U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Pacific Islands Fisheries Science Center
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PROJECT REPORT

VESSEL: NOAA Ship *Oscar Elton Sette*, SE-16-07
(Note: This Project has subsequently been deemed SE-17-01.)

PROJECT PERIOD: 13 October – 15 October 2016 (returned to port)
24 October – 04 November 2016 (post-repair continuation)

AREA OF OPERATION: Main Hawaiian Islands

TYPE OF OPERATION: Insular Bottomfish Survey

ITINERARY:

13 OCT — **Departed Pearl Harbor:** Embarked scientific complement (Barlow, Demarke, Driskell, Giuseffi, McVay, Miller, Norris, O'Brien, Reardon, Richards, Taylor) at Ford Island at 0800. Conducted Welcome Aboard Brief (0830). Departed Pier F9 (1000). Conducted pre-operations Safety Brief (1145), followed by practice launch and recovery from *Oscar Elton Sette* (*SE)* of both mission-readied SAFE Boats (*Rubber Duck* and *Steel Toe*), ship safety drills (1400) and transit to Maui Nui Triangle.

14 OCT — **Maui Nui Triangle Scientific Operations:** Conducted Modular Optical Underwater Survey System (MOUSS) operations (*Rubber Duck* and *Steel Toe*) and tethered DropCam Instrument Package (DCIP) operations (*SE*). Tethered recoveries with currents and winds at odds to each other proved difficult in terms of ship handling/positioning. The decision was made in consultation with the Command to shift to untethered DCIP operations.

Later this night, diesel was discovered in the ship's CHT/Sewage tank, necessitating an overnight return to Pearl Harbor.

15 - 23 OCT — **Pearl Harbor – *SE* Repairs:** *SE* was on station at Papa Hotel (0800) and alongside Pier F9 shortly after 0900. Program equipment was subsequently offloaded from the deck, and a partial

demobilization of scientific spaces occurred inside. All Scientific Personnel disembarked ~1230.

The Science Party continued with local PIFSC-supported (unattached to SE) shore-based small boat MOUSS operations during the repair period.

18 OCT: Rubber Duck *and* Steel Toe *conducted MOUSS operations in Makapuu BRFA "E" east of Oahu.*

19 OCT: Rubber Duck *and* Steel Toe *conducted MOUSS operations in Kaena Point BFRA "D" west of Oahu.*

24 OCT **Departed Pearl Harbor:** Embarked scientific complement (Barlow, Bliss, Demarke, Driskell, McVay, Miller, O'Brien, Reardon, Richards, Taylor) at Ford Island at 0800. Departed Pier F9 (1000). Conducted ship safety drills (1200). Deployed and recovered an untethered DCIP frame (for benefit of Command and Deck) off the south shore of Oahu (1400) and then began transit to Niihau. Science Party reviewed techniques/tools to be employed to free stuck gear (1500).

25 OCT **Niihau BFRA "B":** Conducted MOUSS operations (*Rubber Duck* and *Steel Toe*) and DCIP operations (*SE*) in and around Niihau BFRA "B".

26 OCT **Kauai BFRA "C":** Conducted MOUSS operations (*Rubber Duck* and *Steel Toe*) and DCIP operations (*SE*) in and around Kauai BFRA "C".

On deck this night, a small crack was discovered in the hull of Steel Toe, *rendering the vessel 'out of service' for the remainder of the Project.*

27 OCT **Penguin Bank BFRA "F":** Conducted MOUSS operations (*Rubber Duck*) and DCIP operations (*SE*) in and around Penguin Bank, Maui County BFRA "F".

28 - 30 OCT **Kona Coast:** Conducted MOUSS operations (*Rubber Duck*) and DCIP operations (*SE*) along the Kona Coast of Hawaii Island.

On 28 October, a MOUSS became fouled on the seafloor and was ultimately left unrecovered.

31 OCT **South Point BFRA "M":** Conducted MOUSS operations (*Rubber Duck*) and DCIP operations (*SE*) in and around South Point, Hawaii Island BFRA "M".

01 NOV **Hilo BFRA "L":** Conducted MOUSS operations (*Rubber Duck*) and DCIP operations (*SE*) in and around Hilo, Hawaii BFRA "L".

02 NOV **Hana, Maui BFRA "J":** Conducted MOUSS operations (*Rubber Duck*) and DCIP operations (*SE*) in and around Hana, Maui BFRA "J".

03 NOV **South Coast of Molokai:** Conducted MOUSS operations (*Rubber Duck*) and DCIP operations (*SE*) along the south coast of Molokai.

One DCIP unit became fouled in the propellers of SE *upon the recovery attempt, severing the attached buoy lines and harness, resulting in the sinking of the unit to the seafloor. The unit was not recovered. (This was recovery attempt number 44 out of 45 for the mission.)*

04 NOV **Pearl Harbor; End of Project:** *SE* was on station at Papa Hotel (0800) and subsequently alongside Pier F9 shortly after 0900. Complete offload and demobilization continued for the remainder of the work day.

MISSIONS AND RESULTS:

The objectives of the Project were to:

A. Deploy MOUSS from *Oscar Elton Sette*-based PIFSC 19' SAFE Boats to collect stereoscopic video data to support fishery-independent estimates of species-specific, size-structured abundance for the main Hawaiian Islands Deep-7 bottomfish stock focusing in the State of Hawaii Bottomfish Restricted Fishing Areas (BRFAs).

B. Deploy surface-tethered DropCam Instrument Packages (DCIPs) from *Oscar Elton Sette* for data collection and to test additional camera sensors and equipment. Anticipated tempo is 4 -12 deployments per day, not to interfere with Objective 1.

Results related to each of those objectives are presented below.

In regards to MOUSS operations (Objective A):

1. SE-16-07 was an overall success in terms of MOUSS camera deployments. The research team initially planned to deploy MOUSS at 66 primary sampling units (PSU) spread across 11 BRFAs. Each PSU contains two replicates, for a total of 132 secondary sampling units (SSU).

   By the end of the SE-16-07 (including the 2 shore-based operational days during ship repairs), the two 19' SAFE Boats completed 100 PSU for a total

of 192 SSU (Table 1) across 8 BRFAs (Table 4, Figure 1). *Rubber Duck* completed 59 PSU at an average of 4.5 PSU per day (Table 2). *Steel Toe* completed 18 PSU at an average of 6 PSU per day. All habitat strata were sampled in accordance with the planned sampling design (Table 3).

2. The MOUSS performed successfully on 167 of the 192 deployments (Table 5), recording stunning footage of Deep-7 species as well as the habitats around the MHI (Figure 2). This resulted in 9.7 TB of video data. Various recording errors (e.g. master/slave camera did not record, master/slave camera recorded for less than 15 minutes) were encountered with an overall success rate of 87%.
3. Survey support equipment (e.g. battery banks, pinch pullers, davits) on both SAFE Boats performed successfully with no loss of productivity resulting from electrical or mechanical issues.
4. Three of the BRFAs (G, H, K) could not be sampled due to high winds and swell (Figure 1). However, an additional 53 PSU were sampled outside of the BRFAs (Table 4), primarily along the Kona Coast of Hawaii Island and the south shore of Molokai (Figure 1).
5. On the night of 14 October, NOAA Ship *Oscar Elton Sette* experienced an issue with its CHT/Sewage tank, necessitating an overnight return to Pearl Harbor and a postponement of SE-16-07. The following week, while repairs were being conducted on the ship, the PIFSC MOUSS Team continued sampling operations in BRFAs "D" and "E" around the island of Oahu, launching the two 19' SAFE Boats from shore. These operations were carried out under Center auspices and not operationally supported or linked to *Oscar Elton Sette* during the off-project period of ship repairs.
6. On 26 October, a crack was discovered in the hull of *Steel Toe* below the waterline on the port side. It was determined though conversations with the NOAA Small Boat Program that the necessary repairs could not be safely conducted underway. The vessel was taken out of service, thus removed from further SE-16-07 operations.
7. On 28 October, one MOUSS unit became fouled on the seafloor within PSU 2549 and could not be recovered (Figure 2). The unit remains at approximately N19° 42.467' x W156° 3.482' at a depth of 150 m. A full report is provided in Appendix 1 to this report.

In regards to DCIP operations (Objective B, above):

1. NOAA Ship *Oscar Elton Sette* successfully completed 23 PSU at an average of 2.1 PSU per day (Table 2).
2. The initial plan was to use surface-tethered DCIP such that the DCIP and its anchor were retrieved after each deployment by using the hydraulic pinch-puller mounted on the J-frame of *Oscar Elton Sette*. However, surface-tethered recoveries proved difficult in regards to ship positioning with currents and winds at odds (in the rather protected Maui Nui Triangle) and inefficient (taking between 1.5 – 2.5 hours per recovery attempt). Several issues with the initial tether set-up itself (diameter and scope) may have compounded the

challenges with recoveries. Though the pinch-puller was actually rated for 3/8" line, this diameter ultimately proved too thin and began to slip in the sheaves under load. The tether ultimately parted in two of the three recovery attempts. In these instances, the acoustic released was triggered and the DCIP was recovered from the surface. After the initial day of trials, the DCIP was deployed without the surface tether and the acoustic release was signaled to detach the concrete anchor weight and return the DCIP to the surface for recovery. This was largely successful, made for quick recoveries aboard the ship, and is recommended for future deployments.

3. On 03 November, one DCIP unit became fouled in the propellers of SE within PSU 2549 and could not be recovered (Figure 4). The unit remains at approximately N20° 59.724' x W157° 1.425' at a depth of 200 m. A full report is provided in Appendix 2 to this report.

SCIENTIFIC PERSONNEL:

Name (Last, First)	Title	Date Aboard	Date Disembark	Gender	Affiliation*	Nationality
Barlow, James	Coxswain / Gear Specialist	10/13/16 10/24/16	10/15/16 11/4/16	M	NOAA/SOD	USA
Bliss, LT Kelli-Ann	Gear Specialist	10/24/16	11/4/16	F	NOAA/ESD	USA
Demarke, Christopher	Operations Lead/ Gear Specialist	10/13/16 10/24/16	10/15/16 11/4/16	M	JIMAR/SOD	USA
Driskell, Rory	Gear Specialist	10/13/16 10/24/16	10/15/16 11/4/16	M	NOAA/SOD	USA
Giuseffi, Louise	Coxswain / Gear Specialist	10/13/16	10/15/16	F	NOAA/SOD	USA
McVay, LTJG David	Gear Specialist	10/13/16 10/24/16	10/15/16 11/1/16	M	NOAA/SOD	USA
Miller, Dianna	Gear Specialist	10/13/16 10/24/16	10/15/16 11/1/16	F	JIMAR/SOD	USA
Norris, Erik	Coxswain / Gear Specialist	10/13/16	10/15/16	M	JIMAR/SOD	USA
O'Brien, Kevin	Coxswain / Gear Specialist	10/13/16 10/24/16	10/15/16 11/4/16	M	JIMAR/ESD	USA
Reardon, Russell	Project Leader	10/13/16 10/24/16	10/15/16 11/4/16	M	JIMAR/SOD	USA
Richards, Benjamin	Science Advisor	10/13/16 10/24/16	10/15/16 11/4/16	M	NOAA/FRMD	USA
Taylor, Jeremy	Gear Specialist	10/13/16 10/24/16	10/15/16 11/4/16	M	JIMAR/SOD	USA

* Joint Institute for Marine and Atmospheric Research (JIMAR)
National Oceanic and Atmospheric Administration (NOAA)
Pacific Islands Fisheries Science Center:
Ecosystem Sciences Division (ESD)
Fisheries Research and Monitoring Division (FRMD)
Science Operations Division (SOD)

Submitted by: _____

Russell Reardon, Project Leader
Science Operations Division
Pacific Islands Fisheries Science Center

_____

Benjamin Richards, Ph.D., Science Advisor
Fisheries Research and Monitoring Division
Pacific Islands Fisheries Science Center

Approved by: _____

Michael P. Seki, Ph.D.
Science Director
Pacific Islands Fisheries Science Center

Tables

Table 1. A list of the 100 Primary Sampling Units (PSU) sampled using the Pacific Islands Fisheries Science Center (PIFSC) Modular Optical Underwater Survey System (MOUSS) or Drop Camera Instrument Package (DCIP). MOUSS and DCIP were deployed to collect stereoscopic video data to support fishery-independent estimates of species-specific, size-structured abundance for the Main Hawaiian Islands Deep-7 bottomfish stock focusing in the State of Hawaii Bottomfish Restricted Fishing Areas (BRFAs). BRFAs are listed by their designation letter (A-M).

Island	Cell_ID	BRFA	Median Depth (m)	Strata	Lat_DD_MMmm	Long_DD_MMmm	Sampling Date	Sampling Vessel	Reps
Kauai	41534	NA	-95	SB_H_S	N21° 52.902'	W159° 36.417'	10/26/16	NOAA Ship Oscar Elton Sette	2
Kauai	41308	NA	-230	HB_H_M	N21° 52.130'	W159° 22.767'	10/26/16	NOAA Ship Oscar Elton Sette	2
Kauai	41201	C	-82	HB_H_S	N21° 51.839'	W159° 30.315'	10/26/16	Rubber Duck	2
Kauai	41200	C	-80	SB_H_S	N21° 51.838'	W159° 30.606'	10/26/16	Rubber Duck	2
Kauai	41143	C	-97	SB_H_S	N21° 51.576'	W159° 27.701'	10/26/16	SteelToe	2
Kauai	41137	C	-76	SB_H_S	N21° 51.570'	W159° 29.443'	10/26/16	Rubber Duck	2
Kauai	41132	C	-213	HB_H_M	N21° 51.566'	W159° 30.895'	10/26/16	Rubber Duck	2
Kauai	41086	C	-91	HB_H_S	N21° 51.309'	W159° 25.958'	10/26/16	SteelToe	2
Kauai	41083	C	-120	HB_H_S	N21° 51.307'	W159° 26.829'	10/26/16	SteelToe	2
Kauai	41025	C	-227	HB_H_M	N21° 51.037'	W159° 26.248'	10/26/16	SteelToe	2
Niihau	41006	B	-88	SB_H_S	N21° 50.856'	W160° 5.439'	10/25/16	Rubber Duck	2
Niihau	40819	NA	-206	SB_H_M	N21° 49.481'	W160° 8.331'	10/25/16	NOAA Ship Oscar Elton Sette	2
Niihau	40721	B	-201	HB_H_M	N21° 48.684'	W160° 6.003'	10/25/16	Rubber Duck	2
Niihau	40720	B	-201	HB_H_M	N21° 48.682'	W160° 6.293'	10/25/16	SteelToe	2
Niihau	40685	B	-82	HB_H_S	N21° 48.415'	W160° 5.711'	10/25/16	Rubber Duck	2
Niihau	40684	B	-77	HB_L_S	N21° 48.413'	W160° 6.001'	10/25/16	SteelToe	2
Niihau	40529	B	-215	HB_L_M	N21° 47.329'	W160° 5.993'	10/25/16	SteelToe	2
Niihau	40472	NA	-161	HB_H_S	N21° 47.030'	W160° 10.053'	10/25/16	NOAA Ship Oscar Elton Sette	2
Niihau	39929	NA	-136	HB_H_S	N21° 44.575'	W160° 12.353'	10/25/16	Rubber Duck	2
Niihau	39926	NA	98	HB_H_S	N21° 44.568'	W160° 13.224'	10/25/16	Rubber Duck	2
Niihau	39856	NA	-230	HB_H_M	N21° 44.289'	W160° 14.382'	10/25/16	SteelToe	2
Oahu	38422	D	-266	HB_H_M	N21° 37.702'	W158° 17.795'	10/19/16	Rubber Duck	2
Oahu	38266	D	-225	HB_L_M	N21° 37.151'	W158° 15.768'	10/19/16	SteelToe	2
Oahu	38103	D	-83	HB_L_S	N21° 36.611'	W158° 16.351'	10/19/16	Rubber Duck	2
Oahu	38102	D	-80	HB_L_S	N21° 36.613'	W158° 16.640'	10/19/16	SteelToe	2
Oahu	38099	D	-80	SB_L_S	N21° 36.616'	W158° 17.510'	10/19/16	SteelToe	2
Oahu	36214	E	-120	HB_H_S	N21° 23.653'	W157° 40.531'	10/18/16	Rubber Duck	2
Oahu	36027	E	-215	SB_L_M	N21° 22.289'	W157° 39.386'	10/18/16	SteelToe	2
Oahu	35621	E	-208	HB_H_M	N21° 19.546'	W157° 35.361'	10/18/16	Rubber Duck	2
Oahu	35345	E	-233	HB_L_M	N21° 18.445'	W157° 33.348'	10/18/16	SteelToe	2
Oahu	34795	E	-206	HB_L_M	N21° 17.090'	W157° 33.361'	10/18/16	Rubber Duck	2
Oahu	34784	E	-77	HB_L_S	N21° 17.117'	W157° 36.541'	10/18/16	SteelToe	2
Maui Nui	27012	NA	-219	HB_L_M	N21° 2.998'	W157° 5.786'	11/03/16	Rubber Duck	2
Maui Nui	26717	NA	-207	HB_L_M	N21° 2.694'	W157° 2.903'	11/03/16	Rubber Duck	2
Maui Nui	26707	NA	-227	HB_L_M	N21° 2.727'	W157° 5.789'	11/03/16	Rubber Duck	2
Maui Nui	26698	NA	-203	HB_L_M	N21° 2.756'	W157° 8.387'	11/03/16	Rubber Duck	2
Maui Nui	26692	NA	-229	HB_H_M	N21° 2.774'	W157° 10.118'	11/03/16	Rubber Duck	2
Maui Nui	26383	NA	-240	HB_H_M	N21° 2.513'	W157° 10.987'	11/03/16	Rubber Duck	2
Maui Nui	25521	NA	-179	HB_L_S	N21° 1.590'	W157° 1.186'	11/03/16	NOAA Ship Oscar Elton Sette	1
Maui Nui	25170	F	-78	HB_L_S	N21° 1.557'	W157° 23.698'	10/27/16	Rubber Duck	2
Maui Nui	24923	NA	-269	HB_H_M	N21° 1.179'	W157° 13.024'	11/03/16	Rubber Duck	2
Maui Nui	24340	NA	-111	HB_H_S	N21° 0.716'	W157° 20.821'	10/27/16	Rubber Duck	2
Maui Nui	24063	F	-206	HB_H_M	N21° 0.467'	W157° 23.132'	10/27/16	Rubber Duck	2
Maui Nui	24062	F	-205	HB_L_M	N21° 0.470'	W157° 23.421'	10/27/16	Rubber Duck	2
Maui Nui	23795	F	-212	SB_L_M	N21° 0.207'	W157° 24.289'	10/27/16	NOAA Ship Oscar Elton Sette	2
Maui Nui	23576	NA	-210	SB_L_M	N20° 59.697'	W157° 1.500'	11/03/16	NOAA Ship Oscar Elton Sette	1
Maui Nui	21285	F	-79	HB_H_S	N20° 57.555'	W157° 30.665'	10/27/16	NOAA Ship Oscar Elton Sette	2
Maui Nui	20256	F	-210	SB_H_M	N20° 56.213'	W157° 32.120'	10/27/16	NOAA Ship Oscar Elton Sette	2
Maui Nui	19416	J	-121	SB_L_S	N20° 53.515'	W156° 7.677'	11/02/16	NOAA Ship Oscar Elton Sette	2
Maui Nui	19178	J	-234	SB_H_M	N20° 52.949'	W156° 6.247'	11/02/16	NOAA Ship Oscar Elton Sette	2
Maui Nui	18346	J	-102	HB_H_S	N20° 50.754'	W156° 4.561'	11/02/16	Rubber Duck	2
Maui Nui	18252	J	-75	HB_L_S	N20° 50.483'	W156° 4.566'	11/02/16	Rubber Duck	2
Maui Nui	18162	J	-208	HB_H_M	N20° 50.188'	W156° 3.131'	11/02/16	Rubber Duck	2
Maui Nui	18160	J	-116	SB_H_S	N20° 50.198'	W156° 3.707'	11/02/16	Rubber Duck	2
Maui Nui	17686	J	-102	HB_H_S	N20° 48.523'	W156° 0.860'	11/02/16	Rubber Duck	2
Maui Nui	17546	J	-166	HB_H_S	N20° 47.952'	W155° 59.143'	11/02/16	Rubber Duck	2
Maui Nui	17014	NA	-101	HB_H_S	N20° 46.976'	W156° 40.924'	10/14/16	Rubber Duck	2
Maui Nui	16916	NA	107	HB_L_S	N20° 46.713'	W156° 41.504'	10/14/16	Rubber Duck	2
Maui Nui	16773	NA	-220	HB_H_M	N20° 45.480'	W155° 57.177'	11/02/16	NOAA Ship Oscar Elton Sette	2
Maui Nui	16709	NA	-98	SB_L_S	N20° 46.202'	W156° 43.816'	10/14/16	SteelToe	2
Maui Nui	16521	NA	-121	HB_H_S	N20° 45.622'	W156° 40.944'	10/14/16	SteelToe	2
Maui Nui	16285	NA	-155	HB_L_S	N20° 45.182'	W156° 48.727'	10/14/16	SteelToe	2
Maui Nui	16105	NA	-138	HB_H_S	N20° 44.495'	W156° 37.794'	10/14/16	Rubber Duck	2
Maui Nui	15715	NA	-190	HB_L_S	N20° 43.745'	W156° 42.413'	10/14/16	SteelToe	2
Maui Nui	15347	NA	-186	SB_L_S	N20° 42.838'	W156° 35.516'	10/14/16	Rubber Duck	2
Maui Nui	14667	NA	-191	HB_H_S	N20° 41.594'	W156° 43.597'	10/14/16	NOAA Ship Oscar Elton Sette	2
Big Island	3307	NA	-124	HB_L_S	N19° 49.012'	W156° 4.860'	10/28/16	NOAA Ship Oscar Elton Sette	2
Big Island	3037	NA	-164	HB_H_S	N19° 47.681'	W156° 6.315'	10/28/16	NOAA Ship Oscar Elton Sette	2
Big Island	2906	NA	-80	HB_L_S	N19° 46.831'	W156° 4.041'	10/28/16	Rubber Duck	1
Big Island	2678	NA	-125	HB_L_S	N19° 45.221'	W156° 4.929'	10/28/16	Rubber Duck	1
Big Island	2617	L	-101	HB_H_S	N19° 42.853'	W154° 58.651'	11/01/16	Rubber Duck	2
Big Island	2597	L	-108	HB_H_S	N19° 42.306'	W154° 58.379'	11/01/16	Rubber Duck	2
Big Island	2592	NA	-80	HB_H_S	N19° 43.578'	W156° 3.815'	10/28/16	Rubber Duck	1
Big Island	2577	L	-149	HB_H_S	N19° 41.758'	W154° 58.107'	11/01/16	Rubber Duck	2
Big Island	2549	NA	-198	HB_H_S	N19° 42.490'	W156° 3.549'	10/28/16	Rubber Duck	1
Big Island	2473	L	-223	HB_H_M	N19° 39.299'	W154° 57.026'	11/01/16	NOAA Ship Oscar Elton Sette	2
Big Island	2443	L	-208	HB_H_M	N19° 38.752'	W154° 56.754'	11/01/16	NOAA Ship Oscar Elton Sette	2
Big Island	2329	L	-256	HB_H_M	N19° 36.562'	W154° 55.667'	11/01/16	NOAA Ship Oscar Elton Sette	2
Big Island	2232	L	-213	HB_H_M	N19° 34.914'	W154° 54.566'	11/01/16	Rubber Duck	2
Big Island	1870	NA	-218	HB_H_M	N19° 30.276'	W155° 58.916'	10/29/16	NOAA Ship Oscar Elton Sette	2
Big Island	1848	NA	-90	SB_L_S	N19° 29.666'	W155° 57.784'	10/29/16	Rubber Duck	2
Big Island	1845	NA	-265	HB_H_M	N19° 29.680'	W155° 58.641'	10/29/16	NOAA Ship Oscar Elton Sette	2
Big Island	1835	NA	-204	HB_H_M	N19° 29.400'	W155° 58.075'	10/29/16	Rubber Duck	2
Big Island	1805	NA	-132	HB_H_S	N19° 28.839'	W155° 56.943'	10/29/16	Rubber Duck	2
Big Island	1734	NA	-192	HB_H_S	N19° 27.200'	W155° 56.117'	10/29/16	Rubber Duck	2
Big Island	1703	NA	-269	HB_H_M	N19° 26.383'	W155° 55.847'	10/29/16	Rubber Duck	2
Big Island	1255	NA	-199	HB_H_S	N19° 16.598'	W155° 53.749'	10/30/16	Rubber Duck	2
Big Island	1178	NA	-118	SB_H_S	N19° 16.057'	W155° 53.759'	10/30/16	Rubber Duck	2
Big Island	1122	NA	-106	HB_H_S	N19° 15.520'	W155° 54.054'	10/30/16	Rubber Duck	2
Big Island	1027	NA	-145	HB_H_S	N19° 14.437'	W155° 54.075'	10/30/16	Rubber Duck	2
Big Island	945	NA	-260	HB_H_M	N19° 12.547'	W155° 54.395'	10/30/16	Rubber Duck	2
Big Island	909	NA	-217	HB_H_M	N19° 11.740'	W155° 54.695'	10/30/16	Rubber Duck	2
Big Island	881	NA	-179	HB_H_S	N19° 10.932'	W155° 54.996'	10/30/16	NOAA Ship Oscar Elton Sette	2
Big Island	853	NA	-248	HB_H_M	N19° 10.125'	W155° 55.296'	10/30/16	NOAA Ship Oscar Elton Sette	2
Big Island	380	NA	-235	HB_H_M	N18° 59.145'	W155° 46.674'	10/31/16	Rubber Duck	2
Big Island	322	NA	187	HB_H_S	N18° 58.023'	W155° 44.418'	10/31/16	Rubber Duck	2
Big Island	290	NA	-180	SB_H_S	N18° 57.456'	W155° 43.006'	10/31/16	Rubber Duck	2
Big Island	247	NA	-172	HB_H_S	N18° 56.629'	W155° 42.169'	10/31/16	Rubber Duck	2
Big Island	201	NA	-265	HB_H_M	N18° 55.802'	W155° 41.331'	10/31/16	Rubber Duck	2
Big Island	89	M	-84	HB_L_S	N18° 53.611'	W155° 39.952'	10/31/16	NOAA Ship Oscar Elton Sette	1

Table 2. A count of the number of Primary Sampling Units (PSU) sampled by vessel by day.

Daily Count of PSU Sampled	
Date	Total
10/14/16	9
NOAA Ship Oscar Elton Sette	1
Rubber Duck	4
SteelToe	4
10/18/16	6
Rubber Duck	3
SteelToe	3
10/19/16	5
Rubber Duck	2
SteelToe	3
10/25/16	11
NOAA Ship Oscar Elton Sette	2
Rubber Duck	5
SteelToe	4
10/26/16	10
NOAA Ship Oscar Elton Sette	2
Rubber Duck	4
SteelToe	4
10/27/16	7
NOAA Ship Oscar Elton Sette	3
Rubber Duck	4
10/28/16	6
NOAA Ship Oscar Elton Sette	2
Rubber Duck	4
10/29/16	7
NOAA Ship Oscar Elton Sette	2
Rubber Duck	5
10/30/16	8
NOAA Ship Oscar Elton Sette	2
Rubber Duck	6
10/31/16	6
NOAA Ship Oscar Elton Sette	1
Rubber Duck	5
11/01/16	7
NOAA Ship Oscar Elton Sette	3
Rubber Duck	4
11/02/16	9
NOAA Ship Oscar Elton Sette	3
Rubber Duck	6
11/03/16	9
NOAA Ship Oscar Elton Sette	2
Rubber Duck	7
Grand Total	**100**

Table 3. A count of the sampled Primary Sampling Units (PSU) by habitat strata including the relative and target weighting for each strata.

Strata	Total	%	Target %
HB_H_M: Hardbottom, High Slope, Medium Depth	27	27%	20%
HB_H_S: Hardbottom, High Slope, Shallow Depth	31	31%	24%
HB_L_M: Hardbottom, Low Slope, Medium Depth	9	9%	20%
HB_L_S: Hardbottom, Low Slope, Shallow Depth	14	14%	18%
SB_H_M: Softbottom, High Slope, Medium Depth	3	3%	5%
SB_H_S: Softbottom, High Slope, Shallow Depth	8	8%	5%
SB_L_M: Softbottom, Low Slope, Medium Depth	3	3%	5%
SB_L_S: Softbottom, Low Slope, Shallow Depth	5	5%	5%
Grand Total	**100**		

Table 4. A count of the sampled Primary Sampling Units (PSU) by habitat strata within each Bottomfish Restricted Fishing Area (BRFA).

Strata by BRFA	Total
B	6
HB_H_M: Hardbottom, High Slope, Medium Depth	2
HB_H_S: Hardbottom, High Slope, Shallow Depth	1
HB_L_M: Hardbottom, Low Slope, Medium Depth	1
HB_L_S: Hardbottom, Low Slope, Shallow Depth	1
SB_H_S: Softbottom, High Slope, Shallow Depth	1
C	8
HB_H_M: Hardbottom, High Slope, Medium Depth	2
HB_H_S: Hardbottom, High Slope, Shallow Depth	3
SB_H_S: Softbottom, High Slope, Shallow Depth	3
D	5
HB_H_M: Hardbottom, High Slope, Medium Depth	1
HB_L_M: Hardbottom, Low Slope, Medium Depth	1
HB_L_S: Hardbottom, Low Slope, Shallow Depth	2
SB_L_S: Softbottom, Low Slope, Shallow Depth	1
E	6
HB_H_M: Hardbottom, High Slope, Medium Depth	1
HB_H_S: Hardbottom, High Slope, Shallow Depth	1
HB_L_M: Hardbottom, Low Slope, Medium Depth	2
HB_L_S: Hardbottom, Low Slope, Shallow Depth	1
SB_L_M: Softbottom, Low Slope, Medium Depth	1
F	6
HB_H_M: Hardbottom, High Slope, Medium Depth	1
HB_H_S: Hardbottom, High Slope, Shallow Depth	1
HB_L_M: Hardbottom, Low Slope, Medium Depth	1
HB_L_S: Hardbottom, Low Slope, Shallow Depth	1
SB_H_M: Softbottom, High Slope, Medium Depth	1
SB_L_M: Softbottom, Low Slope, Medium Depth	1
J	8
HB_H_M: Hardbottom, High Slope, Medium Depth	1
HB_H_S: Hardbottom, High Slope, Shallow Depth	3
HB_L_S: Hardbottom, Low Slope, Shallow Depth	1
SB_H_M: Softbottom, High Slope, Medium Depth	1
SB_H_S: Softbottom, High Slope, Shallow Depth	1
SB_L_S: Softbottom, Low Slope, Shallow Depth	1
L	7
HB_H_M: Hardbottom, High Slope, Medium Depth	4
HB_H_S: Hardbottom, High Slope, Shallow Depth	3
M	1
HB_L_S: Hardbottom, Low Slope, Shallow Depth	1
NA	53
HB_H_M: Hardbottom, High Slope, Medium Depth	15
HB_H_S: Hardbottom, High Slope, Shallow Depth	19
HB_L_M: Hardbottom, Low Slope, Medium Depth	4
HB_L_S: Hardbottom, Low Slope, Shallow Depth	7
SB_H_M: Softbottom, High Slope, Medium Depth	1
SB_H_S: Softbottom, High Slope, Shallow Depth	3
SB_L_M: Softbottom, Low Slope, Medium Depth	1
SB_L_S: Softbottom, Low Slope, Shallow Depth	3
Grand Total	**100**

Table 5. A summary of the number of deployments and recording errors for each Pacific Islands Fisheries Science Center (PIFSC) Modular Optical Underwater Survey System (MOUSS) digital video recorder (DVR).

MOUSS DVR	Deployments	Errors	% Error	Notes	Master/slave didn't record	Master/slave < 25 mins
1	6	6	100.00%		4	2
6	49	4	8.16%		3	1
10	26	2	7.69%		0	2
11	14	6	42.86%		5	1
9	53	2	3.77%		2	0
5	23	5	21.74%	lost	0	5
7	27	0	0.00%	lost	0	0

Figures

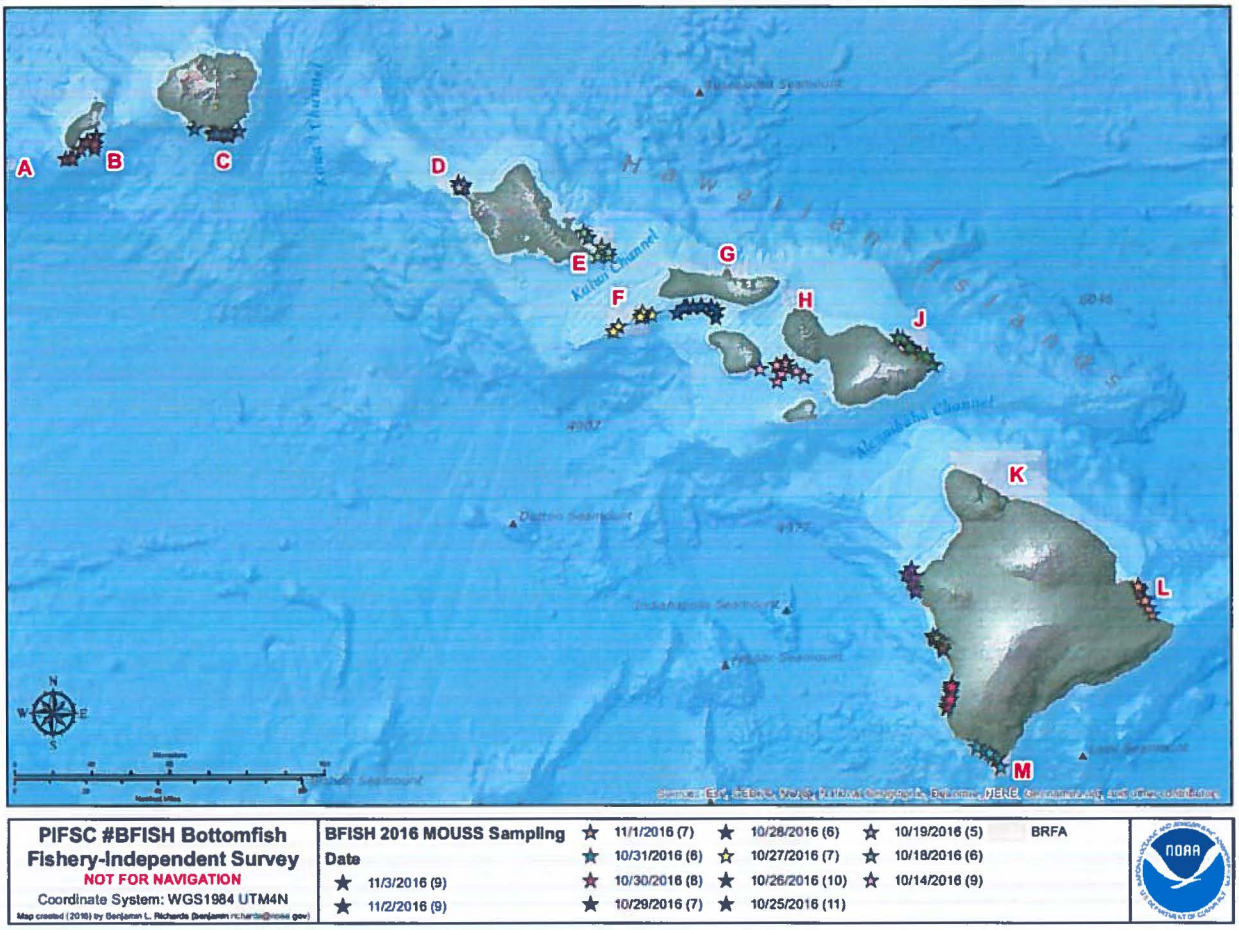

Figure 1. A map showing the daily deployment location of Pacific Islands Fisheries Science Center (PIFSC) Modular Optical Underwater Survey System (MOUSS) and Drop Camera Instrument Package (DCIP). MOUSS and DCIP were deployed to collect stereoscopic video data to support fishery-independent estimates of species-specific, size-structured abundance for the main Hawaiian Islands Deep-7 bottomfish stock focusing in the State of Hawaii Bottomfish Restricted Fishing Areas (BRFAs). BRFAs are listed by their designation letter (A-M).

Figure 2. Example images from the Pacific Islands Fisheries Science Center (PIFSC) Modular Optical Underwater Survey System (MOUSS) showing (clockwise from upper left) opakapaka (*Pristipomoides filamentosus*), ehu (*Etelis carbunculus*), some of the very challenging terrain from camera deployment, as well as a very diverse fish assemblage.

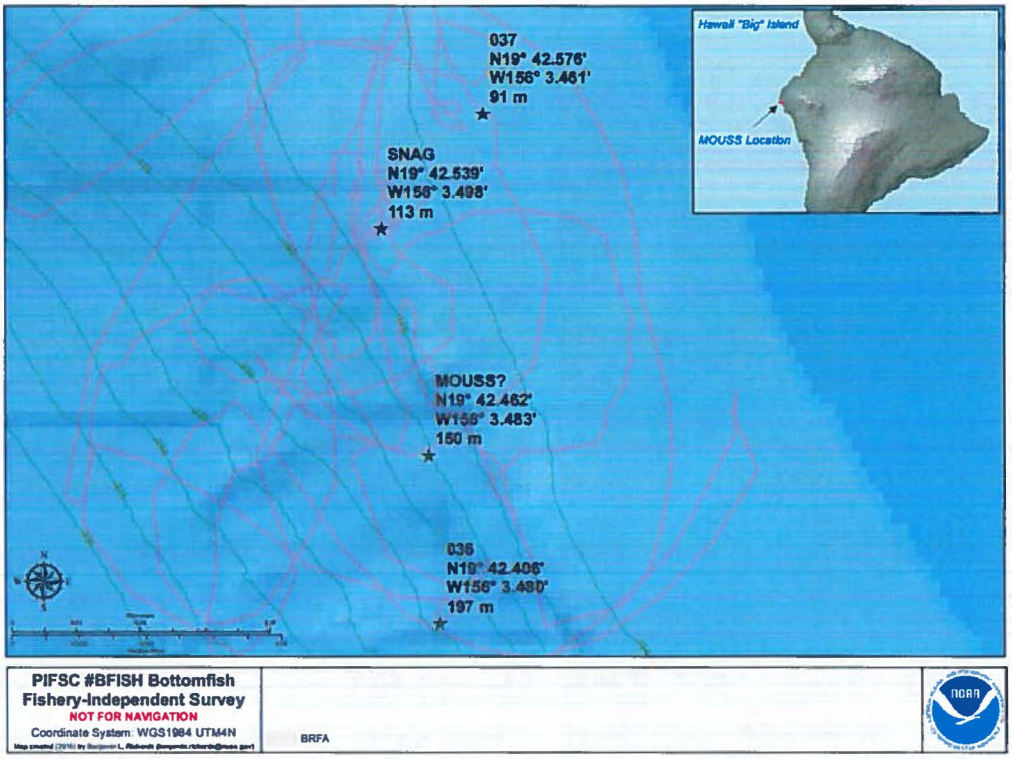

Figure 3. A map showing the approximate location where the Pacific Islands Fisheries Science Center (PIFSC) Modular Optical Underwater Survey System (MOUSS) was lost during recovery from PSU 2549 on October 28, 2016. The green stars indicate the initial drop location (036), the location where the surface line became snagged on the seafloor (SNAG), the position of the 19' SAFE Boat when the surface line parted (037), and the approximate location of the MOUSS (MOUSS?) based on the length of surface line that had been recovered

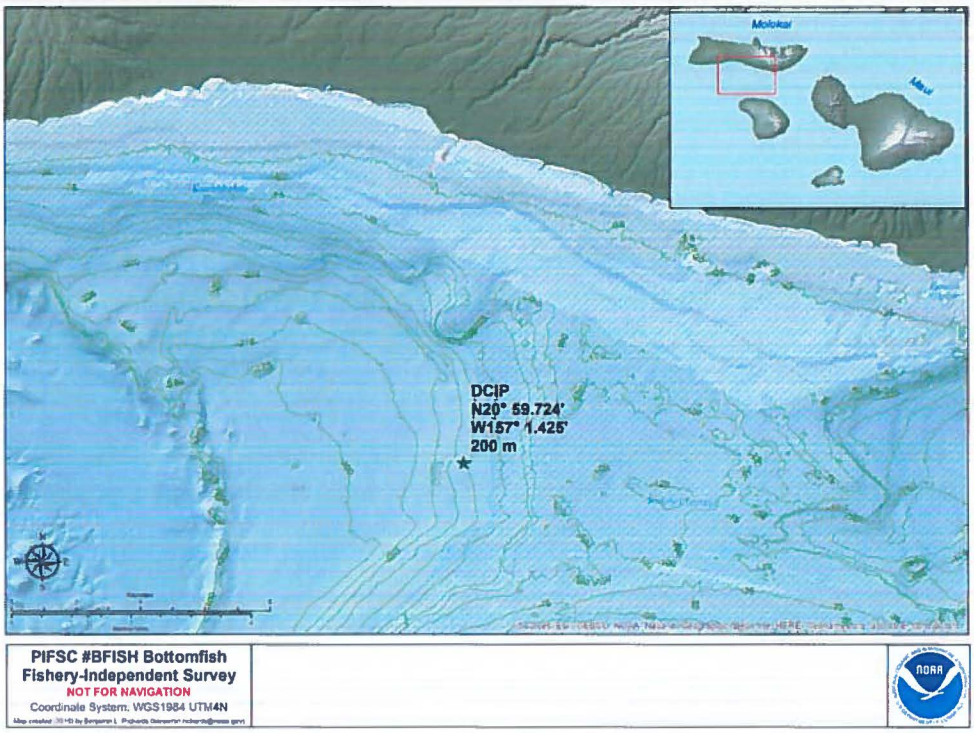

Figure 4. A map showing the approximate location where the Pacific Islands Fisheries Science Center (PIFSC) Drop Camera Instrument Package (DCIP) was lost during recovery on November 3, 2016.

Appendix 1

Non-Recovery of Modular Optical Underwater Camera System (MOUSS) during SE1607

Benjamin L. Richards and Russell Reardon

Incident Report

On October 28, 2016, 1:46 PM HST a Modular Optical Underwater Survey System (MOUSS) containing accountable federal property (Table 1) was unable to be recovered at survey grid 2549 during the 2016 PIFSC Bottomfish Fishery-Independent Survey. The MOUSS was deployed from the survey vessel Rubber Duck (deployed from the NOAA Ship Oscar Elton Sette) to a depth of 139 meters within normal operating conditions. Following a normal bottom time, the boat crew was unable to recover the MOUSS from the seafloor. The MOUSS team attempted to recover the MOUSS using all safe means at their disposal and in which they had been trained. During their recovery attempt, the surface line to the MOUSS parted (Figure 1). Following their unsuccessful attempt to recover the MOUSS, the team returned to the NOAA Ship Oscar Elton Sette for the night. Following are the individual reports of the boat team members.

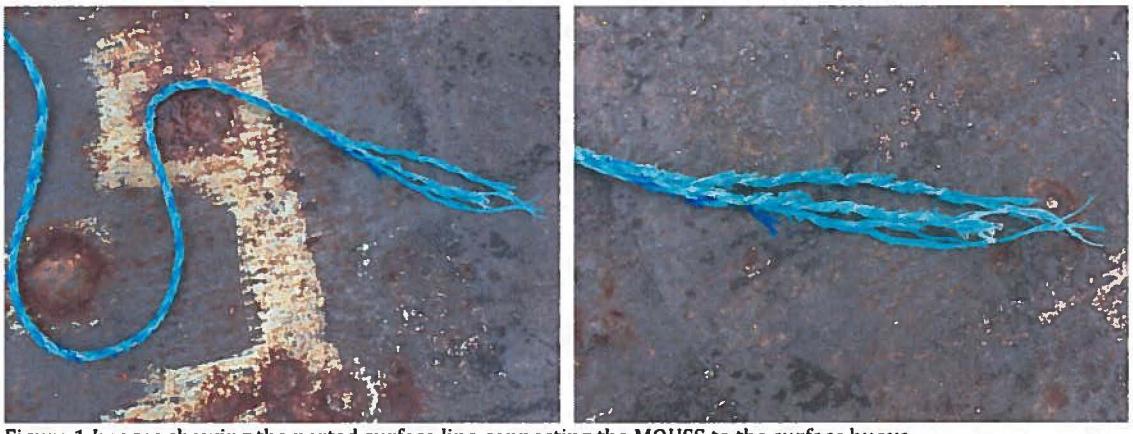

Figure 1 Images showing the parted surface line connecting the MOUSS to the surface buoys.

On the morning of October 29, 2016, a MOUSS team including personnel invoved in the initial recovery attempt as well as the most experienced coxswains and MOUSS handlers returned to the site and attempted to recover the MOUSS unit using a "line pinching" grappling hook (Figure 2). After two unsuccessful hours, the team aborted their recovery attempt. At present, the MOUSS is located in the vicinity of N19° 42.462' x W156° 3.483' at a depth of 90 – 140 meters (Figure 3).

Figure 2 An image of the "line pinching" grappling hooked used to attempt recovery of the MOUSS.

Should they be deemed necessary and appropriate, additional options for recovery include (but are not limited to):

- A technical recovery dive by diver John Hansen (or similar)
- Recovery using PIFSC Phantom ROV from chartered vessel
- A remotely operated vehicle (ROV) operation by the NOAA Ship Okeanos Explorer (or similar)
- Recovery by the RV Falkor during Hawaii-based operations in September and October 2017.
- Recovery by a commercial salvage company
- A training operation by military divers

Table 1 A list of accountable federal property on the un-recovered MOUSS

CD #	Serial #	Description
	ST-CAM-0031	MOUSS Camera Head
	ST-CAM-0022	MOUSS Camera Head
	ST-DVR-0007	MOUSS Digital Video Recorder

Table 2 Itemized cost of MOUSS components

Description	Property	Cost	Quantity	SubTotal	Reference
MOUSS camera	Y	$4,624.00	2	$9,248.00	SeaBed Invoice 2013-007-NOAA
MOUSS camera housing	Y	$1,965.98	2	$3,931.96	Sexton Cost worksheet R1.0
MOUSS DVR	Y	$4,474.00	1	$4,474.00	SeaBed Invoice 2013-007-NOAA
MOUSS DVR Housing	Y	$4,799.99	1	$4,799.99	Sexton Cost worksheet R1.0
MOUSS Battery + Housing	N	$2,813.81	1	$2,813.81	Sexton Cost worksheet R1.0
SubConn cable set	N	$3,279.48	1	$3,279.48	Sexton Cost worksheet R1.0
MOUSS frame	N	$515.00	1	$515.00	PIFSC Contract WE-133F-12-SU-1415
MOUSS basebar	N	$123.60	1	$123.60	PIFSC Contract WE-133F-12-SU-1415
MOUSS bait arm	N	$50.00	1	$50.00	
MOUSS surface line (ft)	N	$0.11	400	$43.33	
MOUSS subsurface bouy	N	$117.30	2	$234.60	
MOUSS light sync	N	$26.00	1	$26.00	
MOUSS light sync housing	N	$250.00	1	$250.00	
MOUSS TDR	N	$400.00	1	$400.00	
MOUSS anchor bar	N	$200.00	1.5	$300.00	
Miscellaneous hardware	N	$100.00	1	$100.00	
			Total	**$30,489.77**	
			Property	**$22,453.95**	

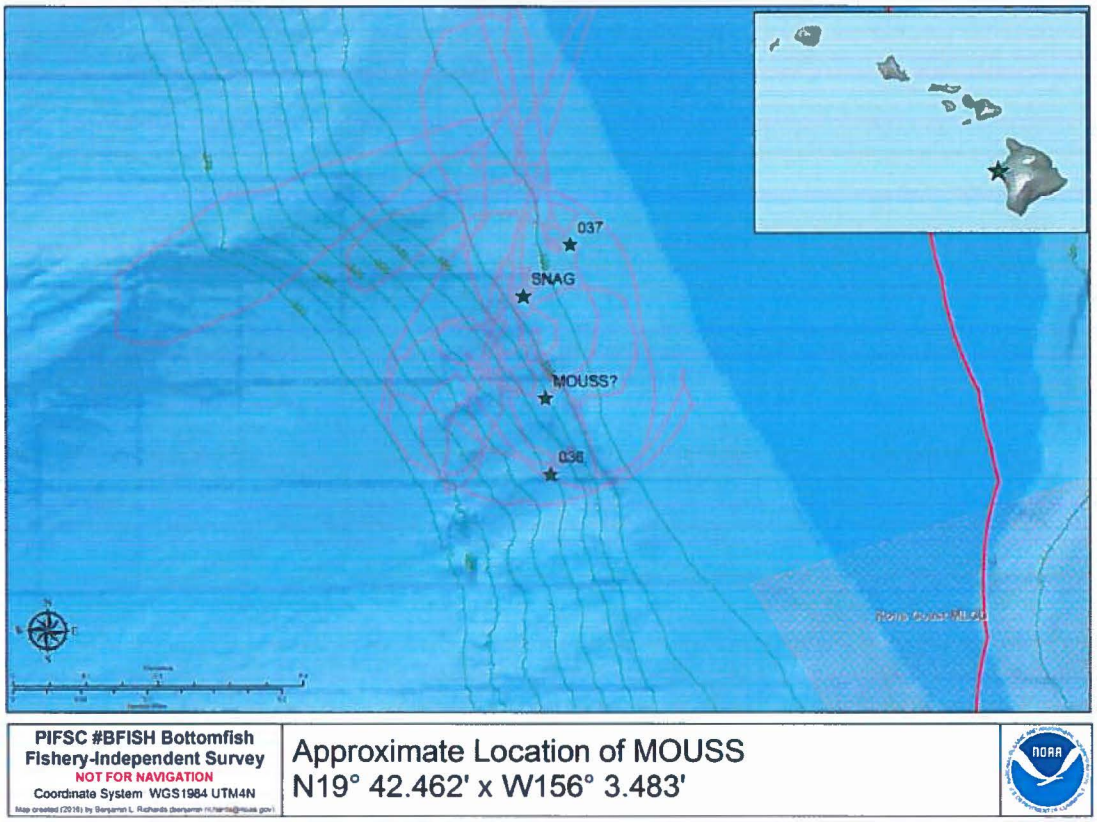

Figure 3. Approximate location of the MOUSS camera system including the deployment location (036) and the location where the surface line appeared to be snagged on the bottom. The track of the survey vessel Rubber Duck during the recovery attempt is shown in purple.

Recommended Future Mitigations

1. Shorten length of surface line to reduce likelihood of entanglement on the seafloor.
2. Develop modular surface line allowing for adjustment of length based on drop depth and current speed.
3. Do not deploy MOUSS in currents greater than 2 knots.
4. Develop burn-wire or similar system allowing MOUSS and subsurface floats to be remotely severed from both anchor and surface line, allowing MOUSS to float to surface if anchor or surface lines become fouled on the seafloor.
5. Develop variable buoyancy system allowing MOUSS to be deployed without surface tether but also without the need to jettison anchors.
6. Consider incorporation of small ROV in MOUSS operations allowing for inspection and potential disentanglement of fouled MOUSS.

Kevin O'Brien (Coxswain)

At 1346 on 10/28/2016 we deployed MOUSS frame B at grid 2549 off the Kona coast (airport vicinity). The current was flowing S to N at approximately 1.5kt on the surface. Sea surface conditions were good with 5-7knot winds from the west and 1-2ft wind waves. We deployed the MOUSS in 139m of water and payed out the

800' tether with surface floats. MOUSS B soaked for 20+ minutes while we pulled up the other replicate. When attempting to recover MOUSS B, we were able to recover approximately 210 ft of the tether (all of the sinking line and a small amount of the floating line) while motoring up-current towards the drop point (as per usual protocol). At that point, the tether snubbed up tight and tended straight down and we blew the break on the pot-hauler due to the load. It became evident that there was a hang-up on the bottom several hundred feet down-current of the MOUSS itself. We payed back out the rest of the sinking line, drifted back on it until it came tight down current, and then powered out into deeper water and up towards the drop point, keeping the line tight and "riding the radius" of the line out into deeper water and then sweeping up toward the drop point. When we were abreast of the point, the line snubbed up tight again and we had to stop driving on the line and instead began hauling in the line with the pot hauler as we slowly drifted back on the line, trying to stay in deeper water to avoid making a 360 degree wrap around the obstruction. Once more, the line snubbed up tight over the snag point, which was about ~800 feet down-current of the MOUSS deployment location (and presumably ~400 down current of the MOUSS's actual resting place due to current drift when dropped.. At that juncture, we added 400' of line to the tether, re-deployed the line down-current of the obstruction, and then attempted the same maneuver out into deeper water and up towards the point, riding the radius of the longer tether. Same results. Again, we drifted back while hauling in with the pot-hauler, staying offshore of the obstruction again to avoid wrapping a complete 360 around the obstruction. When it pulled us in and over the obstruction, the line snubbed up tight and tended downward again, this time we were only able to pull in the additional 400' of green line, and just the very end of the sinking line, which tended directly downward. At this point is was clear that our previous two attempts had not "unwound" the obstruction in the right direction, so we payed out the 600' of available tether we had brought into the boat and ran down-current with it until we reached the end and cleated it off on our bow tow-line. We powered in towards shore, riding the radius of the tether in towards shore and then up towards the point, attempting to "unwind" the obstruction in a clockwise direction. As we came abreast of the drop-point, for a minute or so, the tension on the line slackened a bit and it felt like we had come free of the obstruction because we were able to straighten out our course, as we were not being pulled in on the radius of the line any more. We drove like that for about 30 seconds, upcurrent and directly toward the drop point, but very quickly the line tensioned again and we were pulled back towards the obstruction on the radius of a slightly new circle. At that point we realized that we had perhaps freed ourselves from the original hang-up, but had snagged again on something very close by. We attempted to haul in the pot-hauler while drifting down again, but snubbed up tight over the obstruction area again. So, we motored back up-current, paying out our line until it was all deployed again at which point we motored back towards shore and down-current, keeping tension and riding the radius of the circle back down-current to "unwind" the new obstruction. Once back down current of the obstruction, we attempted hauling in the pot hauler again, which resulted in snubbing up tight vertically over the same obstruction area again. At that point, it was arranged that we would run back to the

ship to pick up Jamie Barlow, who was more experienced at retrieving this gear than our team. We redeployed all the line and surface floats, then ran back to the ship, disembarked Jeremy Taylor, and took on Jamie Barlow. Once back on site, with Jamie's guidance, we attempted riding the radius out into deeper water and up towards the point again as we had tried before, and when that was unsuccessful, we then attempted the same maneuver in towards shore and up towards the drop point, and again back down current, as attempted before. After those were unsuccessful, we attempted to run on a short scope in semi-circles circles above the snag point. After several attempts of clockwise then counterclockwise circles, the line parted due to chafe on the obstruction. Time was approximately 535pm. Waypoints were taken on the drop point, the obstruction, and the line parting location. After the line was retrieved, it was estimated that there was still approximately 450ft of line still on the bottom between the obstruction point and the actual MOUSS.

James Barlow (alternate coxswain)

Approx. 1545 hours I was told that Rubber Duck was experiencing stuck gear, they apparently had been working on freeing that gear for over an hour.

Approx. 1600 hours I embarked on Rubber Duck from the Sette and went back to the stuck gear site. After a 10 minute orientation, with close inspection of the GPS from KOB (Kevin O Brien) we proceeded with boat movements.
The first maneuver and mostly for me to get orientated to the situation was a classic up current with extra line pull. That was unsuccessful. We were proper stuck. We then tried taking the pull direction inshore with extra line and that was also unsuccessful.

The second maneuver we attempted again an offshore pull and with a bit more power. We felt something give (a 3-5 ft jump) so we then decided to check the gear. We hauled the extra 400ft line in. we got to the white line (where the team previously had hauled before) and that was it……then the vessel hauling gear loaded up so we stopped before loading up the davit too much. The "give" we felt did not result in anything.

The third maneuver: we tied off the "choked" or short scope line from the bow pull line and made several pulling attempts. First again off shore, and then inshore. We tried various angles of the short choked line for at least 10 min, The idea being that we might be able to break anything light duty and free the object.

The last maneuver was to go counter clockwise from the previous pull KOB did prior to my arrival. In that movement as we were working well inshore, we were pulling on the radius to possibly unwind it line from the object and suddenly the **line gave out**, I did not have any extra power when this happened, its almost like, as we were un wrapped the line from the rock, the frayed and weakened line just gave

out. Instinctively, we took a waypoint called 037, And hauled the parted line into the boat. That is how we lost the MOUSS.

It's worth mentioning that the stuck point seemed to be in about 85 Meters of water, and the amount of rope that was hauled back (from the part back to the white line) was only 150 feet of green or a total of 350 feet of line....meaning that its very likely the rest of the line is on the other side of the obstruction/ rock.

David McVay (crew member)

On 28 OCT 2016 at approximately 1730 a recovery line parted while conducting MOUSS operations near site # 2549, West side of Hawaii (Southwest of Kona International Airport), leaving a MOUSS unit on the ocean bottom. Boat team: Coxswain Kevin O'Brien, Weight Handler Rory Driskell, Davit Operator David McVay, and MOUSS Handler Jeremy Taylor. Currents were approximately 1.5 knots running from South to North, winds were light and variable, swells and wind waves were 1 to 2 feet, mix of clouds and sun, heavier cloud cover nearshore where we were working.

We resumed operations after lunch, conducting the 7th and 8th deployments of the day. Both deployments were conducted without issue. After deploying the 8th drop (approximately 1345 at approximately 120 meters) we returned to the 7th deployment site and recovered the MOUSS without issue. We then approached the 8th drop at approximately 1410. Standard approach, into the prevailing conditions (1.5 knot currents), the floats were brought aboard and the sinking line was fed through the pot hauler and commenced haul back. We retrieved the sinking line; we noted increasing tension just as the green floating line was coming up. Haul back was secured and the line was fed back overboard to manage tension. Initially we tried to free the line by redeploying most of the line, cleating off the end and driving up current and offshore from the drop site then hauling back again, but were not successful. We made multiple attempts to pull the gear free heading away from the initial deployment site.

400' of additional floating line was added and we utilized the technique of pulling from the bow eye and tried hauling back again. We retrieved the additional line but were only able to recover 10' to 15' of the sinking line; the sinking line came under tension and tended straight up and down in 80 meters of water. With 80 meter (~240') and length of line deployed (~780'), we concluded that the line was caught on the bottom. We made a couple more attempts to free the line before returning to the Sette to enlist the assistance of Jamie Barlow.

Mr. O'Brien briefed Mr. Barlow on the previous operations, including: GPS locations, currents/sea state, freeing attempts, etc. Under Mr. Barlow's guidance we attempted to free the gear by taking the floating line to the starboard bow cleat and driving offshore and up current, but were unsuccessful. We then switched back to pulling from the line made off to the bow eye; we drove the circumference of the end

of the line, but weren't successful. We eventually hauled back to the point in which the additional floating line was aboard and 10' to 15' of the sinking line was in the boat, and the line was tense. We attempted a series of short scope pulls. After a few pulls there was suddenly slack in the line, we started to haul back immediately. The line came in with no tension, the 400' of floating line and sinking line came in; however only a third of the initial floating line came in and was parted at the end. We returned to the Sette at approximately 1745.

Appendix 2

Loss of Drop Camera Instrument Package (DCIP) during SE1607

Benjamin L. Richards and Russell Reardon

Incident Report

On November 3, 2016 at 10:58 am HST, the PIFSC Drop Camera Instrument Package (DCIP) (Table 1) became entangled in the propellers and or rudders of the NOAA Ship Oscar Elton Sette (OES) and was lost. The approximate location of this loss was 20º 59.724 x 157º 01.425 in approximately 200 meters of water (Figure 1).

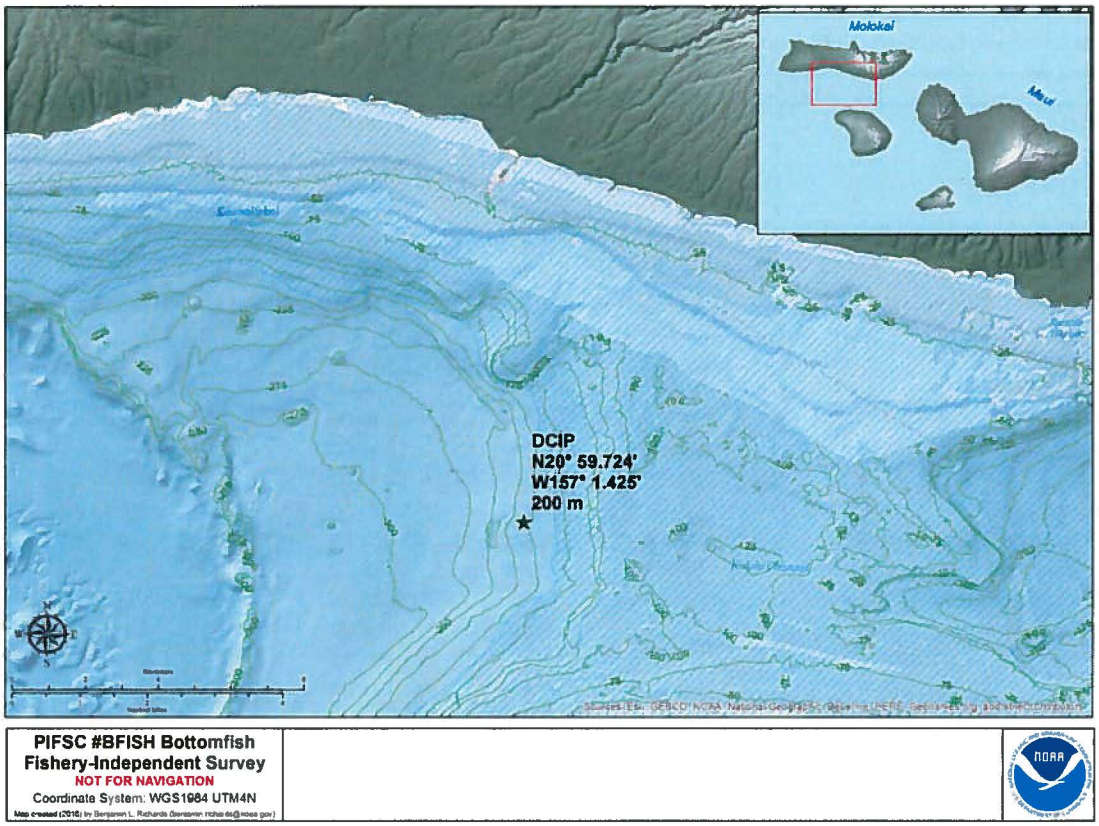

Figure 1 A map showing the approximate location of the Drop Camera Instrument Package (DCIP) following loss during research project SE1607 aboard NOAA Ship Oscar Elton Sette. The DCIP remains south of the island of Molokai in approximately 200 meters of water at N 20º 59.724 x W157 01.425.

Table 1 Itemized list and cost of components installed on the DCIP at the time of loss

Description	Property	Cost	Quantity	SubTotal	Reference
DCIP frame	N	$750.00	1	$750.00	confirm?
MOUSS camera	Y	$4,624.00	2	$9,248.00	SeaBed Invoice 2013-007-NOAA
MOUSS camera housing	Y	$1,965.98	2	$3,931.96	Sexton Cost worksheet R1.0
MOUSS DVR	Y	$4,474.00	1	$4,474.00	SeaBed Invoice 2013-007-NOAA
MOUSS DVR Housing	Y	$4,799.99	1	$4,799.99	Sexton Cost worksheet R1.0
MOUSS Battery + Housing	N	$2,813.81	1	$2,813.81	Sexton Cost worksheet R1.0
Subconn cable set	N	$3,279.48	1	$3,279.48	Sexton Cost worksheet R1.0
MOUSS basebar	N	$123.60	1	$123.60	PIFSC Contract WE-133F-12-SU-1415
DCIP bait arm	N	$50.00	1	$50.00	
DCIP subsurface buoy	N	$250.00	2	$500.00	
MOUSS light sync	N	$26.00	1	$26.00	
MOUSS light sync housing	N	$250.00	1	$250.00	
MOUSS TDR	N	$400.00	1	$400.00	
SeaBird SBE-39	N	$2,439.50	1	$2,439.50	http://tinyurl.com/z43qwsc
Teledyne Benthos Acoustic Release		$7,000.00	1	$7,000.00	confirm?
Kodak 360º camera	Y	$250.00	1	$250.00	
Kodak 360º camera housing	N	$250.00	1	$250.00	
Miscellaneous hardware	N	$100.00	1	$100.00	
			Total	**$40,686.34**	
			Property	**$22,703.95**	

Prior to the incident, the OES was engaged in a routine recovery of the DCIP. Conditions were within normal operating limits with winds at 25 knots, but seas at only 3 feet due to the lee effect of the island of Molokai. The DICP acoustic release was triggered at 10:42am HST and the DCIP was sighted at the surface at 10:48am HST. The OES approached the DCIP for recovery but was not able to get within grappling range during the first approach. The OES began to fall off the wind to starboard and the helmsman began backing down towards the DCIP to bring it alongside the port quarter. This brought the DCIP within grappling reach and the deck department tossed the grapple and got a good hook on the DCIP surface float line, per standard protocol. The line handler then began walking the DCIP forward toward the port side longline pit. As he was walking forward, he felt a tug and the line began to pull through his hands toward the stern. Personnel on the OES fantail heard multiple "thunk" sounds coming from the port side stern and the Operations Officer called an "all stop" on propulsion. The ship remained dead in the water while the situation was assessed. A single DCIP subsurface float was noted on the surface, floating freely off the stern of the ship (Figure 2).

Figure 2 DCIP sub-surface float on the surface off the stern of the NOAA Ship Oscar Elton Sette following loss of DCIP

Once the ship was operating normally, a GoPro camera was attached to a long pole and was lowered over the port quarter to inspect the propellers and rudders. All appeared clear of entanglements and the DCIP was not visible.

Following inspection of the OES, efforts were made to recover the DCIP sub-surface buoys sighted at the surface. One sub-surface float was recovered with remaining pieces of the frame bridle lines and hardware (Figure 3). The sub-surface float showed cut marks consistent with propeller strikes (Figure 4).

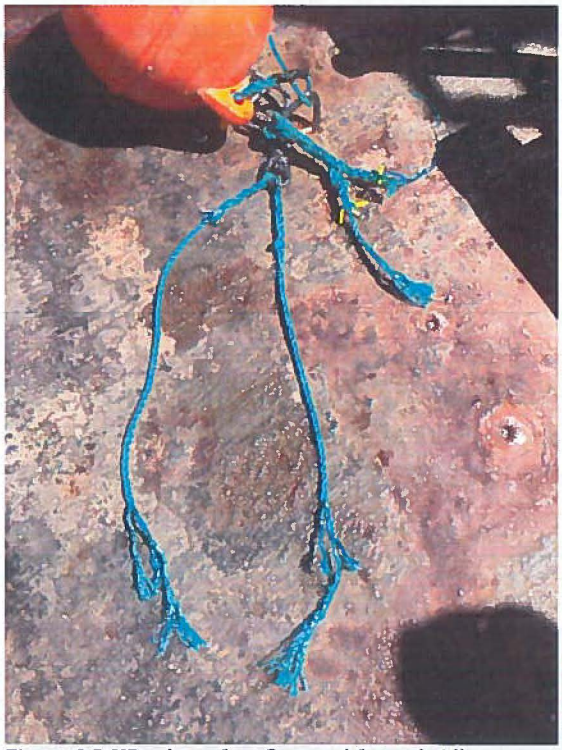

Figure 3 DCIP sub-surface float and frame bridle.

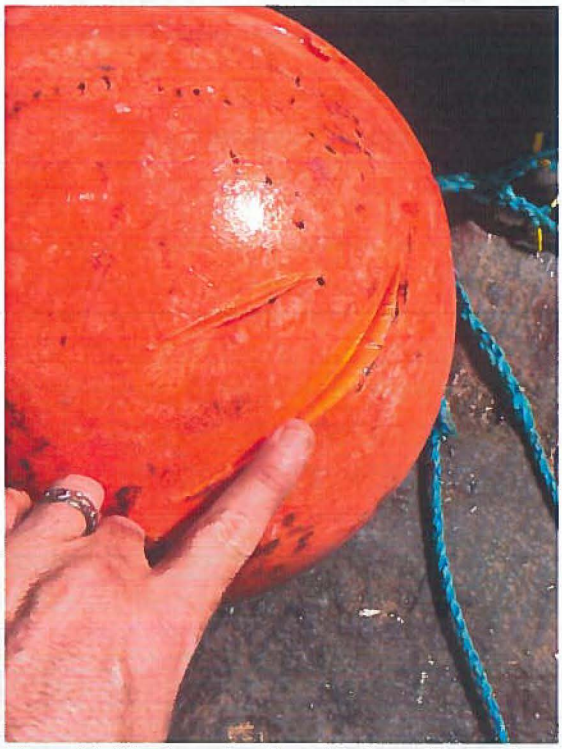

Figure 4 DCIP sub-surface float showing evidence of propeller strike.

Recommended Future Mitigations

1. Ensure helmsman has appropriate qualifications and experience to perform recovery given wind and sea conditions at time of recovery.
2. When possible, secure recovery-side propulsion during recovery.
3. Do not attempt to recover DCIP aft of the cut-out doors.
4. Bring DCIP down the recovery-side of the ship. If recovery is not possible, reposition for a second attempt. Do not back down on gear.
5. Maximum winds speed for DCIP operations should be set at 25 knots.

It should be noted that a subsequent DCIP was successfully recovered on the afternoon of November 3rd in the same surface conditions without issue. This recovery involved a more experienced helmsman.

ENS Solari (Ship Operations Officer, NOAA Ship Oscar Elton Sette)

This statement describes the loss of a Drop Camera Instrument Package (DCIP) from NOAA Ship *Oscar Elton Sette* on November 3rd, 2016 from the perspective of the deck crew on the ship's back deck. The loss occurred during the 3rd DCIP recovery of the day, the previous two recoveries conducted successfully, with no incident. Leading up to the loss, wind speeds in nautical miles per hour were observed to be in the mid-twenties. The location of the loss was south of the island of Molokai, Hawaii.

The beginning of the recovery was typical for this operation. The DCIP was brought down the port side of the ship at a slow rate of speed. As the line trailing from the DCIP passed by the ship's long line pit, crewmembers attempted to grapple the line, in order to bring the DCIP onboard. As the deck crew attempted to grapple the line, the wind was observed to be on the port side of the ship. The distance between the ship and the DCIP increased, and the deck crew was unable to grapple the DCIP's line. While the crew was attempting to grapple the line, the DCIP continued to move aft (in relation to the ship). Eventually, the DCIP was aft and outboard from the ship to a degree that crew halted their grappling attempts, as a successful grapple would not be likely.

The ship began to make sternway, which brought the DCIP closer to the ship and more forward. When the DCIP was within grappling distance of the ship's port quarter, a crewmember successfully grappled the line. Upon grappling the line, the crewmembers attempted to lead and pull the line forward, away from the stern. In doing so, there came a point where they could no longer pull the line forward. This was due to the DCIP having been pulled up alongside the ship, while the bow of the ship was pushed to starboard by the wind. The movement of the bow to starboard caused the stern of the ship to be forced to port and on top of the DCIP.

Due to wave action, the port side of the ship was forced up and then down. This motion caused the DCIP to slip under the ship's chine and to be forced completely under the vessel. The DCIP's movement under the ship caused the grappling line to become taught, pulling more line under the ship. At this time, the DCIP and attached floats made contact with the port propeller. This determination was made by the sound heard by all personnel on the back deck. Upon hearing the sound of contact with the propeller, an all stop was called by the safety officer on the back deck and a request was made to secure the port propeller. One of the three floats that were attached to the DCIP immediately floated to the surface.

At this point, the grappling line was walked around the port quarter to the stern and unfouled. Immediately after the grappling line was unfouled, a second float and the DCIP's bridle were observed floating astern of the vessel. At this point, the determination was made that the ship could continue maneuvering with the port propeller. The ship maneuvered to investigate the floats and found that they were no longer attached to DCIP equipment. The second float and bridle were recovered.

The first float was determined to be unrecoverable. Finally, a GoPro camera was attached to a pole and lowered into the water to investigate the stern of the vessel. The hull was found to be clear of any DCIP equipment or line.

US DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
Office of Marine and Aviation Operations
NOAA Ship *Oscar Elton Sette*
1897 Ranger Loop, Building 184
Honolulu, Hawaii 96818

November 3, 2016

Memorandum For: Russell Reardon, Project Leader, SE-16-07 Insular Bottomfish Survey
Science Operations Division, PIFSC

From: Commander Donald E. Beaucage, NOAA
Commanding Officer, NOAA Ship *Oscar Elton Sette*

Subject: Lost DropCam-Instrument Package Statement

Date/Time of Incident: 11/3/2016, 1050 HST

Location of Incident: Kalohi Channel between Moloka'i & Lana'i, Position: 21 00.1'N/157 01.9'W

Weather/Environmental Conditions: Mostly Sunny, Winds: 090 @ 28 knots, Seas: 100 @ 3-4 ft. Ship was in lee of Moloka'i from NW & NE swells but in a localized wind funneling area. Wind was <25 knots at time of DCIP deployment.

Summary of Incident: Ship was recovering second to last DropCam-Instrument Package (DCIP) of the project down the port side at the grated deck/long-line pit. The ship had deployed and recovered 43 DCIPs successfully in similar conditions during current project, this was #44. This was recovery #3 of the morning. Initial pass of surface float line was missed by grapple throw from back deck personnel so ship continued to back to try and salvage recovery by subsequent throw of grapple hook which had previously been done successfully multiple times during the current project.

Deck department was successful with subsequent grapple throw while surface float line was ~ two points off of the port quarter forward of the stern (CB radioed to bridge good grapple which is standard procedure) and the package was brought alongside aft of port side cut out by deck department hauling in the grapple line. The ship was broad to 28 knots of wind at this point and with the roll of the ship the package went under the port quarter chine as the ship rolled and was forced down by the motion of the ship. The bow thruster was at max thrust to port but could not bring ship's bow through the wind at this point. Safety Officer on back deck called to bridge for all stop and engines were brought to all stop. Safety Officer reported hearing a momentary thump sound from port quarter.

One of the two DCIP floats was then seen floating next to the ship on the port quarter with no line attached. Ship continued to maneuver with bow thruster only. A few minutes later the remaining floats were seen off of the fantail and the grapple hook and line were recovered by the

deck department. A GoPro camera was rigged to a boat pole to inspect the port prop and rudder. The port prop and rudder appeared normal with no sign of fouling/damage.

The two floats with line attached were recovered and the DCIP and acoustic release are assumed to be on the seafloor in 200 meters of water at position 21 00.1'N/157 01.9'W (Project Leader has exact location). Unknown full extent of what part of float/line rigging and/or DCIP frame came in contact with port prop but one float recovered showed evidence of prop strikes and the bridle line had been cut.

Initial Corrective Actions (following meeting with all involved):

Ship procedural changes for DCIP operations:
- 25 Knots is max wind conditions for DCIP operations regardless of wave height/sea conditions.
- If package is not forward of cut-out doors, do not throw grapple hook.
- If miss on initial pass with grapple, call off attempt once package is aft of cut-out doors and reposition ship for another recovery attempt.

Note - Sette had not conducted this operation since 2005 & 2009. It was reported to the command after this morning's incident that the ship had lost a similar camera package during a recovery attempt due to contact with port prop in 2009. DCIP SOP will need to be further reviewed and edited by PIFSC and SE personnel before attempting operation again in the future.