

U. S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Southeast Fisheries Science Center

Cruise Report

Date Submitted:

Platform:

Cruise Number:

Project Title:

Cruise Dates: -

Submitted by:
Field Party Chief

Date:

Approved by:
Division Director

Date:

Approved by:
Director, SEFSC

Date:

INTRODUCTION

The NOAA Ship *Pisces* hosted the Southeast Fishery-Independent Survey (SEFIS) for a research cruise in continental shelf and shelf-break waters off North and South Carolina in 2023. SEFIS was created by the National Marine Fisheries Service in 2010 and operates out of the NOAA-Beaufort Laboratory. This survey was created to conduct applied fishery-independent sampling and related research focusing on the assessment of spatial variability in distribution and abundance of red snapper and other reef species within the snapper-grouper complex, via data collected from fish traps, video cameras, and acoustics.

The original plan was to conduct primary SEFIS trap-video operations during two legs (25 days at sea (DAS) in total), and zig-zag random mapping during two legs (24 DAS; Figure 1). However, after some initial trap-video DAS were lost due to mechanical issues, some mapping days were converted to trap-video days. Storms and other issues resulted in some additional loss of DAS. A total of 32 DAS were eventually realized out of 49 DAS planned.

Original plan	Leg	Objective	Planned DAS	Realized DAS
August 3-7	Leg 1	Transit	5	
August 7-11	Leg 1	Mapping	4	
August 13-25	Leg 2	Trap-video sampling	13	
August 28 – Sept 8	Leg 3	Trap-video sampling	12	
Sept 11 – 30	Leg 4	Mapping	20	
Revised plan				
August 3-7	Leg1	Transit	5	5
August 7-11	Leg 1	Mapping	4	3 ^a
August 13-25	Leg 2	Trap-video sampling	13	9 ^b
August 28 – Sept 8	Leg 3	Trap-video sampling	12	3 ^c
Sept 11 – 23	Leg 4A ^f	Trap-video sampling	13	12 ^d
Sept 23 – 30	Leg 4B	Mapping	8	6 ^e
Total			54	38
a Personnel emergency resulting in departure one day later than expected				
b Bow thruster failure resulted in loss of 4 DAS				
c Engine oil leak caused loss of 9 DAS and unplanned pickup of scientists in Norfolk, VA				
d Tropical Storm Ophelia caused loss of 1 DAS and unplanned disembarkation of scientists in Norfolk, VA				
e Tropical Storm Ophelia (1 DAS) and ship mechanical issues (1 DAS) caused 2-day late departure				
f An at-sea transfer of scientists occurred on September 18 th during leg 4A				

Summary of Objectives:

1. Fishery-independent sampling of randomly selected stations in North and South Carolina. Baited chevron traps, with two mounted high-definition video cameras were utilized for (a) hardbottom reef fish community assessments, (b) collection of reef fish for biological samples (i.e., otoliths and gonads), and (c) comparative gear sampling (cameras versus traps).
2. Use video cameras on chevron traps to address trap selectivity issues, locate and describe hardbottom habitats, and provide an additional index of abundance for stock assessments.
3. Use a conductivity, temperature, depth (CTD) instrument package to collect environmental data (temperature, salinity, dissolved oxygen, turbidity) at camera-trap sampling locations.
4. Multibeam sonar mapping (random zig-zag pattern) to estimate proportion and amount of hardbottom across survey range.
5. Collection of EK-80 data as part of the greater amberjack abundance estimation project.

MATERIALS AND METHODS

Camera-Trap Sampling

Camera-trap gear consisted of two high definition video cameras mounted to a chevron fish trap. Additionally, one of the six traps in a group included an attached stereo-video camera for future fish length measurements. Chevron traps were composed of plastic-coated wire mesh. GoPro cameras (model HD Hero[®] 9) were attached above the mouth and nose of the trap. Traps were baited with Atlantic menhaden, *Brevoortia tyrannus*, and video cameras were set to record before deployment. Camera-traps were deployed at least 200 m apart on suspected or known hardbottom habitats, and soak time was targeted for approximately 90 min. Camera-traps were most often deployed in sets of six. A CTD cast (see environmental data collection) was conducted while traps were soaking. Fish catches were processed after trap retrieval. All fish were enumerated, weighed, and measured to the nearest millimeter. Individuals of priority species (mostly species found in the snapper-grouper complex) were further processed for additional lengths and biological samples (otoliths, gonads, and DNA). Video files were downloaded and backed up on digital media storage devices. Biological samples and video files were brought to the Beaufort Laboratory for further processing and analysis.

Environmental Data Collection

Environmental data were collected with a Seabird CTD instrument package (model SBE 9) and Scientific Computer System (SCS) software. CTD casts were conducted near the middle of the camera-trap soak period; instruments were lowered to within 2 m of the bottom. Numerous water profile measurements were taken, including temperature (°C), salinity, dissolved oxygen (mg/L), average sound velocity (m/s), fluorescence (mg/m³), and beam transmission (%). CTD data were archived for further processing at the Beaufort Laboratory. SCS 5 was used to collect specific

information for each fishing and CTD event, including soak time/cast duration as well as start and end latitude, longitude, and depth (m).

Multibeam Sonar Data Collection

The EM2040 was used by Pisces Survey Technicians to map seafloor habitats during overnight hours when trap and video sampling was not occurring. Two types of mapping occurred: random zig-zag lines to estimate hardbottom or priority areas not previously mapped.

RESULTS AND DISCUSSION

Camera-Trap Sampling

A total of 322 stations were sampled with camera-trap gear during PC-23-03 (Table 1). From these traps, fish were collected and worked up for length frequency data. Various reef fish species were further processed for otolith, gonad, and DNA tissue. One trap was lost when the line was cut on the side of the ship.

Environmental Data Collection

A total of 56 CTD casts (Table 1) associated with trap-video sampling were conducted during the cruise (note that additional CTD casts were conducted overnight for mapping purposes). CTD data will be processed with Seabird SBE Data Processing software (version 7.2), and archived in a database at the NMFS-Beaufort Laboratory for future analysis.

Multibeam Sonar Mapping

Seafloor mapping occurred during the 8 realized mapping days as well as most evenings during trap-video cruises. A total of 37 lines were mapped out of 87 in total that were expected on this cruise. Four additional priority areas were mapped.

EK-80 Data Collection

We collected EK-80 data day and night during all four legs, but the device began experiencing problems early in leg 4. It appeared as though interference was occurring, even though all other sonar devices on the ship were secured.

Time Lost

Leg 1 was reduced by 1 DAS due to a personnel emergency, leg 2 was reduced by 4 DAS due to a bow thruster problem, leg 3 was reduced by 9 DAS due to an engine oil leak, and leg 4 was reduced by 2 DAS due to storms and 1 DAS due to a ship mechanical issue when trying to leave the dock. In total, 32 of 49 DAS were achieved in 2023 (and 17 DAS were lost, 2 DAS lost due to weather and 15 DAS due to ship mechanical or personnel issues).

Acknowledgments

We thank the NOAA Ship *Pisces* officers and ship's company for their hard work during our cruise.

CRUISE PARTICIPANTS

Leg I: August 4-11, 8 DAS

Name	Title	Organization
No scientists on board		

Leg II: August 17-25, 9 DAS

Name	Title	Organization
Nate Bacheler	FPC	NOAA-NMFS-SEFSC
Christina Schobernd	Video lead	NOAA-NMFS-SEFSC
Zach Gillum	Watch chief	CIMAS
David Hoke	Deck watch	NOAA-NMFS-SEFSC
Derek Bolser	Deck watch	NOAA-NMFS
Brad Teer	Watch chief	CIMAS
Erin Pickett	Deck watch	CIMAS
Walt Rogers	Deck watch	CIMAS

Leg III: August 28 – 30, 3 DAS

Name	Title	Organization
Zeb Schobernd	FPC	NOAA-NMFS-SEFSC
Matt Damiano	Video lead	CIMAS
Zach Gillum	Watch chief	CIMAS
Matt Vincent	Deck watch	NOAA-NMFS-SEFSC
Cassidy Peterson	Deck watch	NOAA-NMFS-SEFSC
Brad Teer	Watch chief	CIMAS
Kim Johnson	Deck watch	NOAA-NMFS-SEFSC
Neil McNeill	Deck watch	NOAA-NMFS-SEFSC
Joe Contillo	Deck watch	NOAA-NMFS-SEFSC

Leg IVA part 1: September 11-18, 8 DAS

Name	Title	Organization
Nate Bacheler	FPC	NOAA-NMFS-SEFSC
Zeb Schobernd	Video lead	NOAA-NMFS-SEFSC
Rob Cheshire	Watch chief	NOAA-NMFS-SEFSC
Nick Piscitelli	Deck watch	University of Connecticut
Brad Teer	Watch chief	CIMAS
Ryan Tharp	Deck watch	NC State University
Jenna Charydczak	Deck watch	SCDNR

Leg IVA part 2: September 18-22, 4 DAS

Name	Title	Organization
Nate Bacheler	FPC	NOAA-NMFS-SEFSC
Zeb Schobernd	Video lead	NOAA-NMFS-SEFSC
Zach Gillum	Watch chief	CIMAS
Rob Cheshire	Deck watch	NOAA-NMFS-SEFSC
Sally Dowd	Deck watch	University of North Carolina
Brad Teer	Watch chief	CIMAS
Ryan Tharp	Deck watch	NC State University
Jenna Charydczak	Deck watch	SCDNR
Katrina Bernaus	Deck watch	Duke University

Leg 4B: September 25-30, 6 DAS

Name	Title	Organization
No scientists on board		

Figure 1: Operating area for PC-23-03 outlined in red.

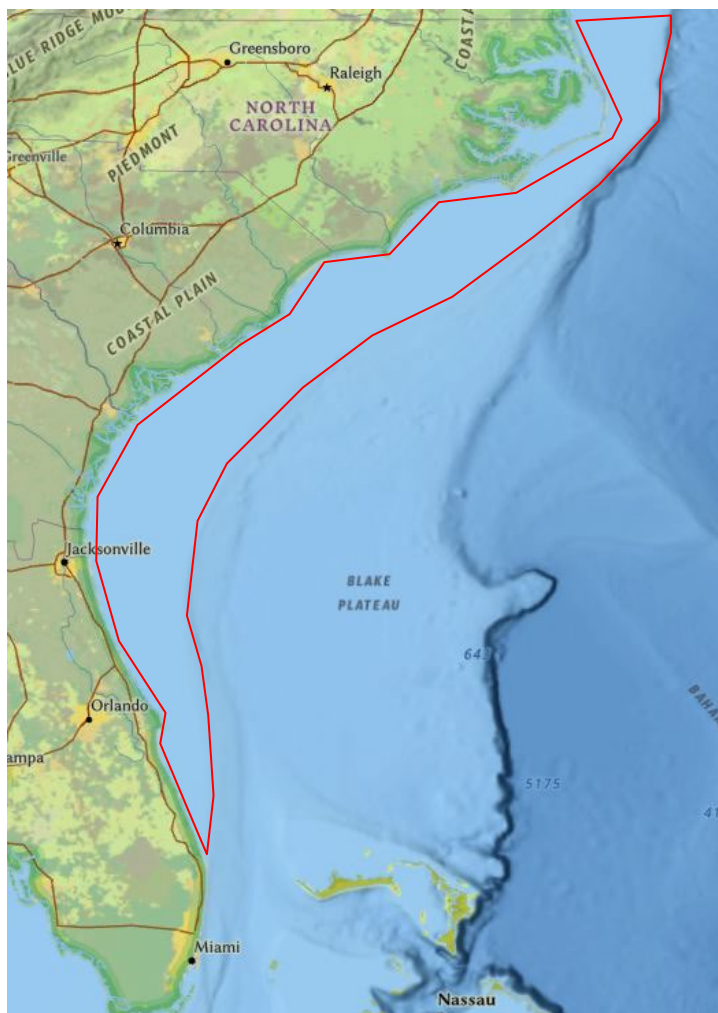


Table 1. Summary of station coordinates, depth (m), date, and time (GMT) for each fishing event (camera-trap, Gear=324) and CTD cast (Gear=298) conducted on the PC-23-03 survey.

Collection number	Gear	Date	Time (GMT)	Latitude	Longitude	Depth (m)
233638	324	8/17/2023	17:42	3426.98278N	7637.54338W	23.3
233639	324	8/17/2023	17:45	3426.82414N	7637.4349W	20.5
233640	324	8/17/2023	17:47	3426.70942N	7637.45968W	15.4
233641	324	8/17/2023	17:51	3426.58012N	7637.29624W	21.6
233642	324	8/17/2023	18:00	3425.84731N	7636.66228W	14.8
233643	324	8/17/2023	18:05	3425.50732N	7636.44994W	23.1
233644	298	8/17/2023	19:09	3425.355N	7636.15638W	22.9
233645	324	8/18/2023	11:01	3416.5066N	7719.7280W	23
233646	324	8/18/2023	11:06	3416.1652N	7719.4040W	22
233647	324	8/18/2023	11:12	3415.8640N	7719.8000W	24.2
233648	324	8/18/2023	11:16	3415.3575N	7719.7520W	24.4
233649	324	8/18/2023	11:19	3415.3474N	7719.7640W	24
233650	324	8/18/2023	11:22	3415.1110N	7719.7640W	23.3
233651	298	8/18/2023	11:40	3415.1200N	7719.8000W	23.4
233652	324	8/18/2023	14:29	3420.5152N	7712.14988W	23.84
233653	324	8/18/2023	14:33	3420.3541N	7711.9412W	22.6
233654	324	8/18/2023	14:37	3420.23584N	7711.8029W	23.67
233655	324	8/18/2023	14:41	3419.95564N	7711.70492W	24.34
233656	324	8/18/2023	14:47	3419.70622N	7711.268W	23.29
233657	324	8/18/2023	14:53	3419.3704N	7710.91784W	23.68
233658	298	8/18/2023	15:07	3419.10808N	7710.77948W	24.18
233659	324	8/18/2023	17:18	3418.1758N	7709.76122W	24.77
233660	324	8/18/2023	17:20	3418.03126N	7709.83784W	25.28
233661	324	8/18/2023	17:22	3417.95896N	7709.6666W	24.87
233662	324	8/18/2023	17:25	3417.77434N	7709.57072W	24.49
233663	324	8/18/2023	17:28	3417.67444N	7709.39078W	24.6
233664	324	8/18/2023	17:31	3417.52468N	7709.18786W	24.78
233665	298	8/18/2023	17:43	3417.32314N	7709.09402W	25.4
233666	324	8/18/2023	20:32	3418.91848N	7703.75552W	25.41
233667	324	8/18/2023	20:37	3418.76926N	7703.63786W	26
233668	324	8/18/2023	20:41	3418.61608N	7703.603W	25.8
233669	324	8/18/2023	20:46	3418.48582N	7703.37764W	25.5
233670	324	8/18/2023	20:50	3418.3975N	7703.08028W	26.18
233671	324	8/18/2023	20:57	3418.1776N	7703.33216W	26.51
233672	298	8/18/2023	21:08	3418.0312N	7703.41646W	26.6
233673	324	8/19/2023	11:15	3409.90786N	7610.05222W	57.72
233674	324	8/19/2023	11:19	3409.78312N	7610.36134W	59.02

233675	324	8/19/2023	11:22	3409.6516N	7610.59528W	58.9
233676	324	8/19/2023	11:25	3409.47814N	7610.81056W	58.06
233677	324	8/19/2023	11:28	3409.3348N	7610.99272W	57.14
233678	324	8/19/2023	11:31	3409.22578N	7611.28768W	53.82
233679	298	8/19/2023	11:48	3409.16182N	7611.94348W	58.07
233680	324	8/19/2023	14:20	3411.76318N	7607.0524W	74.97
233681	324	8/19/2023	14:26	3411.44026N	7607.5555W	71.31
233682	324	8/19/2023	14:28	3411.3511N	7607.69458W	72.06
233683	324	8/19/2023	14:30	3411.26104N	7607.82646W	72.89
233684	324	8/19/2023	14:35	3410.96908N	7607.9875W	60.39
233685	324	8/19/2023	14:41	3410.71474N	7608.38542W	59.27
233686	298	8/19/2023	14:57	3410.53828N	7608.99502W	78.75
233687	324	8/19/2023	18:20	3408.98152N	7609.855W	105.37
233688	324	8/19/2023	18:25	3409.0498N	7609.44748W	109.56
233689	324	8/19/2023	20:19	3409.26508N	7609.01614W	121.35
233690	324	8/19/2023	18:36	3409.67326N	7609.36774W	78.73
233691	324	8/19/2023	18:44	3410.00254N	7608.75796W	101.89
233692	324	8/19/2023	18:51	3410.51986N	7608.2884W	75.39
233693	298	8/19/2023	19:16	3409.705N	7608.28312W	117.55
233694	324	8/20/2023	12:28	3500.91026N	7527.77622W	48.62
233695	324	8/20/2023	11:16	3500.73218N	7527.81804W	49.29
233696	324	8/20/2023	11:20	3500.54162N	7527.64908W	50.41
233697	324	8/20/2023	11:24	3500.2796N	7527.75096W	49.61
233698	324	8/20/2023	11:29	3459.84064N	7527.65136W	50.57
233699	324	8/20/2023	11:32	3459.61816N	7527.65172W	50.38
233700	298	8/20/2023	11:47	3459.301N	7527.36762W	53.41
233701	324	8/20/2023	14:11	3456.2023N	7527.25872W	63.94
233702	324	8/20/2023	15:42	3456.01522N	7527.3837W	61.58
233703	324	8/20/2023	14:21	3455.63446N	7527.7485W	61.55
233704	324	8/20/2023	14:24	3455.48554N	7527.79692W	64.65
233705	324	8/20/2023	14:28	3455.3041N	7527.98136W	65.38
233706	324	8/20/2023	14:33	3455.33866N	7528.27194W	63.04
233707	298	8/20/2023	14:47	3455.56354N	7528.72776W	65.07
233708	324	8/20/2023	16:57	3455.59456N	7530.76188W	54.66
233709	324	8/20/2023	17:06	3455.42194N	7530.06054W	57.22
233710	324	8/20/2023	17:11	3455.1262N	7529.91126W	59.46
233711	324	8/20/2023	17:22	3454.41262N	7530.91074W	57.92
233712	324	8/20/2023	17:26	3454.18N	7531.11456W	58.14
233713	324	8/20/2023	17:28	3454.09504N	7531.27698W	57.37
233714	298	8/20/2023	17:39	3453.98062N	7531.6251W	55.46

233715	324	8/20/2023	20:22	3452.31388N	7530.43812W	57.48
233716	324	8/20/2023	20:26	3452.28814N	7530.6441W	56.18
233717	324	8/20/2023	20:33	3451.9234N	7530.89328W	54.9
233718	324	8/20/2023	20:43	3451.50364N	7531.79088W	57.37
233719	324	8/20/2023	20:50	3451.78024N	7531.81956W	56.23
233720	324	8/20/2023	20:56	3451.79566N	7532.13414W	61.51
233721	298	8/20/2023	21:05	3451.62664N	7532.4186W	66.63
233722	324	8/21/2023	11:17	3429.30322N	7552.05678W	88.26
233723	324	8/21/2023	11:19	3429.15178N	7552.1541W	87.39
233724	324	8/21/2023	11:25	3428.291N	7552.453W	87.7
233725	324	8/21/2023	11:29	3428.5474N	7552.73166W	84.54
233726	324	8/21/2023	11:34	3428.23564N	7552.96836W	86.93
233727	324	8/21/2023	11:37	3428.06764N	7553.20344W	85.05
233728	298	8/21/2023	11:52	3428.5492N	7553.29164W	76.19
233729	324	8/21/2023	14:16	3429.26728N	7553.007W	73.8
233730	324	8/21/2023	14:21	3429.00484N	7553.4384W	74.16
233731	324	8/21/2023	14:33	3427.99336N	7554.58776W	73.53
233732	324	8/21/2023	14:39	3427.58152N	7555.01298W	71.88
233733	324	8/21/2023	14:43	3427.30156N	7555.12254W	73.14
233734	324	8/21/2023	14:46	3427.07836N	7555.35246W	73.12
233735	298	8/21/2023	15:03	3427.39612N	7555.56762W	69.45
233736	324	8/21/2023	17:34	3428.89792N	7552.72686W	79.02
233737	324	8/21/2023	17:38	3428.64508N	7552.91718W	79.73
233738	324	8/21/2023	17:41	3428.44876N	7553.00856W	82.01
233739	324	8/21/2023	17:45	3428.24644N	7553.29308W	81.43
233740	324	8/21/2023	17:49	3428.11288N	7553.55888W	79.52
233741	324	8/21/2023	17:54	3427.80316N	7553.78532W	80.07
233742	298	8/21/2023	18:07	3427.64902N	7554.00834W	80.88
233743	324	8/21/2023	20:21	3426.11524N	7556.0778W	74.78
233744	324	8/21/2023	20:24	3425.973N	7556.271W	72.9
233745	324	8/21/2023	20:30	3425.6656N	7556.73816W	70
233746	324	8/21/2023	20:33	3425.4832N	7556.5737W	72.48
233747	324	8/21/2023	20:36	3425.3146N	7556.62398W	75.18
233748	324	8/21/2023	20:41	3425.40526N	7557.03714W	69.98
233749	298	8/21/2023	21:24	3426.28828N	7555.8873W	75.63
233750	324	8/22/2023	10:59	3436.95124N	7609.52722W	38.2
233751	324	8/22/2023	11:04	3436.7842N	7609.87792W	37.99
233752	324	8/22/2023	11:12	3437.04754N	7609.9276W	37.63
233753	298	8/22/2023	11:23	3437.35144N	7609.72954W	38.38
233754	324	8/22/2023	14:23	3437.4436N	7608.79612W	38.99

233755	324	8/22/2023	14:25	3437.49466N	7608.67894W	38.98
233756	324	8/22/2023	14:27	3437.4421N	7608.57346W	39.27
233757	324	8/22/2023	14:31	3437.46496N	7608.42916W	38.48
233758	324	8/22/2023	14:34	3437.38582N	7608.27358W	39.43
233759	324	8/22/2023	14:36	3437.31742N	7608.17686W	39.89
233760	298	8/22/2023	14:45	3437.414N	7607.414W	38.71
233761	324	8/22/2023	17:21	3437.27446N	7608.87088W	39.27
233762	324	8/22/2023	17:23	3437.37832N	7608.8941W	39.18
233763	324	8/22/2023	17:25	3437.49172N	7608.9439W	38.86
233764	324	8/22/2023	17:27	3437.50804N	7609.06354W	38.81
233765	324	8/22/2023	17:37	3437.56768N	7609.16836W	39.67
233766	324	8/22/2023	17:44	3437.73004N	7609.2298W	38.64
233767	298	8/22/2023	17:53	3437.91358N	7609.0573W	37.85
233768	324	8/22/2023	20:14	3437.3251N	7608.66004W	38.73
233769	324	8/22/2023	20:16	3437.39944N	7608.58696W	39.39
233770	324	8/22/2023	20:19	3437.32972N	7608.43366W	39.16
233771	324	8/22/2023	20:21	3437.27992N	7608.3118W	39.12
233772	324	8/22/2023	20:23	3437.22076N	7608.19186W	39.46
233773	324	8/22/2023	20:27	3437.37052N	7608.226W	39.28
233774	298	8/22/2023	20:39	3437.56N	7608.42862W	38.02
233775	324	8/23/2023	11:00	3431.41126N	7612.82812W	39.49
233776	324	8/23/2023	11:06	3432.06292N	7612.70128W	39.08
233777	324	8/23/2023	11:09	3432.21424N	7612.84846W	38.72
233778	324	8/23/2023	11:15	3432.34942N	7612.60054W	37.89
233779	324	8/23/2023	11:20	3432.61918N	7612.30642W	39.07
233780	324	8/23/2023	11:23	3432.8083N	7612.23244W	39.44
233781	298	8/23/2023	11:38	3433.09696N	7612.15396W	38.43
233782	324	8/23/2023	14:14	3431.12626N	7615.44544W	37.63
233783	324	8/23/2023	14:18	3431.24842N	7615.75876W	37.2
233784	324	8/23/2023	14:31	3432.38584N	7615.09084W	36.92
233785	324	8/23/2023	14:37	3432.727N	7614.650W	37.5
233786	324	8/23/2023	14:41	3432.81904N	7614.23866W	37.7
233787	324	8/23/2023	14:49	3433.14574N	7613.44396W	38.68
233788	298	8/23/2023	15:00	3433.32124N	7613.15824W	39.1
233789	324	8/23/2023	17:28	3433.37776N	7614.24544W	37.49
233790	324	8/23/2023	17:32	3433.67896N	7614.1129W	37.81
233791	324	8/23/2023	17:35	3433.83382N	7613.95588W	38.38
233792	324	8/23/2023	17:43	3434.02438N	7613.35954W	37.83
233793	324	8/23/2023	17:49	3434.0128N	7612.83994W	38.65
233794	324	8/23/2023	17:54	3434.02222N	7612.267W	39.03

233795	298	8/23/2023	18:07	3434.0158N	7611.98452W	39.1
233796	324	8/23/2023	20:18	3435.9655N	7611.78736W	37.66
233797	324	8/23/2023	20:22	3436.1182N	7612.00684W	37.68
233798	324	8/23/2023	20:25	3436.30168N	7611.9922W	37.76
233799	324	8/23/2023	20:28	3436.42516N	7611.95716W	36.87
233800	324	8/23/2023	20:32	3436.5748N	7611.68578W	38.36
233801	324	8/23/2023	20:37	3436.32244N	7611.34396W	38.28
233802	298	8/23/2023	20:47	3436.16254N	7611.13324W	37.64
233803	324	8/24/2023	11:16	3434.2948N	7550.42424W	60.61
233804	324	8/24/2023	11:23	3434.5894N	7549.65594W	62.12
233805	324	8/24/2023	11:28	3434.80648N	7549.41918W	61.63
233806	324	8/24/2023	11:38	3434.2837N	7549.42092W	61.5
233807	324	8/24/2023	11:46	3434.56492N	7548.58608W	61.8
233808	324	8/24/2023	11:51	3434.89762N	7548.32652W	62.25
233809	298	8/24/2023	12:07	3435.37486N	7548.14004W	62.2
233810	324	8/24/2023	14:14	3432.61102N	7548.86778W	76.26
233811	324	8/24/2023	14:21	3433.00762N	7548.49176W	77.4
233812	324	8/24/2023	14:26	3433.07908N	7548.11166W	92.54
233813	324	8/24/2023	14:30	3433.28992N	7547.83308W	96.79
233814	324	8/24/2023	14:36	3433.20664N	7547.28W	101.48
233815	324	8/24/2023	14:45	3434.0362N	7546.97484W	79.49
233816	298	8/24/2023	15:00	3434.41024N	7547.21784W	67.95
233817	324	8/29/2023	11:10	3411.386N	7718.93192W	27.01
233818	324	8/29/2023	11:14	3411.220N	7718.73686W	25.58
233819	324	8/29/2023	11:18	3411.023N	7718.59478W	26.38
233820	324	8/29/2023	11:21	3410.849N	7718.74466W	26.49
233821	324	8/29/2023	11:27	3410.601N	7718.2454W	26.32
233822	324	8/29/2023	11:30	3410.381N	7718.23766W	26.03
233823	298	8/29/2023	11:37	3410.136N	7717.98296W	26.62
233824	324	9/12/2023	17:42	3432.58726N	7624.05976W	20.24
233825	324	9/12/2023	17:44	3432.39472N	7624.13812W	19.79
233826	324	9/12/2023	17:46	3432.30868N	7624.10308W	18.51
233827	324	9/12/2023	17:58	3432.22036N	7624.2148W	19.77
233828	324	9/12/2023	18:01	3432.02674N	7624.1998W	18.17
233829	324	9/12/2023	18:05	3431.775N	7624.270W	18.8
233830	298	9/12/2023	18:24	3431.74042N	7623.77038W	18.89
233831	324	9/12/2023	20:26	3433.43398N	7620.29782W	24.96
233832	324	9/12/2023	20:29	3433.21432N	7620.3733W	24
233833	324	9/12/2023	20:31	3433.07272N	7620.36826W	24.56
233834	324	9/12/2023	20:34	3432.9484N	7620.48976W	28.24

233835	324	9/12/2023	20:38	3432.77326N	7620.49804W	25.14
233836	324	9/12/2023	20:40	3432.60568N	7620.5491W	27.63
233837	298	9/12/2023	20:50	3432.52876N	7620.93424W	26.08
233838	324	9/13/2023	11:21	3331.64034N	7710.47552W	41.71
233839	324	9/13/2023	11:26	3331.37532N	7710.23078W	42.74
233840	324	9/13/2023	11:31	3331.06956N	7710.00236W	42.41
233841	324	9/13/2023	11:39	3330.39252N	7710.22466W	42.88
233842	324	9/13/2023	11:43	3330.19224N	7709.93852W	42.34
233843	324	9/13/2023	11:46	3330.22464N	7709.72864W	42.53
233844	298	9/13/2023	12:03	3330.53916N	7709.13608W	41.63
233845	324	9/13/2023	14:14	3333.78006N	7708.38776W	40.56
233846	324	9/13/2023	14:17	3333.9528N	7708.50104W	39.84
233847	324	9/13/2023	14:22	3333.96942N	7708.93352W	40.48
233848	324	9/13/2023	14:28	3334.07022N	7709.61044W	41.22
233849	324	9/13/2023	14:34	3333.88926N	7710.22562W	41.26
233850	324	9/13/2023	14:38	3333.9012N	7710.55274W	37.92
233851	298	9/13/2023	14:49	3334.14252N	7710.76952W	40.62
233852	324	9/13/2023	17:35	3336.81936N	7707.16328W	38.44
233853	324	9/13/2023	17:38	3336.99948N	7707.15032W	37.52
233854	324	9/13/2023	17:41	3337.22226N	7707.05564W	38.24
233855	324	9/13/2023	17:45	3337.39434N	7707.13658W	38.03
233856	324	9/13/2023	17:52	3337.56012N	7707.0299W	38.21
233857	324	9/13/2023	17:57	3337.58886N	7706.67014W	38.3
233858	298	9/13/2023	18:11	3337.44996N	7706.36W	39.31
233859	324	9/13/2023	20:47	3338.76954N	7710.1988W	35.88
233860	324	9/13/2023	20:50	3338.78796N	7710.43124W	35.71
233861	298	9/13/2023	21:02	3338.68992N	7710.79316W	37.04
233862	324	9/14/2023	11:26	3330.75018N	7752.83414W	27.5
233863	324	9/14/2023	11:30	3330.72414N	7752.59768W	27.26
233864	324	9/14/2023	11:36	3330.54048N	7752.60164W	27.48
233865	324	9/14/2023	11:38	3330.45876N	7752.73778W	28.64
233866	324	9/14/2023	11:45	3329.86284N	7752.84698W	27.88
233867	324	9/14/2023	11:53	3330.1632N	7751.9825W	28.61
233868	298	9/14/2023	12:06	3330.34488N	7751.8115W	28.22
233869	324	9/14/2023	16:19	3328.16592N	7814.91708W	25.9
233870	324	9/14/2023	16:22	3328.33014N	7814.84058W	26.33
233871	324	9/14/2023	16:26	3328.5174N	7814.96076W	26.04
233872	324	9/14/2023	16:32	3328.9359N	7815.04386W	25.66
233873	324	9/14/2023	16:37	3329.2056N	7814.89872W	25.75
233874	324	9/14/2023	16:43	3329.52162N	7815.0723W	25.45

233875	298	9/14/2023	16:54	3329.68158N	7815.2886W	24.92
233876	324	9/14/2023	20:15	3322.35324N	7819.89W	27.13
233877	324	9/14/2023	20:18	3322.61982N	7819.96764W	26.47
233878	324	9/14/2023	20:22	3322.76586N	7819.88394W	26.87
233879	324	9/14/2023	20:26	3323.01144N	7819.90518W	26.45
233880	324	9/14/2023	20:28	3323.15334N	7819.92084W	26.08
233881	324	9/14/2023	20:33	3323.14008N	7820.1951W	27
233882	298	9/14/2023	20:46	3323.4591N	7820.75616W	26.21
233883	324	9/15/2023	15:29	3316.3035N	7825.8972W	27.53
233884	324	9/15/2023	15:31	3316.22628N	7825.7451W	27.51
233885	324	9/15/2023	15:38	3316.40442N	7825.50762W	28.02
233886	324	9/15/2023	15:39	3316.52592N	7825.42272W	28.23
233887	324	9/15/2023	15:49	3316.61892N	7825.53918W	29.13
233888	324	9/15/2023	15:57	3316.87422N	7824.96996W	27.42
233889	298	9/15/2023	16:08	3316.90152N	7824.78288W	27.51
233890	324	9/15/2023	18:32	3316.01286N	7826.51874W	27.36
233891	324	9/15/2023	18:37	3316.32162N	7826.16048W	26.92
233892	324	9/15/2023	18:39	3316.4184N	7826.03736W	27.08
233893	324	9/15/2023	18:44	3316.70034N	7825.80744W	27.97
233894	324	9/15/2023	18:48	3316.842N	7825.5967W	26.8
233895	324	9/15/2023	18:50	3316.93932N	7825.48302W	26.3
233896	298	9/15/2023	19:03	3317.18316N	7825.1805W	26.92
233897	324	9/16/2023	11:25	3328.08636N	7705.82582W	44.1
233898	324	9/16/2023	11:29	3328.26216N	7705.6211W	44.2
233899	324	9/16/2023	11:34	3328.04916N	7705.38578W	43.7
233900	324	9/16/2023	11:39	3328.15644N	7705.28036W	43.63
233901	324	9/16/2023	11:43	3328.43352N	7705.2905W	43.8
233902	324	9/16/2023	11:48	3328.45452N	7705.0715W	43.43
233903	298	9/16/2023	12:01	3328.17132N	7704.92384W	44.58
233904	324	9/16/2023	14:41	3327.41448N	7701.43556W	62.45
233905	324	9/16/2023	14:45	3327.49506N	7701.05792W	59.95
233906	324	9/16/2023	14:51	3327.76032N	7700.38286W	69.03
233907	324	9/16/2023	15:02	3327.06978N	7659.92422W	100.32
233908	324	9/16/2023	15:07	3326.9214N	7700.3312W	87.89
233909	324	9/16/2023	15:12	3326.72898N	7700.7584W	84.39
233910	298	9/16/2023	15:26	3326.48814N	7701.2822W	77.01
233911	324	9/16/2023	18:47	3329.62494N	7657.30786W	76.61
233912	324	9/16/2023	18:53	3330.09606N	7656.92692W	81.38
233913	324	9/16/2023	18:56	3330.1779N	7656.73462W	75.52
233914	324	9/16/2023	18:59	3330.31302N	7656.53524W	82.12

233915	324	9/16/2023	19:03	3330.435N	7656.3652W	77.47
233916	324	9/16/2023	19:07	3330.23484N	7656.28024W	85.76
233917	298	9/16/2023	19:20	3329.98032N	7656.48958W	86.61
233918	324	9/17/2023	11:18	3359.68704N	7700.11412W	34.77
233919	324	9/17/2023	11:23	3359.3916N	7700.1236W	35.85
233920	324	9/17/2023	11:28	3359.10432N	7700.0717W	34.58
233921	324	9/17/2023	11:35	3358.89468N	7659.49432W	35.65
233922	324	9/17/2023	11:44	3358.41474N	7659.02968W	34.65
233923	324	9/17/2023	11:49	3358.04496N	808.77554W	34.31
233924	298	9/17/2023	12:04	3358.10814N	7658.93668W	36.26
233925	324	9/17/2023	14:39	3354.5766N	7657.43656W	37.04
233926	324	9/17/2023	14:42	3354.4008N	7657.61614W	35.81
233927	324	9/17/2023	14:45	3354.23976N	7657.79416W	37.01
233928	324	9/17/2023	14:49	3353.98098N	7657.96576W	36.44
233929	324	9/17/2023	14:53	3353.73936N	7658.08468W	36.69
233930	324	9/17/2023	14:58	3353.3151N	7657.97284W	36.33
233931	298	9/17/2023	15:08	3353.05404N	7657.6918W	36.44
233932	324	9/17/2023	18:03	3347.72088N	7658.92702W	40.61
233933	324	9/17/2023	18:06	3347.5371N	7659.07222W	38.99
233934	324	9/17/2023	18:09	3347.32692N	7659.12322W	38.6
233935	324	9/17/2023	18:20	3346.395N	7700.06192W	38.5
233936	324	9/17/2023	18:23	3346.25046N	7700.13146W	38.1
233937	324	9/17/2023	18:25	3346.10952N	7700.22542W	40.07
233938	298	9/17/2023	18:39	3345.8808N	7700.31812W	40.7
233939	324	9/18/2023	15:37	3434.64982N	7656.78358W	18.97
233940	324	9/18/2023	14:26	3434.96098N	7656.72508W	18.99
233941	324	9/18/2023	14:28	3435.11518N	7656.69364W	18.84
233942	324	9/18/2023	14:34	3435.245N	7656.772W	18.2
233943	324	9/18/2023	14:37	3435.18568N	7657.02436W	18.75
233944	324	9/18/2023	14:44	3435.46198N	7656.91282W	19.19
233945	298	9/18/2023	14:58	3435.40624N	7656.5917W	18.46
233946	324	9/18/2023	18:08	3425.87194N	7654.20292W	23.75
233947	324	9/18/2023	18:14	3426.19252N	7653.9403W	24.61
233948	324	9/18/2023	18:19	3426.33796N	7654.05352W	24.07
233949	324	9/18/2023	18:22	3426.49804N	7654.23154W	24.24
233950	324	9/18/2023	18:26	3426.7426N	7654.39024W	23.77
233951	324	9/18/2023	18:29	3426.96712N	7654.41022W	24.97
233952	298	9/18/2023	18:41	3427.22998N	7654.22344W	24.88
233953	324	9/18/2023	20:34	3428.31022N	7652.66926W	22.32
233954	324	9/18/2023	20:40	3428.72344N	7652.51326W	21.96

233955	324	9/18/2023	20:47	3428.84482N	7653.15544W	22.35
233956	298	9/18/2023	20:57	3428.85136N	7653.37204W	22.89
233957	324	9/19/2023	11:15	3407.9248N	7632.82444W	36.96
233958	324	9/19/2023	11:19	3407.6488N	7632.95128W	37.6
233959	324	9/19/2023	11:24	3407.3407N	7633.06912W	37.51
233960	324	9/19/2023	11:27	3407.16544N	7633.23868W	36.79
233961	324	9/19/2023	11:31	3407.27314N	7633.4335W	36.16
233962	324	9/19/2023	11:36	3407.54062N	7633.5334W	37.04
233963	298	9/19/2023	11:50	3407.99992N	7633.18534W	37.4
233964	324	9/19/2023	14:27	3414.42844N	7635.4924W	31.01
233965	324	9/19/2023	14:30	3414.53782N	7635.64264W	32.12
233966	324	9/19/2023	14:34	3414.84844N	7635.68728W	30.95
233967	324	9/19/2023	14:38	3415.12456N	7635.85894W	31.83
233968	324	9/19/2023	14:42	3415.38328N	7636.1227W	32.08
233969	324	9/19/2023	14:46	3415.54696N	7636.40386W	32.46
233970	298	9/19/2023	14:59	3415.76758N	7636.55092W	33.23
233971	324	9/19/2023	17:55	3413.85844N	7624.30516W	33.63
233972	324	9/19/2023	18:00	3413.938N	7624.04422W	31.43
233973	324	9/19/2023	18:03	3414.00292N	7623.83146W	30.78
233974	324	9/19/2023	18:05	3414.1048N	7623.72616W	31.13
233975	324	9/19/2023	18:15	3414.1648N	7624.43662W	29.6
233976	324	9/19/2023	18:19	3414.16822N	7624.43926W	31.92
233977	298	9/19/2023	18:29	3414.27922N	7624.6135W	33.42
233978	324	9/19/2023	21:04	3420.81076N	7622.8432W	22.41
233979	324	9/19/2023	21:09	3421.10254N	7622.68906W	22.7
233980	298	9/19/2023	21:17	3421.18498N	7622.47498W	26.64
233981	324	9/20/2023	11:19	3338.3061N	7714.27562W	34.01
233982	324	9/20/2023	11:24	3338.14206N	7713.85418W	36.25
233983	324	9/20/2023	11:31	3338.35086N	7713.47912W	35.84
233984	324	9/20/2023	11:37	3338.13408N	7713.31322W	35.94
233985	324	9/20/2023	11:46	3338.19072N	7713.06002W	34.49
233986	324	9/20/2023	11:50	3338.1636N	7712.7212W	33.89
233987	298	9/20/2023	12:04	3338.3226N	7712.63504W	35.93
233988	324	9/20/2023	15:30	3343.81134N	7716.8285W	34
233989	324	9/20/2023	15:34	3343.90266N	7716.5363W	33.4
233990	324	9/20/2023	15:36	3343.9824N	7716.39152W	33.5
233991	324	9/20/2023	15:38	3344.08104N	7716.25394W	33.7
233992	324	9/20/2023	15:44	3344.31996N	7715.98154W	34.2
233993	324	9/20/2023	15:48	3344.56764N	7715.85548W	34
233994	298	9/20/2023	16:00	3344.83086N	7715.91506W	37.1

233995	324	9/20/2023	18:36	3349.02576N	7716.51152W	31.2
233996	324	9/20/2023	18:42	3349.32888N	7716.12056W	32.3
233997	324	9/20/2023	18:44	3349.30308N	7715.90162W	32.62
233998	324	9/20/2023	18:47	3349.44768N	7715.94548W	32.96
233999	324	9/20/2023	18:51	3349.67928N	7716.0119W	32.42
234000	324	9/20/2023	18:59	3349.86714N	7715.98352W	32.39
234001	298	9/20/2023	19:10	3350.02548N	7716.04832W	32.31
234002	324	9/21/2023	11:19	3408.42802N	7649.52196W	34.7
234003	324	9/21/2023	11:25	3407.97406N	7649.31466W	34.1
234004	324	9/21/2023	11:33	3407.8843N	7648.66534W	33.6
234005	324	9/21/2023	11:44	3408.10168N	7648.59532W	33
234006	324	9/21/2023	11:47	3408.42538N	7648.55632W	32.5
234007	324	9/21/2023	11:50	3408.52846N	7648.76944W	32.8
234008	298	9/21/2023	11:59	3408.51658N	7649.10466W	33.2
234009	324	9/21/2023	15:28	3411.22552N	7656.95284W	31.68
234010	324	9/21/2023	15:35	3411.37834N	7657.04416W	33.15
234011	324	9/21/2023	15:37	3411.38662N	7656.85324W	32.49
234012	324	9/21/2023	15:43	3411.75436N	7656.63184W	32.14
234013	324	9/21/2023	15:51	3411.67714N	7656.22966W	32.04
234014	324	9/21/2023	15:58	3411.88366N	7655.56942W	31.73
234015	298	9/21/2023	16:12	3412.18468N	7655.34202W	33.32