CRUISE REPORT
mf93-05 ~~MF93-04~~ (3MF93)
13-30 APRIL, 1993

NOAA Ship MILLER FREEMAN
NOAA Alaska Fisheries Science Center (AFSC)
NOAA Pacific Marine Environmental Laboratory (PMEL)

1.0 Introduction

Fisheries Oceanography Coordinated Investigations (FOCI) is a joint effort by scientists at PMEL and AFSC to understand the biological and physical processes which cause variability of recruitment to commercially valuable fish and shellfish stocks in Alaskan waters. The FOCI program is presently studying the biotic and abiotic environment on the early life stages of walleye pollock spawned ins Shelikof Strait, Gulf of Alaska, and certain areas of the eastern Bering Sea. There are two aspects to the study: the acquisition and analysis of time-series data, and specific research topics to be covered on a cruise-by-cruise basis.

The objectives of this cruise were:

1) to continue acquisition of long-term biological and physical time series;
2) to conduct large-scale and small-scale ichthyoplankton and zooplankton surveys in the Bogaslav Island to determine horizontal patterns of distribution and abundance of walleye pollock larvae and locate areas of high concentrations;
3) to collect larvae for age and feeding analysis;
4) to collect larvae and microzooplankton to study horizontal feeding patterns;
5) to release satellite-tracked drifter buoys in areas of high larval concentrations so that the currents affecting larval advection and dispersal may be studied;
6) to collect vertical distribution information for calibration of ADCP backscatter;
7) to collect protozoa as prey for larvae;
8) to collect macrozooplankton to study biochemical composition;

2.0 Chronology

Depart Kodiak, AK	13 April
Start Field Operations	15 April
Complete Field Operations	30 April
Arrive Dutch Harbor, AK	30 April

3.0 Participating Scientists

William Rugen (Chief Scientist)	M/USA	NOAA/AFSC
Doug Schleiger (Watch Chief)	M/USA	NOAA/PMEL
Stella Spring (Watch Chief)	F/USA	NOAA/AFSC
Lisa Britt	F/USA	NOAA/AFSC
Leslie Lawrence	F/USA	NOAA/PMEL
Sigrid Salo	F/USA	NOAA/PMEL
William Flerx	M/USA	NOAA/AFSC
Patricia Dell'Arciprete	F/Argentina	Univ. Wash
Lewis Haldorson	M/USA	Univ. AK Fairbanks
Nicola Hilgruber	F/Germany	Univ. Ak Fairbanks

4.0 Operations

Proceeded to study area (figure 1) and began exploratory bongo tows to determine viability of depth distribution work to determine depth of bongo tows during large- and small-scale grid work. Because of problems with the MOCNESS gear, a series of Tucker trawls was done to determine the larval depth distribution. The sampling scheme was:

tow #	Net 1	Net 2
1	500-400 m	400-0 m
2	400-300 m	300-0 m
3	300-200 m	200-0 m
4	200-100 m	100-0 m

The scanmar was used to determine the sampling depths on the first of the two Tucker series, but because of battery failure, we used wire-out from the first series to determine net depths during the second series. Because of the number of larvae found deeper in the water column, it was decided that the bongo tows would be due to 400 m. Pollock larvae were removed for future gut and otolith analysis.

Next, we did a large-scale bongo grid of 54 stations spaced 15 nm apart (figures 2,3). This lasted from April 16-21. Pollock larvae were removed for future gut and otolith analysis.

The MOCNESS was fished once during the large-scale grid to assure that it was working properly and again once the large-scale grid was finished. It was rigged with 153 um mesh nets and fished obliquely and sampled the depths 500-400 m, 400-300 m, 300-200 m, 200-100 m, 100-75 m, 75-50 m, 50-25 m. Pollock larvae were removed for future gut and otolith analysis.

We then began a small-scale bongo grid of 25 stations situated 3.75 nm apart (figures 1,4). As with the large-scale grid, the target tows depth was 400 m. However, because of problems with the Seacat, tow depths were estimated based on wire out readings taken during the large-scale grid. The wire out used was 520 m. Pollock

larvae were removed for future gut and otolith analysis.

After the completion of the small-scale grid, three of the satellite drifter buoys were deployed in a triangular pattern, 1 km apart, near grid station BS 16 (figure 2).

At approximately the same site (grid station BS 16), we then did 10 MOCNESS tows with various goals. Four of the tows (2 day and 2 night) were to calibrate ADCP backscatter. These tows sampled 240-202 m, 202-170 m, 170-138 m, 138-106 m, 106-74 m, 74-42 m, 42-10 m, 10-0 m. A series of three MOCNESS tows was done for researchers at University of Alaska Fairbanks. These tows took three replicate samples at the depths of 70 m, 50 m, 40 m, 30 m, 20 m and 10 m. Three more oblique MOCNESS tows were also done, sampling the depths 500-400 m, 400-300 m, 300-200 m, 200-100 m, 100-75 m, 75-50 m, 50-25 m and 25-0 m. Pollock larvae were removed for future gut and otolith analysis.

At this same location we did (grid station BS 16): 4 CTD casts for microzooplankton at the depths of 90 m, 70 m, 50 m, 40 m, 30 m, 20 m, 10 m and 5 m (for researchers from the University of Alaska Fairbanks); 3 CTDs to collect samples for protozoan studies; live tows to collect larvae for histological purposes; and a ADCP backtrack-L calibration transect.

After finishing the studies in this area we moved to a station on the shelf (figure 1) where we did 4 MOCNESS tows, sampling the depths from near bottom-90 m, 90-75 m, 75-60 m, 60-45 m, 45-30 m, 30-15 m and 15-0 m. CTDs and live tows were also done at this location. Pollock larvae were removed for future gut and otolith analysis.

Due to a break-down of the ship's boilers, it was necessary to put in to Dutch Harbor for repairs. This took approximately 39 hours.

On the way into Dutch Harbor, a transect of three bongo tows were done at grid stations BG 7, BJ 4 and BM 1 (figure 2), to check for the presence of larvae. Using this information, we then began sampling at station BJ 4 after repairs were completed. At this location we did 7 MOCNESS tows (1 series of 3 horizontal tows for UAF, and 4 oblique tows), pollock larvae were removed for future gut and otolith analysis; CTDs for microzooplankton and protozoans; live tows for histological studies; and two 10 minute surface tows using the bongo to collect Atka mackerel larvae for Delsa Anderl and Sandra Lowe.

Over the course of two days, we completed a 5 station bongo transect that extended from a shallow shelf area to an area where bottom depth was greater than 2000 m. This work was done for Bill Shaw's work on macrozooplankton biochemical analysis.

After the transect was completed, we began another small-scale bongo grid (figures 1,5). Because of time constraint, only 23 of

the 25 stations were completed. CTD casts were done at 5 of the stations and at one station we did a CTD to collect microzooplankton at the depths of 90 m, 70 m, 50 m, 40 m, 30 m, 20 m, 10 m and 5m. Pollock larvae were removed for future gut and otolith analysis.

5.0 Summary

There appeared to be many more larvae this year as compared to last year. There was an area of relatively high larval concentration near Unalaska that was concurrent with an area of high salinity. The evidence suggests that an eddy was present in that area. Larvae found at the shelf station appeared to be larger than those found in other areas of the basin. The vertical distribution of the larvae shows that they are generally confined to the upper 50 m of the water column both on the shelf and in the basin.

6.0 Cruise Statistics (number of stations unless otherwise indicated)

Drifter buoys deployed	6	buoys
60 cm bongos	108	(216 samples)
20 cm bongos	51	
Tucker trawls	8	
CTD	29	
Microzooplankton	9	casts
Protozoans (frozen)	2	
Protozoans (lugols)	5	
MOCNESSes	23	
Larvae for histology	16	tows
Larvae for gut and otolith analysis	11215	individuals
Size fractionated macrozooplankton samples	5	
ADCP backtrack-L transect	1	
Surface bongo tows	2	

7.0 Acknowledgements

I would like to thank C.O. Robert Pawlowski and the officers of the NOAAS MILLER FREEMAN for all their hard work and flexibility during what turned out to be a sometimes jinxed cruise. I would also like to thank the crew for all of the often unnoticed hard work that goes into a successful trip. Special thanks goes to ET Jim Lynn for all the help he gave us with getting the MOCNESS back up and running (several times), the survey department, Bill Floering and Monica Cisternelli, for their unflagging effort.

Figure 1. 3MF93, summary of activities

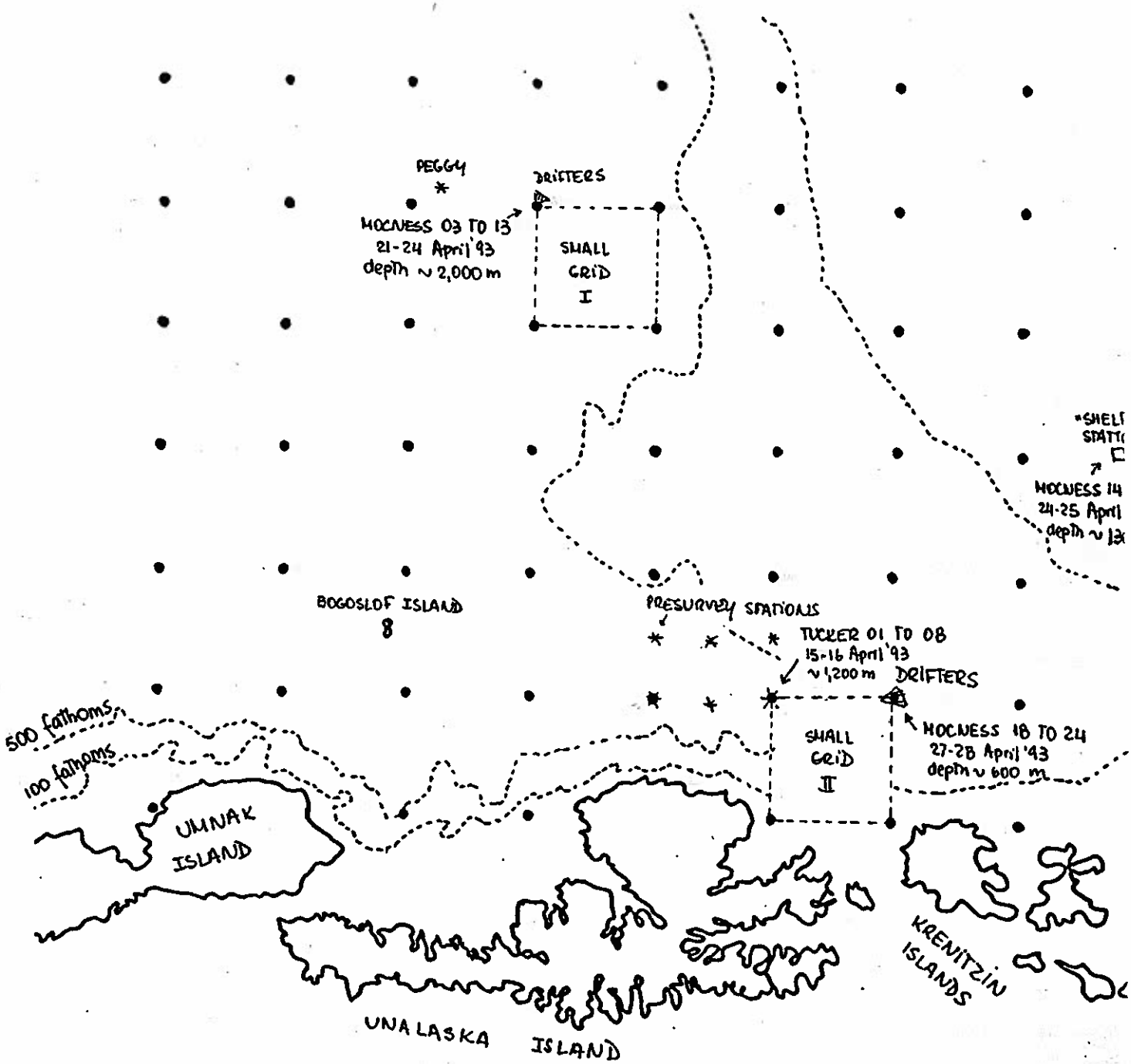

Figure 2. 3MF93, large scale master grid of stations.

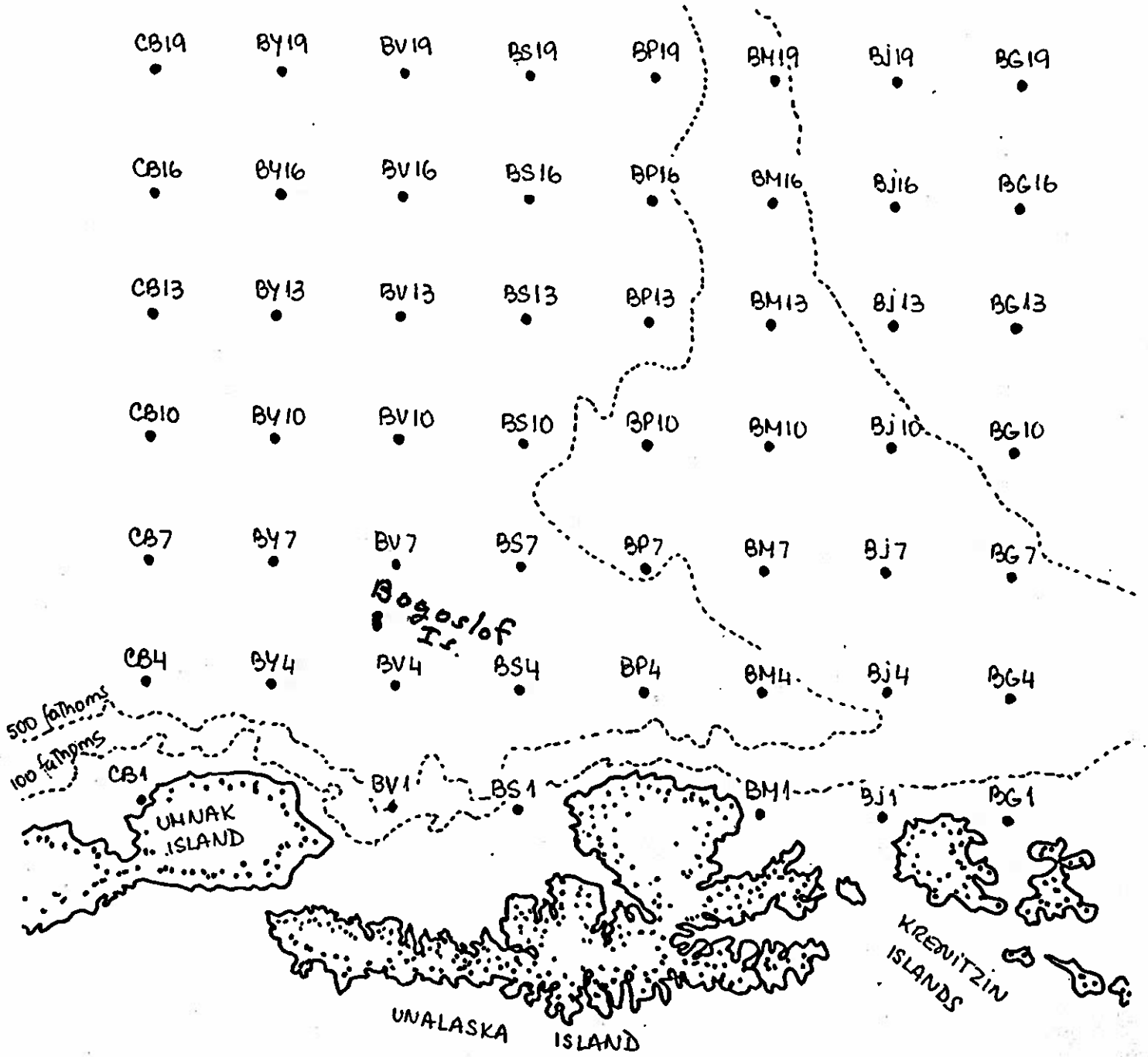

Figure 3. 3MF93, large scale grid, station numbers and trajectory.

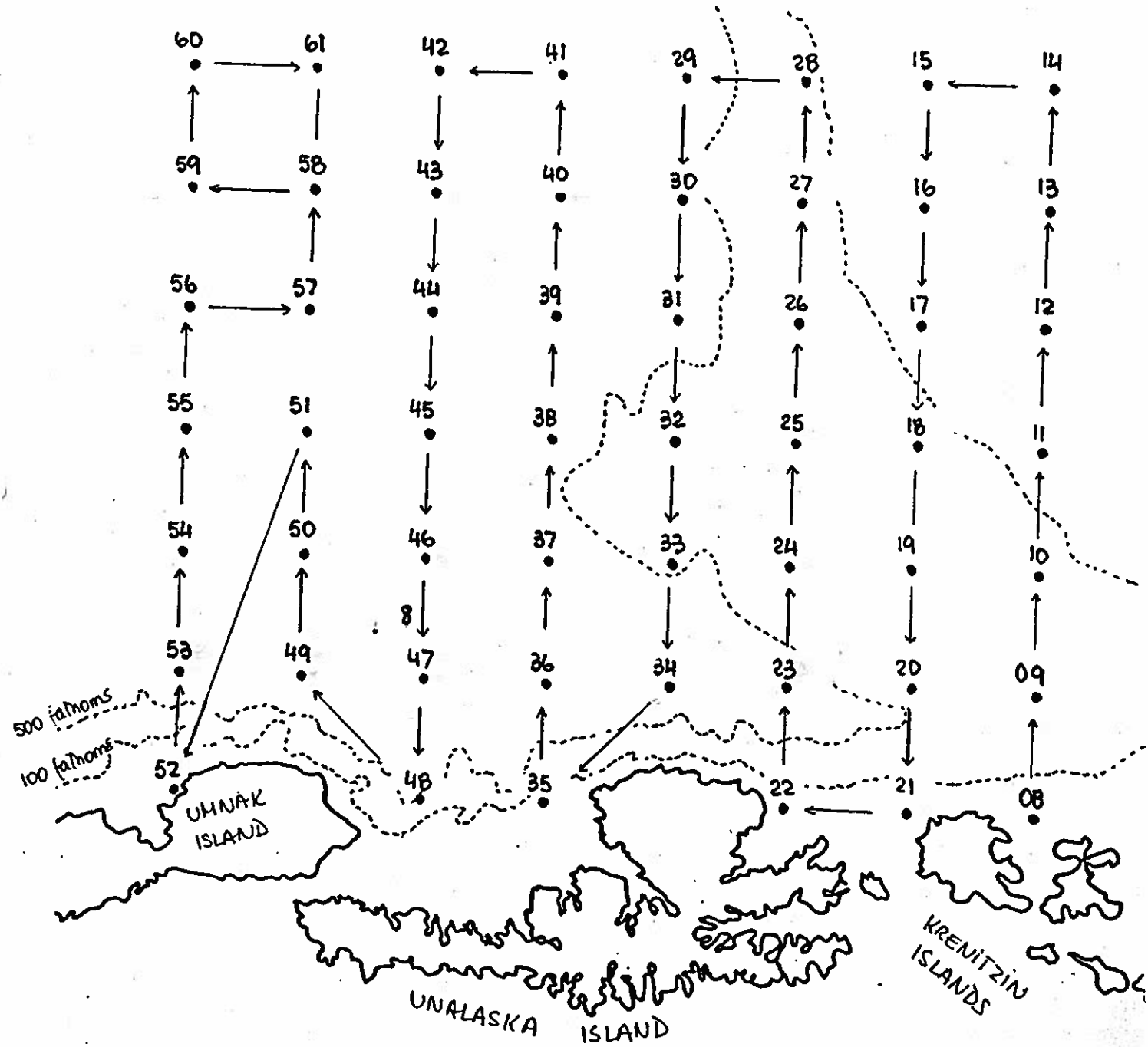

Figure 4. 3MF93, small grid I, station numbers and ship trajectory

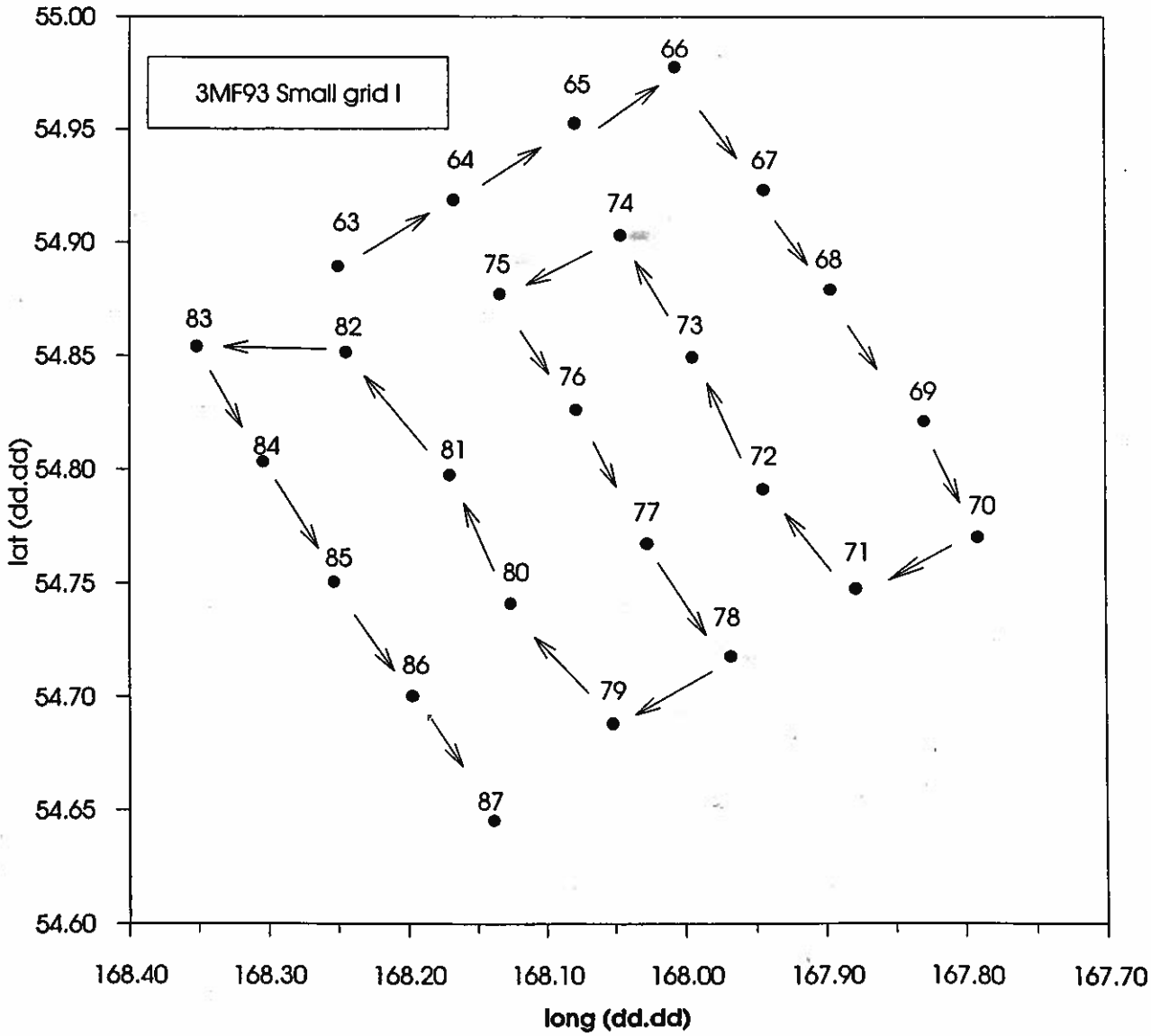

Figure 5. 3MF93, small grid II, station numbers and ship trajectory, circled stations indicate CTD work.