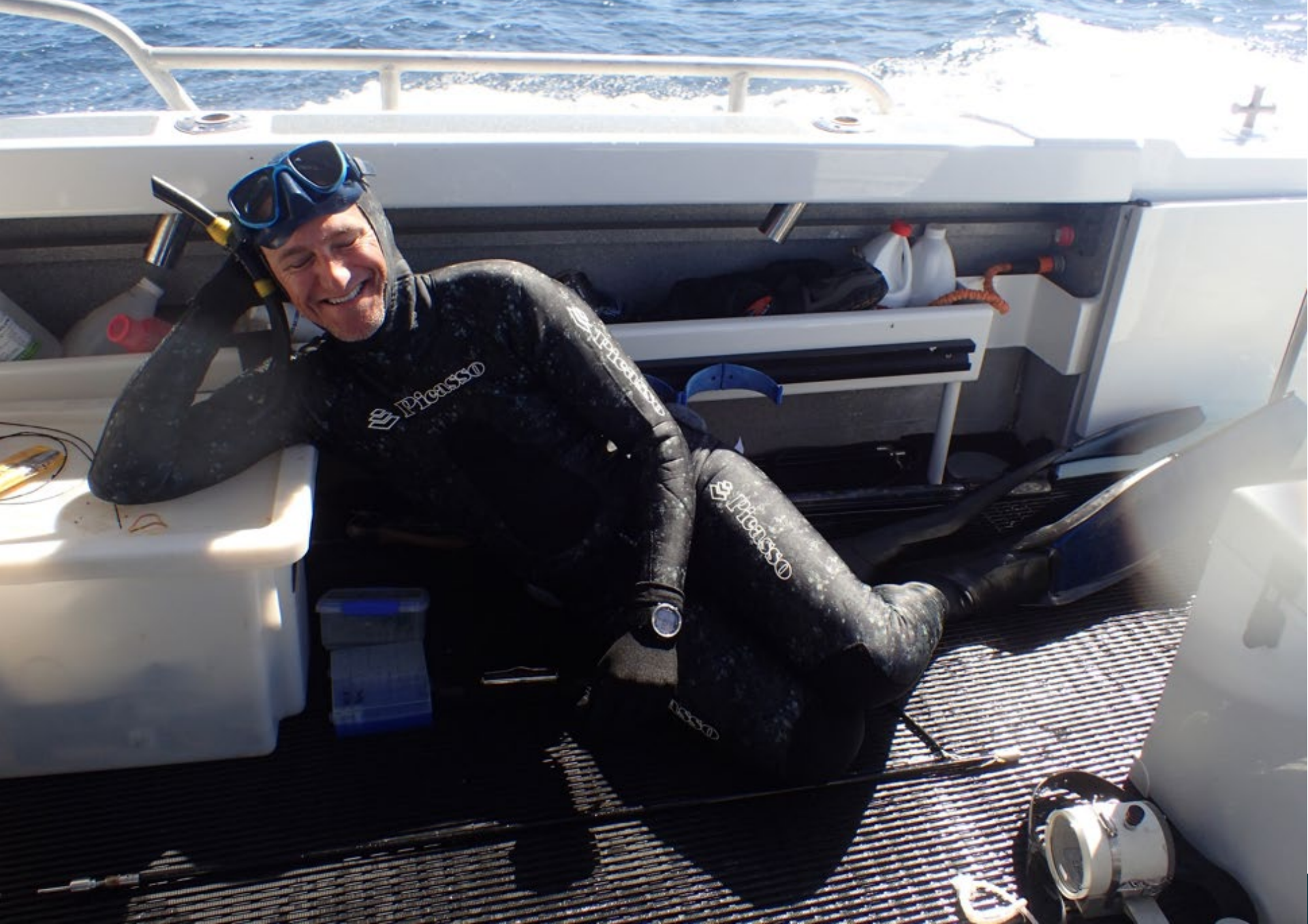
We now have this data each year from 2017-2023 (excluding 2020).



# Observations 2015 - 2023

<b>Data source</b>	<b>Number</b>
Flank photographs (identification)	589
DOV video footage (lengths)	583
Biopsy samples (genetics)	582
Tagged (satellite or acoustic)	56





# Photographic identification

The spot pattern on each whale shark is unique, like a fingerprint





# Photographic identification

Step 1: take photograph of left and right flank of whale shark



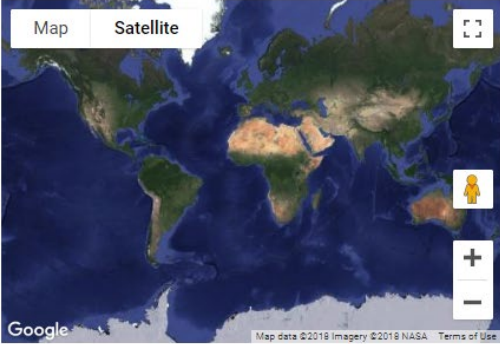
# Photographic identification

## Step 2: upload metadata and images to Wildbook for Sharks database

Water depth: Unknown  
Report an encounter ▾ Learn ▾ Participate ▾ Individuals ▾ Encounters ▾ Search ▾ Contact Us ▾ Administer ▾

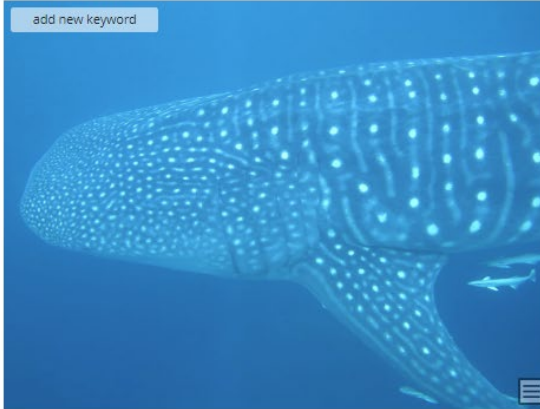
Note: If you zoom in too quickly, Google Maps may claim that it does not have the needed maps. Zoom back out, wait a few seconds to allow maps to load in the background, and then zoom in again.

Map Satellite

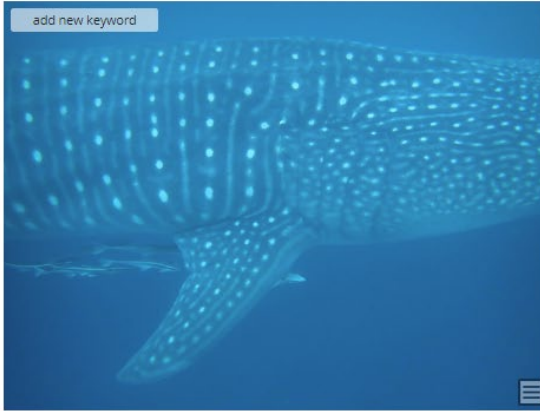


Google Map data ©2018 Imagery ©2018 NASA Terms of Use

add new keyword



add new keyword



**Identity** Edit

Identified as: A-356

Matched by: Pattern match

Alternate ID:

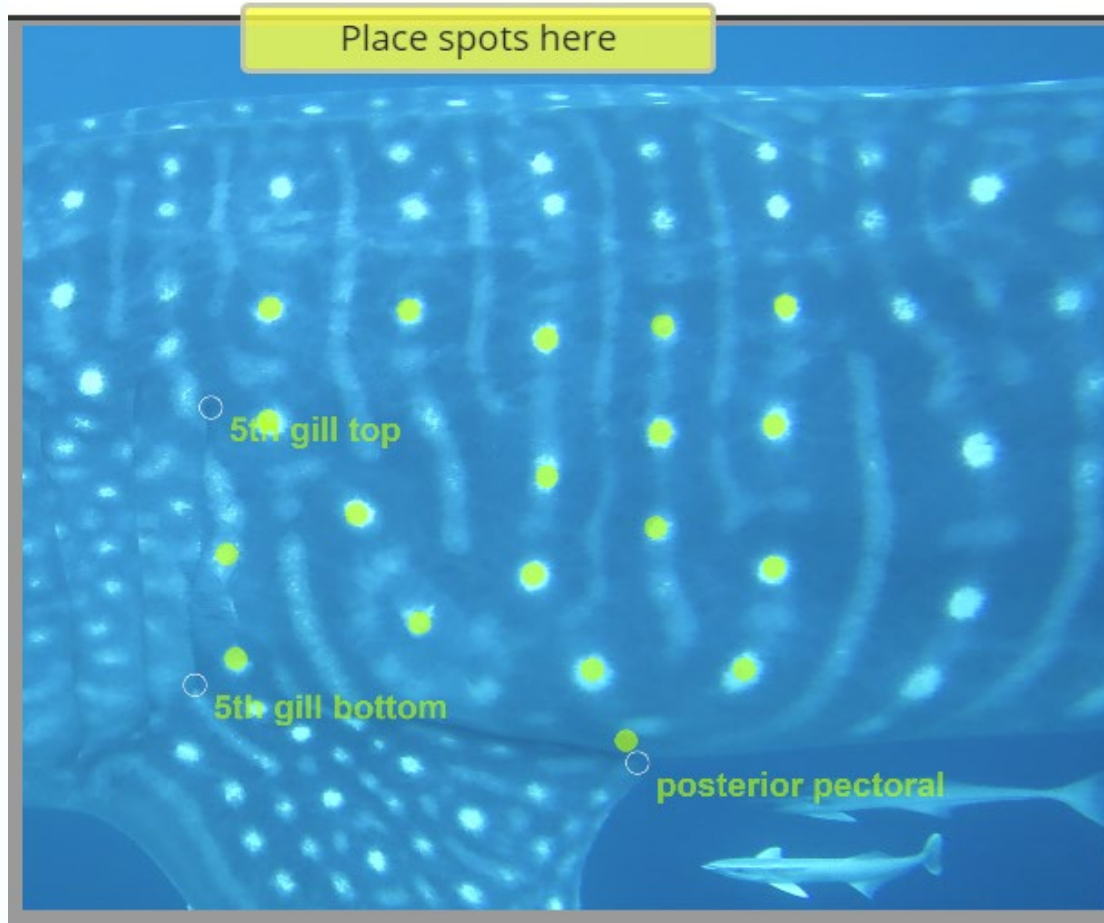
Occurrence ID: None assigned.

**Contact Information** Edit

Submitters

# Photographic identification

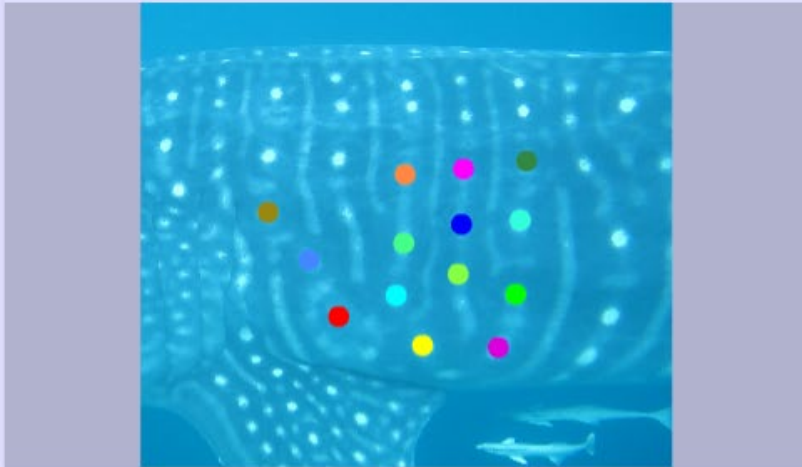
Step 3: on each flank image, locate reference points (3), spots and then start scanner



# Photographic identification

Step 4: using the Groth Algorithm, find potential match in database

Match Score: **234.78** (Match 1 of 301)



Number = **83b48078-1ae6-4610-82c7-9cf01314d8ee**  
Date = 2018-06-10  
Sex = unknown  
Assigned to =  
Size = unknown  
Location = Ningaloo  
Location ID = 1a



Number = **329050a9-dd62-4fe3-bbcc-0e90cc395bb2**  
Date = 2013-06-18 11:52  
Sex = male  
Assigned to = A-356  
Size =  
Location = North Ningaloo  
Location ID = 1a1

# Calculating length

- Diver Operated Video (DOV)
  - Calibrated stereo pair of cameras
- EventMeasure (SeaGIS software)



# Calculating length

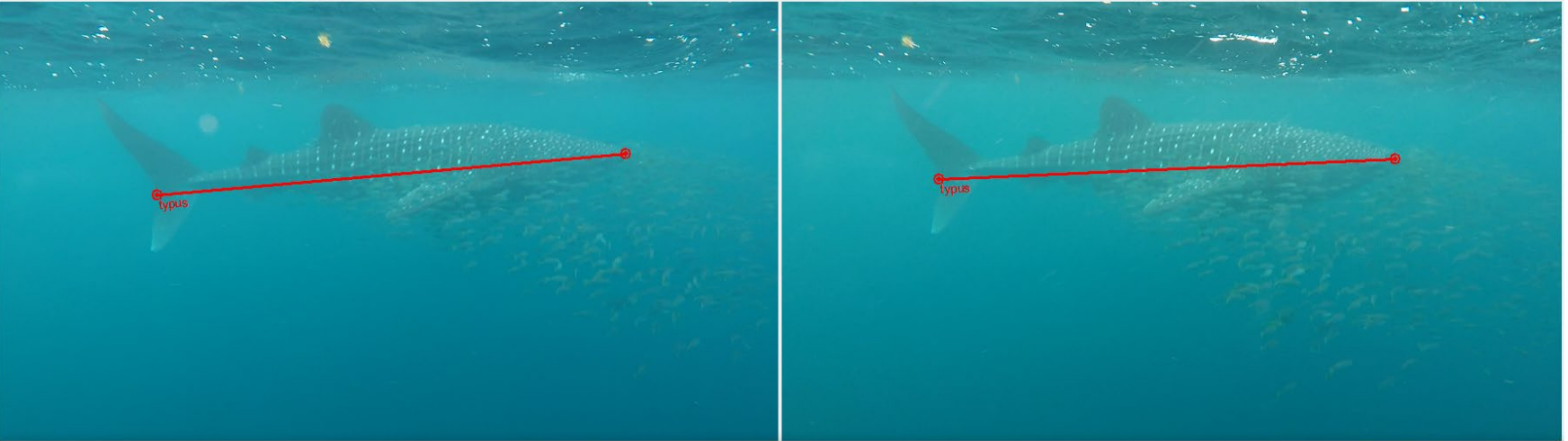
Accurate lengths can be recorded.

EM EventMeasure : WS22-032.EMObs : WS22-032\_Left\_GOPR2579.MP4 : WS22-032\_Right\_GOPR5721.MP4

Program Picture Measurement Stereo About

Zoom 4 ◀ ▶ 1 Frames Toggle view

Play movie ◀ ▶ Lock Frame 4220 ( 1.4067 mins) Play movie ◀ ▶ Frame 4097



Data

Data view 3D Measurements

Family	Genus	Species	Code	Number	Stage	Activity	LengthTyp	PotentialError	ErrorType	Filename	Frame	Time (mins)	Period	Period time (mins)	Length (mm)	X (mm)	Y (mm)
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	FL			WS22-032_Left_GOPR2579.MP4	4220	1.4067			4285.690	-182.652	439.349
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	FL			WS22-032_Left_GOPR2579.MP4	4244	1.4147			4328.612	137.565	283.252
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	FL			WS22-032_Left_GOPR2579.MP4	4399	1.4663			4307.672	10.885	382.267
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	FL			WS22-032_Left_GOPR2579.MP4	4408	1.4693			4253.393	-69.173	-46.728
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	FL			WS22-032_Left_GOPR2579.MP4	4505	1.5017			4214.697	-451.022	193.257
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	L1			WS22-032_Left_GOPR2579.MP4	4244	1.4147			2343.862	1190.160	532.628
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	L1			WS22-032_Left_GOPR2579.MP4	4399	1.4663			2284.828	1164.634	598.880
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	L1			WS22-032_Left_GOPR2579.MP4	4408	1.4693			2302.065	1057.860	141.272
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	L1			WS22-032_Left_GOPR2579.MP4	4505	1.5017			2286.825	599.918	475.784
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	L1			WS22-032_Left_GOPR2579.MP4	7072	2.3573			2339.609	596.002	1529.7..

# Calculating length

More difficult for large individuals as the shark needs to be further away from the camera to entirely fit in the field of view.

Zoom 4 | 1 Frames | Toggle view

Play movie | Lock Frame 3116 ( 1.0387 mins) | Play movie | Frame 3234

Data

Data view 3D Measurements

Family	Genus	Species	Code	Number	Stage	Activity	LengthType	PotentialError	ErrorType	Filename	Frame	Time (mins)	Period	Period time (mins)	Length (mm)	X (mm)	Y (mm)
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	FL			WS22-025_Left_GOPR2563.MP4	3116	1.0387			7427.940	-605.937	6.366
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	FL			WS22-025_Left_GOPR2563.MP4	7371	2.4570			8093.615	1003.851	45.690
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	FL			WS22-025_Left_GOPR2563.MP4	7383	2.4610			7878.094	878.692	367.448
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	FL			WS22-025_Left_GOPR2563.MP4	7402	2.4673			7897.173	958.218	503.568
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	FL			WS22-025_Left_GOPR2563.MP4	7408	2.4693			8063.944	1207.398	647.403
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	L1			WS22-025_Left_GOPR2563.MP4	3777	1.2590			3920.610	162.186	711.993
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	L1			WS22-025_Left_GOPR2563.MP4	3783	1.2610			3951.124	178.715	839.143
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	L1			WS22-025_Left_GOPR2563.MP4	3796	1.2653			3969.806	268.873	779.017
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	L1			WS22-025_Left_GOPR2563.MP4	3819	1.2730			3958.038	274.248	492.801
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	L2			WS22-025_Left_GOPR2563.MP4	3819	1.2730			4705.764	-108.665	408.306

# Potential alternative length measurements

EM EventMeasure : WS22-004.EMObs : WS22-004\_Left\_GOPR2529.MP4 : WS22-004\_Right\_GOPR5683.MP4

Program Picture Measurement Stereo About

Zoom 4 ◀ ▶ 1 Frames ◻ Toggle view

Play movie ◀ ▶  Lock Frame 2860 ( 0.9533 mins)

Play movie ◀ ▶ Frame 2738

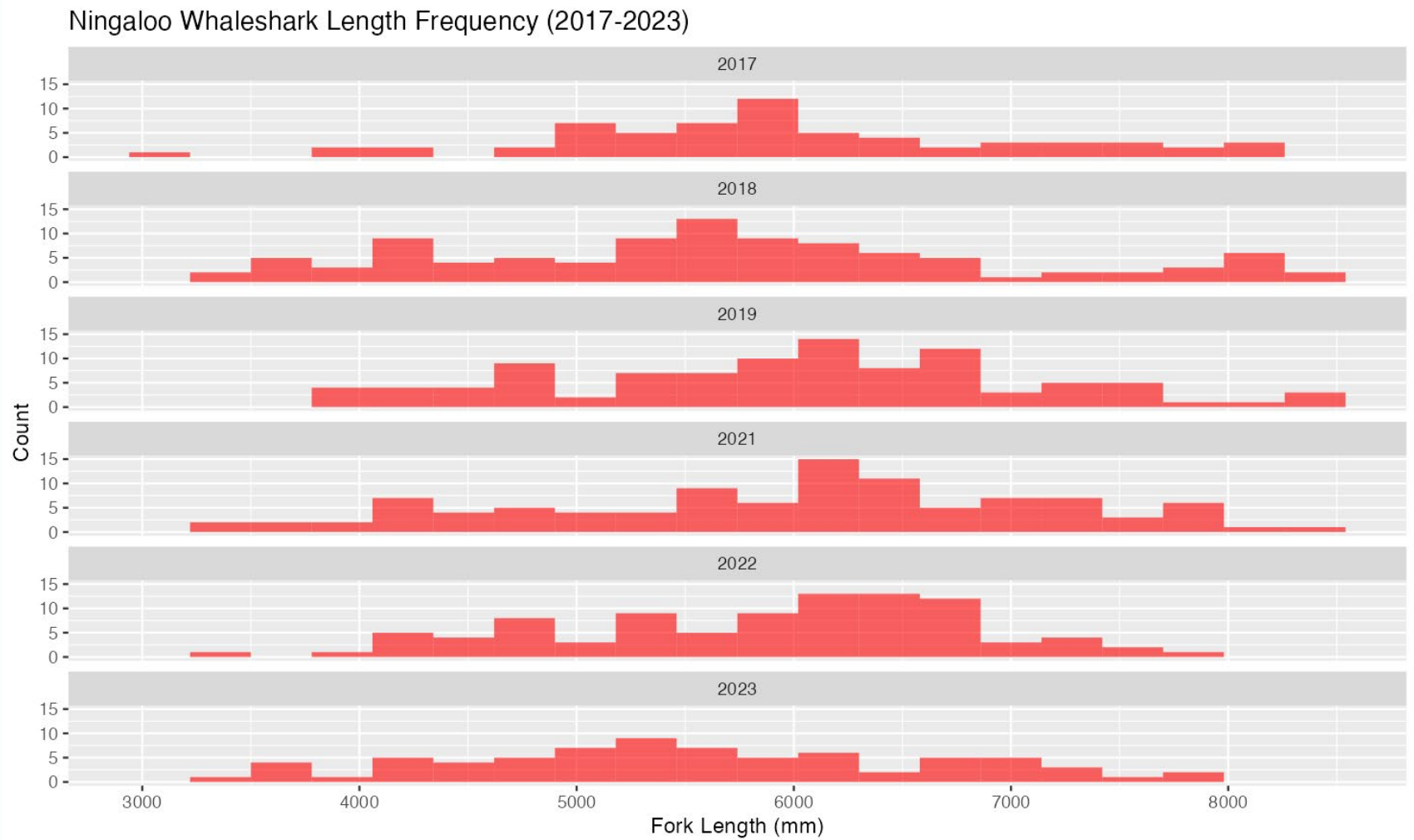
Data

Data view 3D Measurements

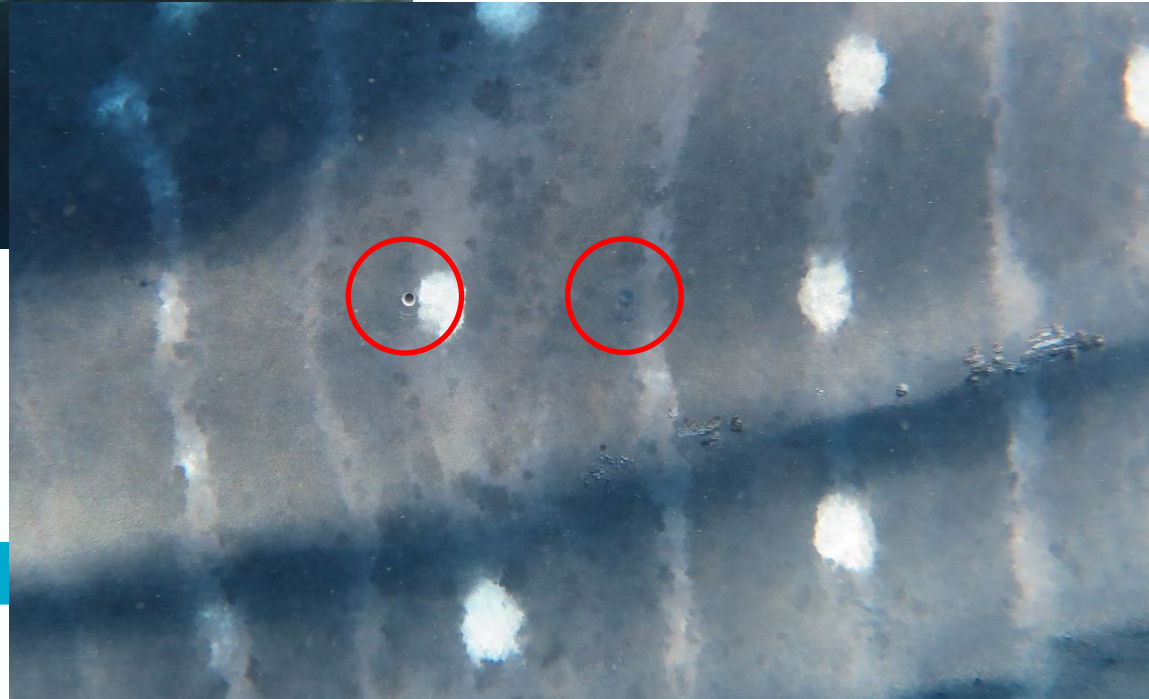
Family	Genus	Species	Code	Number	Stage	Activity	LengthType	PotentialError	ErrorType	Filename	Frame	Time (mins)	Period	Period time (mins)	Length (mm)	X (mm)	Y (mm)
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	L3			WS22-004_Left_GOPR2529.MP4	2573	0.8577			3314.742	-2375.890	374.905
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	FL			WS22-004_Left_GOPR2529.MP4	2822	0.9407			6523.564	-283.303	503.029
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	L1			WS22-004_Left_GOPR2529.MP4	2822	0.9407			3404.257	1289.921	855.581
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	L2			WS22-004_Left_GOPR2529.MP4	2822	0.9407			4034.635	965.512	770.648
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	L3			WS22-004_Left_GOPR2529.MP4	2822	0.9407			3253.735	-1917.459	851.703
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	L4			WS22-004_Left_GOPR2529.MP4	2822	0.9407			2594.025	-2240.071	765.097
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	FL			WS22-004_Left_GOPR2529.MP4	2860	0.9533			6624.483	-73.004	-535.64
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	L1			WS22-004_Left_GOPR2529.MP4	2860	0.9533			3484.542	1527.500	-167.16
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	L2			WS22-004_Left_GOPR2529.MP4	2860	0.9533			4086.959	1174.401	-255.81
Rhincodontidae	Rhincodon	typus	37014001	1	AD	Passing	L4			WS22-004_Left_GOPR2529.MP4	2860	0.9533			2709.377	-2081.857	-332.23



# Analysing length



# Tissue sampling, ID and length



# Observations 2015 - 2023

<b>Total encounters</b>	<b>644</b>
Individuals seen:	
- once	305
- two times	93
- three times	36
- four times	10
- five times	1
<b>Total no. of unique individuals</b>	<b>445</b>

# Acknowledgements



- Woodside – CSIRO Ningaloo Outlook Marine Research Partnership
- DBCA Exmouth Office – Gemma Francis, Dani Rob, Peter Barnes, Matt Smith, Joe Morgan, Sally-Ann Gudge
- AIMS Whale Shark team
- Ningaloo Aviation – Tiff



*We acknowledge the Baiyungu, Thalanyji and Yinikurtura People, the Traditional Owners and original custodians of the Ningaloo Coast and pay our respect to their elders past and present.*