



M/V STELLAR DAISY LIFE RAFT

VISUAL SURVEY REVIEW

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Originator:	Benen Hayden	Senior Geophysicist
Checker:	Fredrick Soul	Senior Geophysicist
Approver:	Patrick Bell	OI Client Representative

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1 EXECUTIVE SUMMARY

The M/V Stellar Daisy, IMO Number 9038725, was a very large ore carrier (VLOC) vessel that sank in the Atlantic Ocean on March 31st 2017. Ocean Infinity were contracted by the Government of the Republic of Korea to search for the M/V Stellar Daisy in February 2019. The vessel was found at a water depth of 3500m on the 16th February 2019 and subsequently the area was surveyed by side scan sonar and high resolution multi beam sonar. Visual inspections were carried out which were recorded on video. A survey report recording these surveys *Results Report M/V Stellar Daisy Search* (OIL-19-STLR-RP-1003) was issued for Client approval on the 1st March 2019.

In the light of new information supplied by the Client which shows the location of life raft stations on the M/V Stellar Daisy; this document details a review of all relevant ROV video footage to try to ascertain whether or not there were remaining, i.e. not deployed, life rafts on the wreck of the M/V Stellar Daisy in those specific areas. The video review took place from the 25th to 29th April 2019. All video reviewed has been previously been supplied to the Client. During this review three objects of interest were found; one which is presumed to be a half of a life boat casing, one white cylinder which has been positively identified as a water tank and one unidentifiable object which may or may not be a life raft casing.

Following the further review of the data; Ocean Infinity confirms that, in our opinion, no life rafts remain attached at their original locations.

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Table 1-1; List of relevant objects observed in ROV video survey

Name	Easting	Northing	Comment	Video Filename	Video Folder Name	Video Start Time	Video End Time
Object 1	730909	619219	Partially buried white cylindrical object. Located under the remains of the port side bridge wing (fly bridge)	20190217000630207@DVR-STBD_Ch1.mp4 (overview)	DATA_20190217000630648	00:11:30	00:12:02
				20190222014417191@DVR-STBD_Ch1.mp4 (close-up)	DATA_20190222014417191	01:56:16	01:56:16
Object 2	730816	6192789	Half of white cylindrical object resembling a fibreglass life raft case	20190222034421197@DVR-STBD_Ch1.mp4	DATA_20190222034421197	04:11:19	04:14:07
Object 3	730892	6192779	White cylindrical object positively identified as a water tank/boiler. No longer of interest.	20190219032502183@DVR-PORT_Ch1.mp4	DATA_20190219032502183	03:47:23	03:47:23
				20190217010632188@DVR-STBD_Ch1.mp4 (overview)	DATA_20190217010632616	01:20:22 & 01:22:41	01:20:56 & 01:23:06
				20190222021418180@DVR-STBD_Ch1.mp4 (close-up)	DATA_20190222021418180	02:22:45	02:26:49

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2 INTRODUCTION

The M/V Stellar Daisy, IMO Number 9038725, was a very large ore carrier (VLOC) vessel that sank on a laden voyage in the Atlantic Ocean approximately 1,700nm off the coast of Uruguay on March 31st 2017. There were 24 crew members on board the vessel. Following the loss of the vessel two crew members were rescued, the other 22 members are missing and presumed deceased. The vessel was 322m in length, 58m in width and 29.5m in depth. It had taken on a cargo of 260,000MT of iron ore fines in Brazil and was en route to Qingdao in China.

Ocean Infinity were contracted by the Government of the Republic of Korea to search for the M/V Stellar Daisy in early 2019. Using autonomous underwater vehicles (AUVs) launched from the survey vessel Seabed Constructor, the wreckage of a large vessel was found at a water depth of 3500m on the 16th February 2019. Subsequent visual inspection by Remotely Operated Vehicle (ROV) on the 17th February positively identified the wreckage as the M/V Stellar Daisy.

Following the discovery; a high resolution multi beam and side scan survey was carried out by AUVs to map the extent of the debris field. There was also a visual inspection carried out by ROV on the main wreckage. This visual inspection, which totalled 68 hours, recorded individual components within the debris field, identified the vessel superstructure, and located and recovered the Simplified Voyage Data Recorder (S-VDR).

During the ROV visual inspection, Dive KD31-D044, possible human remains (HR) were discovered at 22:16 on the 20th February 2019 during the transit from contact P01_G to P01_ZB. Post discovery, a visual survey line pattern with 5m line spacing was designed - emanating from the HR discovery location. The line planning was based on a grid pattern comprising 100m by 100m boxes. There were 20 lines per box, of 100m in length, with the survey vessel situated in the middle of a box while the ROV carried out the visual search.

3 LIFE RAFTS

3.1 INTRODUCTION

A typical life raft on a ship is stored in a fibreglass container, usually cylindrical and white in colour (*Figure 3-1*). A Hydrostatic Release Unit (HRU) is connected to raft container and ship, which releases the raft even after the ship sinks. Within the container is the deflated life raft itself with a high-pressure gas used for automatically inflating the life raft at the time of emergency. Basic survival items and rations are also included. Life rafts are normally located on muster stations port and starboard side near the lifeboat, and sometimes fore and aft of the ship. The location of the life raft generally depends on the size of the ship.



Figure 3-1; Generic example of a ship's life raft.

3.2 M/V STELLAR DAISY MAIN LIFE RAFTS

No information has been supplied on the make and model of life raft used on the M/V Stellar Daisy. The plan of the life rafts on the M/V Stellar Daisy recently supplied by the Client (*Figure 3-3*) show 2 x 16¹ man rafts on either side of the vessel superstructure. The rafts were located just aft of the life boats at deck level; 6 deck levels below the bridge. A Client supplied annotated image also places the life rafts in this position (*Figure 3-2*).

¹The *Stellar Daisy Casualty Investigation Report* (PG 44) states that the life rafts were 15 man.

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Figure 3-2; Client supplied annotated image highlighting life raft location on deck level - aft of lifeboat on port side

3.3 M/V STELLAR DAISY FORWARD LIFE RAFT

The Client supplied plan of the life rafts (Figure 3-3) shows that a 5th life raft, a smaller 6 person raft, was mounted forward; on the deck ahead of the bow mast. A Client supplied annotated image also places it in this position (Figure 3-4). According to the *Stellar Daisy Casualty Investigation Report* (2019) the forward life raft was not required to float free (footnote 142, PG 44).

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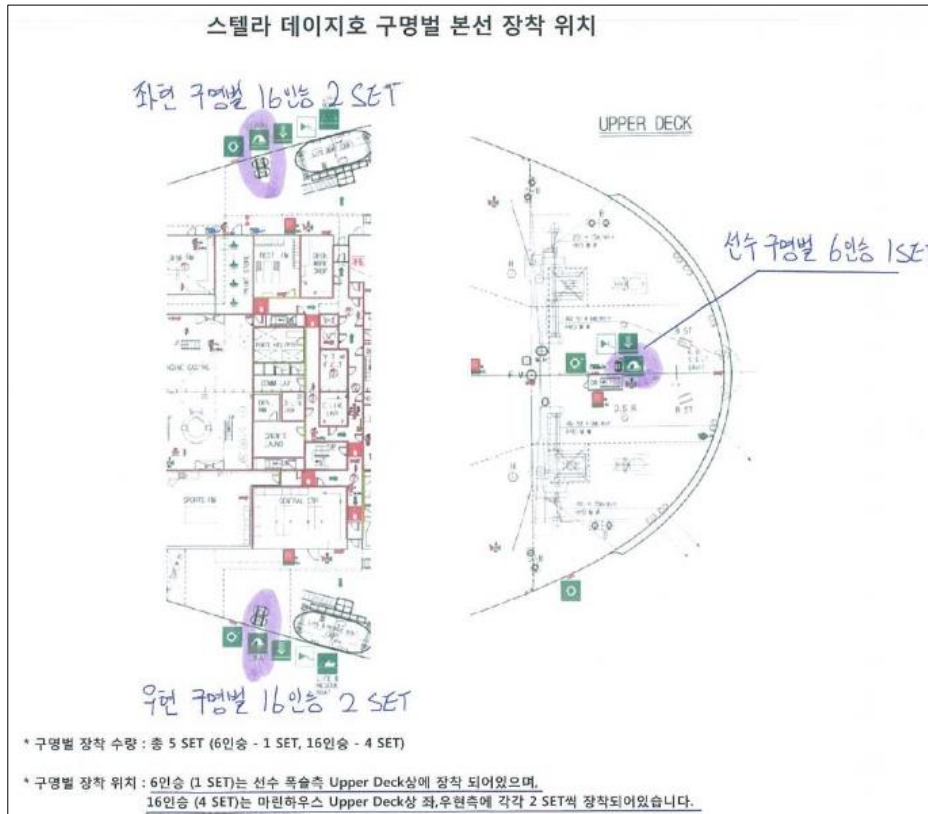


Figure 3-3; Annotated extract from M/V Stellar Daisy ship's plan highlighting locations of life rafts (purple) just aft of the life boats. Source: Client



Figure 3-4; Client supplied annotated image highlighting life raft location on deck level at the bow, fore of the bow mast

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3.4 SAR RECOVERY OF LIFE RAFTS

Two damaged and partially capsized life boats and three life rafts were recovered from the water during search and rescue operations between the 1st and 3rd of April 2017 (Figure 3-5). The remaining two life rafts were not found. The question remains as to whether or not they were deployed by manual or hydrostatic release or if they went down with the vessel.

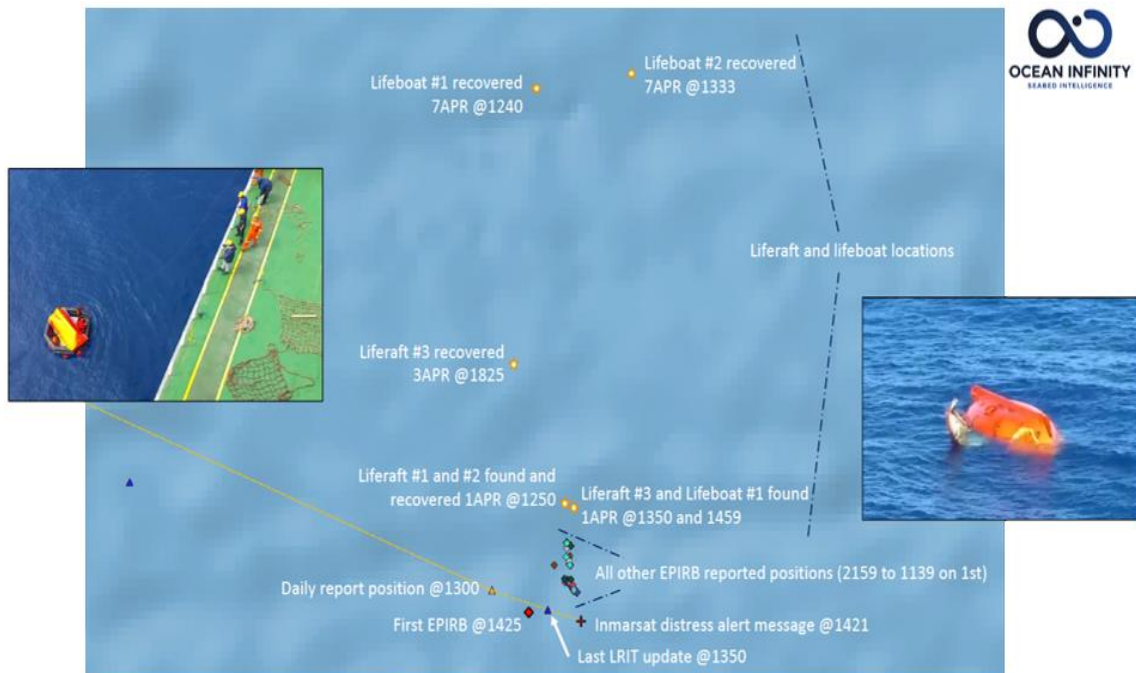


Figure 3-5; Locations of life boats and rafts recovered during SAR operations from the 1st to the 3rd of April 2017. Source: Ocean Infinity

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4 OBJECTS OF POTENTIAL INTEREST

The life rafts on M/V Stellar Daisy were located on the deck level, aft of the lifeboats and associated davits. For the purpose of this report; in addition to the specific superstructure and bow visual footage; all other relevant footage from the visual survey was reviewed. In addition; all footage from the HR survey was reviewed as that survey provided some close inspection footage of the same areas. Three objects of potential interest were observed during the data review (Figure 4-1). Those objects are detailed in Table 3.1. More information and images are provided in the relevant sections of this report.

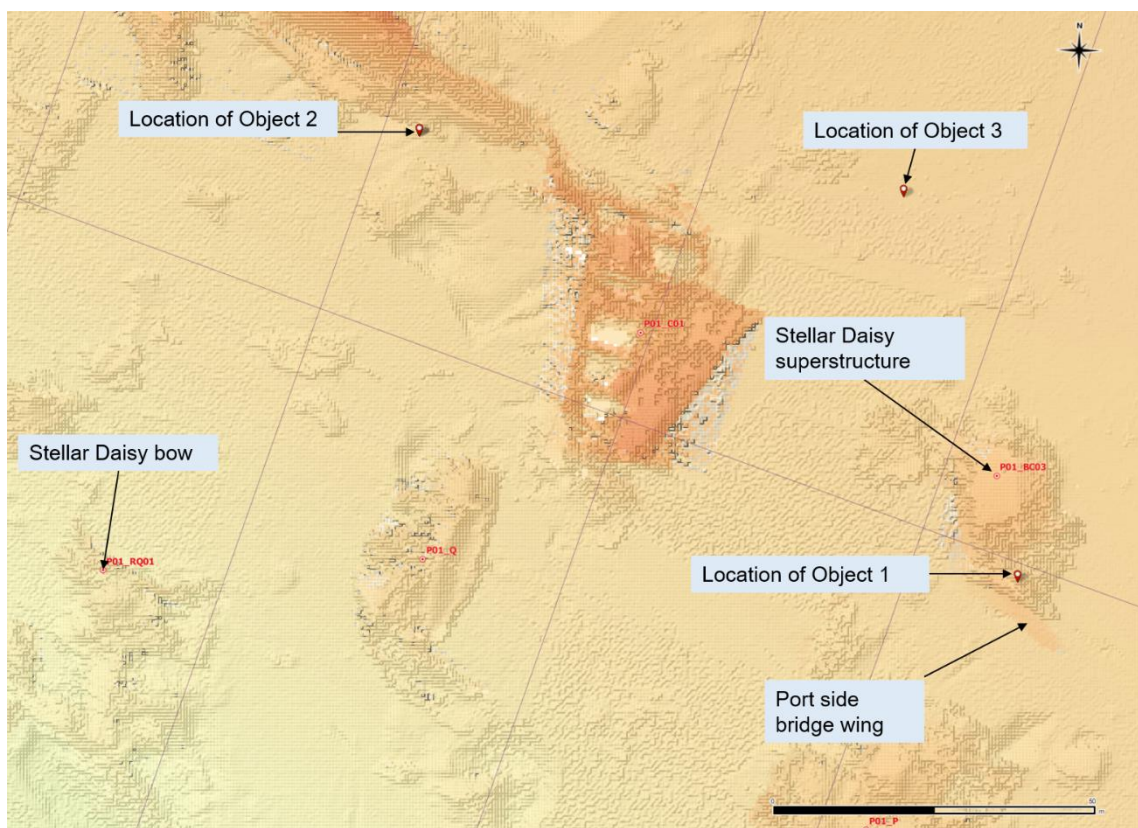


Figure 4-1; Locations of M/V Stellar Daisy bow and superstructure within debris field. Locations of three relevant objects also highlighted

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4.1 SUPERSTRUCTURE AREA VIDEO REVIEW

A copy of the General Arrangement drawing observed in the *Stellar Daisy Casualty Investigation Report* (2019) records that there are six levels of bridge superstructure above deck (Figure 4-2). In the video footage the superstructure of the vessel is seen to be standing more or less upright on the seabed, but only the upper three levels are visible. It is evident that the lower section of the bridge superstructure, particularly on the starboard side, is buried in the seabed and iron ore material. Figure 4-3 is an example of such burial on the starboard side. The lower levels are also crushed from the impact & weight of the structure above. Figure 4-4 is an example of the crushed lower level on the port side.

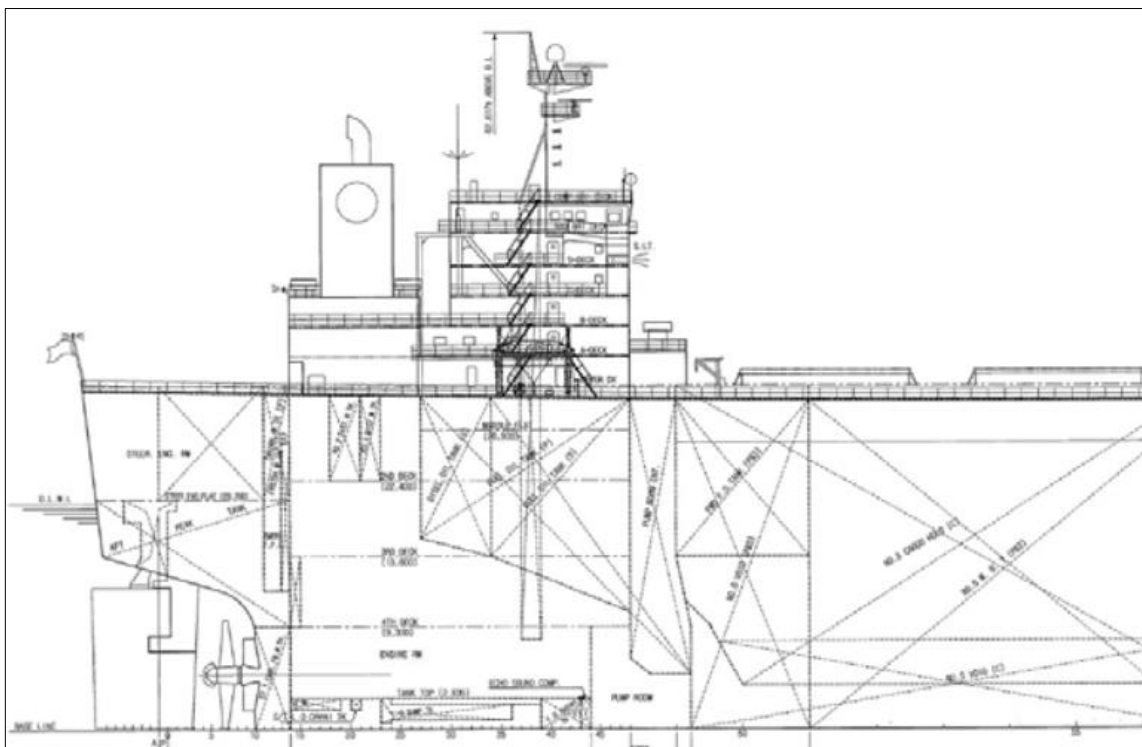


Figure 4-2; Excerpt from the General Arrangement drawing showing M/V Stellar Daisy superstructure.

Source: *Stellar Daisy Casualty Investigation Report* (2019).

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Figure 4-3; ROV image of starboard side of the superstructure highlighting burial of lower structure in the seabed / iron ore material



Figure 4-4; ROV image of port side of superstructure highlighting crushing of lower level(s) of the superstructure

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4.1.1 Object 1 - Unidentified

In video clip 20190217000630207@DVR-STBD_Ch1.mp4; a portion of a semi-buried white cylindrical object can be seen adjacent to the vessel superstructure (Figure 4-5, Figure 4-6). This object is located under the remains of the port side bridge wing (fly bridge), which is close to the location of the life rafts defined in the recently supplied data (Figure 3-3). The object is located at approximately E730909, N6192719 (Figure 4-1). It is visible on the ROV video clip recorded on the 17/02/2019 from 00:11:30 to 00:12:02.



Figure 4-5; ROV image showing location of Object 1 (highlighted) adjacent to superstructure on port side.



Figure 4-6; ROV image close-up of Object 1 - adjacent to superstructure on port side

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The object was also seen on the HR visual survey conducted on the on the 22/02/2019 on video clip 20190222014417191@DVR-STBD_Ch1.mp4 at 01:56:16. This footage offers a view from a different angle but is still inconclusive (Figure 4-7, Figure 4-8). It is difficult to ascertain the size of the object from a distance.



Figure 4-7; ROV image of general area of Object 1

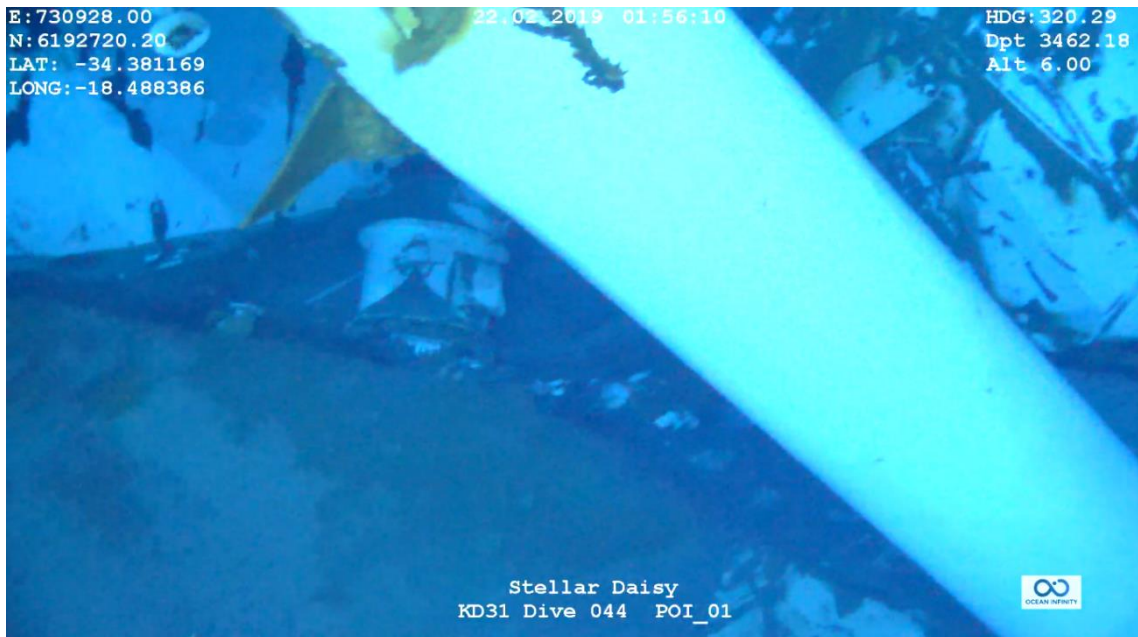


Figure 4-8; Close-up ROV image of Object 1

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4.2 BOW SECTION VIDEO REVIEW

The ROV footage of the previously identified bow section has been reviewed on the video clip 20190219210542177@DVR-STBD_Ch1.mp4. The exact location where the life raft would have been fitted has not been identified. Given the condition of the steel (mangled and twisted) which makes up the former hull; it is difficult to see how a fibreglass life raft case could be still in position or intact, in the event that it failed to deploy. Example images below illustrate the condition of the bow section.



Figure 4-9; ROV video image illustrating the condition of bow section



Figure 4-10; ROV video image illustrating the condition of bow section

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4.3 ADDITIONAL AREAS

In addition to the specific superstructure and bow areas all of the footage from the HR survey was reviewed for the purpose of this report.

4.3.1 Object 2 - Unidentified

During the HR survey an object was observed at approximately E730816, N6192789 in an area with other wreckage, including large sections of the hull (*Figure 4-11*). The object is white, half of a cylinder, hollow and partially filled with iron ore (*Figure 4-12*, *Figure 4-13*). It resembles the discarding casing (half section) of a life raft housing. It was observed on ROV video clip *20190222034421197@DVR-STBD_Ch1.mp4* located in folder *DATA_20190222034421197* on the 22/02/2019 between 04:11:19 and 04:14:07.



Figure 4-11; ROV Black and White video image showing an overview of the area in which Object 2 is located. Object 2 is highlighted in red.

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Figure 4-12; ROV video image of the area in which Object 2 is located



Figure 4-13; ROV video image close up of Object 2

4.3.2 Object 3 - Water heater tank

In video clip 20190219032502183@DVR-PORT_Ch1.mp4 - a white cylindrical object can be seen on the seabed 40m north of the vessel superstructure (*Figure 4-14*). The cylinder is located at approximately E730892, N6192779 (*Figure 4-1*). From a distance the object resembles a life raft case, but later footage from the HR survey shows that it is a hot water tank/boiler (*Figure 4-15, Figure 4-16*). It is visible on the ROV footage recorded on the 19/04/2019 at 03:47:23.

The object is also visible, from a different angle (opposite side) and further away, on the ROV video clip 20190217010632188@DVR-STBD_Ch1.mp4. The video was recorded on the 17/02/2019 between 01:20:22 and 01:20:56 and between 01:22:41 to 01:23:06.

The cylinder was seen more clearly during the HR survey on the 22/04/2019 (*Figure 4-15, Figure 4-16*). It was seen in close-up at 02:22:45 and 02:26:49 on video clip 20190222021418180@DVR-STBD_Ch1.mp4.

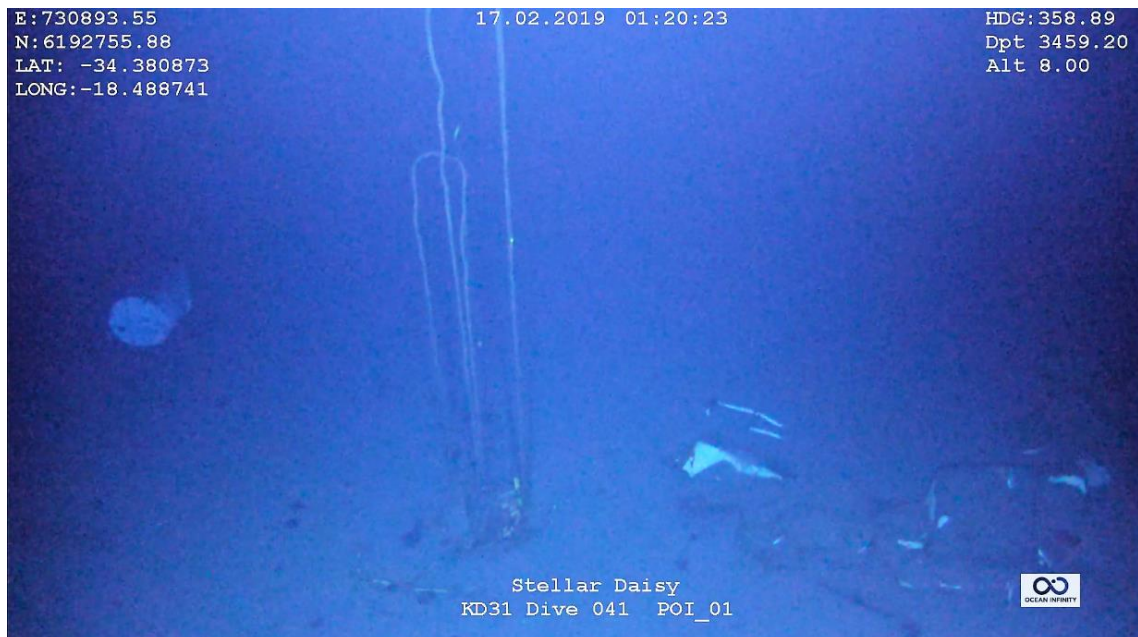


Figure 4-14; ROV video image overview of Object 3, located in left middle-ground

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Figure 4-15; ROV video image close-up of Object 3



Figure 4-16; ROV video image close-up of Object 3

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5 REFERENCES

Maritime Administrator, Republic of the Marshall Islands (2019). *Stellar Daisy Casualty Investigation Report. Loss of Buoyancy and Foundering with Multiple Loss of Life.*
<https://www.register-iri.com/wp-content/uploads/Republic-of-the-Marshall-Islands-Office-of-the-Maritime-Administrator-STELLAR-DAISY-Casualty-Investigation-Report.pdf>