



Whitsand and Looe Bay MCZ Side-scan Sonar Survey 2018

Survey Field Report for the 2018 Whitsand and Looe Bay MCZ
side-scan sonar survey

Completed by: Cornwall Inshore Fisheries and Conservation
Authority (Cornwall IFCA)

Authors: Colin Trundle, Kate Owen, Annie Jenkin, Steph Sturgeon
and Hilary Naylor

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Cornwall IFCA
Chi Gallos
Hayle Marine Renewables Business Park
North Quay
Hayle
Cornwall
TR27 4DD

Tel: 01736 336842 Email: enquiries@cornwall-ifca.gov.uk

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1 Project Background

Whitsand and Looe Bay Marine Conservation Zone (MCZ) is located in south-west England (directly to the East of Looe), on the south coast of Cornwall (Figure 1). The MCZ covers 52 km² and is 25 m at the deepest point. The MCZ consists of a variety of sand and sediment habitats, with seagrass beds in shallower water, likely to be an important habitat for fish species. Intertidal rock with diverse seaweed and invertebrate species is found at Hannafore and Looe Island, whilst shipwrecks and small areas of subtidal rocky reef in deeper water provide habitat for pink sea fans (*Eunicella verrucosa*) (Defra, 2013a). The full designated feature list for Whitsand and Looe Bay MCZ can be found in Table 1.

In 2017 Cornwall Inshore Fisheries and Conservation Authority (IFCA) consulted on a byelaw to prohibit the use of bottom towed fishing gear in the whole of the Whitsand and Looe Bay MCZ site. This byelaw was not confirmed by the Department for Environment, Food and Rural Affairs (DEFRA), who felt it went beyond what was required to protect the features of the site. Cornwall IFCA redrafted the byelaw, incorporating a zoned approach, permitting bottom towed gear to be used in an area where the impact to the features was felt to be minimal but ensuring the activity would not encroach on more sensitive habitats (Figure 2). During the informal consultation for the revised byelaw, there was a suggestion that the boundary line between the closed area and the area where bottom gear was allowed should be moved to the west, enlarging the zone where bottom towed gear could be used.

To confirm the location of the sensitive features and therefore the appropriateness of the proposed boundary, Cornwall IFCA carried out an acoustic survey along the proposed boundary line using side-scan sonar (SSS). An additional aim of the survey was to investigate the potential to incorporate the consultee suggested line into the revised byelaw

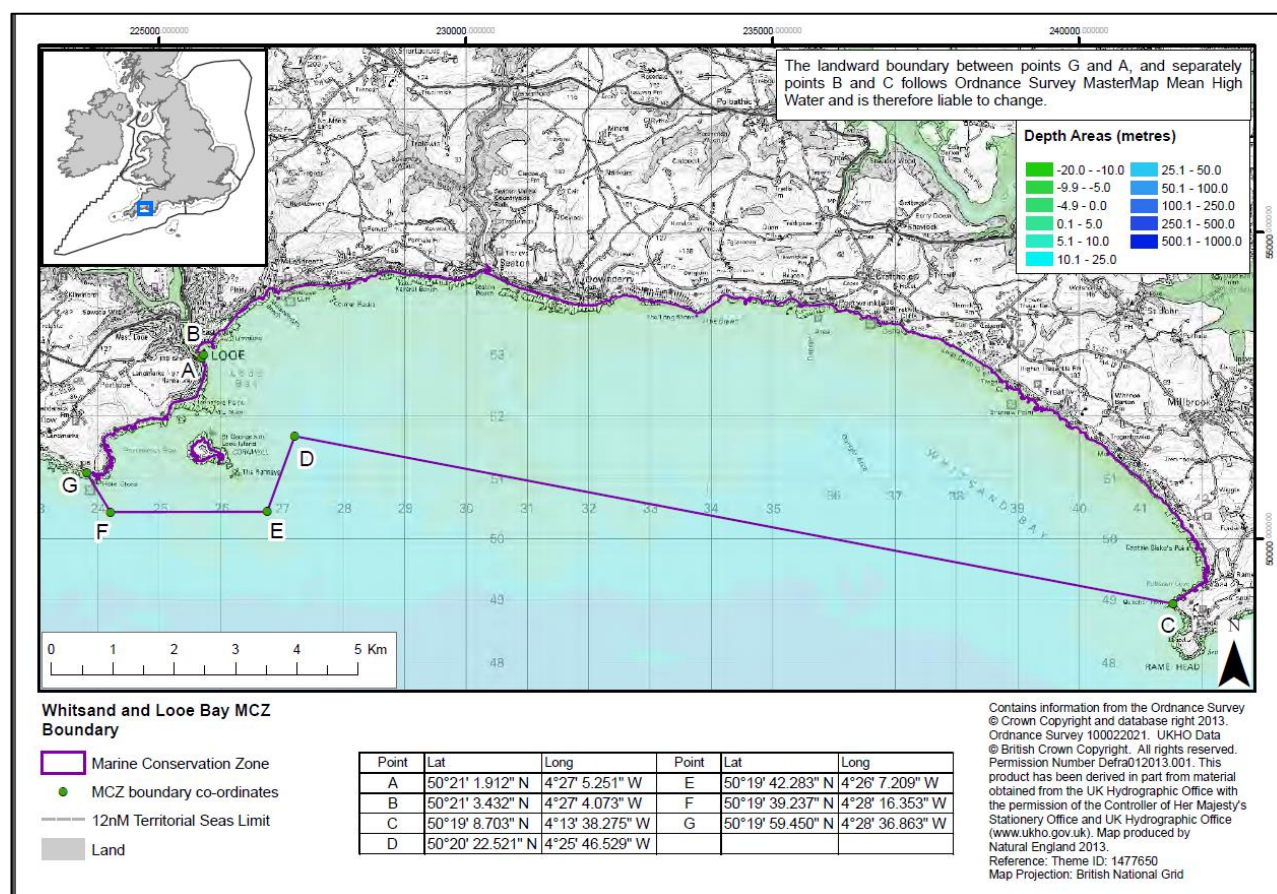


Figure 1: The boundary of Whitsand and Looe Bay Marine Conservation Zone in south-west England (Source: The Manacles designation map (Defra, 2013b).

Table 1: The designated features and their general management approach in Whitsand and Looe Bay Marine Conservation Zone (Defra, 2013a).

Features	General management approach
Intertidal coarse sediment	Maintain in favourable condition
Intertidal sand and muddy sand	Maintain in favourable condition
Subtidal coarse sediment	Maintain in favourable condition
Subtidal sand	Maintain in favourable condition
Low energy intertidal rock	Maintain in favourable condition
Moderate energy intertidal rock	Maintain in favourable condition
High energy intertidal rock	Maintain in favourable condition
Seagrass beds	Maintain in favourable condition
Ocean quahog (<i>Arctica islandica</i>)	Maintain in favourable condition
Pink sea-fan (<i>Eunicella verrucosa</i>)	Recover to favourable condition
Sea-fan anemone (<i>Amphianthus dohrnii</i>)	Recover to favourable condition
Stalked jellyfish (<i>Haliclystus auricula</i>)	Maintain in favourable condition

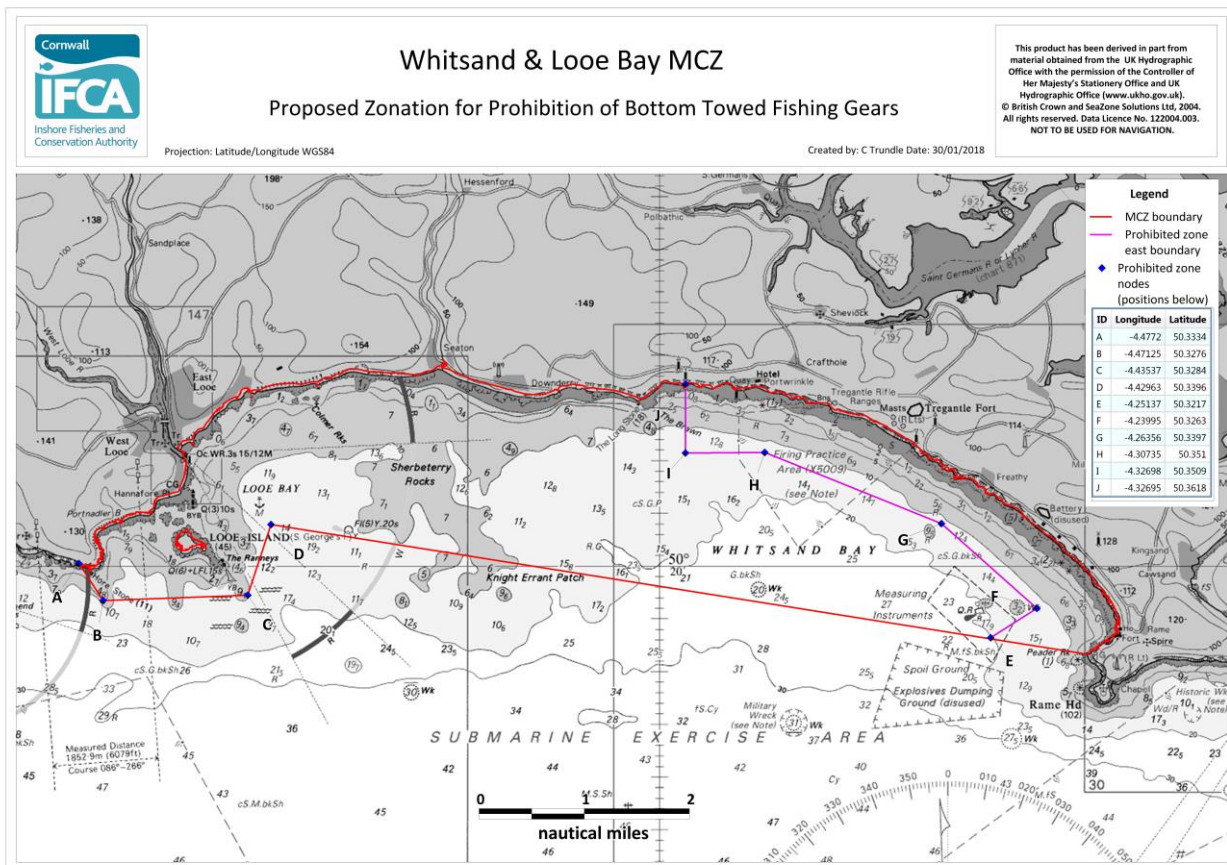


Figure 2: The boundaries of the Whitsand and Looe Bay Marine Conservation Zone (red) and the eastern boundary of the proposed closed zone to bottom towed fishing gears (purple)

1.1 Aims and objectives

1.1.1 Aims

- To verify seabed habitats along the currently proposed byelaw boundary line in Whitsand and Looe Bay MCZ .

1.1.2 Objectives

- To produce high quality acoustic imagery using SSS that can be used to verify seabed habitats along the currently proposed byelaw boundary line in Whitsand and Looe Bay MCZ .

2 Methodology

The survey was carried out using SSS along transects within the MCZ onboard Cornwall IFCA's survey vessel R/V Tiger Lily VI (Figure 3) on the 16th May 2018.

2.1 Vessel Specification

R/V Tiger Lily has been refitted for survey work and includes a purpose built survey station within the wheelhouse, fitted with an inverter and uninterruptable power supply (UPS) for stable 240v power, NMEA outputs and dedicated GPS with WAAS enabled. All position information was recorded using the Long/Lat WGS84 projection taken from the dedicated survey GPS receiver. All times recorded are in UTC from a single source, a Furuno GP32 GPS. R/V Tiger Lily VI is MCA coded to Cat 2 and is fitted with all necessary safety equipment, including life rafts, lifejackets, first aid kits and fire suppression systems.



Figure 3: Cornwall IFCA's dedicated survey vessel, R/V Tiger Lily VI.

2.2 Personnel

The crew consisted of two scientific officers (Colin Trundle and Kate Owen) and a skipper.

2.3 Personal Protective Equipment (PPE)

While working on deck all crew were required to wear lifejackets with personal location beacons (PLBs) and steel toe cap boots. No accidents or near misses were reported.

2.4 Acoustic Survey

An acoustic survey was carried out using SSS. The SSS system works by emitting an acoustic signal that interacts with the seafloor and returns a signal which is interpreted based on its strength. Based on the reflectivity, different sediment types can be seen, with harder substrates returning a stronger signal.

2.4.1 Equipment

An EdgeTech 4200: Dual Frequency SSS System with 300/600 kHz operating frequencies was used to capture acoustic imagery of the seabed. The SSS comes accompanied with a portable topside processor with laptop running Windows 7 and EdgeTech Discover software for data capture. The add on, Discover Coverage, was used to enable the skipper to keep note of the seabed coverage of the acoustic swathe. The acoustic data was captured in both .jsf and .xtf file formats.

The equipment specifications of the side-scan sonar system are shown in Table 2. Details of the system are available online: <http://www.edgetech.com/pdfs/ut/4200-Brochure-122012.pdf>

Table 2: Details of the side-scan sonar system used for the side-scan survey carried out by Cornwall IFCA

Equipment	Camera System
Manufacturer	Edgetech
Model	Edgetech 4200 side-scan sonar
Frequency	Dual frequency (300/ 600 kHz)

2.4.2 Methodology

The survey was carried out using the 'Mapping European Seabed Habitats (MESH) Recommended Operating Guidelines (ROG) for side-scan surveys' (Henriques *et al.*, 2013).

The fish was connected to the tow line and data cables on the stern deck of the vessel. The laptop was set up on the workbench inside the wheel house. The Cornwall IFCA proposed byelaw boundary line for the site was pre-programmed into the survey navigation plotter. SSS tow lines were then chosen to give 100% coverage, using the 300k Hz frequency, of the area around the Cornwall IFCA proposed boundary line and the recently suggested amendment.

Once on location the fish was deployed into the water using the winch and A Frame located at the stern of the vessel. A trial run was carried out to determine the correct gain and time variable gain (TVG) for the waterfall display. The altitude of the fish (the height of the fish above the seabed) was determined by the depth of the water and the achievable acoustic swathe. The depth of the fish was changed by altering the amount of tow line fed away via a hydraulic winch and a consistent altitude was applied on all tows where possible.

When the survey officers were sure the SSS was working correctly the vessel was manoeuvred to the start of the first survey line and the SOL was recorded. All display settings on the waterfall were kept constant throughout the survey. The tow speed was approximately 4 knots and the lay-back position of the fish kept at approximately 12m.

2.4.3 Data Handling

Both high frequency and low frequency data were recorded at the same time. Data was saved in-situ onto the dedicated Edgetech side-scan laptop and backed up to an external hard drive at the end of the day. The SSS data was reviewed with display gains but these were not applied to the raw data, which was used for processing.

The .xtf data was then post processed using CodaOctopus:GEO (GeoSurveyTM v6.1.2). The acoustic image data was adjusted (TVG and image enhancement) to best quality applicable, using the same settings for all tows. The data was then converted to a north-up geoTIFF file using GeoSurvey Mosaic software. GeoTIFF images were imported into MapInfo Pro (Version 15.2.0) where they were corrected using the Lat/Long WGS84 projection. GeoTIFF images were then overlaid on to a base map of Whitsand and Looe Bay, with the proposed byelaw boundary lines also mapped.

Lighter acoustic signatures were analysed in MapInfo Pro and those representing rocky habitat were digitised by creating polygons around their perimeters. The total area of these polygons was then calculated to give an approximate figure for the area of rocky habitat represented in the tows.

3 Results

The SSS was carried out on the 16th May 2018 and the daily log can be seen in Annex 2. The majority of the seabed along the proposed byelaw boundary lines was mapped acoustically and exact locations of tows are provided in Annex 2. During the first tow the Marine Biological Association (MBA) survey vessel Sepia was encountered in the MCZ. Communication was made with the MBA team, who were conducting scientific trawl surveys, to ensure good clearance was maintained.

3.1 Side-scan sonar Tow Lines

Initially three tow lines were proposed but to increase coverage of the seabed four separate tow lines were carried out on the day. On the third SSS tow line Tiger Lily altered course slightly to ensure good clearance was given to fishing gear in the water, this is noticeable as a slight curve in the tow line in Figure 4.

3.2 Rocky Habitat

Different acoustic signatures can be seen in the data from Whitsand Bay. All four survey lines show areas of a lighter colour, representing a harder substrate on the seabed (Figure 4). When analysed and mapped on MapInfo Pro (Figure 5) the rocky habitat represented an area of approximately 0.51km².

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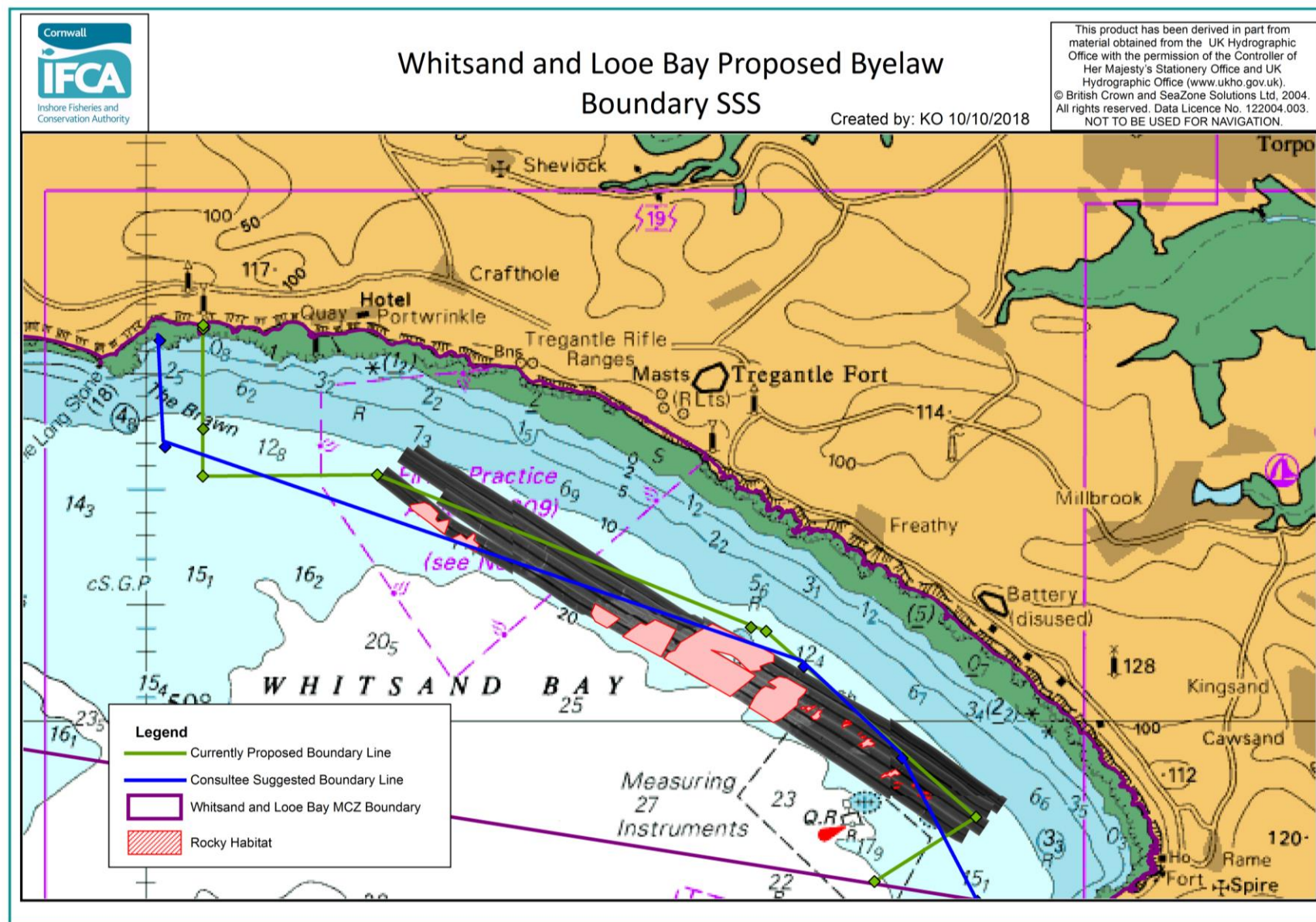


Figure 5: The location of side-scan sonar tows carried out by Cornwall IFCA in 2018 within Whitsand and Looe Bay MCZ. Rocky habitat identified on the side-scan sonar data is highlighted in red hatching.

4 Discussion

The four survey tows were conducted successfully and evidenced the seabed habitat around the proposed boundary lines. The side-scan data shows the presence of a harder rocky substrate, potentially supporting protected site features such as pink sea fans (*Eunicella verrucosa*). The consultee proposed boundary line excludes some of the rocky habitat and crosses other rocky areas but in many places does not provide an appropriate buffer zone. The consultee proposed boundary would also leave the wreck, the James Egan Layne, within the area open to bottom towed gear and this wreck is known to support pink sea fans. The data collected during the acoustic survey therefore supports the location of the boundary line originally proposed by Cornwall IFCA, which at the closest point passes approximately 60m clear of the identified rocky habitat, ensuring an appropriate buffer zone for bottom towed gear will be left around the potentially sensitive site features.

5 References

Defra, 2013a. Whitsand and Looe Bay MCZ Factsheet. <http://publications.naturalengland.org.uk/publication/6628749109886976?category=1721481> [Accessed 11/06/2018]

Defra, 2013b. Whitsand and Looe Bay MCZ Designation Map. <https://www.gov.uk/government/publications/marine-conservation-zone-2013-designation-whitsand-and-looe-bay> [Accessed 11/06/2018]

Henriques, V., Mendes, B., Pinheiro, L.M., Goncalves, D. and Long, D. 2013. Recommended Operating Guidelines (ROG) for side-scan sonars. *MeshAtlantic Recommended Operating Guideline*.

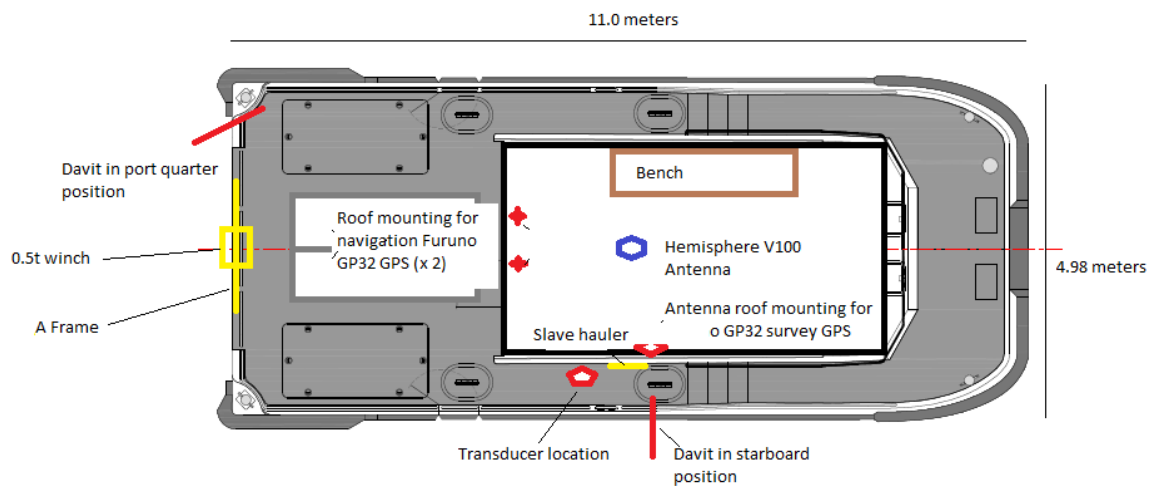
6 Appendices

Annex 1 – RV Tiger Lily Deck Plan & Offsets



Builder	South Boats Ltd
Model	Island MkII
Built	2007
LOA	11.0m
Beam	4.98m
Draught	1.1m (aft)
Tonnage	c.10 tonnes
Area of operation	MCA Category 2
Call sign	MRWR7
MMSI Number	235054954
MECAL Certification number	M07WB0111059
Complement	14 (including min 2 crew)
Propulsion	2 x 450hp Iveco NEF series
Speed	Cruising: 16 – 18 knots Top: 24 – 26 knots
Range	c. 400 nautical miles
240v AC supply	Victron 3Kw power inverter 5KvA Volvo-Perkins generator (All 240 AC power is accessed via APC Smart UPS C1500)
Stern Gantry	500kg SWL
Winch (on stern gantry)	Spencer Carter 0.5t with scrolling level wind
Slave hauler	Sea Winch 200m dia.
Electric line hauler	12v Spencer Carter Bandit
Positioning	Hemisphere V100 GNSS 3 x Furuno GP32
NMEA data outputs	4 x USB 4 x Serial 4 x banjo
Navigation	Olex with data export Knockle Hypack Max

Tiger Lily VI General Layout - Plan view



			Offset (m)		
NMEA Device	Make/Model	Offset Name	X (f'wd)	Y (port)	Z (+/-)
Sounder	Furuno Navnet	Transducer	7.0	4.2	-0.5
GPS	Furuno GP32	GPS 1	4.8	3.48	+2.2
GNSS	Hemisphere V100	GNSS 1	5.0	2.5	+2.35

Annex 2- Daily log

The daily log for the survey carried out on 16th May 2018 is shown in Table 3.

Survey code: 20180516_CIFCA_MCZ__WHITSAND_SSS

Staff: Colin Trundle (Principal Scientific Officer, Cornwall IFCA), Kate Owen (Scientific Officer, Cornwall IFCA), Chris Lowe (Skipper)

Vessel: Tiger Lily VI

All times recorded in UTC

Table 3: Daily log from survey carried out onboard R/V Tiger Lily on 3rd March 2016.

Time	Description
06:20	Depart Mylor
	Side-scan set up on the journey out
08:10	Arrived In Whitsand Bay, final equipment set up
08:33:09	SSS - Tow 1 SOL
	Vessel encounters MBA Sepia mid tow, who are conducting survey trawls in the bay
09:11:22	SSS - Tow 1 EOL
09:16:56	SSS - Tow 2 SOL
09:57:48	SSS - Tow 2 EOL
10:04:49	SSS - Tow 3 SOL
10:48:00	SSS - Tow 3 EOL
10:54:01	SSS - Tow 4 SOL
11:34:48	SSS - Tow 4 EOL
11:51	Side-scan disconnected and fish recovered
12:00	Boat departs Whitsand for Mylor
13:35	Alongside berth at Mylor

Annex 3 – Side-scan sonar Tow Locations

The time and location of the side-scan sonar tows is shown in Table 4.

Table 4: Time and location of side-scan sonar tows in Whitsand and Looe Bay MCZ

Time (UTC)	Tow ID	Details/description of tow	Depth (m)	Latitude	Longitude
08:33:09	Tow 1 start of line	Outside track	18	50.3493	-4.2995
09:11:22	Tow 1 end of line		15.6	50.3254333	-4.238666667
09:16:56	Tow 2 start of line	Middle track	15	50.32675	-4.238666667
09:57:48	Tow 2 end of line		12.5	50.3525	-4.304833333
10:04:49	Tow 3 start of line	Inside track	12.5	50.3526	-4.303166667
10:48:00	Tow 3 end of line		12.5	50.3269	-4.236166667
10:54:01	Tow 4 start of line	Extra line to NW	12.5	50.3250333	-4.241333333
11:34:48	Tow 4 end of line		13.2	50.3510667	-4.307