Northwest Atlantic Fisheries Organization

Serial No. N096

NAFO SCR Doc. 80/VI/58

SCIENTIFIC COUNCIL MEETING - JUNE 1980

Hydrographic conditions on Hamilton Inlet Bank (Div. 2J) in early December 1979

by

M. Stein
Bundesforschungsanstalt für Fischerei
Institut für Seefischerei
Hamburg, Federal Republic of Germany

Introduction

The hydrographic observations along the Seal Island Section (ICNAF Subarea 2) as performed from *RV "Anton Dohrn"* and *RV "Walther Herwig"* during numerous groundfish surveys, mean-while cover the period from 1969 to 1979. There are two gaps of observations, that is 1970 and 1978. Whereas in the previous years the oceanographic measurements were obtained by means of Nansen bottles, the 1979 results (30 November - 2 December 1979) originate from CTD (Conductivity, Temperature, Depth) measurements. Due to the profiling technique these data thus permit a closer view to the complex vertical structure of the watercolumn along the Standard Section.

Instrumentation and data processing

The vertical profiles of conductivity and temperature were obtained by means of a KIEL Multisonde (KROEBEL 1973; KROEBEL, DIEHL and RATHLEV 1976; RATHLEV 1977; STEIN 1978; CORNUS and STEIN, 1979). The *conductivity* measurements required a calibration against water samples. Linear regression of the salinometer (Guildline) values resulted in a correction formula which was applied to the salinity as calculated from the obtained parameters C,T,D. Salinity was calculated according to BENNETT (1976). The final step of data processing was interpolation to one decibar intervalls, calculation of density (σ_t) and storage on magnetic disks. Further data processing yielded mean values of temperature and salinity for standard layers along the Seal Island Section (Table 1,2) as well as TS-diagrams of the individual standard stations (Fig. 1).

TS-diagrams of standard stations S3 to S8

According to ICNAF Circular Letter 76/79 the positions of the hydrographic stations were chosen: Starting with 53°14'N, 55°39'W as station S1, S3 (113) to S8 (125) follow the list mentioned above. The TS-diagrams as shown in fig. 1 reveal the mixture of the two main water masses in the area under investigation: Labrador Shelf Surface Water (LSSW) which is the arctic component of the Labrador Current, and Labrador Sea Intermediate Water (LSIW) which is the Westgreenland component of the Labrador Current. As for the TS-characteristics of these two water masses it seems suitable to use $T \leq 0°C$, $S \leq 33$ppm for the LSSW and $T \geq 3.6°C$, $S \geq 34.78$ppm for the LSIW, values which were found during our observations from 29 November to 8 December 1974 (STEIN, 1975).
The"near-shore" stations (113, 114, 122) indicate at the lower end of their TS-diagram the influence of LSSW, whereas stations 123, 124 and 125 are in their deeper layers influenced by the LSIW (upper end of the TS-diagrams). Between the two mixing water masses the TS-points are grouped along a mixing line which is more or less disturbed. At station 114, for example, an intrusion of a cold water mass can be observed: The temperature drops from 1°C to nearly 0°C, whereas the salinity increase is 0.09 ppm. This station exhibits the pronounced layering in the arctic component of the Labrador Current. At station 124 and 125 a warm intermediate water mass can be traced at the upper end of the TS-diagrams: Being warmer than 4°C this water mass is centered around 300m depth. The salinity of this water mass ranges between 34.87 ppm and 34.91 ppm.

Mean values of temperature and salinity along the Standard Section

Compared to the 1977 and 1975 observations, which were also done in early December, the 1979 results yield higher mean values of temperature and salinity. With the exception of the surface layer (0-50m) at S3, S4 and the deep layer (50-200m) at S8 the temperature was up to 0.73°C above the mean value. This indicates a general warming of the Labrador Current along the entire section, with the exceptions mentioned above. The overall changes are largest in the subsurface layer (50-200m). The salinity results included, which are all above normal, the conclusion may be drawn that the influence of the warm saline component of the Labrador Current on the thermohaline conditions along the Hamilton Bank Section has increased during early December 1979.

References

CORNUS, H.P.; STEIN, M. 1979:
Antarctic Expedition of the Federal Republic of Germany 1977/78. Oceanographic Data Report Part I. Mitt.Inst.Seefisch.Hamburg (27): 1-381 u. I-XLIII, 1979.

KROEBEL, W., 1973: Die Kieler Multimeeressonde. Ein Gerät zur in situ-Messung von Temperatur, Leitfähigkeit, Salzgehalt, Schallgeschwindigkeit und lichtoptischer Attenuation mit den ersten Ergebnissen der "Meteor"-Fahrt Nr. 23 (1971) westlich von Gibraltar. "Meteor"-Forsch.-Ergebn. (A) No 12, S. 53-67.

KROEBEL, W., DIEHL, P., RATHLEV,J., et al., 1976:
Die Kieler Multimeeressonde der Jahre 1975/76, ihre Sensoren, Parameter mit Ergebnissen von Datenaufnahmen und Perspektiven für ihre Auswertungen.
In: Interocean 76. 3. Internat. Conf. and Exhibition for Ocean Engn. and mar.Sci. Düsseldorf 15-19 June 1976. Kongreß-Berichtswerk Bd. 2, S.1034-1046.

RATHLEV, J., 1977: Microcomputer steuert Bordgerät der Kieler Multisonde und berechnet den Salzgehalt.
Dt. hydrogr. Z. 30, 131-136.

STEIN, M., 1975: Hydrographic conditions on Hamilton Inlet Bank (Div. 2J) in the fall of 1974.
ICNAF Res.Doc. 75/29.

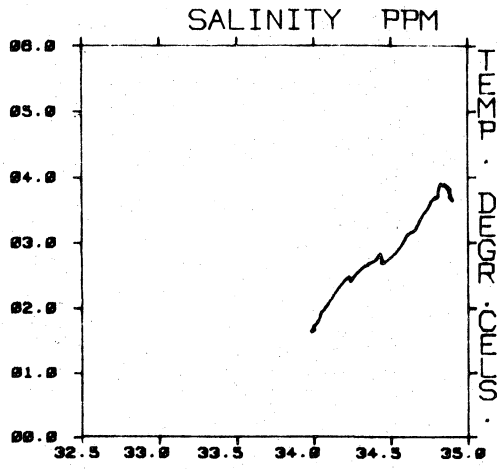
STEIN, M., 1978: Erfolgreicher Einsatz des Meßverbundsystems KIEL-Multisonde/WANG-Computer 2200 während der 2. Antarktis-Expedition 1977/78 der Bundesrepublik Deutschland.
Inf.Fischwirtsch. Nr. 3/4 (1978).

Table 1. Mean temperature ($\bar{t}$ = average 1969-79, excl. 70, 78) and mean temperature differences in degree celsius as compared to 1979 ($\bar{t} - t$) in distinct water layers on the Seal Island Section in early December 1979.

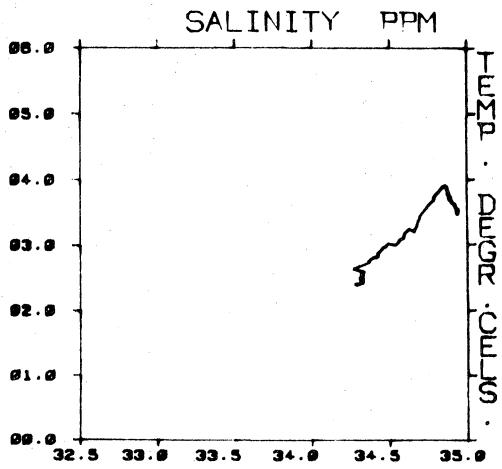
layer \ station		S3	S4	S5	S6	S7	S8
0 - 50m	$\bar{t}$	0.49	0.31	0.31	0.88	1.04	2.51
	$\bar{t} - t$	0.22	0.09	-0.32	-0.43	-0.73	-0.06
50 - 200m	$\bar{t}$	0.91	--	1.13	1.82	1.91	3.10
	$\bar{t} - t$	-0.14	--	-0.66	-0.69	-0.61	0.13
0 - 200m	$\bar{t}$	0.84	--	0.96	1.62	1.71	2.97
	$\bar{t} - t$	-0.01	--	-0.54	-0.59	-0.63	0.10

Table 2. Mean salinity ($\bar{s}$ = average 1969-79, excl. 70, 78) and mean salinity differences in ppm as compared to 1979 ($\bar{s} - s$) in distinct water layers on the Seal Island Section in early December 1979.

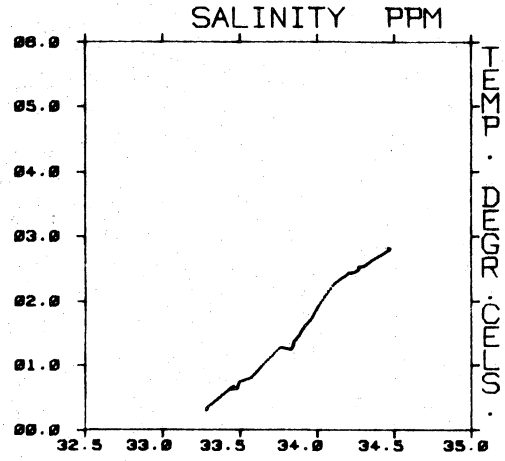
layer \ station		S3	S4	S5	S6	S7	S8
0 - 50m	$\bar{s}$	32.84	32.80	32.91	33.27	33.45	34.07
	$\bar{s} - s$	-0.35	-0.37	-0.52	-0.60	-0.59	-0.29
50 - 200m	$\bar{s}$	33.34	--	33.52	33.82	33.91	34.43
	$\bar{s} - s$	-0.33	--	-0.46	-0.48	-0.40	-0.07
0 - 200m	$\bar{s}$	33.02	--	33.41	33.72	33.81	34.35
	$\bar{s} - s$	-0.53	--	-0.44	-0.47	-0.43	-0.11



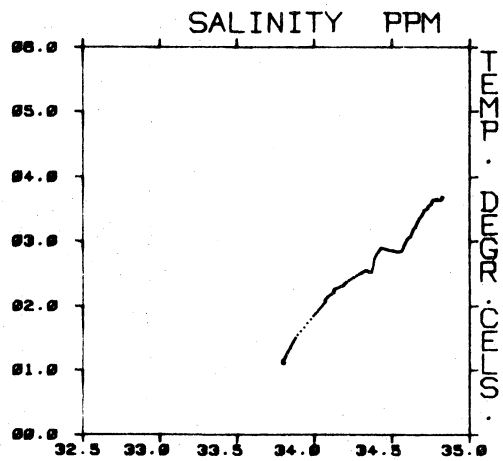
STATION NR.: Ø124



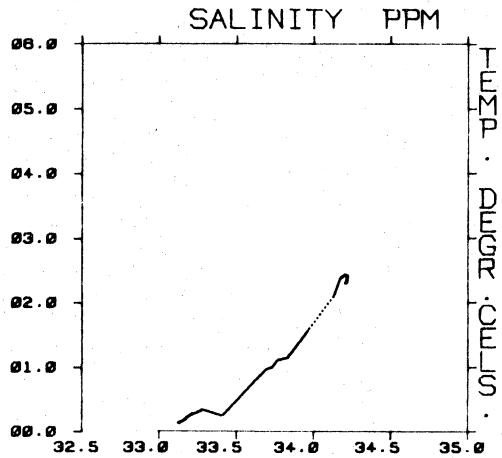
STATION NR.: Ø125



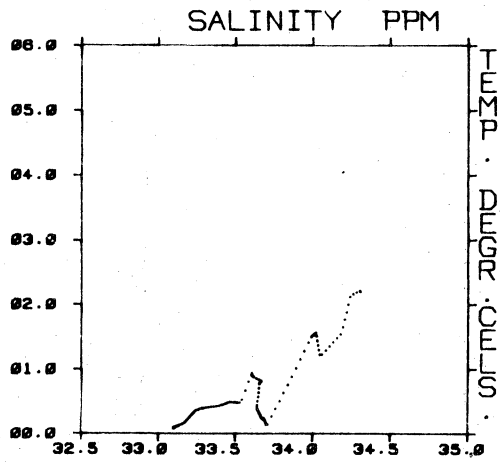
STATION NR.: Ø122



STATION NR.: Ø123



STATION NR.: Ø113



STATION NR.: Ø114