FRI-UW-7412
August 1974

Fisheries Research Institute
College of Fisheries
University of Washington
Seattle, Washington 98195

ACOUSTIC ASSESSMENT OF HERRING STOCKS IN SOUTHEASTERN ALASKA IN 1974

by

Richard E. Thorne

FINAL CONTRACT REPORT
State of Alaska Department of Fish and Game
Project Period: November 1, 1973-June 30, 1974

Approved

Submitted _____

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Director

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INTRODUCTION

During the last four years, the University of Washington has provided technical support and data analysis services to Alaska Department of Fish and Game (ADF&G) for surveys of herring stocks in Alaska by means of contracts between ADF&G and the University's Fisheries Research Institute. Results of data analysis of surveys conducted during the fourth year are detailed in this contract report.

METHODS

Surveys were conducted aboard the M.V. Kittiwake in various locations throughout Southeastern Alaska from February 11 to April 28, 1974. Equipment and survey techniques were the same as those used in previous years and are described in earlier contract reports. During the first two years of the hydroacoustic survey program in Southeastern Alaska, echo amplitudes from herring schools were estimated visually by use of an oscilloscope (CRT). During the past two years, a more precise digital echo integration system (DDAPS), developed under the University's Sea Grant Marine Acoustics Program, has been utilized for analysis of the acoustic data from Southeastern Alaska. All of the data collected by ADF&G during the past year were analyzed by DDAPS, but in addition many comparisons were made between the two techniques and between various CRT operators.

RESULTS AND DISCUSSION

Results of analysis of all surveys by DDAPS and various CRT processors are detailed in Table 1. There was considerable variation between CRT operators on individual runs, but the average values are in good agreement. However, as noted in previous comparisons (1973 contract report), the CRT method generally overestimates echo amplitude, and the resulting biomass estimates are typically twice the values obtained with DDAPS. A summary of the biomass estimates obtained with DDAPS is given in Table 2.

The calibration relationship used to estimate herring biomass from echo amplitudes is based on a limited number of target strength measurements conducted in Carroll Inlet during 1972. This relationship has been considered a convenient measure of relative abundance rather than an accurate measure of absolute abundance, and the need for further refinement is clearly recognized. A calibration relationship was developed independently for herring surveys in Puget Sound and is based on comparison with midwater trawl catches (Thorne, 1973). The two techniques were compared during the past year by calibration of the two

acoustic systems at the University's Applied Physics Laboratory. The tests showed that the relationship used with the acoustic system in Alaska underestimated herring biomass by a factor of two when compared with the calibration relationship used in Puget Sound. The Puget Sound relationship is presumed more accurate as it is based on considerably more information. Biomass estimates of herring in Alaska obtained by processing with DDAPS must be doubled to be comparable with the Puget Sound data. However, the estimates from Alaska obtained by processing with the CRT are already comparable to the Puget Sound data, as the CRT method typically results in a 100% overestimation of echo intensity.

It is apparent that further research is required before acoustic surveys can be confidently assumed to provide absolute biomass estimates of herring. In the interim, the characteristics of the various methods must be considered when intercomparisons are made between different times and locations.

In addition to the analysis of survey data, a second data acquisition system was assembled for ADF&G under this contract. The system, which is basically a duplicate of the first system, was completed and installed aboard the ADF&G research vessel Montague.

LITERATURE CITED

Thorne, R. E. 1973. Acoustic assessment of Pacific hake and herring stocks in Puget Sound, Washington, and Southeastern Alaska. Paper No. 15, ICES/FAO/ICNAF Symposium on Acoustic Methods in Fisheries Research, Bergen, Norway. 30 pp.

Table 1. Results of acoustic surveys in Southeastern Alaska from February to April 28 1974, DDAPS and Various CRT Operators (p 1)

Location	Date	Run	Transect	Volume ($10^4 m^3$)	Density (lbs/m^3)	Biomass ($10^6/lb$)	Processor
Carroll Inlet	2/11/74	1	1	0.11	0.90	0.10	CRT-RT
			2	0.11	0.90	0.10	CRT-RT
		1	1	0.12	0.85	0.10	CRT-JD
			2	0.12	1.50	0.17	CRT-JD
		1	1	--	--	0.06	DDAPS
			2	--	--	0.11	DDAPS
		2	1	0.21	2.0	0.42	CRT-RT
			2	0.21	2.0	0.42	CRT-RT
		2	1	0.27	1.2	0.38	CRT-JD
			2	0.22	1.0	0.22	CRT-JD
		2	1	--	--	0.16	DDAPS
			2	--	--	0.16	DDAPS
George Inlet	2/12/74	1	1	0.26	0.85	0.22	CRT-JD
			2	0.23	0.85	0.20	CRT-JD
			3	0.19	0.85	0.16	CRT-JD
			4	0.13	0.54	0.07	CRT-JD
			5	0.24	0.75	0.18	CRT-JD
			6	0.21	1.00	0.21	CRT-JD
			7	0.24	1.10	0.26	CRT-JD
			Total	--	--	1.36	CRT-JD
		1	1	0.34	0.87	0.29	CRT-SM
			2	0.31	0.45	0.14	CRT-SM
			3	0.20	0.70	0.14	CRT-SM

Table 1. Results of acoustic surveys in Southeastern Alaska from February to April 28, 1974, DDAPS and Various CRT Operators (p 2 cont'd)

Location	Date	Run	Transect	Volume ($10^4 m^3$)	Density (lbs/m^3)	Biomass ($10^6/lb$)	Processor
George Inlet	2/12/74	1	4	0.16	0.45	0.10	CRT-SM
			5	0.25	0.45	0.11	CRT-SM
			6	0.37	0.70	0.26	CRT-SM
			7	0.28	0.70	0.20	CRT-SM
			Total	--	--	1.02	CRT-SM
		1	1	--	--	0.13	DDAPS
			2	--	--	0.14	DDAPS
			3	--	--	0.13	DDAPS
			4	--	--	0.05	DDAPS
			5	--	--	0.09	DDAPS
			6	--	--	0.15	DDAPS
			7	--	--	0.15	DDAPS
			Total	--	--	0.84	DDAPS
		2	1	0.23	0.76	0.18	CRT-JD
			2	0.48	0.93	0.45	CRT-JD
			3	0.96	0.88	0.85	CRT-JD
			4	0.87	0.76	0.68	CRT-JD
			5	0.12	1.33	0.16	CRT-JD
			Total	--	--	2.30	CRT-JD
		2	1	0.21	0.55	0.12	CRT-SM
			2	0.50	0.89	0.45	CRT-SM
			3	0.82	1.47	1.21	CRT-SM
			4	0.84	0.89	0.75	CRT-SM
			5	0.12	1.02	0.12	CRT-SM
			Total	--	--	2.64	CRT-SM
		2	1	--	--	0.08	DDAPS
			2	--	--	0.22	DDAPS
			3	--	--	0.40	DDAPS
			4	--	--	0.46	DDAPS
			5	--	--	0.10	DDAPS
		Total				1.26	DDAPS

Table 1. Results of acoustic surveys in Southeastern Alaska from February to April 28, 1974, DDAPS and various CRT Operators (p 3 cont'd)

Location	Date	Run	Transect	Volume ($10^4 m^3$)	Density (lbs/m^3)	Biomass (10^6 lb)	Processor
George Inlet	2/12/74	3	1	0.42	0.55	0.23	CRT-JD
			2	0.26	0.53	0.14	CRT-JD
			3	1.00	0.63	0.63	CRT-JD
			4	0.97	0.80	0.78	CRT-JD
			5	1.00	0.60	0.60	CRT-JD
			6	1.00	1.10	1.10	CRT-JD
			Total	--	--	3.48	CRT-JD
		3	1	0.45	0.71	0.32	CRT-SM
			2	0.34	0.46	0.16	CRT-SM
			3	0.75	1.39	1.05	CRT-SM
			4	0.87	0.89	0.78	CRT-SM
			5	0.81	1.82	1.48	CRT-SM
			6	0.74	2.01	1.49	CRT-SM
			Total	--	--	5.28	CRT-SM
		3	1	--	--	0.13	DDAPS
			2	--	--	0.14	DDAPS
			3	--	--	0.34	DDAPS
			4	--	--	0.46	DDAPS
			5	--	--	0.29	DDAPS
			6	--	--	0.60	DDAPS
			Total	--	--	1.96	DDAPS
		4	1	0.37	1.66	0.66	CRT-SM
			2	0.58	1.66	0.96	CRT-SM
			3	1.19	1.66	1.97	CRT-SM
			4	0.27	1.50	0.41	CRT-SM
			Total	--	--	4.01	CRT-SM
		4	1	--	--	0.21	DDAPS
			2	--	--	0.23	DDAPS
			3	--	--	0.46	DDAPS
			4	--	--	0.13	DDAPS
			Total	--	--	1.03	DDAPS

Table 1. Results of acoustic surveys in Southeastern Alaska from February to April 28, 1974, DDAPS and various CRT Operators (p 4 cont'd)

Location	Date	Run	Transect	Volume ($10^4 m^3$)	Density (lbs/m^3)	Biomass (10^6 lbs)	Processor
Carrol Inlet	2/14/74	1	1	0.06	1.90	0.12	CRT-JD
			2	0.23	2.84	0.65	CRT-JD
			3	0.05	1.00	0.05	CRT-JD
			4	1.00	1.90	0.19	CRT-JD
			5	0.08	1.50	0.12	CRT-JD
		1	1	0.07	1.90	0.13	CRT-SM
			2	0.20	1.90	0.39	CRT-SM
			3	0.05	1.50	0.08	CRT-SM
			4	0.12	0.85	0.10	CRT-SM
			5	0.10	1.15	0.11	CRT-SM
			6	0.04	4.61	0.16	CRT-SM
			Total	--	--	0.97	CRT-SM
		1	1	--	--	0.08	DDAPS
			2	--	--	0.37	DDAPS
			3	--	--	0.07	DDAPS
			4	--	--	0.18	DDAPS
			5	--	--	0.09	DDAPS
			6	--	--	0.12	DDAPS
			Total	--	--	0.91	DDAPS
		2	1	0.03	2.74	0.07	CRT-JD
			2	0.14	4.28	0.62	CRT-JD
			3	0.20	1.90	0.37	CRT-JD
			4	0.19	1.90	0.36	CRT-JD
			5	0.10	1.90	0.18	CRT-JD
			6	0.06	0.93	0.05	CRT-JD
			7	0.06	1.38	0.08	CRT-JD
			Total	--	--	1.74	CRT-JD
		2	1	0.02	4.98	0.12	CRT-SM
			2	0.16	2.35	0.37	CRT-SM
			3	0.25	1.39	0.34	CRT-SM
			4	0.19	1.75	0.34	CRT-SM

Table 1. Results of acoustic surveys in Southeastern Alaska from February to April 28, 1974, DDAPS and various CRT Operators (p 5 cont'd)

Location	Date	Run	Transect	Volume ($10^4 m^3$)	Density (lbs/m^3)	Biomass (10^6 lbs)	Processor
Carroll Inlet	2/14/74		5	0.14	1.25	0.17	CRT-SM
			6	0.05	1.11	0.05	CRT-SM
			7	0.04	0.56	0.02	CRT-SM
			Total	--	--	1.41	CRT-SM
		2	1	--	--	0.04	DDAPS
			2	--	--	0.25	DDAPS
			3	--	--	0.22	DDAPS
			4	--	--	0.26	DDAPS
			5	--	--	0.19	DDAPS
			6	--	--	0.04	DDAPS
			7	--	--	0.03	DDAPS
			Total	--	--	1.02	DDAPS
		3	1	0.12	1.32	0.16	CRT-JD
			2	0.48	0.85	0.41	CRT-JD
			3	0.03	0.93	0.03	CRT-JD
			4	0.27	0.90	0.24	CRT-JD
			Total	--	--	0.84	CRT-JD
		3	1	0.09	0.65	0.06	CRT-SM
			2	0.47	0.65	0.31	CRT-SM
			3	0.02	1.35	0.03	CRT-SM
			4	0.30	1.30	0.39	CRT-SM
			Total	--	--	0.78	CRT-SM
		3	1	--	--	0.08	DDAPS
			2	--	--	0.30	DDAPS
			3	--	--	0.04	DDAPS
			4	--	--	0.16	DDAPS
			Total	--	--	0.57	DDAPS
		4	1	0.27	0.44	0.12	CRT-JD
			2	0.09	0.34	0.03	CRT-JD
			3	0.28	0.39	0.11	CRT-JD

Table 1. Results of acoustic surveys in Southeastern Alaska from February to April 28, 1974, DDAPS and various CRT Operators (p 6 cont'd)

Location	Date	Run	Transect	Volume (10^4 m^3)	Density (lbs/m^3)	Biomass (10^6 lbs)	Processor
Carroll Inlet	2/14/74	4	4	0.10	0.02	0.002	CRT-JD
			5	0.06	0.09	0.006	CRT-JD
			6	0.08	0.09	0.008	CRT-JD
			Total	--	--	0.269	CRT-JD
		4	1	0.45	0.41	0.18	CRT-SM
			2	0.11	0.12	0.013	CRT-SM
			3	0.40	0.23	0.093	CRT-SM
			4	0.07	0.014	0.001	CRT-SM
			5	0.04	0.12	0.005	CRT-SM
			6	0.08	0.08	0.006	CRT-SM
			Total	--	--	0.300	CRT-SM
		4	1	--	--	0.16	DDAPS
			2	--	--	0.022	DDAPS
			3	--	--	0.12	DDAPS
			4	--	--	0.002	DDAPS
			5	--	--	0.006	DDAPS
			6	--	--	0.009	DDAPS
			Total	--	--	0.316	DDAPS
Deer Island	2/16/74	1	Total	--	--	0.046	DDAPS
		2	1	--	--	0.247	CRT-SM
			2	--	--	0.259	CRT-SM
			3	--	--	0.177	CRT-SM
			4	--	--	0.003	CRT-SM
			5	--	--	0.023	CRT-SM
			Total	--	--	0.709	CRT-SM
		2	1	--	--	0.06	DDAPS
			2	--	--	0.04	DDAPS
			3	--	--	0.04	DDAPS
			4	--	--	0.05	DDAPS
			5	--	--	0.01	DDAPS
			Total	--	--	0.155	DDAPS

Table 1. Results of acoustic surveys in Southeastern Alaska from February to April 28, 1974, DDAPS and various CRT Operators (p 7 cont'd)

Location	Date	Run	Transect	Volume (10 m	Density (lbs/m	Biomass (10/b	Processor
Deer Island	2/16/74	3	Total	--	--	0.040	DDAPS
		4	1	--	--	0.093	CRT-SM
			2	--	--	0.108	CRT-SM
			3	--	--	0.077	CRT-SM
			4	--	--	0.003	CRT-SM
			5	--	--	0.029	CRT-SM
			Total	--	--	0.31	CRT-SM
		4	1	--	--	0.014	DDAPS
			2	--	--	0.028	DDAPS
			3	--	--	0.035	DDAPS
			4	--	--	0.001	DDAPS
			5	--	--	0.012	DDAPS
			Total	--	--	0.090	DDAPS
		5	Total	--	--	0.010	DDAPS
Anita Bay	2/18/74	1	Total	--	--	0.014	DDAPS
		2	1	--	--	0.007	DDAPS
			2	--	--	0.005	DDAPS
			3	--	--	0.009	DDAPS
			4	--	--	0.015	DDAPS
			Total	--	--	0.036	DDAPS
		2	1	--	--	0.015	CRT-SM
			2	--	--	0.020	CRT-SM
			3	--	--	0.015	CRT-SM
			4	--	--	0.040	CRT-SM
			Total	--	--	0.090	CRT-SM
		3	Total	--	--	0.014	DDAPS
		4	Total	--	--	0.004	DDAPS
		5	Total	--	--	0.012	DDAPS

Table 1. Results of acoustic surveys in Southeastern Alaska from February to April 28, 1974, DDAPS and various CRT Operators (p 8 cont'd)

Location	Date	Run	School or Transect	Volume	Density	Biomass	Processor
Scow Bay	2/20/74	1	1	--	--	0.012	DDAPS
			2	--	--	0.005	DDAPS
			3	--	--	0.002	DDAPS
			4	--	--	0.012	DDAPS
			5	--	--	0.007	DDAPS
			6	--	--	0.022	DDAPS
			7	--	--	0.026	DDAPS
			8	--	--	0.108	DDAPS
			9	--	--	0.032	DDAPS
			10	--	--	0.047	DDAPS
			Total	--	--	0.272	DDAPS
		1	1	--	--	0.009	CRT-SM
			2	--	--	0.007	CRT-SM
			3	--	--	0.002	CRT-SM
			4	--	--	0.004	CRT-SM
			5	--	--	0.007	CRT-SM
			6	--	--	0.024	CRT-SM
			7	--	--	0.006	CRT-SM
			8	--	--	0.052	CRT-SM
			9	--	--	0.054	CRT-SM
			10	--	--	0.054	CRT-SM
			Total	--	--	0.218	CRT-SM
		2	1	--	--	0.022	DDAPS
			2	--	--	0.049	DDAPS
			3	--	--	0.017	DDAPS
			4	--	--	0.016	DDAPS
			5	--	--	0.049	DDAPS
			6	--	--	0.038	DDAPS
			7	--	--	0.023	DDAPS

Table 1. Results of acoustic surveys in Southeastern Alaska from February to April 28, 1974, DDAPS and various CRT Operators (p 9 cont'd)

Location	Date	Run	School or Transect	Volume	Density	Biomass	Processor
Scow Bay	2/20/74		8	--	--	0.004	DDAPS
			Total	--	--	0.209	DDAPS
		2	1	--	--	0.006	CRT-SM
			2	--	--	0.042	CRT-SM
			3	--	--	0.018	CRT-SM
			4	--	--	0.036	CRT-SM
			5	--	--	0.102	CRT-SM
			6	--	--	0.089	CRT-SM
			7	--	--	0.029	CRT-SM
			8	--	--	0.002	CRT-SM
			Total	--	--	0.324	CRT-SM
Port Houghton	2/21/74	1	Total	--	--	0.01	DDAPS
Fritz Cove	2/25/74	1	1	--	--	0.074	DDAPS
			2	--	--	0.021	DDAPS
			3	--	--	0.023	DDAPS
			4	--	--	0.112	DDAPS
			5	--	--	0.094	DDAPS
			6	--	--	0.011	DDAPS
			7	--	--	0.002	DDAPS
			Total	--	--	0.335	DDAPS
		1	1	--	--	0.159	CRT-SM
			2	--	--	0.052	CRT-SM
			3	--	--	0.102	CRT-SM
			4	--	--	0.488	CRT-SM
			5	--	--	0.360	CRT-SM
			6	--	--	0.023	CRT-SM
			7	--	--	0.003	CRT-SM
			Total	--	--	1.188	CRT-SM

Table 1. Results of acoustic surveys in Southeastern Alaska from February to April 28, 1974, DDAPS and various CRT Operators (p 10 cont'd)

Location	Date	Run	School or Transect	Volume	Density	Biomass	Processor
Fritz Cove	2/25/74	2	1	--	--	0.041	DDAPS
			2	--	--	0.070	DDAPS
			3	--	--	0.046	DDAPS
			4	--	--	0.010	DDAPS
			5	--	--	0.090	DDAPS
			6	--	--	0.024	DDAPS
			7	--	--	0.120	DDAPS
			8	--	--	0.048	DDAPS
			9	--	--	0.053	DDAPS
			Total	--	--	0.502	DDAPS
		2	1	--	--	0.154	CRT-SM
			2	--	--	0.259	CRT-SM
			3	--	--	0.125	CRT-SM
			4	--	--	0.016	CRT-SM
			5	--	--	0.441	CRT-SM
			6	--	--	0.032	CRT-SM
			7	--	--	0.306	CRT-SM
			8	--	--	0.107	CRT-SM
			9	--	--	0.071	CRT-SM
			Total	--	--	1.511	CRT-SM
		3	1	--	--	0.053	DDAPS
			2	--	--	0.076	DDAPS
			3	--	--	0.057	DDAPS
			4	--	--	0.019	DDAPS
			5	--	--	0.041	DDAPS
			6	--	--	0.158	DDAPS
			7	--	--	0.197	DDAPS
			8	--	--	0.177	DDAPS

Table 1. Results of acoustic surveys in Southeastern Alaska from February to April 28, 1974, DDAPS and various CRT Operators (p 11 cont'd)

Location	Date	Run	School or Transect	Volume	Density	Biomass	Processor
Fritz Cove	2/25/74		9	--	--	0.317	DDAPS
			10	--	--	0.026	DDAPS
			11	--	--	0.237	DDAPS
			12	--	--	0.144	DDAPS
			Total	--	--	1.503	DDAPS
		3	1	--	--	0.049	CRT-SM
			2	--	--	0.075	CRT-SM
			3	--	--	0.094	CRT-SM
			4	--	--	0.029	CRT-SM
			5	--	--	0.176	CRT-SM
			6	--	--	0.336	CRT-SM
			7	--	--	0.683	CRT-SM
			8	--	--	0.392	CRT-SM
			9	--	--	0.102	CRT-SM
			10	--	--	0.021	CRT-SM
			11	--	--	0.600	CRT-SM
			12	--	--	0.328	CRT-SM
			Total	--	--	2.886	CRT-SM
		4	1	--	--	0.007	DDAPS
			2	--	--	0.033	DDAPS
			3	--	--	0.036	DDAPS
			4	--	--	0.132	DDAPS
			5	--	--	0.005	DDAPS
			6	--	--	0.016	DDAPS
			7	--	--	0.309	DDAPS
			8	--	--	0.374	DDAPS
			9	--	--	0.023	DDAPS
			10	--	--	0.409	DDAPS
			11	--	--	0.462	DDAPS

Table 1. Results of acoustic surveys in Southeastern Alaska from February to April 28, 1974, DDAPS and various CRT Operators (p 12 cont'd)

Location	Date	Run	School or Transect	Volume	Density	Biomass	Processor
Fritz Cove	2/25/74		12	--	--	0.170	DDAPS
			13	--	--	0.077	DDAPS
			14	--	--	0.692	DDAPS
			15	--	--	1.395	DDAPS
			16	--	--	0.913	DDAPS
			17	--	--	0.926	DDAPS
			18	--	--	0.924	DDAPS
			19	--	--	0.595	DDAPS
			20	--	--	0.525	DDAPS
			21	--	--	0.516	DDAPS
			22	--	--	0.638	DDAPS
Fritz Cove	2/26/74	4	23	--	--	0.019	DDAPS
			Total	--	--	9.276	DDAPS
		4	1	--	--	0.003	CRT-SM
			2	--	--	0.005	CRT-SM
			3	--	--	0.001	CRT-SM
			4	--	--	0.120	CRT-SM
			5	--	--	0.005	CRT-SM
			6	--	--	0.012	CRT-SM
			7	--	--	0.257	CRT-SM
			8	--	--	0.292	CRT-SM
			9	--	--	0.012	CRT-SM
			10	--	--	0.306	CRT-SM
			11	--	--	0.285	CRT-SM
			12	--	--	0.104	CRT-SM
			13	--	--	0.036	CRT-SM
			14	--	--	0.524	CRT-SM
			15	--	--	1.836	CRT-SM
			16	--	--	0.922	CRT-SM
			17	--	--	0.732	CRT-SM

Table 1. Results of acoustic surveys in Southeastern Alaska from February to April 28, 1974, DDAPS and various CRT Operators (p 13 cont'd)

Location	Date	Run	School or Transect	Volume	Density	Biomass	Processor
Fritz Cove	2/26/74		18	--	--	1.130	CRT-SM
			19	--	--	0.566	CRT-SM
			20	--	--	0.498	CRT-SM
			21	--	--	0.485	CRT-SM
			22	--	--	1.064	CRT-SM
			23	--	--	0.023	CRT-SM
			Total	--	--	9.216	CRT-SM
Lisiunske Inlet	3/14/74	1	All	--	--	10.0	DDAPS
Slocum Inlet	3/15/74	1	All	--	--	0.88	DDAPS
Katlian Bay	3/16/74	1	1-3	--	--	0.011	DDAPS
			4-6	--	--	0.140	DDAPS
			7-12	--	--	0.301	DDAPS
			13-14	--	--	0.137	DDAPS
			15-18	--	--	0.194	DDAPS
			Total	--	--	0.78	DDAPS
		1	1-3	--	--	0.027	CRT-SM
			4-6	--	--	0.343	CRT-SM
			7-12	--	--	0.714	CRT-SM
			13-14	--	--	0.595	CRT-SM
			15-18	--	--	0.600	CRT-SM
			Total	--	--	2.28	CRT-SM
	3/20/74	2	1-3	--	--	0.48	DDAPS
			4	--	--	0.054	DDAPS
			5-7	--	--	0.044	DDAPS
			8-10	--	--	0.215	DDAPS
			11	--	--	0.026	DDAPS
			12-17	--	--	0.94	DDAPS

Table 1. Results of acoustic surveys in Southeastern Alaska from February to April 28, 1974, DDAPS and various CRT Operators (p 14 cont'd)

Location	Date	Run	School or	Volume	Density	Biomass	Processor
Katlian Bay	3/20/74		18-14	--	--	0.21	DDAPS
			Total	--	--	2.0	DDAPS
		2	1-3	--	--	0.476	CRT-SM
			4	--	--	0.053	CRT-SM
			5-7	--	--	0.172	CRT-SM
			8-10	--	--	0.201	CRT-SM
			11	--	--	9,9k3	CRT-SM
			12-17	--	--	0.762	CRT-SM
			18-19	--	--	0.229	CRT-SM
			Total	--	--	1.90	CRT-SM
& Nukwasina Sound	3/17/74	1	1-2	--	--	0.053	DDAPS
			3	--	--	0.29	DDAPS
			4	--	--	0.26	DDAPS
			5	--	--	0.046	DDAPS
			6	--	--	0.003	DDAPS
			7	--	--	0.036	DDAPS
			8-9	--	--	0.52	DDAPS
			Total	--	--	1.2	DDAPS
		1	1-2	--	--	0.07	CRT-SM
			3	--	--	0.55	CRT-SM
			4	--	--	0.57	CRT-SM
			5	--	--	0.26	CRT-SM
Katlian Bay	3/20/74	2	8-10	--	--	0.201	CRT-SM
			8-10	--	--	0.013	CRT-SM
			12-17	-	-	0.762	CRT-SM
			18-19	--	--	0.229	CRT-SM
			Total	--	--	1.90	CRT-SM

Table 1. Results of acoustic surveys in S-utheastern Alaska from February to April 28, 1974, DDAPS and various CRT Operators (p 15 cont'd)

Location	Date	Run	School or Transect	Volume	Density	Biomass	Processor
Nakwasina Sound	3/17/74	1	1-2	--	--	0.053	DDAPS
			3	--	--	0.29	DDAPS
			4	--	--	0.26	DDAPS
			5	--	--	0.046	DDAPS
			6	--	--	0.003	DDAPS
			7	--	--	0.036	DDAPS
			8-9	--	--	0.52	DDAPS
			Total	--	--	1.2	DDAPS
		1	1-2	--	--	0.07	CRT-SM
			3	--	--	0.55	CRT-SM
			4	--	--	0.57	CRT-SM
			5	--	--	0.26	CRT-SM
			6	--	--	0.11	CRT-SM
			7	--	--	0.25	CRT-SM
			8-9	--	--	1.20	CRT-SM
			Total	--	--	3.01	CRT-SM
	3/20/74	2	Total	--	--	1.1	DDAPS
		3	Total	--	--	1.4	DDAPS
		4	1	--	--	0.013	DDAPS
			2	--	--	0.044	DDAPS
			3	--	--	0.120	DDAPS
			4	--	--	0.52	DDAPS
			5-7	--	--	0.166	DDAPS
			Total	--	--	0.88	DDAPS
		4	1	--	--	0.027	CRT-SM
			2	--	--	0.087	CRT-SM
			3	--	--	0.201	CRT-SM
			4	--	--	1.43	CRT-SM
			5-7	--	--	0.48	CRT-SM
			Total	--	--	2.33	CRT-SM

Table 1. Results of acoustic surveys in Southeastern Alaska from February to April 28, 1974, DDAPS and various CRT Operators (p 16 cont'd)

Location	Date	Run	School or Transect	Volume	Density	Biomass	Processor
Seymour Canal	4/27/74	1	1	--	--	.011	DDAPS
			2	--	--	.077	DDAPS
			3	--	--	.050	DDAPS
			4	--	--	.012	DDAPS
			5	--	--	.066	DDAPS
			6	--	--	.002	DDAPS
			7	--	--	.004	DDAPS
			8	--	--	.002	DDAPS
			9	--	--	.086	DDAPS
			10	--	--	.036	DDAPS
			11	--	--	.018	DDAPS
			12	--	--	.109	DDAPS
			13	--	--	.035	DDAPS
			14	--	--	.119	DDAPS
			15	--	--	.003	DDAPS
Seymour Canal	4/27/74	1	16	--	--	.002	DDAPS
			17	--	--	.002	DDAPS
			18	--	--	.032	DDAPS
			19	--	--	0.027	DDAPS
			20	--	--	0.031	DDAPS
			21	--	--	0.008	DDAPS
			22	--	--	0.046	DDAPS
			Total	--	--	0.799	DDAPS
		1	1	--	--	0.028	CRT-SM
			2	--	--	0.157	CRT-SM
			3	--	--	0.084	CRT-SM
			4	--	--	0.009	CRT-SM
			5	--	--	0.179	CRT-SM
			6	--	--	0.001	CRT-SM
			7	--	--	0.002	CRT-SM
			8	--	--	0.005	CRT-SM

Table 1. Results of acoustic surveys in Southeastern Alaska from February to April 28, 1974, DDAPS and various CRT Operators (p 17 cont'd)

Location	Date	Run	School or Transect	Volume	Density	Biomass	Processor
			9	--	--	0.187	CRT-SM
			10	--	--	0.108	CRT-SM
			11	--	--	0.036	CRT-SM
			12	--	--	0.092	CRT-SM
			13	--	--	0.164	CRT-SM
			14	--	--	0.176	CRT-SM
			15	--	--	0.002	CRT-SM
			16	--	--	0.006	CRT-SM
			17	--	--	0.002	CRT-SM
			18	--	--	0.045	CRT-SM
			19	--	--	0.140	CRT-SM
			20	--	--	0.085	CRT-SM
			21	--	--	0.009	CRT-SM
Seymour Canal	4/27/74	1	15	--	--	0.006	CRT-SM
			Total	--	--	1.584	CRT-SM
		2	Total	--	--	0.977	DDAPS

Table 2. Biomass estimates from surveys in Southwestern Alaska from February 11 to April 28, 1974 processed with DDAPS

Location	Date	Run	Biomass (10 /lb)
Carroll Inlet	2/11/74	1	0.17
		2	0.32
	2/14/74	1	0.91
		2	1.02
		3	0.57
		4	0.32
George Inlet	2/12/74	1	0.84
		2	1.26
		3	1.96
		4	1.03
Deer Island	2/16-17/74	1	0.05
		2	0.16
		3	0.04
		4	0.09
		5	0.01
Anita Bay	2/18/74	1	0.014
		2	0.036
		3	0.014
		4	0.004
		5	0.012
Skow Bay	2/20/74	1	0.272
		2	0.209
Port Houghton	2/21/74	1	0.01
Fritz Cover	2/25/74	1	0.335
		2	0.502
		3	1.503
		4	9.272
Lisianski Inlet	3/14/74	1	11.0
Slocan Inlet	3/15/74	1	0.88

Table 2. Biomass estimates from surveys in Southwestern Alaska from February 11 to April 28, 1974 processed with DDAPS

Location	Date	Run	Biomass (10 /lb)
Katlian Bay	3/16/74	1	0.78
	3/20/74	1	2.0
Nakwasina Sound	3/17-20/74	1	1.2
		2	1.1
		3	1.4
		4	0.88
Seymour Canal	4/27-28/74	1	0.78
		2	0.98