Cruise Report

R/V ENDEAVOR Cruise 290 to Georges Bank

18 - 22 December 1996

Acknowledgments

We thank Captain Tyler and the crew of the R/V Endeavor for their professionalism and help throughout this cruise. Their hard work made our efforts possible.

This report was prepared by Craig Lee. The work described herein was sponsored by the National Science Foundation as part of the U.S. GLOBEC Georges Bank Study.

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1. Purpose

Project Summary: Retention Processes- Highly Resolved Hydrography

Georges Bank is a broad, shallow section of continental shelf that supports a productive, though heavily stressed, fishery. Several important fish species have extensive hatching areas on the bank, where their larvae enjoy an increased chance of success. Processes which remove larvae from the bank to the deeper surrounding waters decrease their chances of survival, and thus play a strong role in determining the success of the fishery. This study will examine the physics and biology of several processes which may remove water, nutrients and larvae from the southern flank of Georges Bank. Of specific interest are the effects of Gulf Stream rings, strong wind events and instabilities in the flow along the edge of the bank. A towed, undulating instrument package, known as the SeaSoar, made physical and biological measurements while cycling between about 5 m below the surface to 10 m off the bottom (or to a maximum depth of 350 m, whichever is shallower). Shipboard instrumentation measured currents and collect meteorological data.

The December Engineering Cruise

The primary goal of the six-day engineering cruise was to test the SeaSoar configuration to be flown for the two science cruises in March (R/V Oceanus) and July (R/V Endeavor). Several aspects of the GLOBEC configuration were new and relatively untried, including the high-bandwidth, fiber-optic sea cable system and the SeaSoar configuration of the Video Plankton Recorder (VPR). Concerns regarding the stability of the SeaSoar when flying the high-drag combination of a VPR and

a Tracor Acoustic Plankton Recorder (TAPS) also motivated field testing. Time remaining after the SeaSoar trials was to be used for SeaSoar sampling of the Southern flank of Georges Bank, MOCNESS tows in the area between the Great South Channel and Wilkinson Basin and/or testing of the VPR group's V-fin towed profiler.

2. Cruise Narrative: EN290- SeaSoar Engineering

Local time is used throughout this narrative- GMT is 5 hours ahead. Figure 1 illus-

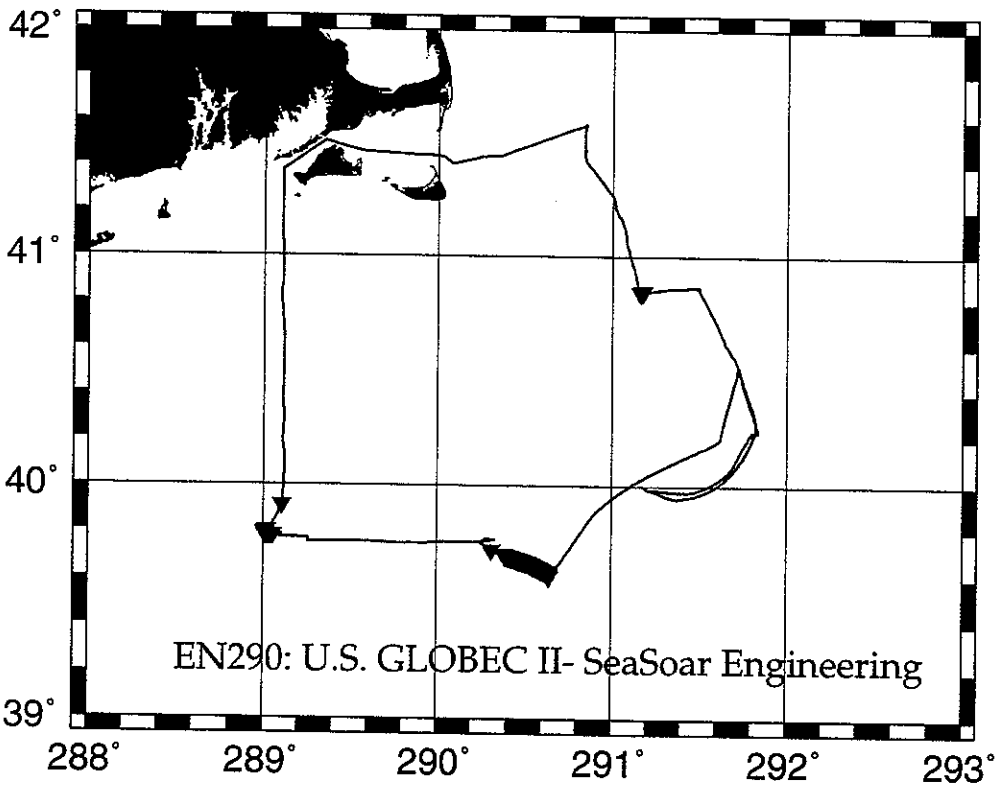

Figure 1. Cruise track for EN290, 18 - 22 December, 1996. Inverted triangles mark the locations of SeaSoar tows.

trates the cruise track, with the locations of SeaSoar deployments marked by

inverted triangles. Due to time constraints and cruise objectives, no water or net samples were taken.

18 December

R/V Endeavor sailed from Woods Hole, MA at 07:30 and proceeded generally southward to deep water required for SeaSoar testing. The initial SeaSoar deployment took place at 16:38, 39° 55' N, 70° 53' W in over 500 m of water. After dangling the instrument at full extension to detorque the new fiber optic sea cable, we turned the power on. Approximately one minute after power-up, current consumption increased dramatically and the CTD failed, suggesting a short in the system. Fiber optic communication with SeaSoar was never lost, however. We recovered SeaSoar and set to work making repairs. Inspection revealed that a salt water leak into the oil-filled junction box allowed power to arc across the insulating barrier of a connector strip, shorting the CTD. Air bubbles trapped in the junction box assembly permitted sea water to gain entrance into the enclosure, and a pool of salt water had separated from the oil and collected at the lowest point of the system. A wider barrier strip was added and the junction box was thoroughly cleaned, refilled and burped.

Deployment two took place at 20:37, 39° 47.21' N, 70° 54.03' W, again in deep water. Initially, SeaSoar was flown without powering up the CTD in an effort to gather flight data before risking a second short. Impeller turns were low and we were unable to shift the wings from the upwing position. Powering up the CTD again resulted in a short. SeaSoar was recovered at 22:22. A deck test immediately after

recovery found the wings unresponsive and locked in the upwing configuration. A search revealed that a (second) short had activated the emergency recovery system, which tries to bring SeaSoar to the surface by overriding all external commands and forcing the vehicle to climb. Removing the system restored normal control. The short was eventually traced to the failure of a miniature penetrating connector which was being used for the first time on SeaSoar.

19 December

For the third deployment, both the emergency override system and the TAPS were removed. We deferred the troubleshooting and repair of the CTD to a later deck period, allowing us to rapidly redeploy the SeaSoar and test its flight characteristics while carrying the VPR. SeaSoar was deployed at 00:35, 39° 46.67' N, 70° 53.83' W with 240 m of cable out. The instrument flew well, and consistently repeated profiles to depths of 130 m under automatic control. We recovered SeaSoar at 02:00 and secured the deck for the night.

After tracing the CTD failure to the same junction box problem experienced on the first deployment, the conductors were removed from the connection strip, soldered together and potted with Scotch Coat and self-vulcanizing tape. The junction box was then carefully refilled, burped and sealed, and TAPS was reattached to the instrument cage. Worsening weather and predictions of a brewing storm made time a critical factor, and we redeployed SeaSoar at 12:43, 39° 45.64' N, 69° 41.95' W without replacing the emergency recovery system. SeaSoar flew well, even with the high-drag combination of TAPS and the VPR, and the CTD functioned normally. Flight

characteristics were similar to those of the previous deployment (VPR only), with the addition of a slight instability at 80 m in the dive cycle. Faced with building seas and the possibility of being unable to recover the instrument if conditions worsened, Sea-Soar was brought back aboard at 15:10.

Weather worsened throughout the day, with winds gusting to 50 knots and 5 m seas. We set a course for the southern end of Ron Schlitz's moored array, but were unable to make much progress. All deck operations were shut down, and we eventually hove to due to weather.

20 December

Weather remained poor throughout the day. Endeavor was hove to with 5-7 m seas and winds again gusting to 50 knots.

21 December

Winds dropped off around 03:00, with the seas calming quickly afterwards. At 05:00, 40° 14' N, 68° 10.5' W, we began a bathymetric survey of Ron Schlitz's proposed mooring line, initially running north to 40° 52' N, 68° 30.6' W. The VPR group's V-Fin depressor was ready for testing at this point, and was deployed at 10:33, 40° 51.91' N, 68° 31.07' W, near the apex of the moored array. We then towed while surveying the E-W oriented mooring line. The V-Fin was recovered for adjustments at 12:12, 40° 51.80' N, 68° 34.19' W, redeployed at 12:20 and recovered at 13:33, 40° 51.66' N, 68° 41.28' W.

To test whether TAPS suffered from acoustic interference from a pair of crash guards protruding from the bow of the SeaSoar, we performed two lowerings, each approximately 20 minutes long and to a depth of 5 m, one with the guards in place followed by one without them. A line tied to SeaSoar's tail kept the fish oriented horizontally and was used to force its bow to point away from Endeavor. The initial lowering began at 14:40, 40° 50.94' N, 68° 49.29' W and ended at 15:02. The second began at 15:20, 40° 50.58' N, 68° 50.10' W and ended at 15:44.

The remainder of the day was spent steaming northward to deeper water, performing V-Fin tows with several recoveries/redeployments for adjustments and repairs.

22 December

V-Fin tows continued, with the final recovery occurring at 00:47, 41° 34.75' N, 69° 09.10' W. Endeavor tied up at the Woods Hole dock at 08:00.

3. List of Participants

Name	Institution	Project
Craig Lee	WHOI	SeaSoar, Chief Scientist
Philip Alatalo	WHOI	Video Plankton Recorder
Brian Arbic	WHOI	SeaSoar
Carin Ashjian	WHOI	Video Plankton Recorder
Frank Bahr	WHOI	SeaSoar
Cabell Davis	WHOI	Video Plankton Recorder
Jerome Dean	WHOI	SeaSoar
Paul Fucile	WHOI	SeaSoar
Scott Gallager	WHOI	Video Plankton Recorder
Andrew Girard	WHOI	Video Plankton Recorder
Allan Gordon	WHOI	SeaSoar

Appendix - Event Log

All event log times are local (EST). Separate cast sequences were kept for the SeaSoar and VPR. 's/e' refers to start and end times and 'reg.' refers to region, neither of which is used here.

Event #	Inst.	cast #	sta. #	std. sta. #	Mon	Date	Time	s/e	Lat (N)	Lon (W)	Water Dep. (m)	Cast Dep. (m)	P.I.	Reg.	Time Zn.	Comments
1	SeaSoar	1	-	-	12	18	16:38	-	39 57.70	70 53.50	-	-	Lee	-	EST	deploy
2	SeaSoar	1	-	-	12	18	16:50	-	39 57.70	70 53.50	-	-	Lee	-	EST	recover
3	SeaSoar	2	-	-	12	18	20:37	-	39 48.21	70 58.76	-	-	Lee	-	EST	deploy
4	SeaSoar	2	-	-	12	18	22:22	-	38 41.33	70 54.03	-	-	Lee	-	EST	recover
5	SeaSoar	3	-	-	12	19	00:35	-	39 46.67	70 53.83	-	-	Lee	-	EST	deploy
6	SeaSoar	3	-	-	12	19	02:03	-	39 45.43	70 44.65	-	-	Lee	-	EST	recover
7	SeaSoar	4	-	-	12	19	12:43	-	39 45.64	69 41.95	-	-	Lee	-	EST	deploy
8	SeaSoar	4	-	-	12	19	15:30	-	39 36.57	69 21.68	-	-	Lee	-	EST	recover
9	VPR	1	-	-	12	21	10:33	-	40 51.91	68 31.07	-	-	Davis	-	EST	deploy

Event #	Inst.	cast #	sta. #	std. sta. #	Mon	Date	Time	s/e	Lat (N)	Lon (W)	Water Dep. (m)	Cast Dep. (m)	P.I.	Reg.	Time Zn.	Comments
10	VPR	1	-	-	12	21	12:12	-	40 51.80	68 34.19	-	-	Davis	-	EST	recover
11	VPR	2	-	-	12	21	12:20	-	40 51.80	68 34.19	-	-	Davis	-	EST	deploy
12	VPR	2	-	-	12	21	13:33	-	40 51.66	68 41.28	-	-	Davis	-	EST	recover
13	SeaSoar	5	-	-	12	21	14:40	-	40 50.94	68 49.29	-	-	Lee	-	EST	deploy
14	SeaSoar	5	-	-	12	21	15:02	-	40 50.94	68 49.29	-	-	Lee	-	EST	recover
15	SeaSoar	6	-	-	12	21	15:20	-	40 50.58	68 50.10	-	-	Lee	-	EST	deploy
16	SeaSoar	6	-	-	12	21	15:44	-	40 50.58	68 50.10	-	-	Lee	-	EST	recover
17	VPR	3	-	-	12	21	15:55	-	40 50.78	68 50.68	-	-	Davis	-	EST	deploy
18	VPR	3	-	-	12	21	16:31	-	40 53.30	68 51.50	-	-	Davis	-	EST	recover
19	VPR	4	-	-	12	21	17:04	-	40 54.87	68 52.00	-	-	Davis	-	EST	deploy
20	VPR	4	-	-	12	21	18:35	-	41 03.10	68 55.50	-	-	Davis	-	EST	recover
21	VPR	5	-	-	12	21	18:50	-	41 04.20	68 55.30	-	-	Davis	-	EST	deploy

Event #	Inst.	cast #	sta. #	std. sta. #	Mon	Date	Time	s/e	Lat (N)	Lon (W)	Water Dep. (m)	Cast Dep. (m)	P.I.	Reg.	Time Zn.	Comments
22	VPR	5	-	-	12	21	19:03	-	41 05.30	68 55.50	-	-	Davis	-	EST	recover
23	VPR	6	-	-	12	21	19:12	-	41 05.90	68 55.50	-	-	Davis	-	EST	deploy
24	VPR	6	-	-	12	21	19:46	-	41 08.80	68 56.60	-	-	Davis	-	EST	recover
25	VPR	7	-	-	12	21	20:11	-	41 10.01	68 57.11	-	-	Davis	-	EST	deploy
26	VPR	7	-	-	12	21	20:51	-	41 12.66	68 59.17	-	-	Davis	-	EST	recover
27	VPR	8	-	-	12	21	22:27	-	41 25.84	69 09.58	-	-	Davis	-	EST	deploy
28	VPR	8	-	-	12	21	22:35	-	41 26.23	69 09.59	-	-	Davis	-	EST	recover
29	VPR	9	-	-	12	21	22:44	-	41 26.44	69 09.58	-	-	Davis	-	EST	deploy
30	VPR	9	-	-	12	21	23:00	-	41 27.49	69 09.59	-	-	Davis	-	EST	recover
31	VPR	10	-	-	12	21	23:14	-	41 27.95	69 09.56	-	-	Davis	-	EST	deploy
32	VPR	10	-	-	12	21	23:23	-	41 28.36	69 09.62	-	-	Davis	-	EST	recover
33	VPR	11	-	-	12	21	23:27	-	41 28.36	69 09.62	-	-	Davis	-	EST	deploy

Event #	Inst.	cast #	sta. #	std. sta. #	Mon	Date	Time	s/e	Lat (N)	Lon (W)	Water Dep. (m)	Cast Dep. (m)	P.I.	Reg.	Time Zn.	Comments
34	VPR	11	-	-	12	22	00:47	-	41 34.75	69 09.10	-	-	Davis	-	EST	recover