Cruise Report SU-93-03
NOAA Ship *Surveyor*

Itinerary and Area – Dutch Harbor to Dutch Harbor (1–23 September 1993). North of the Aleutian Islands to recover the PROTEUS mooring and calibrate sensors; stop at Umnak Island (Nikolski) to offload two scientists; CTD casts along the south side of the Aleutian Islands westward to Amchitka Pass; casts along the north side of the Islands and across Amukta Pass; CTD casts (and deployment of four current moorings) along the continental slope and shelf of the eastern Bering Sea to 60°N; search for lower part of mooring 2; and return to Dutch Harbor.
Participating Organizations – NOAA, Pacific Marine Environmental Laboratory (PMEL) and NOAA, Alaska Fisheries Science Center (AFSC).
Scientific Personnel – Ron Reed, Carol DeWitt, Leslie Lawrence, LTJG Carrie Hadden, Rick Miller, and Bill Parker.
Objectives – The goals of this project were to gain understanding of circulation along the south and north sides of the Aleutian Islands and through the island passes, and to examine circulation and slope-shelf exchange along the eastern boundary of the deep basin. This work was all part of Bering Sea – FOCI (Fisheries Oceanography Coordinated Investigations).
Summary – The PROTEUS mooring, and a subsurface ADCP mooring, were recovered on 2 September. A total of 182 CTD casts were taken. Four subsurface current moorings were deployed, each at a depth of ~200m. One satellite-tracked drifter was released in the Alaskan Stream. Details on all the observations are given in the attached table.
PROTEUS Mooring – Both a subsurface ADCP mooring and the surface PROTEUS mooring were recovered on 2 September. A CTD calibration cast was taken prior to recovery of the surface mooring. Eleven chlorophyll (and nutrient) samples were taken, processed, and frozen. Three Tucker trawls were planned at the site; only one was successfully taken, mainly because of problems with the electronic counter (wire out). The large sample was split and preserved in formalin.
Current Moorings – Four subsurface current moorings were deployed anchor first, using a gravity release when the weight touched bottom. Each mooring had an upper (50m depth) acoustic current meter and a lower (190m depth) rotor/vane current meter. Moorings 1, 2, and 3 were all placed at 200m, and mooring 4 was deployed on a steep slope at 205m. The only major difficulty was in deploying mooring 2. Winds increased rapidly to ~30 kt; their effect on the ship produced a large wire angle, and it was difficult to get the gravity hook to release.
On 15 September, two days after deployment of mooring 2, we were notified by PMEL that the upper meter on the mooring had been pulled up by a trawler. Consequently, we were requested to search for it, on the return to Dutch Harbor, and attempt to redeploy it. On 22 September, we located mooring 1 and determined that its range was 2.5nm. We then searched for mooring 2, using a spacing of 2.0nm, first around the deployment site and then along the trawl line, as reported by the trawler. The search was futile. After our return to Seattle (24 September), PMEL received a message that the bottom meter had been found by another trawler. Hence none of mooring 2 is near the original site, and only the anchor and acoustic release remain in the water.
CTD Casts – The CTD casts obtained provide an excellent synoptic data set that shows variations in water properties and details of the circulation system. Agreement between CTD salinity, temperature, and pressure and salinometer salinities, reversing thermometer temperatures, and thermometric depths was excellent. This does not mean we had no problems with the instruments, however. On station 35, salinity oscillations were noted and found to be caused by a faulty thermister. The thermistor was changed and the cast repeated. Later, intermittent spiking (in one, two, or all sensors) became a problem. The CTD

connections were cleaned and the cable reterminated. Eventually, however, spiking became much worse, and the conductivity and pressure sensors were replaced. This essentially solved the problem. (The spikes, though bothersome, can be easily removed from the data.) We had problems with Niskin bottles, used to collect nutrient samples, tripping on a few stations.. This was corrected by change to a new rosette.

Acknowledgments – I appreciate the excellent cooperation and the efforts of CAPT Jones, LT Lowell, and the officers and crew of the *Surveyor*. ET May was quite helpful in assisting with CTD problems. The careful monitoring of CTD data by the scientific staff (Carol DeWitt, Leslie Lawrence, and Carrie Hadden), and their efforts to fix problems and provide data output, are greatly appreciated.

R.K. Reed
Chief Scientist

Attachment (Table)

NOAA Ship SURVEYOR
EOCI Cruise: SU-93-03
From Dutch Harbor, AK
To Dutch Harbor, AK
September 1 - 23, 1993

Sta	Date / Time GMT		Activit	Latitude Deg	Min		Longitude Deg.	Min.		Depth (m)
			Depart Dutch Harbor							
001	02-Sep	20:15	Recover subsurface ADCP	54	49.8	N	168	33.2	W	2280
002	02-Sep	21:38	CTD at PEGGY93	54	47.9	N	168	32.5	W	2216
003	02-Sep	22:30	Tucker at PEGGY93	54	47.7	N	168	31.6	W	2216
004	03-Sep	00:21	Tucker at PEGGY93	54	47.3	N	168	32.1	W	2212
005	03-Sep	01:37	Tucker at PEGGY93	54	47.3	N	168	32.8	W	2217
005	03-Sep	01:45	Tucker at PEGGY93	54	47.0	N	168	32.8	W	2210
006	03-Sep	02:10	Recover PEGGY93	54	47.4	N	168	32.2	W	2213
	03-Sep	18:00	Disembark sci party	52	55.0	N	169	45.0	W	
007	04-Sep	01:51	CTD #002	52	28.1	N	169	40.5	W	257
008	04-Sep	03:45	CTD #003	52	22.9	N	169	36.9	W	935
009	04-Sep	05:41	CTD #004	52	17.3	N	169	34.6	W	1526
010	04-Sep	07:57	CTD #005	52	10.2	N	169	31.0	W	4618
011	04-Sep	09:09	CTD #006	52	02.1	N	169	24.9	W	3296
012	04-Sep	12:49	CTD #007	51	46.8	N	169	17.3	W	4618
013	04-Sep	15:56	CTD #008	51	33.4	N	169	12.2	W	6513
014	05-Sep	04:26	CTD #009	51	53.8	N	173	30.7	W	350
015	05-Sep	06:00	CTD #010	51	51.0	N	173	31.9	W	1489
016	05-Sep	07:07	Deploy drifter S/N 7235	51	49.3	N	173	32.9	W	1672
017	05-Sep	08:19	CTD #011	51	45.3	N	173	31.8	W	2909
018	05-Sep	10:17	CTD #012	51	39.6	N	173	31.2	W	3684
019	05-Sep	12:42	CTD #013	51	29.6	N	173	30.9	W	4587
020	05-Sep	15:34	CTD #014	51	15.5	N	173	30.9	W	4724
021	06-Sep	18:00	CTD #015	50	42.7	N	177	43.7	W	4385
022	06-Sep	07:14	CTD #016	50	56.2	N	177	42.4	W	4214
023	06-Sep	09:37	CTD #017	51	08.0	N	177	42.6	W	3104
024	06-Sep	11:58	CTD #018	51	16.7	N	177	43.6	W	2347
025	06-Sep	14:54	CTD #019	51	23.3	N	177	41.6	W	1581
026	06-Sep	16:52	CTD #020	51	28.7	N	177	41.7	W	1146
027	06-Sep	18:00	CTD #021	51	32.6	N	177	41.4	W	354
028	06-Sep	23:50	CTD #022	51	31.3	N	179	08.8	W	1160
029	07-Sep	00:45	CTD #023	51	29.2	N	179	23.3	W	1089
030	07-Sep	02:34	CTD #024	51	29.9	N	179	35.3	W	1158
031	07-Sep	04:12	CTD #025	51	27.4	N	179	41.1	W	885
032	07-Sep	06:12	CTD #026	51	29.9	N	180	00.8	W	1130
033	07-Sep	08:21	CTD #027	51	28.3	N	180	20.0	W	1110
034	07-Sep	10:05	CTD #028	51	28.0	N	180	35.0	W	1347
035	07-Sep	18:45	CTD #029	52	57.6	N	179	32.5	W	1384
036	07-Sep	20:35	CTD #030	52	57.9	N	179	16.1	W	1358
037	07-Sep	22:28	CTD #031	52	57.7	N	179	00.6	W	3482
038	08-Sep	00:55	CTD #032	52	57.5	N	178	30.6	W	3724
039	08-Sep	03:40	CTD #033	52	57.4	N	177	57.2	W	3714
040	08-Sep	06:05	CTD #034	52	42.1	N	177	59.4	W	3628
041	08-Sep	09:55	CTD #035	52	24.1	N	177	57.3	W	3524
042	08-Sep	11:30	CTD #036	52	12.9	N	177	59.5	W	3288
043	08-Sep	13:43	CTD #037	52	05.3	N	177	59.0	W	2754
044	08-Sep	15:24	CTD #038	52	02.0	N	177	59.5	W	2358
045	08-Sep	17:06	CTD #039	51	57.0	N	178	01.8	W	960
	08-Sep	21:38	ADAK	51	55.0	N	176	35.0	W	
046	09-Sep	00:54	CTD #040	52	09.6	N	176	07.6	W	1450
047	09-Sep	02:27	CTD #041	52	12.0	N	176	07.6	W	2148
048	09-Sep	04:17	CTD #042	52	17.3	N	176	06.4	W	3039
049	09-Sep	06:46	CTD #043	52	32.3	N	176	07.3	W	3588
050	09-Sep	08:59	CTD #044	52	46.2	N	176	07.8	W	3706

Sta	Date / Time GMT		Activity	Latitude Deg	Min		Longitude Deg.	Min.		Depth (m)
051	09-Sep	11:20	CTD *045	53	02.0	N	176	07.2	W	3739
052	09-Sep	18:12	CTD *046	53	11.5	N	174	05.6	W	3528
053	09-Sep	20:47	CTD *047	52	56.8	N	174	05.8	W	3413
054	09-Sep	23:05	CTD *048	52	46.5	N	174	06.6	W	3200
055	10-Sep	01:48	CTD *049	52	33.3	N	174	05.1	W	2080
056	10-Sep	03:40	CTD *050	52	27.7	N	174	06.2	W	1282
057	10-Sep	05:02	CTD *051	52	25.1	N	174	06.1	W	582
058	10-Sep	11:12	CTD *052	52	21.6	N	172	08.5	W	390
059	10-Sep	15:00	CTD *053	52	21.7	N	171	57.6	W	325
060	10-Sep	14:00	CTD *054	52	23.0	N	171	44.4	W	335
061	10-Sep	15:32	CTD *055	52	26.0	N	171	32.4	W	340
062	10-Sep	17:55	CTD *056	52	27.9	N	171	04.6	W	457
063	10-Sep	19:03	CTD *057	52	31.7	N	170	57.1	W	434
064	10-Sep	20:43	CTD *058	52	46.5	N	170	58.6	W	740
065	10-Sep	23:03	CTD *060	53	02.8	N	171	05.5	W	1150
066	10-Sep	00:53	CTD *061	53	09.8	N	171	08.9	W	1695
067	11-Sep	03:04	CTD *062	53	22.1	N	171	13.7	W	2301
068	11-Sep	05:18	CTD *063	53	33.0	N	171	18.5	W	2789
069	11-Sep	07:40	CTD *064	53	48.4	N	171	24.9	W	3187
070	11-Sep	16:32	CTD *065	54	23.8	N	168	40.6	W	1514
071	11-Sep	19:00	CTD *066	54	07.9	N	168	28.4	W	2419
072	11-Sep	21:12	CTD *067	53	56.4	N	168	19.4	W	1888
073	11-Sep	23:10	CTD *068	53	47.8	N	168	12.5	W	1411
074	12-Sep	00:50	CTD *069	53	41.2	N	168	10.7	W	1281
075	12-Sep	02:19	CTD *070	53	36.8	N	168	04.9	W	653
076	12-Sep	06:12	CTD *071	53	58.8	N	167	00.2	W	193
077	12-Sep	07:37	CTD *072	54	04.6	N	167	04.5	W	1052
078	12-Sep	09:13	CTD *073	54	09.0	N	167	10.0	W	1521
079	12-Sep	11:27	CTD *074	54	20.5	N	167	18.5	W	788
080	12-Sep	13:27	CTD *075	54	31.5	N	167	28.5	W	683
081	12-Sep	15:15	CTD *076	54	41.7	N	167	38.0	W	849
082	12-Sep	19:40	CTD *077	55	19.9	N	166	46.9	W	138
083	12-Sep	21:02	CTD *078	55	09.3	N	166	39.7	W	141
084	12-Sep	22:30	CTD *079	54	58.6	N	166	32.5	W	143
085	12-Sep	23:53	CTD *080a	54	48.0	N	166	24.9	W	205
086	13-Sep	01:25	CTD *081	54	37.3	N	166	17.7	W	402
087	13-Sep	03:02	CTD *082	54	26.1	N	166	09.9	W	544
088	13-Sep	04:16	CTD *083	54	20.7	N	166	06.3	W	701
089	13-Sep	05:23	CTD *084	54	15.9	N	166	02.9	W	430
090	13-Sep	07:34	CTD *085	54	20.1	N	165	23.5	W	81
091	13-Sep	08:22	CTD *086	54	24.3	N	165	17.9	W	180
092	13-Sep	09:18	CTD *087	54	28.5	N	165	11.2	W	147
093	13-Sep	09:18	CTD *088	54	33.1	N	165	04.2	W	72
094	13-Sep	14:00	CTD *089	54	26.2	N	166	09.9	W	548
095	13-Sep	15:30	CTD *090	54	33.4	N	165	54.3	W	449
096	13-Sep	18:58	Deploy SSE1	54	46.5	N	166	08.2	W	196
097	13-Sep	19:24	CTD *080b	54	46.6	N	166	08.1	W	194
098	13-Sep	23:57	Deploy SSE2	54	45.4	N	165	24.2	W	195
099	14-Sep	00:27	CTD *093	54	45.7	N	165	23.8	W	191
100	14-Sep	01:52	CTD *091	54	39.5	N	165	38.9	W	325
101	14-Sep	02:53	CTD *092	54	42.8	N	165	30.6	W	254
102	14-Sep	04:36	CTD *094	54	52.6	N	165	07.2	W	108
103	14-Sep	05:47	CTD *095	54	57.8	N	164	51.8	W	91
104	14-Sep	07:07	CTD *096	54	48.1	N	164	40.1	W	47
105	14-Sep	08:00	CTD *097	54	53.1	N	164	45.8	W	62
106	14-Sep	09:06	CTD *098	54	58.1	N	164	51.5	W	82
107	14-Sep	10:27	CTD *099	55	08.0	N	165	03.6	W	109
108	14-Sep	11:55	CTD *100	55	18.1	N	165	15.6	W	111
109	14-Sep	13:19	CTD *101	55	28.1	N	165	27.9	W	110
110	14-Sep	17:35	CTD *102	56	06.9	N	166	25.0	W	116
111	14-Sep	19:00	CTD *103	55	58.8	N	166	39.8	W	126

Sta	Date / Time *GMT	Activity	Latitude Deg	Min		Longitude Deg.	Min.		Depth (m)
112	14-Sep 20:25	CTD #104	55	50.8	N	166	54.4	W	132
113	14-Sep 21:47	CTD #105	55	42.8	N	167	09.3	W	132
114	14-Sep 23:16	CTD #106	55	34.6	N	167	24.2	W	133
115	15-Sep 00:44	CTD #107	55	26.2	N	167	38.8	W	139
116	15-Sep 01:38	CTD #108	55	22.4	N	167	46.3	W	152
117	15-Sep 02:33	CTD #109	55	18.1	N	167	53.8	W	290
118	15-Sep 03:41	CTD #110	55	14.0	N	168	01.3	W	757
119	15-Sep 05:10	CTD #111	55	09.4	N	168	07.9	W	1704
120	15-Sep 07:32	CTD #112	55	01.7	N	168	22.5	W	2013
121	15-Sep 19:47	CTD #113	54	54.0	N	168	37.8	W	2340
122	15-Sep 12:30	CTD #114	54	45.7	N	168	53.2	W	2023
123	15-Sep 18:08	CTD #115	55	42.8	N	169	18.0	W	2483
124	15-Sep 20:30	CTD #116	55	51.9	N	169	07.4	W	2206
125	15-Sep 22:44	CTD #117	56	02.3	N	168	56.8	W	1212
126	16-Sep 00:14	CTD #118	56	07.3	N	168	51.7	W	616
127	16-Sep 01:20	CTD #119	56	11.9	N	168	44.9	W	211
128	16-Sep 02:08	CTD #120	56	16.7	N	168	39.7	W	159
129	16-Sep 02:56	CTD #121	56	21.2	N	168	34.2	W	131
130	16-Sep 04:22	CTD #122	56	30.8	N	168	22.9	W	113
131	16-Sep 05:40	CTD #123	56	40.2	N	168	12.1	W	102
132	16-Sep 04:02	CTD #124	56	49.9	N	168	02.3	W	87
133	16-Sep 11:46	CTD #125	56	27.8	N	169	40.1	W	83
134	16-Sep 13:07	CTD #126	56	18.2	N	169	52.4	W	106
135	16-Sep 14:23	CTD #127	56	09.2	N	170	04.4	W	119
136	16-Sep 15:18	CTD #128	56	04.4	N	170	10.6	W	127
137	16-Sep 16:50	CTD #129	55	59.7	N	170	17.3	W	696
138	16-Sep 18:26	CTD #130	55	55.1	N	170	23.2	W	1048
139	16-Sep 19:56	CTD #131	55	49.8	N	170	28.5	W	1404
140	16-Sep 22:03	CTD #132	55	40.6	N	170	40.9	W	2847
141	17-Sep 00:17	CTD #133	55	30.5	N	170	52.7	W	3318
142	17-Sep 02:32	CTD #134	55	21.5	N	171	05.3	W	3235
143	17-Sep 07:17	CTD #135	55	54.1	N	171	24.9	W	3082
144	17-Sep 09:33	CTD #136	56	05.0	N	171	15.4	W	2685
145	17-Sep 11:21	CTD #137	56	10.0	N	171	12.8	W	1300
146	17-Sep 13:00	CTD #138	56	15.0	N	171	08.0	W	425
147	17-Sep 13:58	CTD #139	56	20.0	N	171	03.3	W	130
148	17-Sep 14:47	CTD #140	56	25.0	N	170	59.1	W	123
149	17-Sep 18:28	Deploy SSE3	56	28.1	N	171	27.2	W	195
150	17-Sep 18:48	CTD #143b	56	27.8	N	171	27.5	W	217
151	17-Sep 22:33	Deploy SSE4	56	34.5	N	172	09.2	W	200
152	17-Sep 22:56	CTD #144a	56	34.4	N	172	08.3	W	204
153	18-Sep 02:43	CTD #141	56	35.0	N	170	50.1	W	115
154	18-Sep 03:58	CTD #142	56	44.7	N	170	41.4	W	106
155	18-Sep 05:07	CTD #143a	56	54.8	N	170	32.6	W	91
156	18-Sep 08:53	CTD #144b	57	19.8	N	171	34.0	W	99
157	18-Sep 10:11	CTD #145	57	10.5	N	171	51.4	W	104
158	18-Sep 11:30	CTD #146	57	03.3	N	172	02.9	W	112
159	18-Sep 12:47	CTD #147	56	54.9	N	172	17.0	W	120
160	18-Sep 14:12	CTD #148	56	46.8	N	172	30.8	W	126
161	18-Sep 15:16	CTD #149	56	42.1	N	172	38.0	W	129
162	18-Sep 16:13	CTD #150	56	38.2	N	172	44.9	W	128
163	18-Sep 17:27	CTD #151	56	34.0	N	172	51.8	W	593
164	18-Sep 19:00	CTD #152	56	29.8	N	172	58.7	W	2292
165	18-Sep 21:26	CTD #153	56	21.3	N	173	11.3	W	2611
166	19-Sep 00:01	CTD #154	56	13.1	N	173	25.8	W	3206
167	19-Sep 02:33	CTD #155	56	04.6	N	173	41.0	W	3380
168	19-Sep 11:43	CTD #156	57	46.6	N	174	45.6	W	2288
169	19-Sep 13:59	CTD #157	57	54.3	N	174	27.8	W	1243
170	19-Sep 16:17	CTD #158	57	58.1	N	174	16.0	W	1472
171	19-Sep 18:57	CTD #159	58	00.9	N	174	08.0	W	947
172	19-Sep 20:02	CTD #160	58	05.9	N	174	01.0	W	127

Sta	GMT		Activity	Latitude Deg	Latitude Min		Longitude Deg.	Longitude Min.		Depth (m)
173	19-Sep	21:03	CTD #161	58	10.7	N	173	49.8	W	115
174	19-Sep	22:14	CTD #162	58	15.9	N	173	38.9	W	112
175	19-Sep	23:31	CTD #163	58	22.0	N	173	21.9	W	111
176	20-Sep	00:54	CTD #164	58	30.0	N	173	04.0	W	110
177	20-Sep	11:26	CTD #165	59	56.9	N	175	27.0	W	118
178	20-Sep	11:26	CTD #166	59	47.2	N	175	33.9	W	125
179	20-Sep	14:04	CTD #167	59	37.3	N	175	41.5	W	133
180	20-Sep	15:26	CTD #168	59	27.6	N	175	49.4	W	138
181	20-Sep	16:47	CTD #169	59	17.7	N	175	56.9	W	132
182	20-Sep	18:05	CTD #170	59	08.1	N	176	04.3	W	133
183	20-Sep	19:22	CTD #171	58	58.4	N	176	11.9	W	130
184	20-Sep	20:35	CTD #172	58	49.0	N	176	19.5	W	123
185	20-Sep	22:08	CTD #173	58	38.5	N	176	26.7	W	140
186	20-Sep	23:11	CTD #174	58	33.6	N	176	30.3	W	458
187	21-Sep	00:31	CTD #175	58	28.6	N	176	34.0	W	1655
188	21-Sep	02:23	CTD #176	58	24.0	N	176	38.0	W	2894
189	21-Sep	19:59	CTD #177	58	19.4	N	176	41.6	W	3046
190	21-Sep	06:05	CTD #178	58	09.5	N	176	49.4	W	2585
191	21-Sep	08:11	CTD #179	57	59.6	N	176	57.8	W	3120
192	20-Sep	10:09	CTD #180	57	49.5	N	177	03.4	W	3560
193	22-Sep	16:45	Located BSSE-1	54	46.5	N	166	08.2	W	196
194	22-Sep	20:00	Begin search for BSSE-2							
195	23-Sep	08:30	End search for BSSE-2							
196	22-Sep	16:45	Arrive Dutch Harbor							