

FISHERIES RESEARCH INSTITUTE
College of Fisheries
University of Washington
Seattle, Washington 98195

ACOUSTIC ASSESSMENT OF HERRING STOCKS IN ALASKA
DURING 1976-1977

by

Richard E. Thorne

FINAL REPORT
For the period October 1, 1976 to June 30, 1977
Contract with
State of Alaska Department of Fish and Game

Submitted August 31, 1977

Approved

for Ray E. Nakatani
Director

ACOUSTIC ASSESSMENT OF HERRING STOCKS IN ALASKA
DURING 1976-1977

INTRODUCTION

Acoustic assessment techniques which were developed by the Sea Grant Marine Acoustics Program at the University of Washington have been applied to herring stocks in Alaska. The acoustic assessment program is conducted by Alaska Department of Fish and Game (ADF&G) with technical support from the University of Washington. Data analysis services are provided by the University's Fisheries Research Institute (FRI) through contractual arrangements with ADF&G. The results of acoustic surveys during the past year have been previously reported to ADF&G, but mainly by telephone since timeliness is a very important factor. This final contract report serves to consolidate these results and to document the procedures used in the analysis.

PROCEDURES

The surveys were conducted primarily by ADF&G personnel in southeastern Alaska aboard ADF&G research vessels Auklet, Kittiwake and Sundance. Additional data were collected in cooperation with the National Marine Fisheries Service (NMFS) at Auke Bay aboard various NMFS research vessels. As in previous years the acoustic system aboard all the vessels was the Ross 200 A echo sounder modified for collection of data on analog magnetic tape (Thorne et al., 1972). This system operates at 105 kHz with a 7° circular transducer (nominal full beam angle) and a pulse length of 0.6 msec.

The acoustic data are heterodyned to 5 kHz for recording on tape. The survey procedure is to define an area encompassing a herring concentration by preliminary search or previous experience, then run a series of oblique transects spaced evenly over the area. An example of a survey track in Carroll Inlet is shown in Fig. 1.

After the survey, the tapes are sent to FRI either by mail or Alaska Airlines Gold Streak Express, depending upon time limitations. The data are rapidly analyzed and the results telephoned to ADF&G. Data analysis is by echo integration. The present data analysis system uses a PDP 11/45 computer with special software and hardware modifications (Thorne et al., 1977; Thorne in press). All results are standardized to an assumed target strength of -33 dB/kg. Calibration of the ADF&G acoustic data acquisition systems is done by the University's Applied Physics Laboratory (APL). A special calibration system for routine use in Alaska was completed by APL and used by ADF&G personnel near the end of the past season. This system measures the acoustic source level and receiver performance.

RESULTS AND DISCUSSION

A total of 77 surveys were conducted (Table 1). Substantial concentrations of fish were observed in several areas including Port Camden, Deer Island, Anita Bay, Fritz Cove, Katlian Bay and Seymour Canal. The amount of acoustic survey data was nearly 70 hours, which is the largest total collected during the seven year program. Quality of the acoustic data was also improved over previous years. Saturation and data logging problems were reduced.

The continued improvement in quality and quantity of the acoustic data indicates that most of the logistic and training problems in the program have

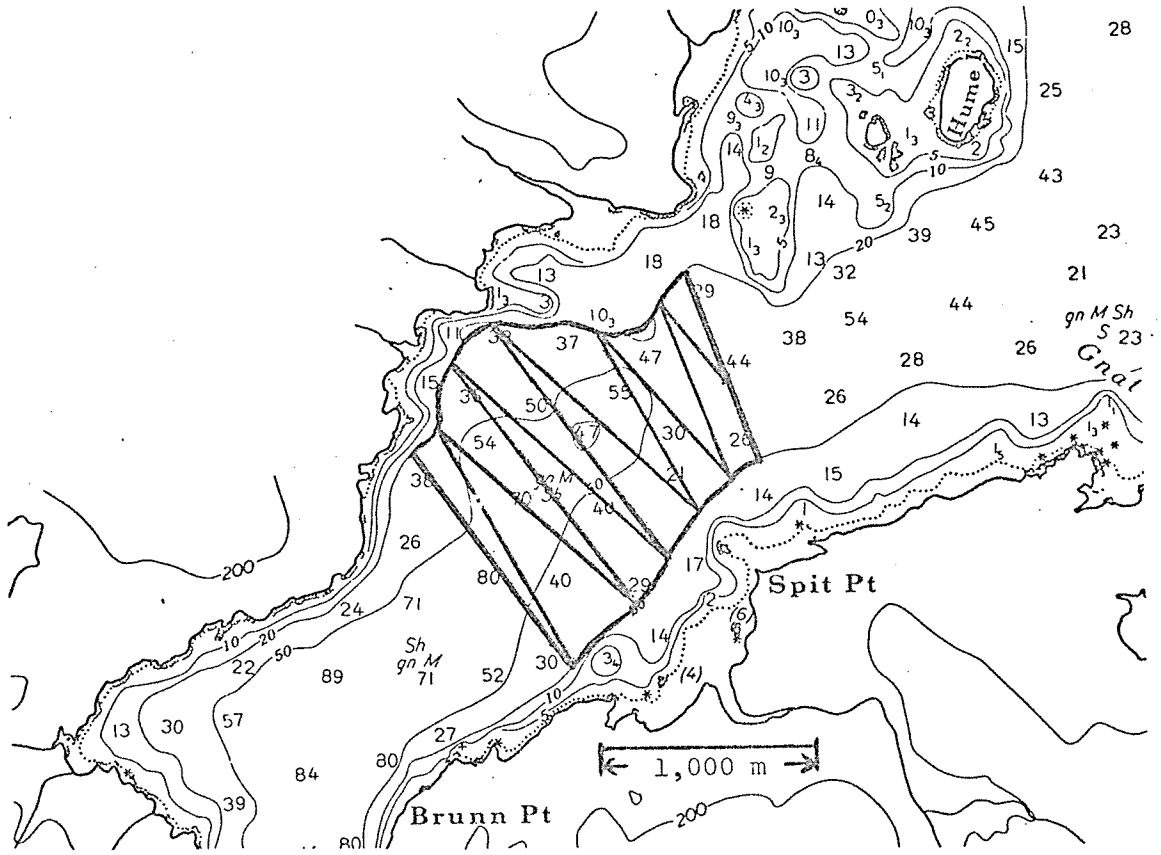


Fig. 1. Example of acoustic survey track in Carroll Inlet.

Table 1. Summary of herring computer hydroacoustical estimates made in Southeastern Alaska during 1976-77.

Date	Location	Survey Number	Vessel	Computer Ave. Density lbs/m ²	Surveyed Area (m ²)	Biomass 10 ⁶ lbs.
<u>1976</u>						
10-11	Pt. Camden	1	AUKLET	.40	3,418,784	1.3
10-28	" "	1	"	1.30	8,184,362	10.6
10-28	" "	2	"	.80	7,096,567	5.7
11-17	George Inlet	1	"	1.80	643,107	1.2
11-17	" "	2	"	5.70	643,107	3.6
11-18	Tongass Narrows	1	"	1.40	1,286,214	1.8
11-18	" "	2	"	1.40	1,286,214	1.8
11-19	Carroll Inlet	1	"	.35	1,146,874	.4
11-20	George Inlet	1	"	4.20	481,630	2.0
11-20	" "	2	"	3.20	481,630	1.5
11-21	Lisianski In.	1	KITTIWAKE	.10	4,233,787	.4
11-21	" "	2	"	.04	5,487,846	.2
11-21	Stag Bay	1	"	1.13	1,918,602	2.2
11-22	Tongass Narrows	1	AUKLET	1.80	943,224	1.7
11-22	" "	2	"	2.30	943,224	2.2
11-26	Deer Island	1	"	3.80	2,786,797	10.6
11-27	" "	1	"	3.40	1,800,699	6.1
11-27	" "	2	"	7.60	1,500,583	11.4
11-28	Anita Bay	1	"	.96	9,775,226	9.8
11-28	" "	2	"	1.03	9,903,847	10.2
12-6	Hood Bay	1	"	.16		
12-10	Lisianski Straits	1	"	3.30	1,179,029	3.9
12-27	Fritz Cove	2	NMFS	3.47	3,922,952	13.6
12-28	Pt. Camden	1	AUKLET	.96	4,247,580	4.1
<u>1977</u>						
1-4	Anita Bay	1	AUKLET	.14	8,703,381	1.2
1-5	Fritz Cove	1	NMFS	4.90	2,057,942	10.1
1-6	George Inlet	1	AUKLET	2.33	321,553	.75
1-6	" "	2	"	13.06	321,553	4.2
1-10	Fritz Cove	1	NMFS	2.20	2,454,525	5.4
1-11	" "	1	"	1.70	2,315,185	3.9
1-11	" "	2	"	1.80	2,861,826	5.2
1-11	" "	3	"	2.50	2,626,020	6.6
1-17	Deer Island	4	AUKLET	4.90	330,000	1.6
1-17	" "	5	"	8.00	536,000	4.3
1-17	" "	6	"	5.50	619,000	3.4
1-18	" "	3	"	3.40	1,362,000	4.7
1-18	" "	4	"	3.70	1,032,000	3.8
1-18	Fritz Cove	1	NMFS	3.20	3,504,933	11.2
1-19	Deer Island	2	AUKLET	4.90	867,000	4.2
1-20	Hood Bay	1	NMFS	.10	2,244,175	.22
1-21	Bocas de Finas	1	"	.35	5,380,662	1.9
1-21	" " "	2	"	.44	5,380,662	2.4
1-26	Fools Inlet	1	AUKLET	.44	1,929,321	.8

Date	Location	Survey Number	Vessel	Computer Ave. Density lb./m ²	Surveyed Area (m ²)	Biomass 10 ⁶ lbs.
1-27	Lisianski Straits	1	SUNDANCE	5.60	1,050,408	5.9
1-27	" "	2	"	8.60	1,050,408	9.0
1-27	Deer Island	1	AUKLET	9.10	428,738	3.9
1-27	" "	2	"	1.10	728,854	.8
1-28	Hood Bay	1	KITTIWAKE	7.30	696,699	5.1
1-28	" "	2	"	4.86	696,699	3.4
1-28	" "	3	"	3.71	696,699	2.6
1-29	Katlian	1	SUNDANCE	1.10	1,714,952	1.9
1-30	Bocas de Finas	1	KITTIWAKE	.14	11,340,120	1.6
1-30	" " "	2	"	.20	8,070,992	1.6
1-30	Favorite Bay	1	"	28.90	167,475	4.8
1-30	" "	2	"	38.50	167,475	6.4
1-30	" "	3	"	26.30	301,456	7.9
2-14	Pt. Camden	2	AUKLET	1.26	1,093,281	1.4
2-17	Scow Bay	1	"	1.72	2,644,775	4.5
3-2	Kasaan Bay	1	SUNDANCE	.31	1,479,146	.5
3-8	Katlian Bay	1	KITTIWAKE	2.70	4,223,069	11.3
3-9	" "	1	"	1.90	3,676,428	7.0
3-10	Kasaan Bay	1	SUNDANCE	.40	2,358,059	.9
3-10	" "	2	"	.13	2,165,126	.3
4-1	Old Sitka Rocks	1	AUKLET	.42	6,002,332	2.5
4-1	" " "	2	"	2.00	5,402,099	10.8
4-6	" " "	1	KITTIWAKE	1.10	4,523,186	5.0
4-7	" " "	1	"	1.70	3,395,749	5.8
4-7	" " "	2	AUKLET	3.10	3,395,749	10.5
4-11	Kasaan Bay	1	SUNDANCE	.04	3,387,030	.1
4-11	" "	2	"	.02	3,537,088	.06
4-28	Seymour Canal	1	AUKLET	1.91	643,107	1.2
4-28	" "	2	"	1.01	643,107	.6
4-28	" "	3	"	.26	500,780	.1
4-29	" "	1	"	1.81	4,051,570	7.3
4-30	" "	1	"	2.66	2,448,344	6.5
4-30	" "	2	"	1.74	3,305,760	5.8
5-1	" "	1	"	.79	2,239,901	1.8

been solved. The completion of the mobile calibration system may eliminate one of the remaining uncertainties. Complete pre-operational calibration of all systems and periodic checks are important to ensure accurate results. Some of the discrepancies in results from different ships may be due to differences between the individual systems and can only be resolved by good calibration information.

Remaining problem areas are species composition and unavailability (near-surface or bottom). Improved sampling capability is strongly recommended. Many of the problems due to distribution of fish near-bottom appear to be resolved by diel surveys. However, near-surface schools and scattered schools over large areas are still a survey problem. The use of sonar as a quantitative auxiliary sampler should be investigated as a possible solution to these sampling problems.

LITERATURE CITED

- Thorne, R. [In press]. A new digital hydroacoustic data processor and some observations on herring in Alaska. *J. Fish. Res. Board Can.*
- Thorne, R., E. Nunnallee, and J. Green. 1972. A portable hydroacoustic data acquisition system for fish stock assessment. Washington Sea Grant Publ. 72-4. 15 pp.
- Thorne, R., O. Mathisen, R. Trumble, and M. Blackburn. 1977. Distribution and abundance of pelagic fish off Spanish Sahara during CUEA Expedition JOINT I. *Deep Sea Res.* 24:75-82.