

APPENDIX 1.

Report on an inter-ship calibration
between the research vessels

G.O.Sars and Prof.Marty

21/6 - 22/6 1993.

INTRODUCTION

An intercalibration between the two vessels took place from the evening of 21st to about 9 o'clock in the morning of 22nd June, in the area between latitude North 70°49', 70°00' and longitude East 032°28', 034°00'.

Data from two pelagic channels were collected, covering the depth range from 15 to 100 m. The main aim of the exercise was to compare the performance of the acoustic systems of the two vessels. The two vessels' CTD - systems were also compared and the results are presented in this report.

METHODS

The sailing formation between the vessels was: G.O.Sars in front with Pr.Marty 170° to starboard side and 1/2 nautical mile behind as shown in *Fig.1*. The two vessels started from N70°40', E34°00' with a course of 340° up to N70°49', E33°50' and turned to 248° down to the end at N70°00' and E34°00'. The total distance sailed was 85 nautical miles, and it was covered with a speed of 8 knots. The direction and course line were chosen to avoid disturbance due to bad weather conditions, and to cover a high fish density area.

Both vessels used their own navigation log for measurement of distance and for resetting their echo integrator. After 85 nautical miles, the difference of the vessels' logs was only 1 mile. Communication took place on VHF radios.

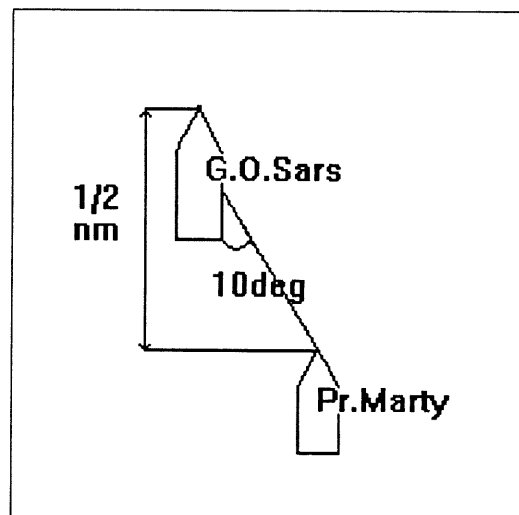


Fig. 1. Sailing formation

The equipment, and the settings of the echo sounder and integration systems, were mainly the same as used during the survey. The details are shown in *Table 2*, (*Echo sounder and integrator settings*). The integrator channels used during the intercalibration were 15-50 m, and 50-100 meter.

The echo recordings and the mean area backscattering coefficients, S_a , were compared on board G.O.Sars the 22nd of June 1993.

REGISTRATION AND CONDITIONS

The echo recordings consisted of small high density schools, and patches of herring between 10 and 125 m depth. It must be considered that these kinds of registrations, are not especially good for intercalibration. The weather conditions during the performance were not too good in the evening of the 21st, but ended excellently the day after.

ANALYSIS AND RESULTS

In *Fig .2*, the total values for the two pelagic channels are shown in succession for each 5-nautical miles sailed.

In some 5 - miles Prof. Marty has higher mean Sa-values than G.O.Sars and vice versa, but there is no general trend in this, even though Prof.Marty has the highest values.

Because of the composition and type of echo recordings in the surveyed area it is only possible to compare the average of the five nautical miles values, of the mean area backscattering coefficients (Sa) between the two vessels.

On the basis of a simple two-sample analysis of the 17 five nm's covered it can be concluded that there is no difference between the average values of the vessels. The average of both vessels is well within the average of the other +- the Standard Error estimate, hence the difference is not significant.

Table nr. 1. Two-Sample Analysis Results

	GOS	Marty	Pooled
Sample Statistics: Number of Obs.	17	17	34
Average	1695.06	1996.18	1845.62
Variance	2.83985E6	7.91246E6	5.37615E6
Std. Deviation	1685.18	2812.91	2318.65
Std. Error	408.72	682.23	
Median	1355	800	914
Conf. Interval For Diff. in Means: 95 Percent			
(Equal Vars.) Sample 1 - Sample 2	-1921.45	1319.22	32 D.F
(Unequal Vars.) Sample 1 - Sample 2	-1935.72	1333.48	26.2 D.F
Conf. Interval for Ratio of Variances: 0 Percent			
Sample 1 - Sample 2			
Hypothesis Test for HO: Diff = 0		Computed t statistic = -0.378626	
vs Alt: NE		Sig. Level = -0.707466	
at Alpha = 0.05		so do not reject HO.	

This gives the ratio of the mean area backscattering coefficients(Sa):

$$Sa \text{ G.O.Sars} / Sa \text{ Prof.Marty} = 1$$

CTD SYSTEM

At the end of the intercalibration a calibration between the two vessels CTD - systems was performed. Five hydrographic samplings were carried out in the same position from each vessel. *Fig. 3* shows the average temperature recordings in 5 depths between 0 and 200 m from G.O.Sars and Prof. Marty. The conclusion is that the CTD - systems of the two vessels can be considered to give equal results.

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Table nr. 2.

Echo sounder and integrator data.

	G.O.Sars	Pr.Marty
Echo sounder	Simrad EK500	Simrad EK500
Frequency	38 Khz	38 Khz
Transmitter power	4000 Watt	2000 Watt
Transducer type	ES 38b 7.1x7.1	
Range compensation	20 log R	20 log R
Pulselength/Bandwidth	1.0 ms/ 3.8 khz	1.0 ms/3.8 khz
Basic range	0-500 m	0-500 m
Sv Threshold	-80 dB	-75 dB
Sv transducer gain	25.2 dB	23 dB
Ts transducer gain	25.2 dB	23 dB
2-way beam angle	-21.0 dB	-20.4 dB

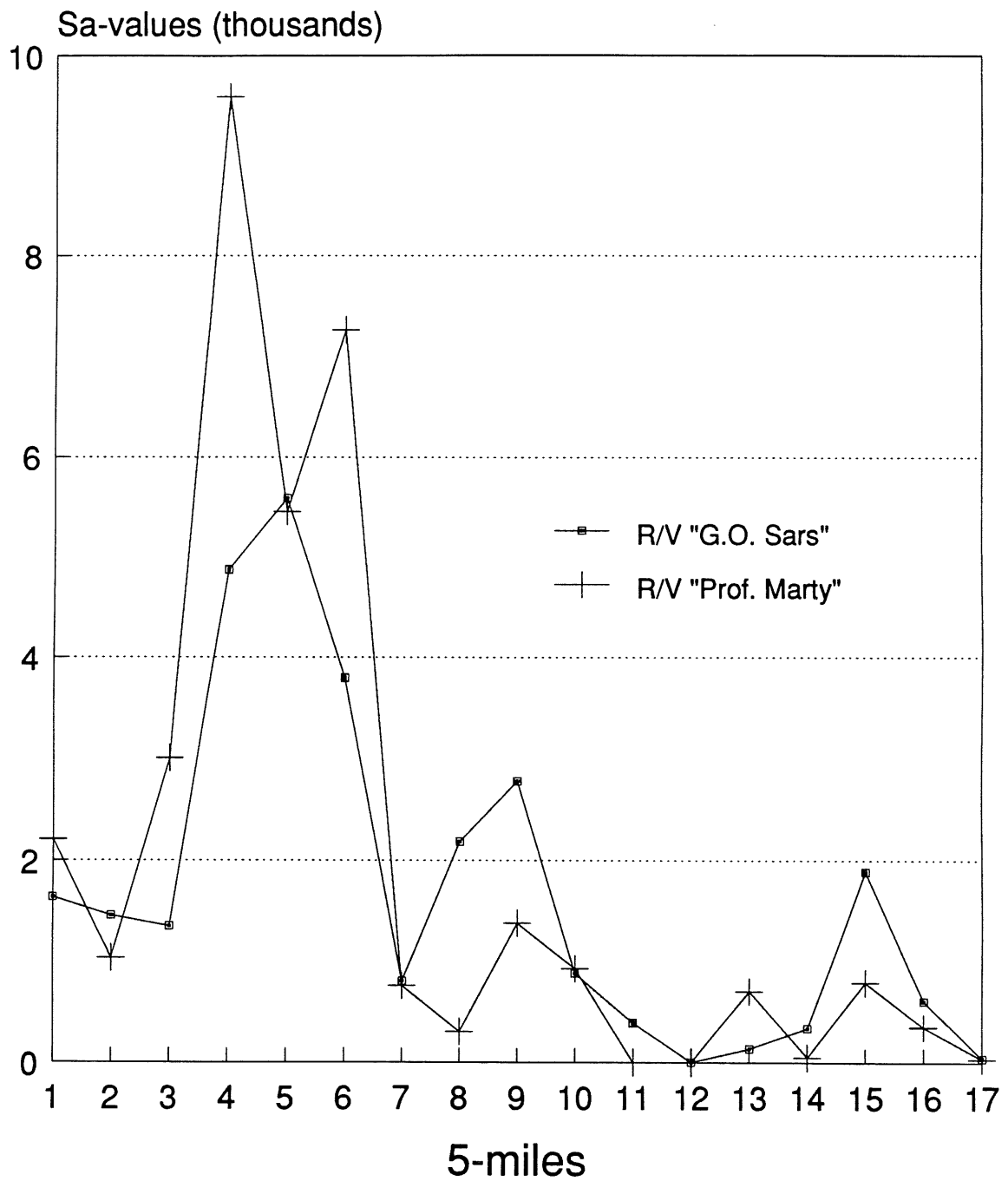


Figure 2. Mean SA-values for the two vessels during the intercalibration, 21 - 22 June 1993.

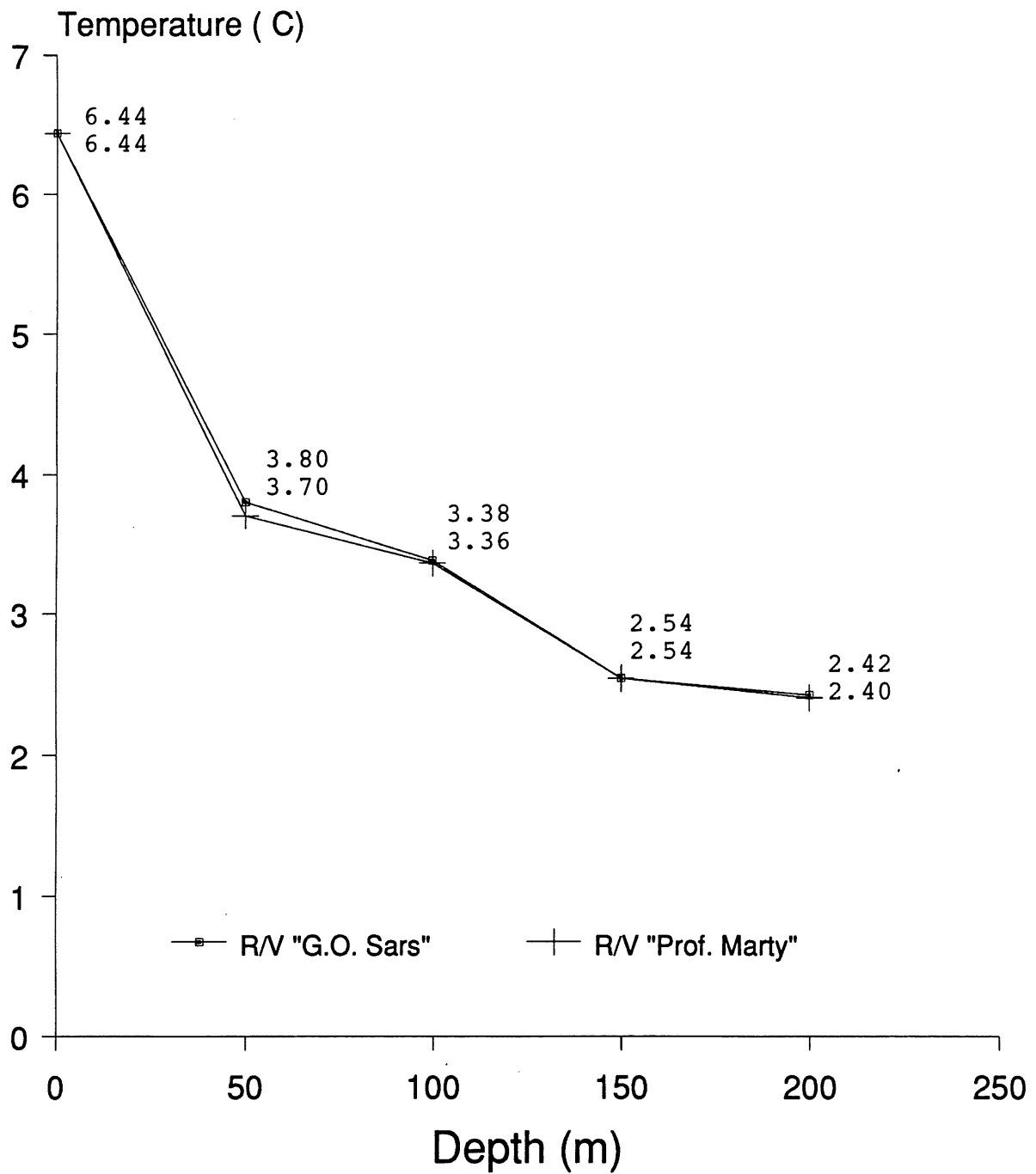


Figure 3. Mean temperature from 5 samples at 5 depths for the two vessels.