SUMMARY REPORT
April 1, 2000 – August 31, 2002
Caribbean/NMFS Cooperative SEAMAP Program
NA07FS0100-01

SEAMAP-C USVI
St. Croix Fisheries Independent Trap and Line Survey

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INTRODUCTION

The Southeast Area Monitoring and Assessment Program for the Caribbean (SEAMAP-C) is a cooperative program between the National Marine Fisheries Service, the Department of Natural Resources in Puerto Rico and the Department of Planning and Natural Resources, Division of Fish and Wildlife, in the U.S. Virgin Islands. The objective of the SEAMAP-C program is to collect data needed to assess the status of the marine resources of the U.S. Caribbean and to monitor any changes in that status.

The SEAMAP-C program collects fishery independent data, which are collected without direct reliance on the data reported by commercial and recreational fishermen. Information collected directly from fishermen (fishery-dependent data) can be greatly influenced by economic conditions, vessel and gear designs, catch discard patterns, and varying fishing practices. Important fish population parameters, such as reproductive biomass and age structures, cannot always be estimated without bias, especially in the multi-species, multi-fishing gear fishery in the Caribbean. A properly designed fishery independent survey program will collect data in a consistent and statistically valid format without the potential biases associated with the normal activities of fishermen.

This report provides a summary of activities for the USVI SEAMAP-C program for the period April 1, 2000 to August 31, 2002. The project used baited fish traps and baited hand lines to sample reef fishes and to obtain information on relative abundance and species composition. All data collected was sent to the Pascagoula Laboratory of the National Marine Fishery Service for archiving and analysis.

OBJECTIVE

In order to provide biological and ecological information on the shallow water reef resources, long time series data is needed to maintain and manage the reef resources. Under the SEAMAP-C program, the U.S. Virgin Islands Division of Fish and Wildlife collects data and information on shallow water reef resources needed to identify and implement fishery management measures to protect and restore the fishing stocks to sustain recreational and commercial reef fisheries.

METHODOLOGY

Sampling methodology for this study followed that presented in PR/DNER (1994).

Research activities

Sampling activities planned in St. Croix for the project period April 1, 2000 to March 31, 2001 were delayed due to extensive repairs and equipment installation required to the Division of Fish and Wildlife's 30-year old research vessel, R/V Sarima, in preparation for the project. In

September 2000, the R/V Sarima was delivered to Independent Boat Yard in St. Thomas for repairs. In anticipation of the delayed startup for the project, a no-cost extension request was made to the National Marine Fisheries Service. Independent Boat Yard repairs to R/V Sarima were completed in April 2001. The vessel was outfitted with hydraulics for trap hauling by staff from the Division of Fish and Wildlife's St. Thomas office in July 2001. In August 2001, the vessel was delivered to St. Croix. A davit to haul traps was designed and fabricated by Walsh Welding and installed by Division of Fish and Wildlife staff in January 2002.

Due to the high cost of repairs to the R/V Sarima, increase in logistics time required to conduct SEAMAP projects on St. Croix (20% travel time/day from office to marina and return) and greater number of fish samples to process (compared with St. Thomas/St. John SEAMAP-C trap surveys), overall SEAMAP-C funding available was sufficient for only 10 of the initially planned 20 trapping trips.

Site selection

An area to the northeast of St. Croix was designated as the sampling area for the SEAMAP-C component. A 20-square mile area was divided into five, 2 x 2 nautical mile (nm) quadrats, each with sixteen 0.5 x 0.5 mile "sub-quadrats" (Figure 1). The study area overlays the insular shelf platform extending from 1.5 nm west of Buck Island to 5.5 nm northeast of Buck Island onto Lang Bank. The depth ranges from 4.5-26.0 m to the shelf edge, where it slopes precipitously from 28 to 50 m to 406 m in depth.

Sampling Methodology

The first five quadrats and subquadrats were pre-selected for repeat sampling as they represented sites from a SEAMAP trap study conducted in 1993-1994 (see Dixon and Maidment, 1994). Subsequent quadrats and subquadrats were randomly selected using a random numbers table and physically located using a Magellan NAV 5000-D Global Positioning System (GPS). The Magellan GPS unit was replaced with a Garmin 76map GPS with Wide Area Augmentation System (WAAS) capability on sampling trip #5 and used thereafter. Some details of sampling were subject to minor modifications owing to logistics and prevailing conditions of weather. The sampling area was stratified based on the following depth criteria to distinguish shallow water platform areas from shelf edge areas: (1) 0-10 fathoms, (2) 11-20 fathoms, and (3) > 20 fathoms. Sampling frequency was based on the relative area of each depth strata as follows:

1. 9 samples for 0-10 fathom depth
2. 10 samples for 10-20 fathom depth
3. 1 sample for greater than 20 fathom depth

Within a given depth stratum, quadrat samples were assigned randomly.

Twelve standardized fish traps were deployed on each sample date. Traps were constructed using

a standard square shaped trap made of 1 ½ inch square mesh, with dimensions approximating 4' x 4' x 1.5'. The funnel opening was 19"x 6". Traps were baited with dwarf herring (*Jenkensia lamprotaenia*) or redear sardine (*Harengula humeralis*), placed in bait containers made from folded ½" x ½" mesh plastic netting. Each trap was tied with 3/8" polypropylene line to a separate surface buoy. The between trap distance was approximately 150 feet as standardized in the sampling protocol. Traps were deployed from the research vessel in a randomly chosen subquadrat. Time of deployment, depth and GPS location were recorded for each trap set. Soak time was standardized at approximately six hours. Three Division staff members participated on each SEAMAP trapping trip.

During the fish trap soak period, three DFW staff fished with handlines equipped with three hooks each (#06 Mustad O'Shaughnessy 33407SS) above a sinker weight. Additional weights were added to maintain the baited lines on the bottom if the current was strong and the vessel's drift was fast. The handlines were baited with cut squid and fished for 6 hours. Handline fishing was conducted while the vessel drifted through the sampling subquadrat. GPS coordinates were taken at the beginning and end of each drift for trips #1-4. For trips #5-10, a Garmin 76map GPS was used to plot each drift course. After each drift, the vessel motored to the up current boundary of the subquadrat for another drift. The location for each drift was changed to provide complete sampling coverage in the subquadrat.

For each trip the following data was recorded:

1. date, time (i.e. time out and time returned to dock),
2. quadrat code (latitude and longitude),
3. trap soak time for each trap and fishing time for lines to the nearest 15 minutes,
4. total number of traps hauled and lines fished per trip,
5. comments on the general weather conditions,
6. water depth (in feet) of trap sets and start and end points of drift fishing using a color depth recorder (Furuno Model #CV281),
7. Substrate type characterized by surface visual observations from the vessel and whenever possible, by depth recorder color image or by entanglement of fishing gear with the bottom substrate. Substrate characterization followed the NOAA habitat classification presented in Kendall et al (2001).

Fish caught by handline were separated for each angler, immediately placed in individual plastic bags and retained on ice. Fish caught in traps were identified and recorded by individual trap number, placed in separate plastic bags identified by trap number and retained on ice. Additional ice was added to the catch upon reaching shore to maintain the fish for biostatistical measurements and gonad analysis in the laboratory the following day.

Laboratory analysis of the catch included recording the number of fish caught by fisher or by trap, the individual fish weight in grams (25 gram increments) and fork length (FL) to the nearest millimeter, sex and gonadal condition. Identification of the gonadal condition of the fish caught followed that outlined in the sampling protocol manual (PR/DNER 1994). Unripe individuals were classified as and F1 and M1, gonads not developed. Sub-ripe individuals were classified as F2 and M2, gonads starting to enlarge and eggs may be distinguishable. Ripe individuals were classified as F3 and M3. F3 females have ovaries that are usually transparent and colorless with large well-developed eggs. M3 males have testes with loose or running milt. Individuals with spent gonads are classified as F4 and M4. Gonads at this stage are enlarged and flaccid.

Data Collection

Data collection during the sampling trips was recorded on the NMFS Pascagoula Station Sheet-Type II Caribbean (Appendix 1). Data were entered into the SEAMAP Data Management System provided by The National Marine Fisheries Service. Data files were converted to EXCEL format and used for the summary analysis here.

RESULTS

Ten sites northeast of St. Croix, USVI were sampled from 29 January to 9 July 2002, totaling 59 hours soak time for traps and 59 hours of line fishing (Appendix 2). One sampling trip was aborted due to mechanical problems on the vessel.

The number of fish caught by gear type for each sampling trip is shown in Table 1. A total of 804 fish were caught, 175 by trap and 629 by handline fishing. Five trips each were made in the <10 fathoms and 10-20 fathoms depth stratum. No sampling was conducted in the >20 fathoms depth strata.

Table 2 shows the number of fish, total weight and percent caught by the two gear types. Of the 804 fish caught in the study, 78% were caught by handline and 22% by trap. Handline catch represented 83% by weight (144 lbs) and trap catch represented 17% by weight (29 lbs). Fifteen species of fish from 10 families were caught by handline and 18 species of fish from 10 families were caught by trap.

Serranids were the most abundant fish caught by handline in the hardbottom habitats (Table 3). Coney (*Cephalopholis fulva*), red hind (*Epinephelus guttatus*) and grasby (*Cephalopholis cruentatus*) represented 72.0% by number and 56.0% by weight, 6.5% by number and 9.3% by weight, and 1.4% by number and 0.9% by weight, respectively, of the total handline catch. The family Malacanthidae, represented by the sand tilefish (*Malacanthus plumieri*), was the second most abundant fish caught (11.8% by number and 19.0% by weight), followed by the blue runner *Caranx crysos* (Carangidae), 6% by number and 9.4% by weight, in soft bottom habitats. Coney was also the most abundant species caught in traps (34.9% by number and 43.9% by weight),

followed by two species of Chaetodons, the foureye butterflyfish (*Chaetodon capistratus*) and the banded butterflyfish (*Chaetodon striatus*), 16.0% by number and 4.2% by weight and 9.1% by number and 3.6% by weight, respectively (Table 4).

Figure 2 shows a plot of quadrat number vs. catch. The number of fish caught per trip generally increased from a west to east direction as the presence of hard bottom communities increased.

DISCUSSION

The location of the sampling area for the SEAMAP-C trap study off the northeast coast of St. Croix lies exposed to the prevailing winds and seas from the easterly quadrant. Sampling trips were conducted on a sea conditions permitting basis. Extensive periods of strong tradewinds in excess of 20 mph with seas greater than 5-7 ft and small craft warnings issued by the National Weather Service were typical during the sampling period. These weather conditions caused delays in the frequency of sampling trips.

This project was designed to collect data for entry in a central database and not for immediate analysis. Therefore, a comprehensive discussion, of fishing trends, species diversity, and abundance was not made. As sites were picked randomly, sampling was conducted independently of habitat. Traps were sometimes placed on sandy bottoms and grass or algal beds, resulting in empty traps or low handline catches at some sampling sites. Sampling sites with hard bottom and reef yielded a higher harvest. In general, the catch increased as sampling moved from west to east (Quadrat 1 to Quadrat 5).

Greater sampling accuracy was obtained by using the Garmin 76map GPS with WAAS capability. Habitat identification at the sampling stations was subjective, based on surface observations. With additional computer software, GPS sampling locations can be interfaced with NOAA habitat maps to identify exact habitat type.

LITERATURE CITED

Dixon, H. and S. Maidment. 1994. Annual Summary Report, April 1993-March 1994, Caribbean /NMFS Cooperative SEAMAP Program NA27FS107-01. 6 pp.

Kendall, M.S., M.E. Monaco, K.R. Buja, J.D. Christensen, C.R. Kruer, M. Finkbeiner and R.A. Warner. 2001. Methods Used to Map the Benthic Habitats of Puerto Rico and the U.S. Virgin Islands. URL: http://biogeo.nos.nloaa.gov/projects/mapping/caribbean/startup.htm.

Puerto Rico Department of Natural and Environmental Resources (PR/DNER). 1994. Southeast Area Monitoring and Assessment Program (SEAMAP-C). 14 pp.

ACKNOWLEDGEMENTS

This work was supported by many people. In St. Thomas, repairs to the R/V Sarima were coordinated by Julian Aubain and Dr. Roger Uwate, DFW/STT. The pot hauler was installed by Julian Aubain. Field studies were conducted by DFW/STX staff including: William Tobias, Hector Rivera, Willy Ventura, Carmen Cortez, and Dr. Wes Toller. Data entry to the NMFS Pascagoula Station Sheet Type II Caribbean was completed by Ruth Gomez, DFW/STT. An earlier draft of this report was reviewed by Drs. Roger Uwate and Barbara Kojis.

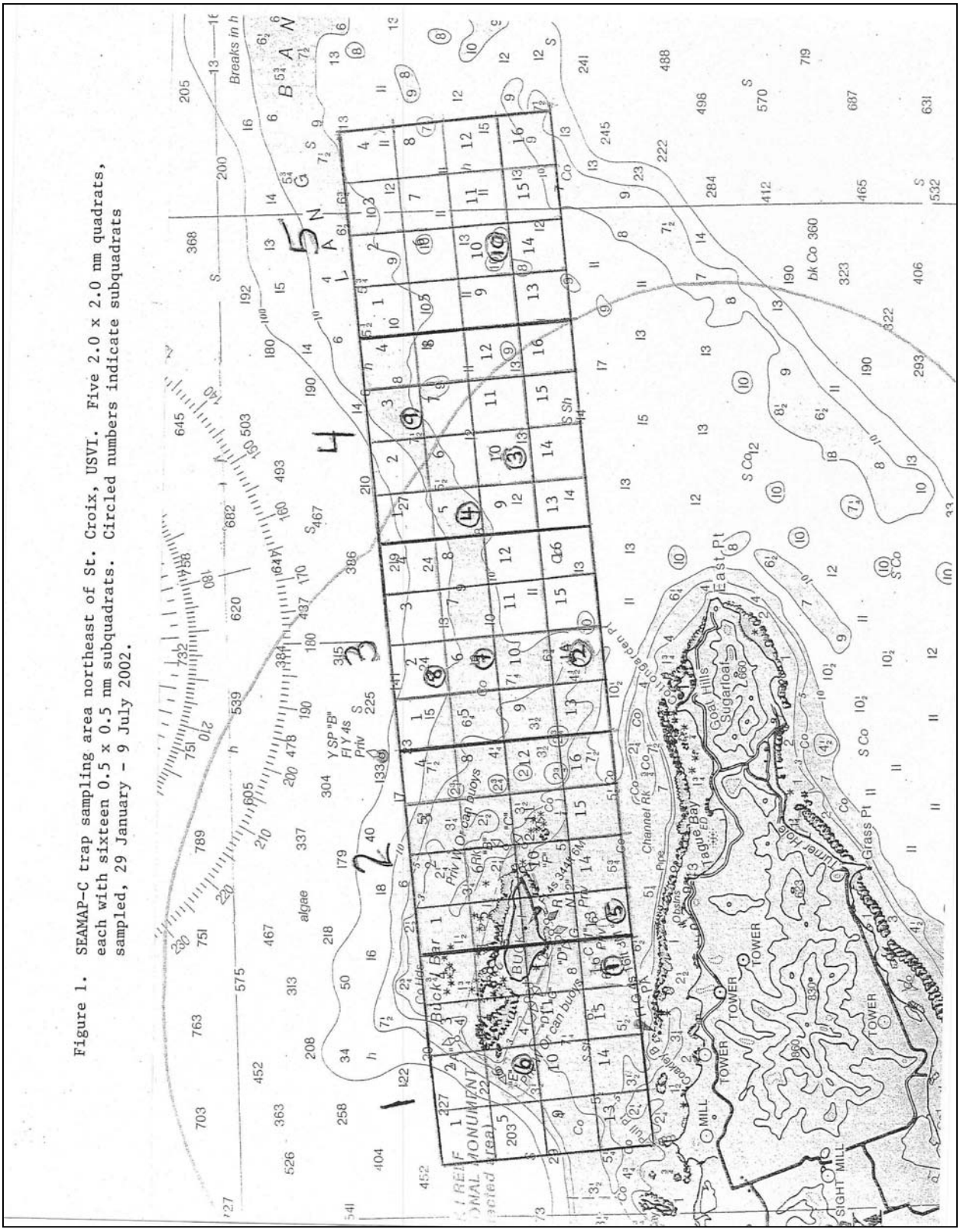


Figure 1. SEAMAP-C trap sampling area northeast of St. Croix, USVI. Five 2.0 x 2.0 nm quadrats, each with sixteen 0.5 x 0.5 nm subquadrats. Circled numbers indicate subquadrats sampled, 29 January - 9 July 2002.

Figure 2. Quadrat vs. Catch

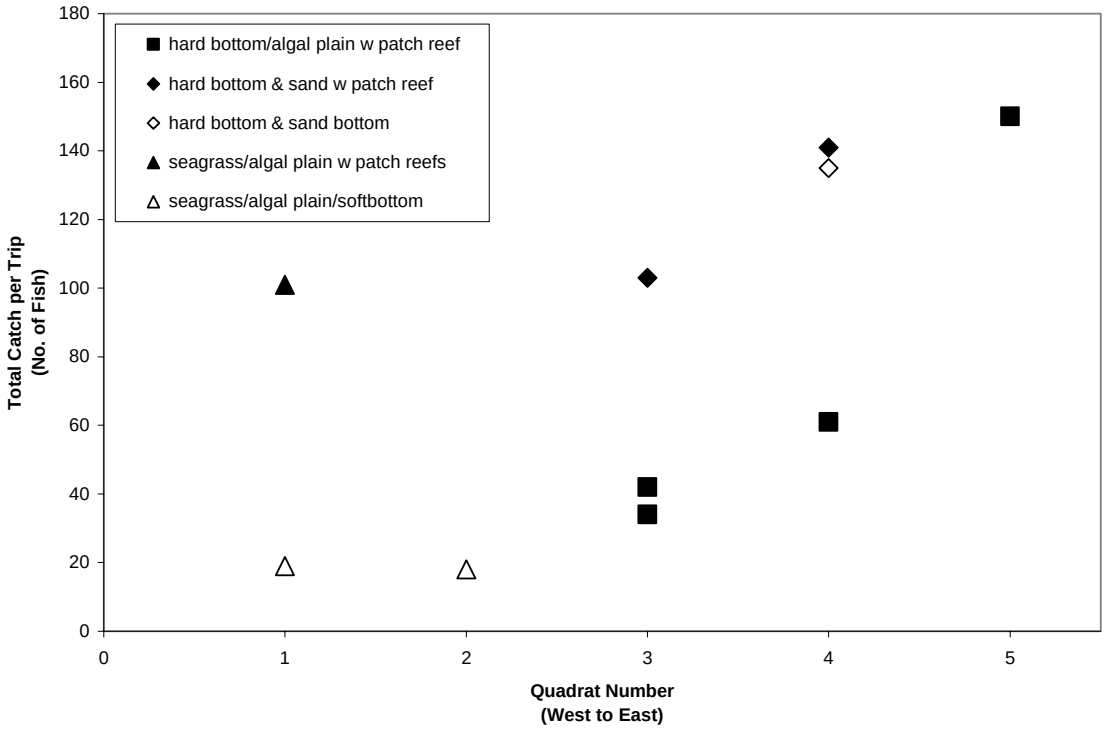


Table 1. Number of Fish Caught by Gear Type for Each Sampling Trip

Trip #	Date	Trap No. of Fish	Handline No. of Fish	Subtotal	Quadrat/ Subquadrat	Depth (fathoms)	Habitat Category
1	1/29/2002	0	19	19	1 / 16	< 10	seagrass/algal plain/softbottom
2	2/6/2002	0	103	103	3 / 14	< 10	hard bottom/patch reef & sand
3	2/25/2002	17	118	135	4 / 10	10 - 20	hard bottom & sand bottom
4	2/28/2002	24	117	141	4 / 5	10 - 20	hard bottom/patch reef & sand
5	3/19/2002	0	18	18	2 / 13	< 10	seagrass/algal plain/softbottom
6	3/21/2002	28	73	101	1 / 6	< 10	seagrass/algal plain w patch reefs
7	6/4/2002	12	30	42	3 / 6	10 - 20	hard bottom/algal plain w patch reef
8	6/13/2002	15	19	34	3 / 2	10 - 20	hard bottom/algal plain w patch reef
9	6/26/2002	31	30	61	4 / 3	< 10	hard bottom/algal plain w patch reef
10	7/9/2002	48	102	150	5 / 10	10 -20	hard bottom/algal plain w patch reef
	Total =	175	629	804			

Trends noted in the data:
1. handline catch and trap catch were positively correlated (but with low r-squared value)
2. fewer fish were caught from seagrass/algal plain/softbottom habitats than hard-bottom habitats
3. catch generally increased as sampling moved from West to East (quadrat 1 to quadrat 5)

Table 2. Number and Weight of Fish by Gear Type

	Gear Type				
	Handline	**%**	**Trap**	**%**	**Total**
Total No. of Fish	629	78.23	175	21.77	804
Total Weight of Fish	143.75	83.02	29.41	16.98	173.15
No. of Species	15	-	18	-	27
No. of Families	10	-	10	-	16

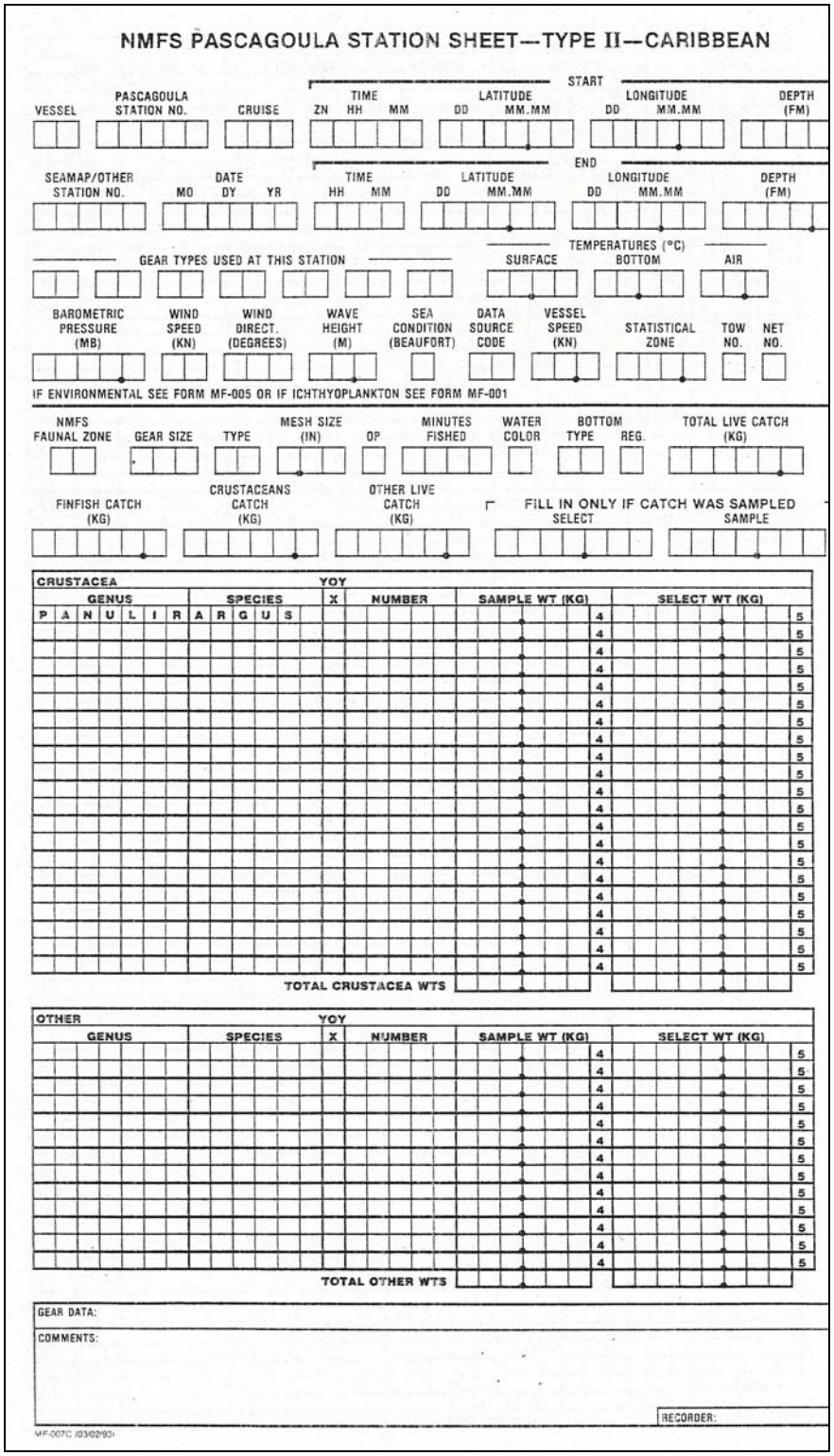
Table 3. Species Composition of Catch - Handline

Common Name	Species	Family	No.	%	Weight	%
coney	*Cephalopholis fulva*	Serranidae	453	72.0	80.499	56.0
sand tilefish	*Malacanthus plumieri*	Malacanthidae	74	11.8	27.35	19.0
red hind	*Epinephelus guttatus*	Serranidae	41	6.5	13.425	9.3
blue runner	*Caranx crysos*	Carangidae	38	6.0	13.55	9.4
graysby	*Cephalopholis cruentatus*	Serranidae	9	1.4	1.275	0.9
longspine squirrelfish	*Holocentrus rufus*	Holocentridae	4	0.64	0.575	0.4
spotted moray	*Gymnothorax moringa*	Muraenidae	2	0.32	0.750	0.5
black-ear wrasse	*Halichoeres poeyi*	Labridae	1	0.16	0.75	0.5
straight-tail razorfish	*Hemipteronotus martinicensis*	Labridae	1	0.16	0.025	0.0
blackfin snapper	*Lutjanus buccanella*	Lutjanidae	1	0.16	0.225	0.2
spotted trunkfish	*Lactophrys bicaudalis*	Ostraciidae	1	0.16	0.550	0.4
scrawled cowfish	*Lactophrys quadricornis*	Ostraciidae	1	0.16	0.975	0.7
buffalo trunkfish	*Lactophrys trigonus*	Ostraciidae	1	0.16	0.950	0.7
princess parrotfish	*Scarus taeniopterus*	Scaridae	1	0.16	0.125	0.1
great barracuda	*Sphyraena barracuda*	Sphyraenidae	1	0.16	2.725	1.9
		Total =	**629**	**100.0**	**143.749**	**100.0**

Table 4. Species Composition of Catch - Trap

Common Name	Species	Family	Number	%	Weight	%
coney	*Cephalopholis fulva*	Serranidae	61	34.9	12.895	43.9
foureye butterflyfish	*Chaetodon capistratus*	Chaetodontidae	28	16.0	1.225	4.2
banded butterflyfish	*Chaetodon striatus*	Chaetodontidae	16	9.1	1.05	3.6
longspine squirrelfish	*Holocentrus rufus*	Holocentridae	12	6.9	1.425	4.8
ocean surgeonfish	*Acanthurus bahianus*	Acanthuridae	11	6.3	1.325	4.5
reef butterflyfish	*Chaetodon sedentarius*	Chaetodontidae	9	5.1	0.485	1.6
blue tang	*Acanthurus coeruleus*	Acanthuridae	8	4.6	1.25	4.3
french grunt	*Haemulon flavolineatum*	Haemulidae	7	4.0	0.975	3.3
queen triggerfish	*Balistes vetula*	Balistidae	6	3.4	3.500	11.9
red hind	*Epinephelus guttatus*	Serranidae	5	2.9	2.825	9.6
blackfin snapper	*Lutjanus buccanella*	Lutjanidae	3	1.7	0.375	1.3
princess parrotfish	*Scarus taeniopterus*	Scaridae	3	1.7	0.475	1.6
graysby	*Cephalopholis cruentatus*	Serranidae	1	0.57	0.2	0.7
white grunt	*Haemulon plumieri*	Haemulidae	1	0.57	0.100	0.3
yellow chub	*Kyphosus incisor*	Kyphosidae	1	0.57	0.65	2.2
yellowtail snapper	*Ocyurus Chrysurus*	Lutjanidae	1	0.57	0.3	1.02
spotted goatfish	*Psuedupeneus maculatus*	Mullidae	1	0.57	0.225	0.77
redband parrotfish	*Sparisoma aurofrenatum*	Scaridae	1	0.57	0.125	0.43
		Total =	**175**	**100.0**	**29.405**	**100.0**

APPENDIX 1
NMFS PASCAGOULA STATION SHEET – TYPE II – CARIBBEAN



NMFS PASCAGOULA STATION SHEET—TYPE II—CARIBBEAN

START: VESSEL | PASCAGOULA STATION NO. | CRUISE | TIME (ZN HH MM) | LATITUDE (DD MM.MM) | LONGITUDE (DD MM.MM) | DEPTH (FM)

END: SEAMAP/OTHER STATION NO. | DATE (MO DY YR) | TIME (HH MM) | LATITUDE (DD MM.MM) | LONGITUDE (DD MM.MM) | DEPTH (FM)

GEAR TYPES USED AT THIS STATION

TEMPERATURES (°C): SURFACE | BOTTOM | AIR

BAROMETRIC PRESSURE (MB) | WIND SPEED (KN) | WIND DIRECT. (DEGREES) | WAVE HEIGHT (M) | SEA CONDITION (BEAUFORT) | DATA SOURCE CODE | VESSEL SPEED (KN) | STATISTICAL ZONE | TOW NO. | NET NO.

IF ENVIRONMENTAL SEE FORM MF-005 OR IF ICHTHYOPLANKTON SEE FORM MF-001

NMFS FAUNAL ZONE | GEAR SIZE | TYPE | MESH SIZE (IN) | OP | MINUTES FISHED | WATER COLOR | BOTTOM TYPE | REG. | TOTAL LIVE CATCH (KG)

FINFISH CATCH (KG) | CRUSTACEANS CATCH (KG) | OTHER LIVE CATCH (KG) | FILL IN ONLY IF CATCH WAS SAMPLED: SELECT | SAMPLE

CRUSTACEA GENUS	SPECIES	YOY X	NUMBER	SAMPLE WT (KG) 4	SELECT WT (KG) 5
PANULIRA	ARGUS				

TOTAL CRUSTACEA WTS

OTHER GENUS	SPECIES	YOY X	NUMBER	SAMPLE WT (KG) 4	SELECT WT (KG) 5

TOTAL OTHER WTS

GEAR DATA:

COMMENTS:

RECORDER:

MF-007C (03/02/93)

APPENDIX 1 (continued)
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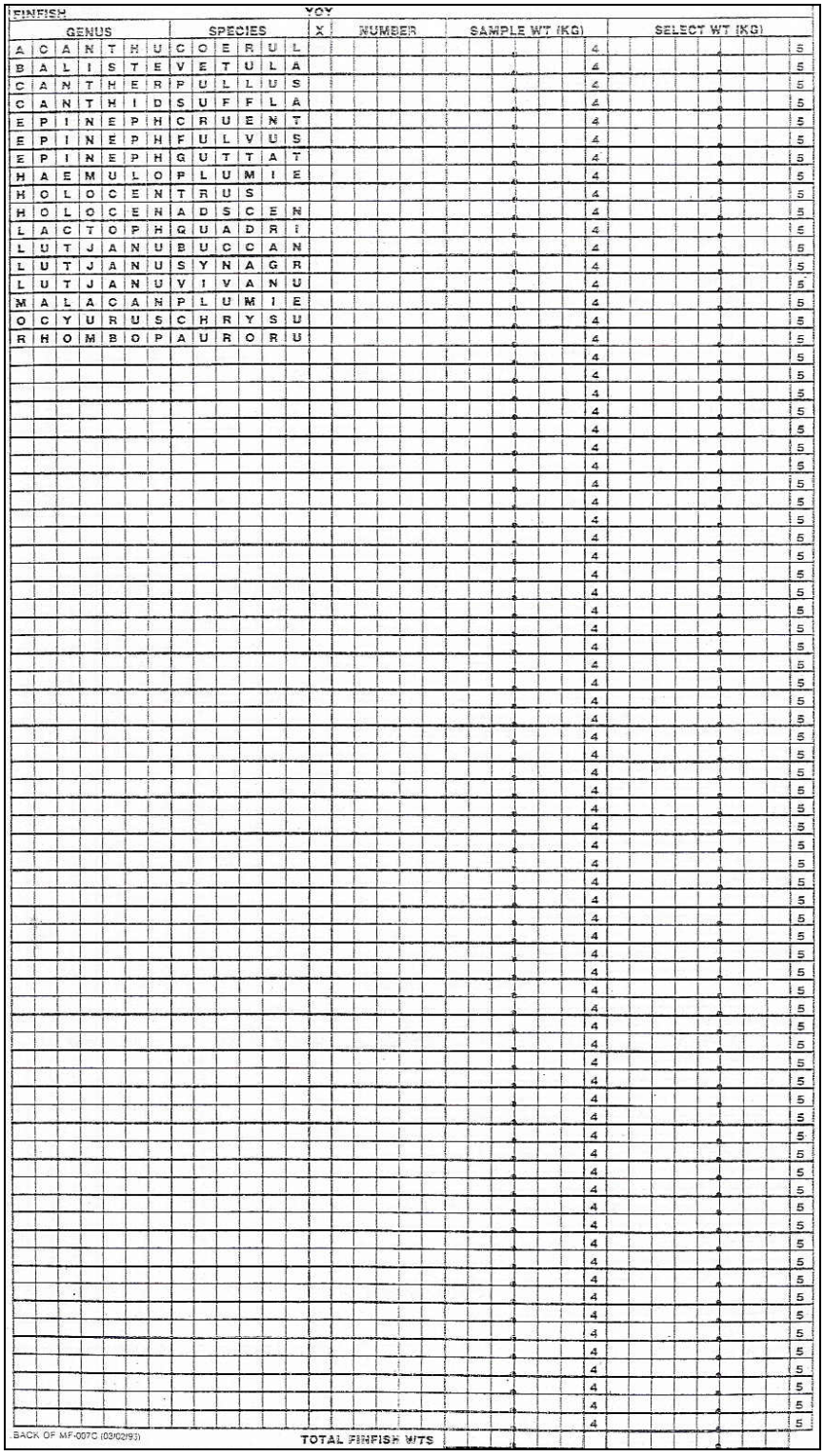


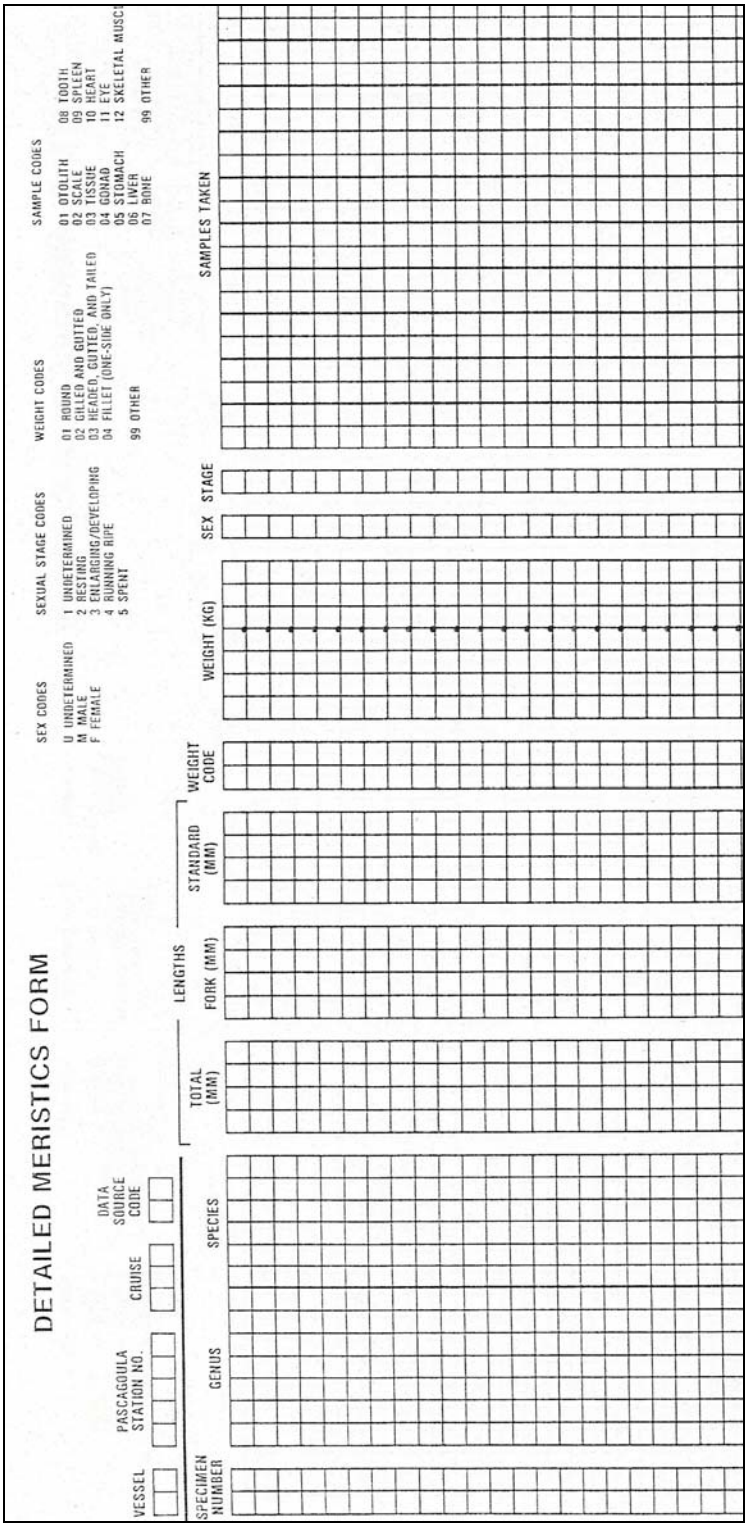
FINFISH

GENUS	SPECIES	X	NUMBER	SAMPLE WT (KG)	SELECT WT (KG)
ACANTHUROCOERULEUS					
BALISTESVETULA					
CANTHERPULLUS					
CANTHIDUSUFFLAVA					
EPINEPHCRUENTUS					
EPINEPHFULVUSS					
EPINEPHGUTTATUS					
HAEMULOPLUMIERI					
HOLOCENTRUS					
HOLOCENADSCENSI					
LACTOPHGUADRIF					
LUTJANUBUCCANAN					
LUTJANUSYNAGRIS					
LUTJANUVIVANUS					
MALACANTHUPLUMIER					
OCYURUSCHRYSURU					
RHOMBOPAUROLIN					

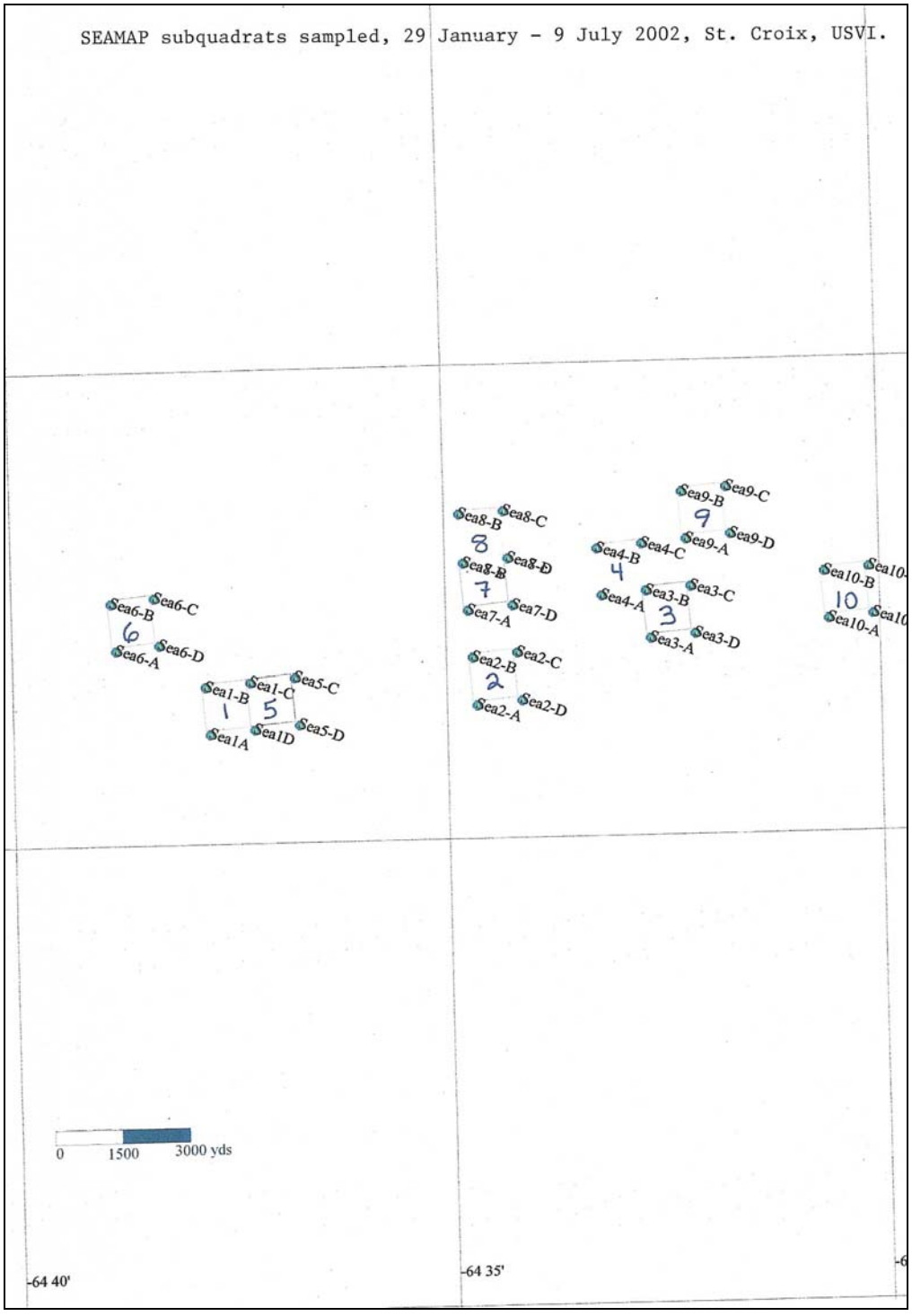
BACK OF MF-007C (03/02/93)

TOTAL FINFISH WTS

APPENDIX 1 (continued)
NMFS PASCAGOULA STATION SHEET – TYPE II – CARIBBEAN



APPENDIX 2
SEAMAP-C St. CroixTrap and Handline - Subquadrats Sampled



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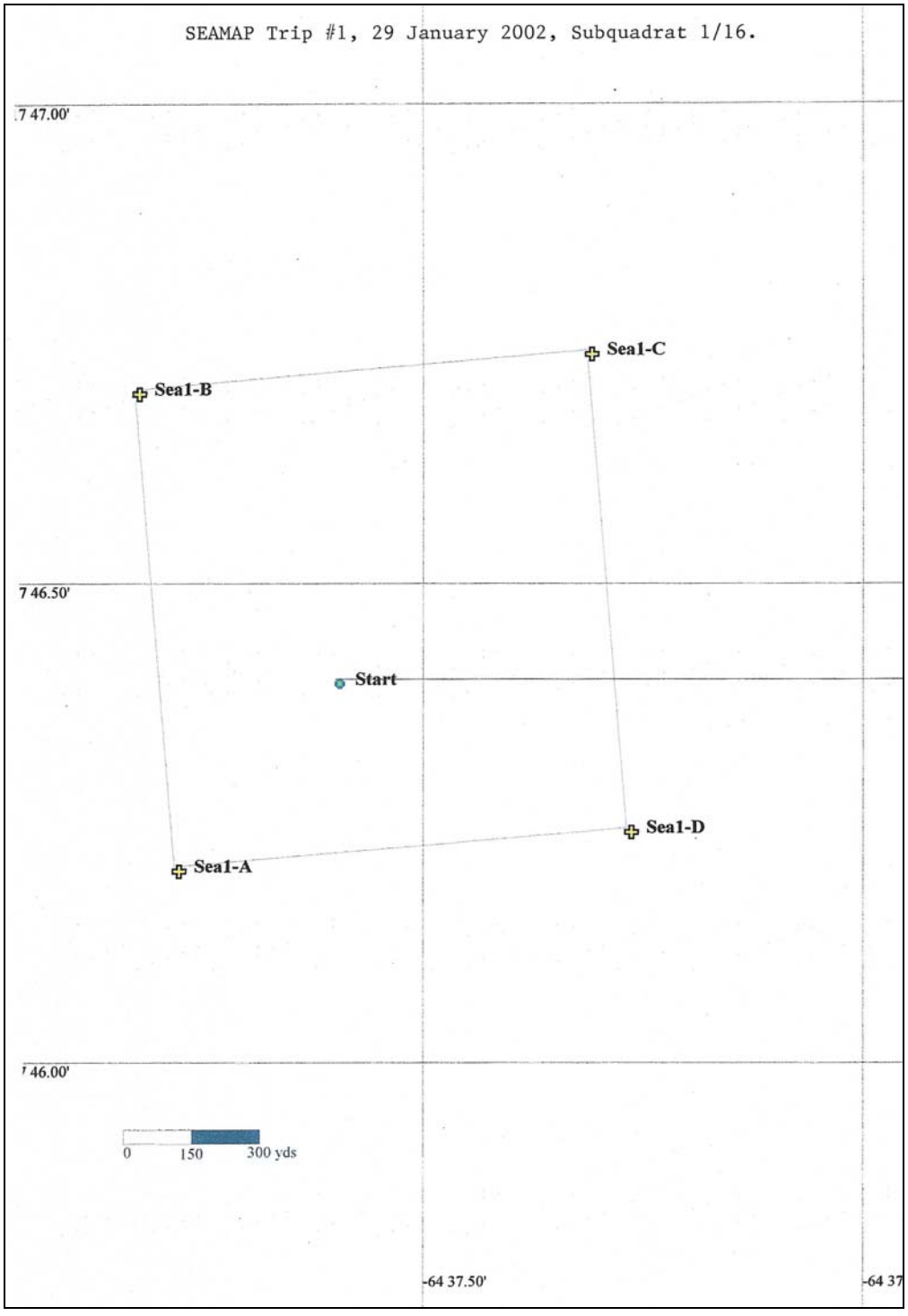

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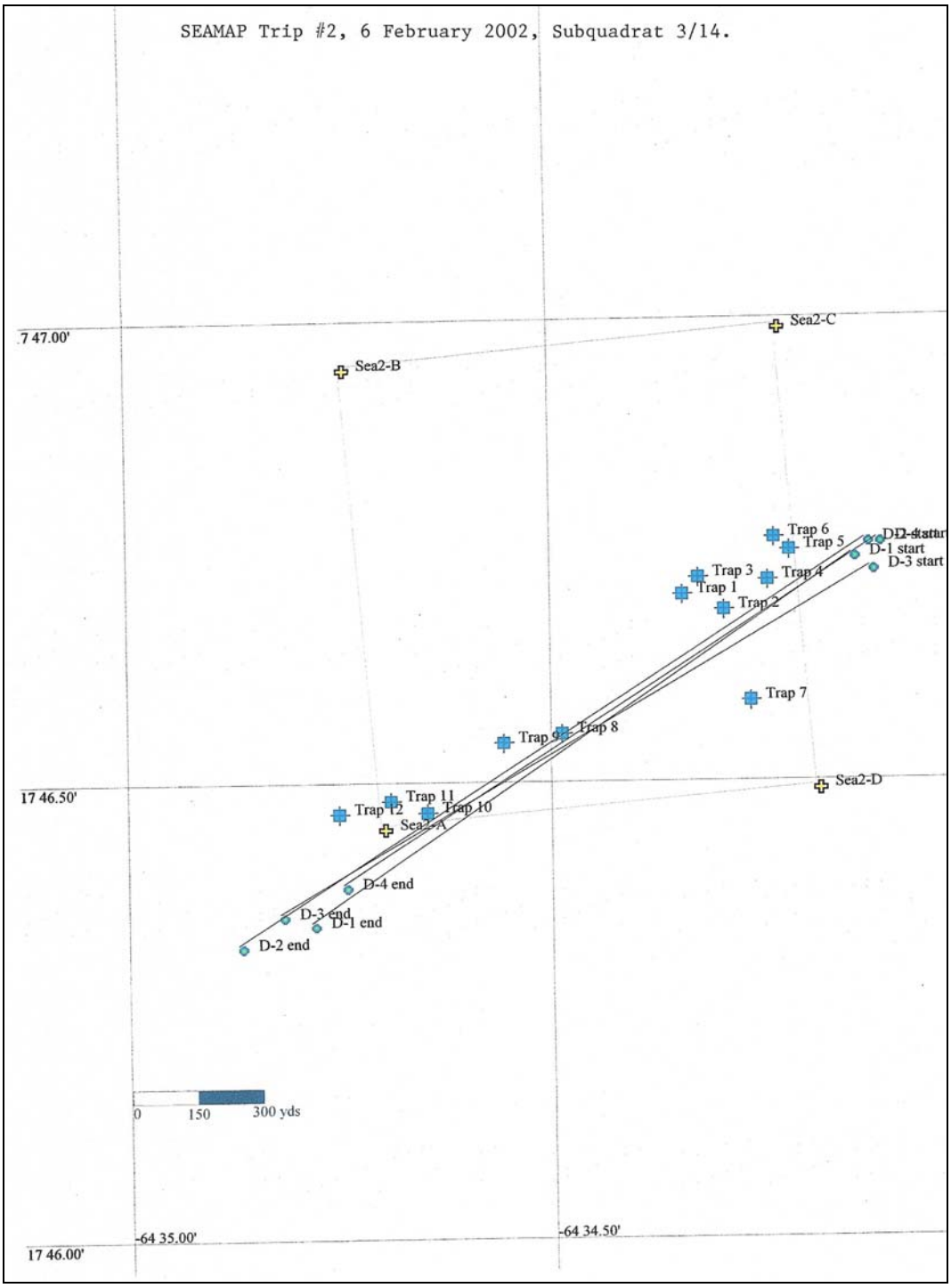

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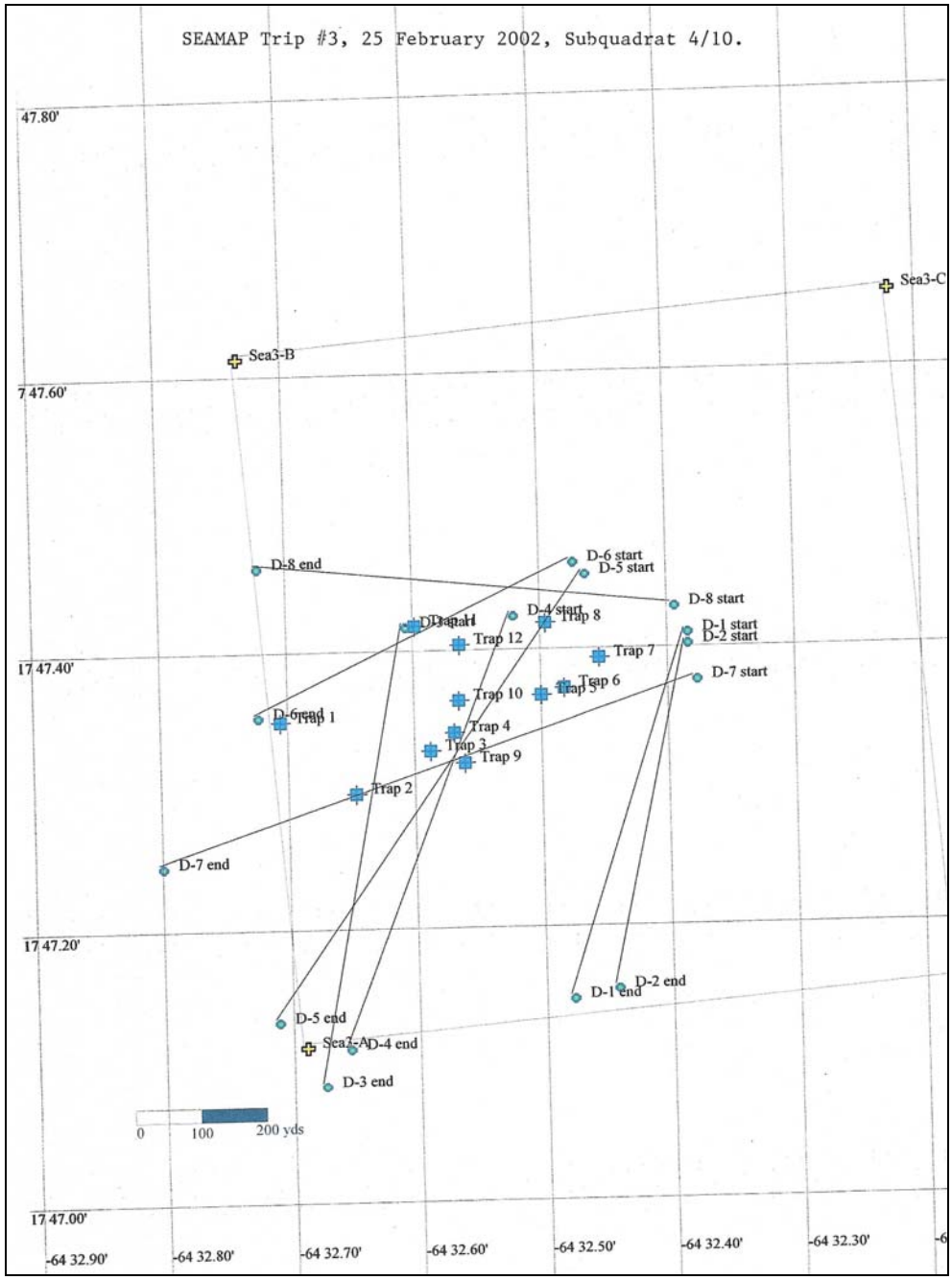

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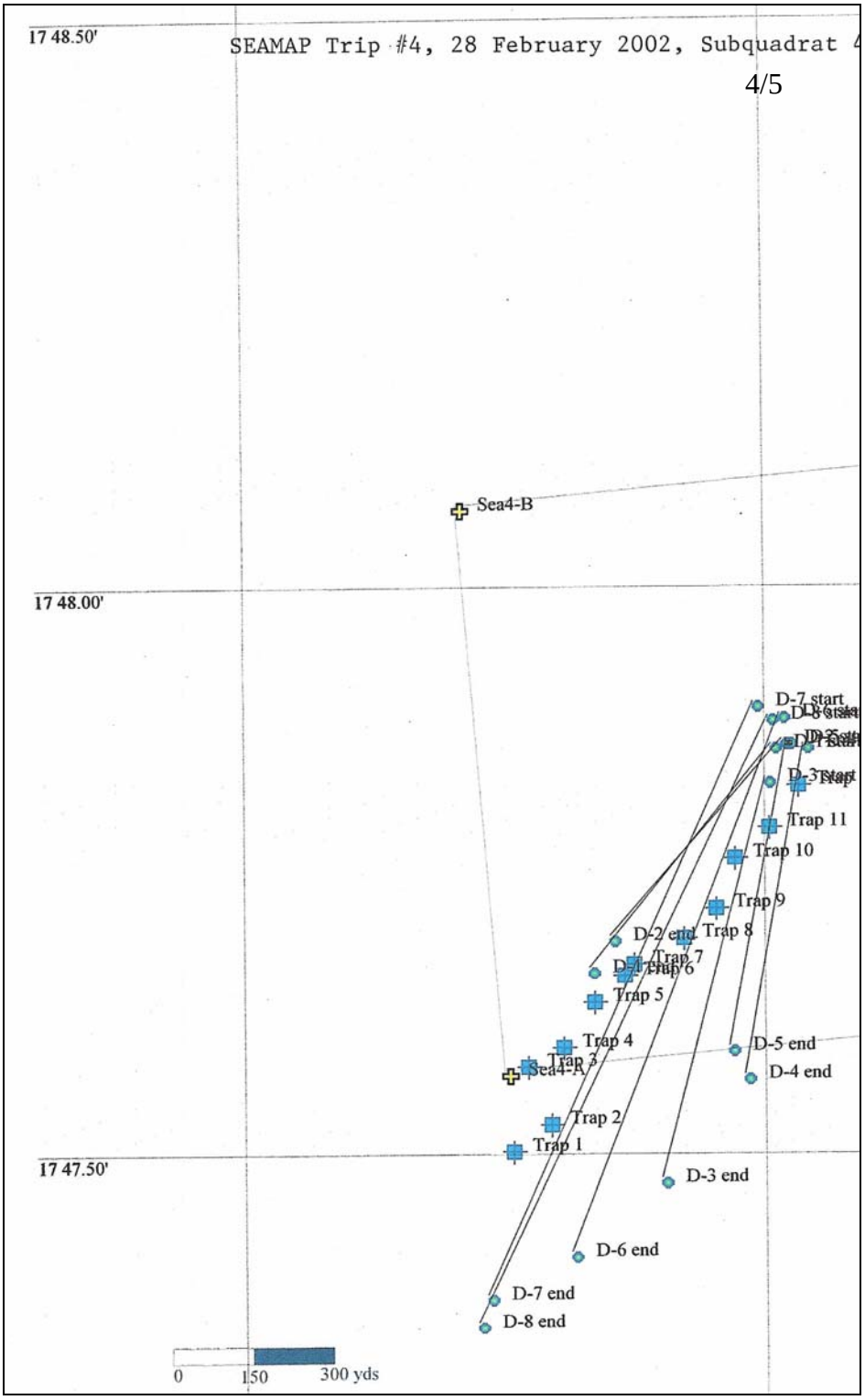
SEAMAP-C St. CroixTrap and Handline - Subquadrats Sampled



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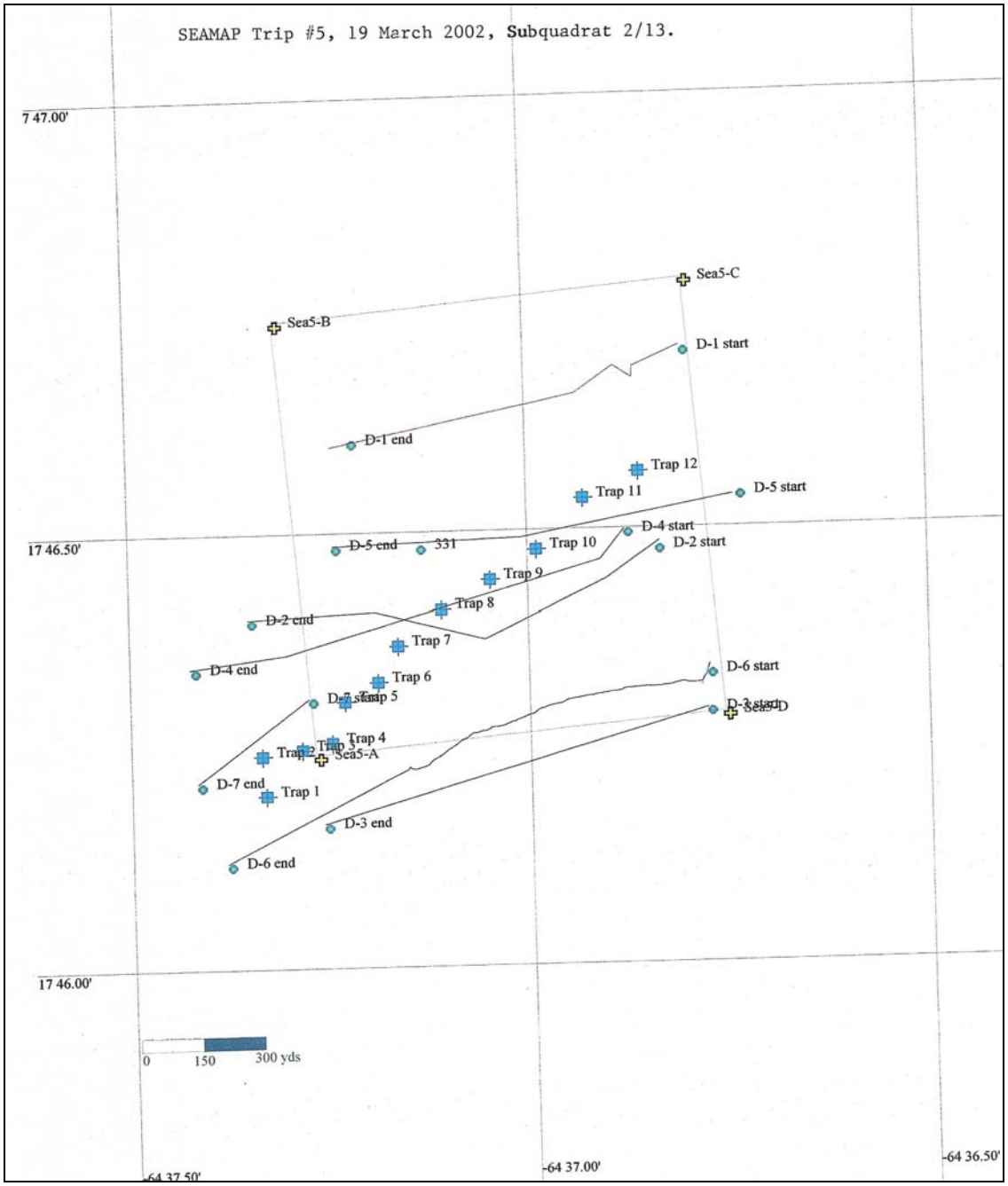

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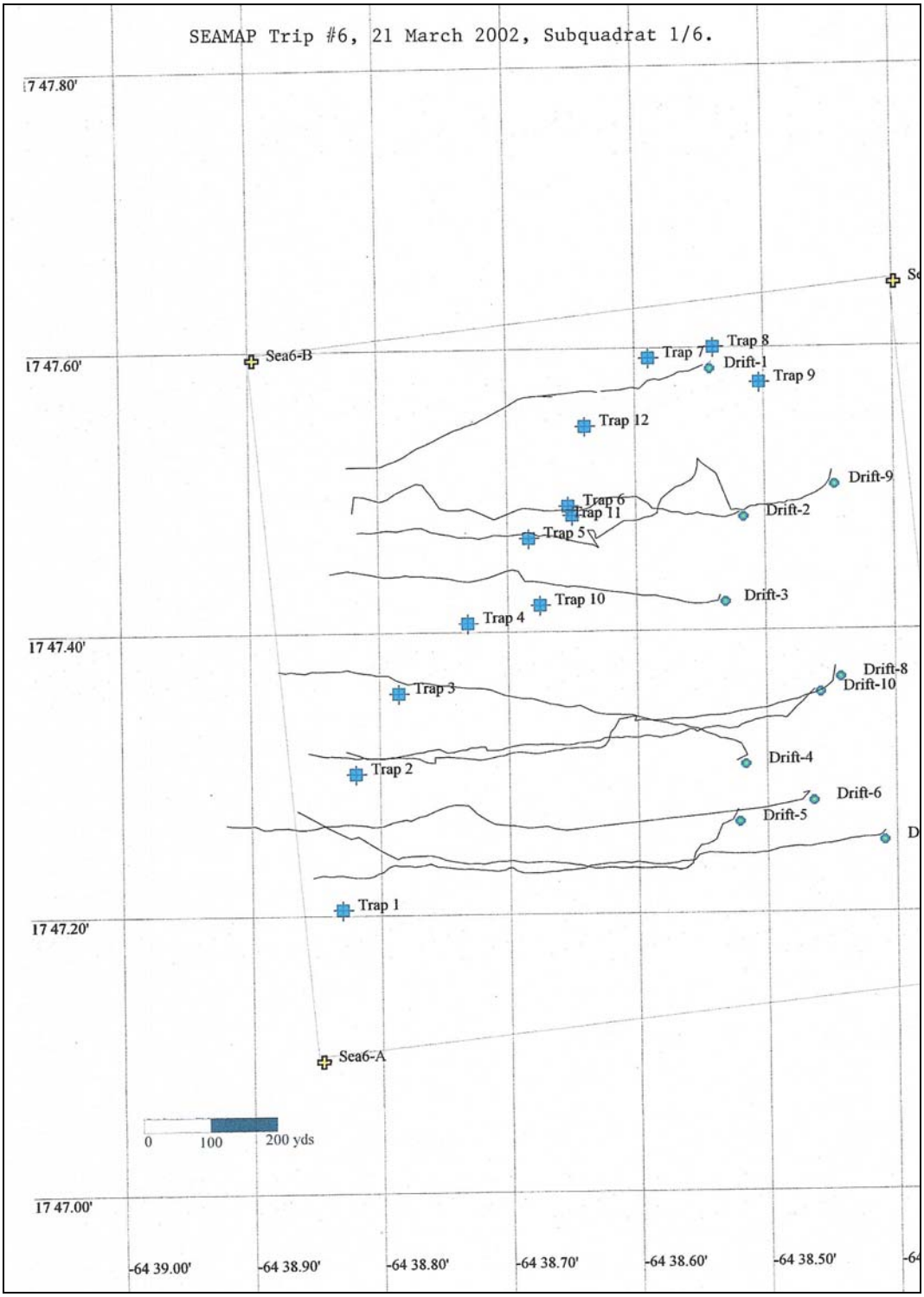

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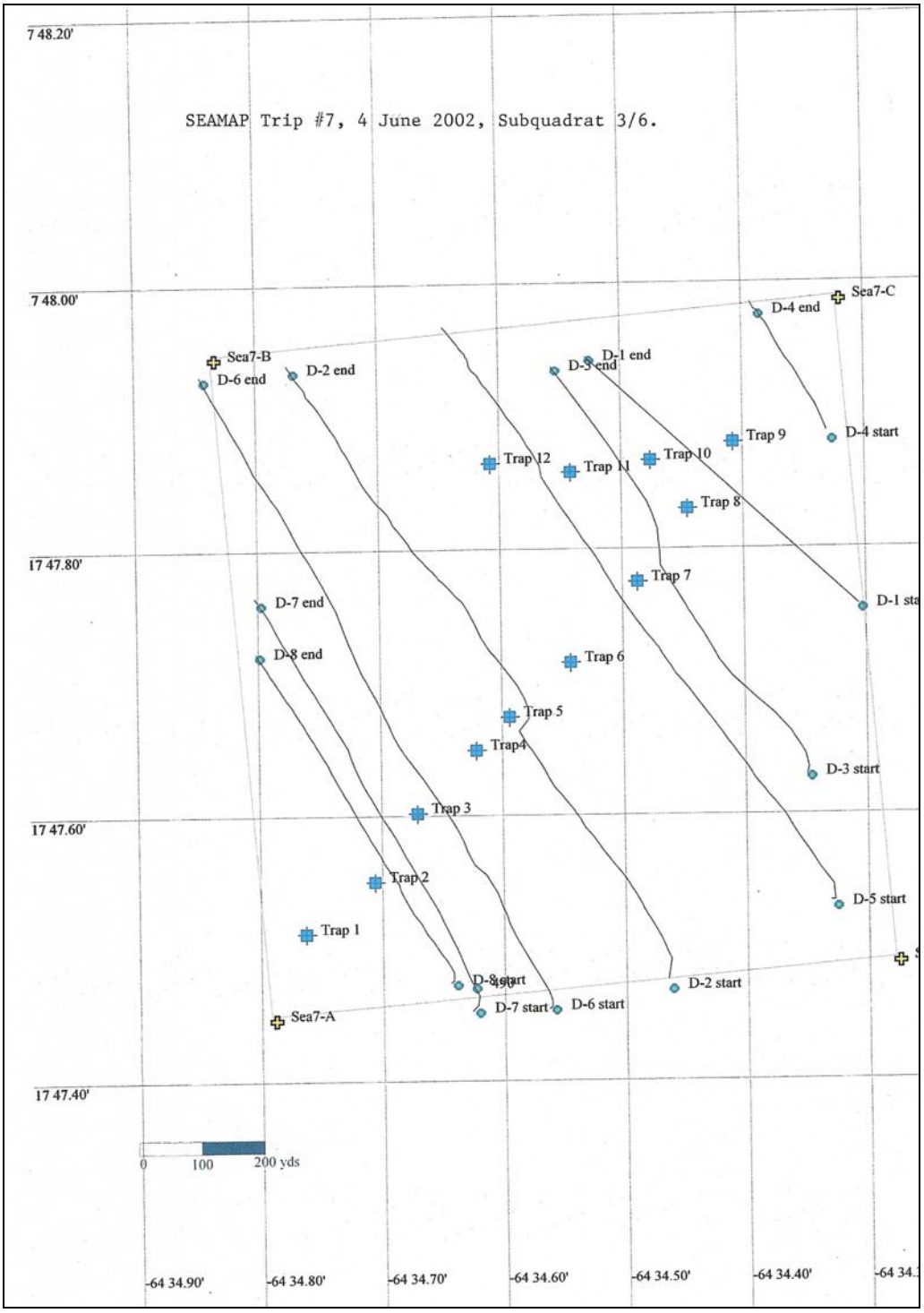
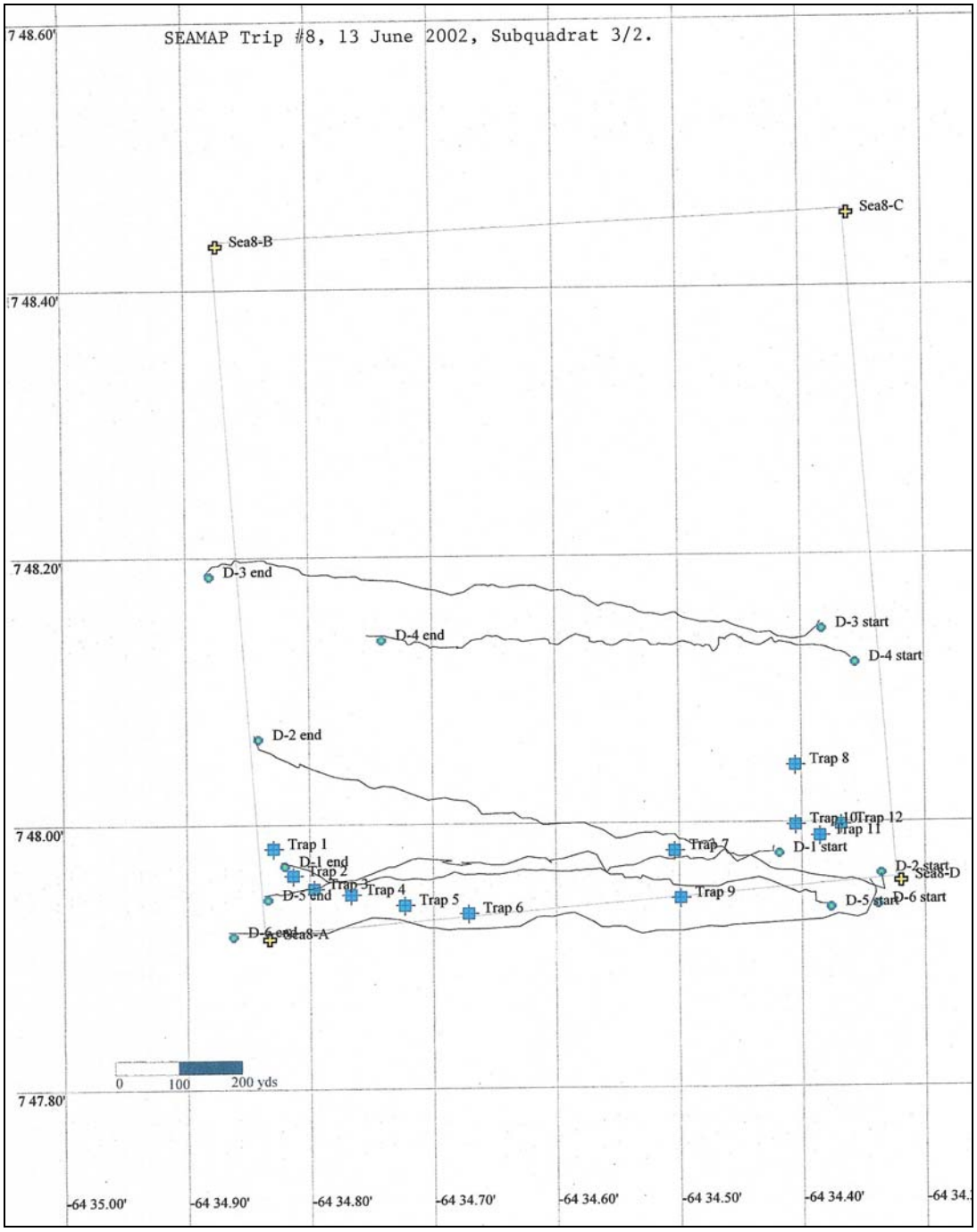
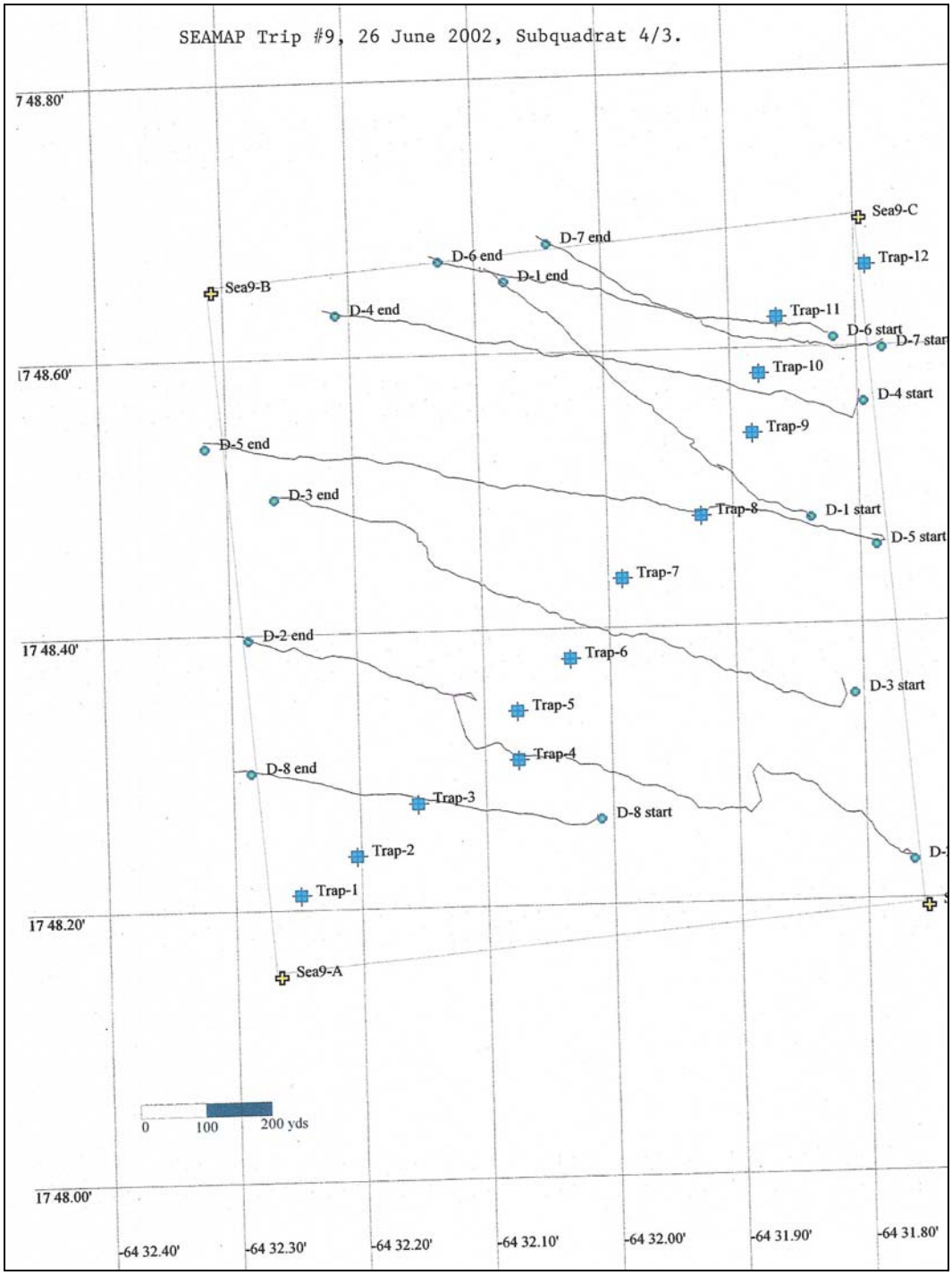


APPENDIX 2 (continued)
SEAMAP-C St. CroixTrap and Handline - Subquadrats Sampled



APPENDIX 2 (continued)
SEAMAP-C St. CroixTrap and Handline - Subquadrats Sampled



APPENDIX 2 (continued)
SEAMAP-C St. CroixTrap and Handline - Subquadrats Sampled