Northwest Atlantic Fisheries Organization

Serial No. N4816 **NAFO SCR Doc. 03/10**

SCIENTIFIC COUNCIL MEETING – JUNE 2003

Oceanographic Conditions in NAFO Subareas 5 and 6 During 2002

by

Maureen H. Taylor, Cristina Bascunan, James P. Manning and David G. Mountain
Northeast Fisheries Science Center
Woods Hole, Massachusetts, USA 02543

Abstract

The Northeast Fisheries Science Center collected over 1 600 temperature and salinity profiles in NAFO Subareas 5 and 6 during 2002. The temperatures over the region were higher than recent years and higher than a decade-long reference period (1978-87), particularly in the Middle Atlantic Bight during the winter and spring. The salinity generally exhibited an increase through the year relative to the reference period values, continuing a trend that began in 2001.

Introduction

The Northeast Fisheries Science Center (NEFSC) collects temperature and salinity profile data during a variety of surveys each year on the US northeast continental shelf. The region of sampling comprises the coastal portions of NAFO Subareas 5 and 6. Many of the surveys are conducted to support assessment of the living marine resources, both finfish and bivalves. Other surveys monitor other components of the shelf ecosystem.

Temperature and salinity observations from 12 NEFSC surveys conducted during 2002 are summarized in this report. A list of the surveys is provided in Table 1. Over 1 600 temperature and salinity profiles were obtained in the shelf region during 2002. A more complete presentation and summary of these observations is contained in Taylor *et al.* (2003), which is available via the internet at http://www.nefsc.noaa.gov/nefsc/publications/crd/crd0305/. Similar annual reports have been prepared since 1991.

Methods

The measurements were obtained using a Seabird Electronics (SBE) model 19 profiling CTD instrument, which measures the pressure, temperature and conductivity of the water twice per second. The instrument was deployed either in a vertical cast with the vessel stationary or as part of a double oblique bongo net tow (see Taylor and Bascunan, 2000). In the latter case, the data from the retrieval (upcast) portion of the tow was used as the primary data. For each profile the raw data were processed using the software provided by the manufacturer (SBE) to produce 1-decibar averaged files of temperature and salinity. Water samples were collected on a subset of stations on each survey, and analyzed for salinity. A salinity correction for the CTD salinity values was calculated and applied.

For each profile an anomaly for surface and bottom temperature and salinity was determined relative to reference annual cycles for these parameters, as explained in Holzwarth and Mountain (1990). The reference cycles were determined from observations collected in the period 1978-1987. For each survey the average surface and bottom temperature and salinity, and anomaly of temperature and salinity, was calculated for five regions of the northeast continental shelf (Fig. 1). The data also were combined and sorted into two-month bins for analysis. The

distribution of station locations within the two-month bins is shown in Fig. 2. Area-average values of the surface and bottom temperature and salinity, and their anomalies, also were determined for each two-month period in each of the five regions of the shelf. The bimonthly values are presented in Tables 2 and 3.

Results

The temperature anomalies (Table 2, Fig. 3a) indicate that the whole shelf region was considerably warmer in 2002 than the reference period. The 2002 temperatures also are generally warmer than other recent years, as well – particularly for the Middle Atlantic Bight regions from January through April. The large, positive temperature anomalies were not an artifact of warmer, offshore Slope Water encroaching onto the shelf. The warmer temperatures occurred widely over the Middle Atlantic Bight.

During 2002 the salinity anomalies (Table 3, Fig. 3b) generally increased from near zero or negative values at the beginning of the year to be positive by the end of the year. This continued a trend of increasing salinity over the shelf region that began in early 2001. The exception to this pattern was in the southern Middle Atlantic Bight where the salinity anomalies at both the surface and bottom decreased during the second half of 2002.

References

Holzwarth, T.J. and D. Mountain. 1990. Surface and bottom temperature distributions from the Northeast Fisheries Center spring and fall bottom trawl survey program, 1963-1987. Woods Hole, MA: Northeast Fisheries Center. Reference Document 90-03. Available from: Information Services Section, NMFS/Northeast Fisheries Science Center, Woods Hole, MA, 02543.

Taylor, M.H. and C. Bascunan. 2000. CTD data collection on Northeast Fisheries Science Center cruises: standard operating procedures. Northeast Fisheries Science Center Reference Document 00-11; 28p. Available from: Information Services Section, NMFS/Northeast Fisheries Science Center, Woods Hole, MA, 02543.

Taylor, M.H., C. Bascunan and J.P. Manning. 2003. Description of the 2002 oceanographic conditions on the northeast continental shelf. Northeast Fisheries Science Center Reference Document 03-05; 110p. Available from: Information Services Section, NMFS/Northeast Fisheries Science Center, Woods Hole, MA, 02543.

Table 1. Summary of 2002 Cruises.

Cruise	Program	Dates	Regions[1]
ALB0202	ECOMON Survey	23 – 30 January	GB, GOM
ALB0203	Winter Bottom Trawl	6 February – 2 March	GB, MAB
DEL0201	Hydroacoustic Survey	22 February – 7 March	MAB
ALB0204	Spring Bottom Trawl	6 March – 25 April	GOM, MAB, GB
ALB0206	ECOMON Survey	23 May – 6 June	GOM, MAB, GB
NOB0201	ECOMON Survey	14 – 29 August	GOM, MAB, GB
ALB0208	Scallop Survey	17 July – 15 August	GB, MAB
ALB0209	Benthic Habitat	20 – 29 August	GB
DEL0208	Hydroacoustic Survey	5 September – 10 Oct.	GB, GOM
ALB0210	Fall Bottom Trawl	4 September – 25 Oct.	GOM, GB, MAB
OC384	Benthic Habitat	24 Oct. – 2 November	MAB
DEL0210	ECOMON Survey	29 Oct. – 14 Nov.	GOM, GB, MAB

[1] Regional Abbreviations:

GOM = Gulf of Maine
MAB = Mid-Atlantic Bight
GB = Georges Bank

Table 2. Area-averaged surface and bottom temperature and temperature anomalies presented in two month time periods using hydrographic data collected during 2002 in the five regions of the northeast continental shelf.

	SURFACE					BOTTOM				
Region	**#obs**	**Temp**	**Anomaly**	**SDV1**	**SDV2**	**#obs**	**Temp**	**Anomaly**	**SDV1**	**SDV2** [(1)]
					January - February					
GOMW	14	6.47	0.72	0.29	0.62	13	7.20	1.02	0.24	0.49
GOME	18	5.70	0.41	0.25	0.73	14	7.52	0.37	0.31	1.21
GB	20	6.43	1.08	0.30	.60*	15	6.79	1.27	0.23	.65*
MABN	51	6.96	2.06	0.27	1.05	37	7.15	2.31	0.31	1.03
MABS	102	9.67	3.41	0.21	2.34	78	9.65	3.23	0.27	1.75
					March - April					
GOMW	46	6.37	1.39	0.20	0.86	44	6.40	1.30	0.16	0.76
GOME	35	5.46	0.71	0.19	0.74	32	7.36	0.52	0.22	0.75
GB	65	6.19	1.26	0.16	0.71	55	6.80	1.52	0.21	0.96
MABN	63	7.17	2.65	0.26	0.98	54	7.84	2.68	0.32	1.25
MABS	88	9.22	3.11	0.24	0.95	82	9.10	2.95	0.29	1.29
					May - June					
GOMW	34	10.81	0.59	0.21	0.61	20	6.71	1.22	0.19	0.89
GOME	21	9.10	0.73	0.20	0.47	10	8.18	1.08	0.33	0.70
GB	32	11.20	1.94	0.26	1.34	26	8.80	1.12	0.28	0.99
MABN	23	12.49	0.96	0.35	1.22	20	8.50	0.86	0.42	1.51
MABS	41	14.62	-0.15	0.31	0.64	41	11.76	2.72	0.36	1.44
					July - August					
GOMW	36	18.07	1.46	0.26	1.91	34	7.59	0.88	0.21	2.37
GOME	35	16.58	2.37	0.24	1.82	33	9.22	0.59	0.29	2.69
GB	122	19.11	3.25	0.15	2.04	117	12.28	0.72	0.17	2.22
MABN	43	23.05	3.07	0.32	1.88	40	10.74	1.13	0.37	1.54
MABS	83	24.99	1.14	0.24	1.21	80	13.11	1.72	0.28	2.15
					September - October					
GOMW	111	14.90	1.41	0.14	0.79	96	8.24	1.21	0.11	1.33
GOME	53	13.74	1.14	0.19	0.72	49	9.65	1.14	0.20	1.37
GB	80	17.81	2.45	0.21	1.42	71	14.57	1.80	0.22	1.99
MABN	63	19.66	1.41	0.27	1.26	56	13.07	0.93	0.34	2.76
MABS	120	21.74	1.01	0.20	1.05	103	15.94	1.60	0.24	2.50
					November - December					
GOMW	11	10.70	0.55	0.38	0.49	9	8.92	0.66	0.31	.94*
GOME	8	11.90	0.34	0.33	.66*	6	9.61	0.28	0.42	.91*
GB	30	12.78	0.09	0.23	0.65	28	12.76	0.80	0.27	1.04
MABN	22	15.77	1.16	0.38	1.39	18	14.67	1.44	0.42	1.21
MABS	18	16.07	0.34	0.43	.84*	14	15.19	0.65	0.47	.63*

(1) "Region", the geographic region of the northeast continental shelf; "#obs", the number of observations included in each average; "Temp", the areal average temperature; "Anomaly", the areal average temperature anomaly; "SDV1", the standard deviation associated with the average temperature anomaly; "SDV2", the standard deviation of the individual anomalies from which the the average anomaly was derived.

(*) A true areal average could not be calculated due to poor station coverage. The average values listed were derived from a simple average of the observations within the region.

Table 3. Area-averaged surface and bottom salinity and salinity anomalies presented in two month time periods using the hydrographic data collected during 2002 in the five regions of the northeast continental shelf

	SURFACE					BOTTOM				
Region	**#obs**	**Salt**	**Anomaly**	**SDV1**	**SDV2**	**#obs**	**Salt**	**Anomaly**	**SDV1**	**SDV2** [1]
					January - February					
GOMW	14	32.99	-0.06	0.14	0.26	13	33.67	0.10	0.08	0.24
GOME	18	32.35	-0.37	0.13	0.32	14	33.91	0.01	0.09	0.41
GB	20	32.80	-0.29	0.14	.43*	15	32.99	0.01	0.08	.24*
MABN	51	33.10	0.01	0.12	0.43	37	33.24	-0.13	0.12	0.34
MABS	100	34.13	0.52	0.13	0.72	78	34.23	0.51	0.10	0.53
					March - April					
GOMW	46	32.51	-0.05	0.09	0.44	44	33.41	0.05	0.06	0.26
GOME	34	32.27	-0.20	0.11	0.32	32	34.02	0.05	0.07	0.32
GB	64	32.69	-0.27	0.06	0.32	54	33.12	-0.07	0.08	0.34
MABN	62	33.10	0.14	0.11	0.46	54	33.46	0.05	0.11	0.41
MABS	87	33.79	0.78	0.14	0.82	82	33.92	0.42	0.10	0.60
					May - June					
GOMW	34	32.07	-0.07	0.09	0.24	20	33.50	0.18	0.08	0.28
GOME	21	32.37	-0.06	0.12	0.22	10	33.99	0.21	0.10	0.29
GB	32	32.76	-0.11	0.10	0.25	26	32.84	-0.19	0.10	0.29
MABN	22	32.51	0.11	0.16	0.38	19	33.09	-0.24	0.14	0.47
MABS	41	33.20	0.99	0.18	0.61	41	33.78	0.45	0.13	0.36
					July - August					
GOMW	34	32.26	0.23	0.12	0.38	34	33.57	0.10	0.07	0.19
GOME	35	32.59	0.18	0.13	0.33	33	34.24	0.25	0.09	0.35
GB	122	32.96	0.30	0.05	0.60	117	33.07	0.09	0.06	0.34
MABN	43	32.33	-0.01	0.14	0.56	40	33.16	-0.15	0.12	0.33
MABS	82	32.26	0.51	0.16	0.68	80	33.36	0.26	0.11	0.53
					September - October					
GOMW	92	32.71	0.30	0.07	0.27	95	33.84	0.22	0.04	0.32
GOME	51	32.90	0.33	0.12	0.25	49	34.45	0.22	0.07	0.27
GB	79	33.11	0.36	0.09	0.62	71	33.32	0.36	0.08	0.48
MABN	63	32.99	0.38	0.11	0.56	56	33.51	0.11	0.11	0.57
MABS	120	32.68	0.36	0.11	0.62	102	33.05	-0.16	0.09	0.56
					November - December					
GOMW	11	33.09	0.33	0.17	0.13	9	33.57	0.03	0.11	.39*
GOME	7	33.01	0.33	0.17	.08*	5	34.03	0.08	0.11	.39*
GB	30	32.96	0.23	0.08	0.16	28	33.24	0.23	0.10	0.34
MABN	22	34.00	1.03	0.17	0.69	18	34.12	0.51	0.15	0.42
MABS	18	33.21	0.42	0.22	.51*	14	32.79	0.03	0.17	.47*

(1) "Region", the geographic region of the northeast continental shelf; "#obs", the number of observations included in each average; "Salt", the areal average salinity; "Anomaly", the areal average salinity anomaly; "SDV1", the standard deviation associated with the average temperature anomaly; "SDV2", the standard deviation of the individual anomalies from which the the average anomaly was derived.

(*) A true areal average could not be calculated due to poor station coverage. The average values listed were derived from a simple average of the observations within the region.

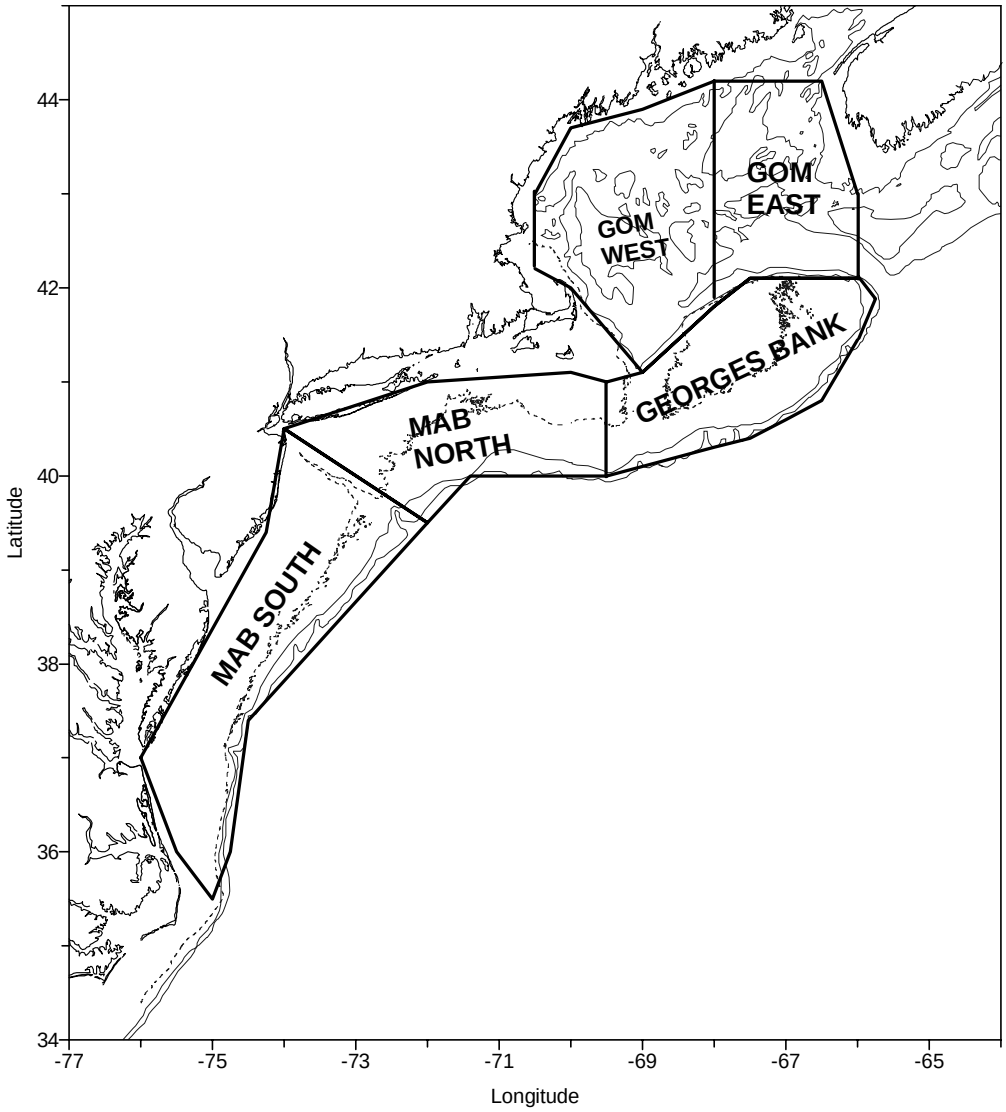

Fig.1. The regions of the northeast continental shelf covered by the Northeast Fisheries Science Center cruises during 2002.

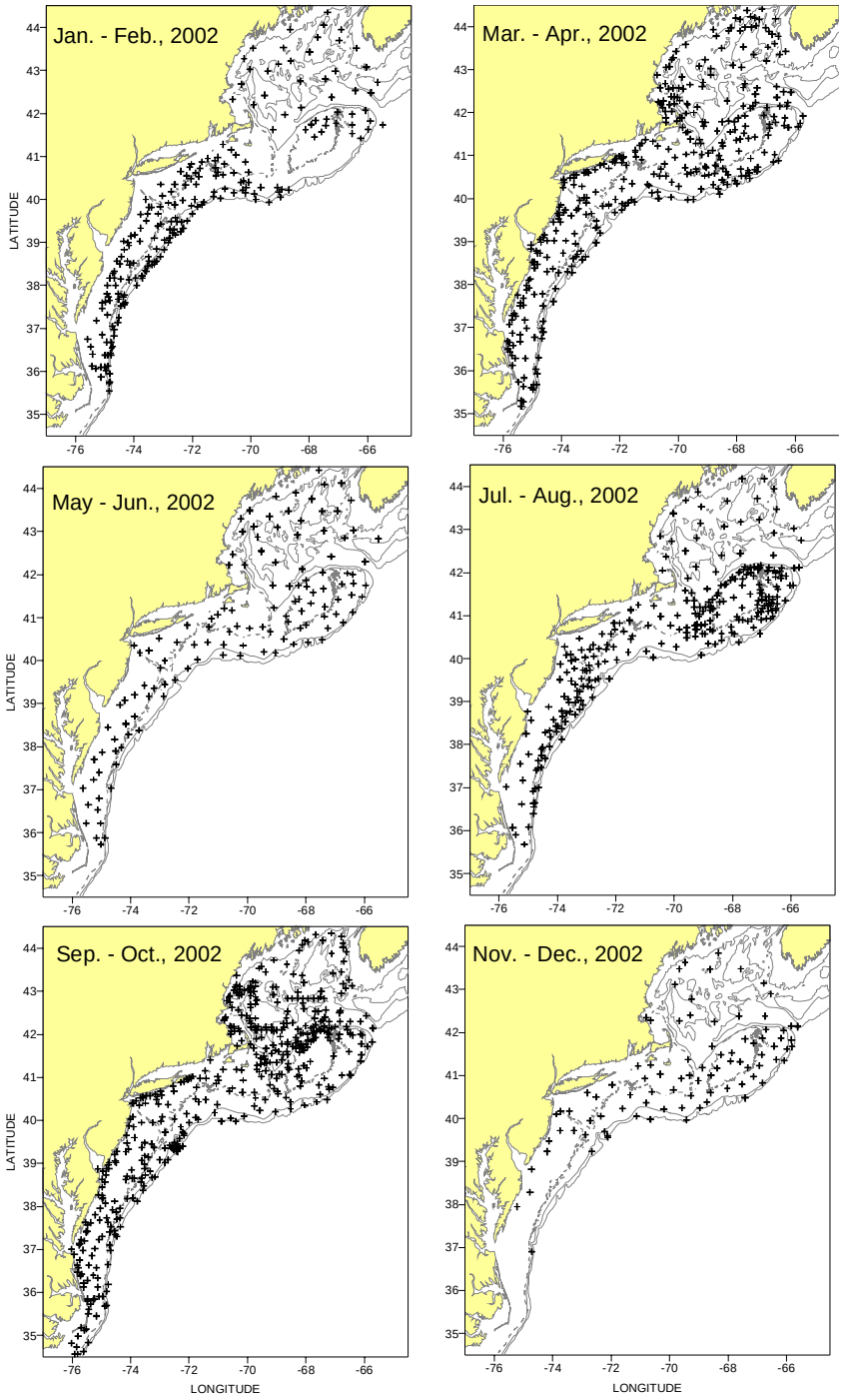

Fig. 2. Distributions of hydrographic stations occupied during 2002.

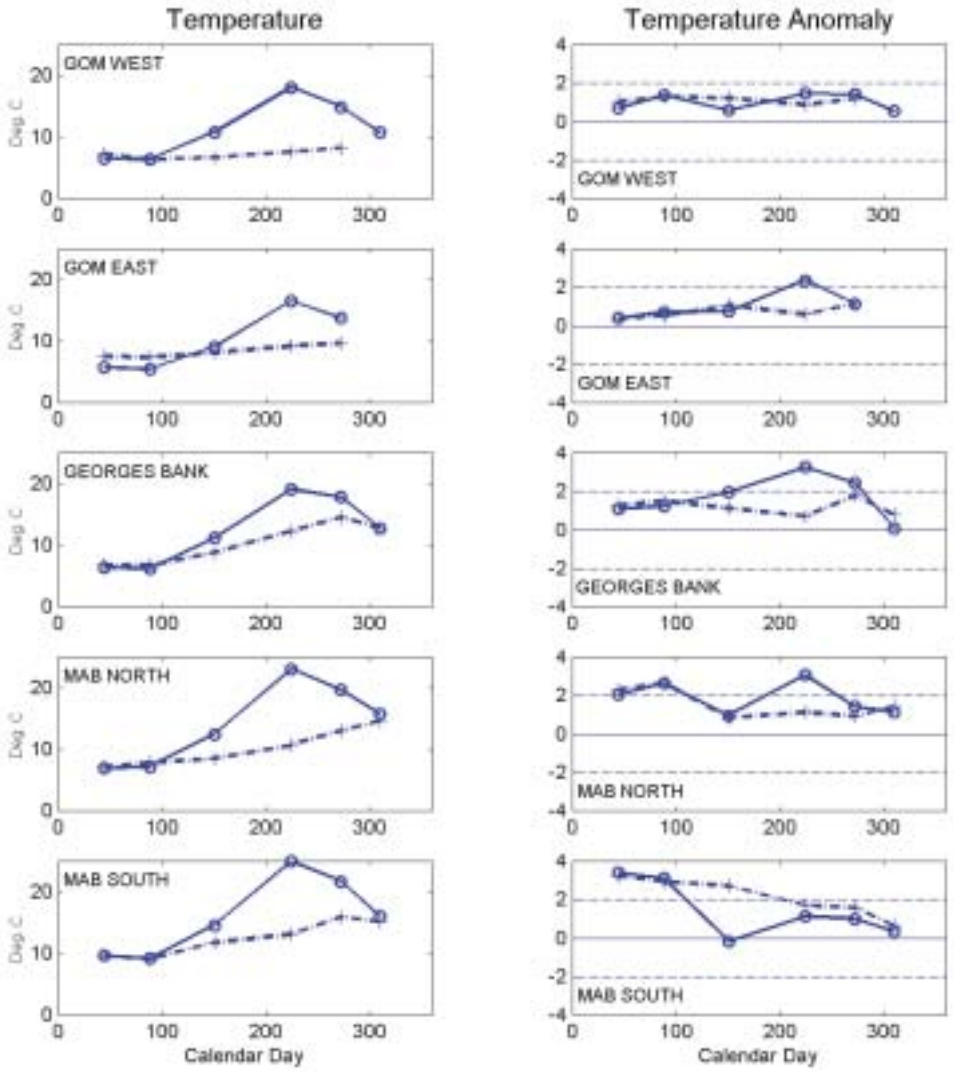

Fig. 3a. Bimonthly area-averaged surface (o-o) and bottom (+ -- +) temperature and temperature anomaly in the five regions of the northeast continental shelf during 2002.

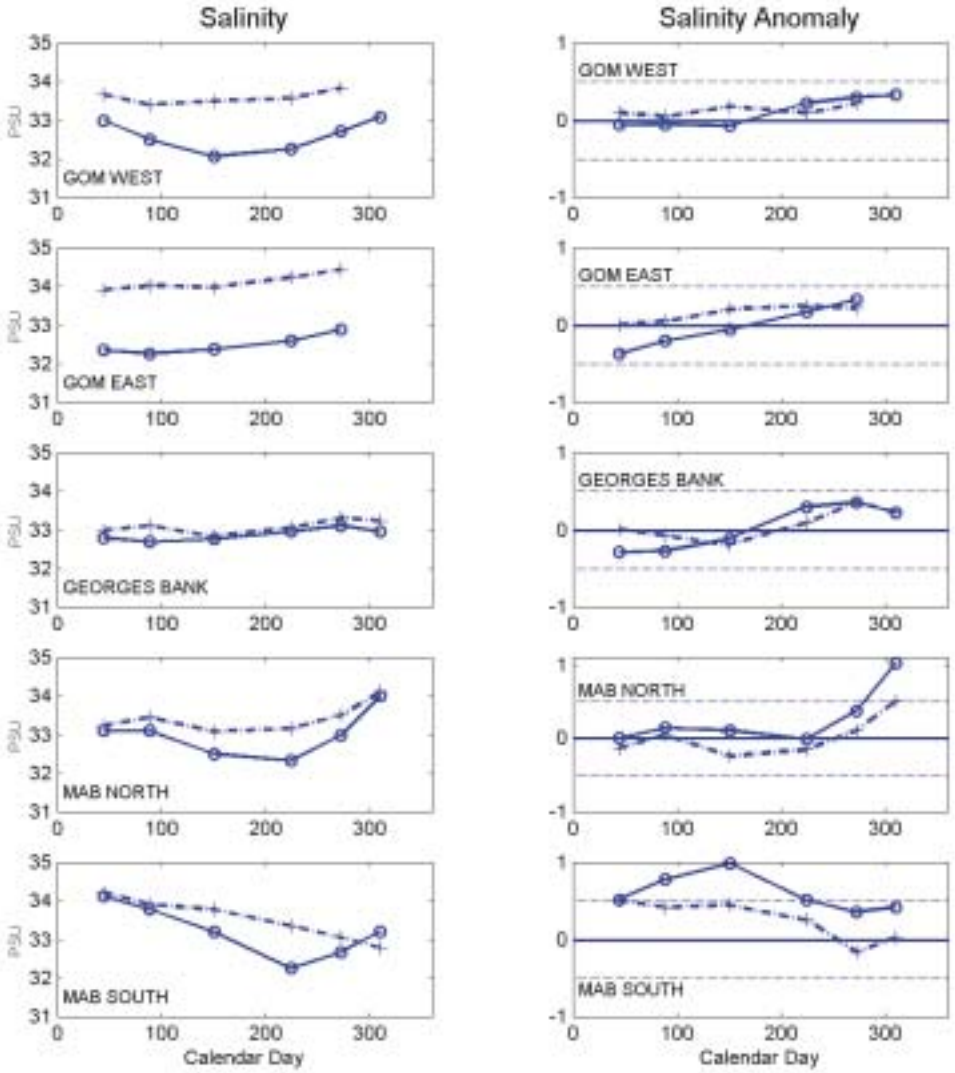

Fig. 3b. Bimonthly area-averaged surface (o-o) and bottom (+ -- +) salinity and salinity anomaly in the five regions of the northeast continental shelf during 2002.