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ACOUSTIC ASSESSMENT OF HERRING STOCKS IN ALASKA DURING 1974-1975

by

Richard E. Thorne

Final Report
For the period October 15, 1974 to June 30, 1975
Contract with
State of Alaska Department of Fish and Game

UNIVERSITY OF WASHINGTON
COLLEGE OF FISHERIES
FISHERIES RESEARCH INSTITUTE

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INTRODUCTION

During the past five years, the Fisheries Research Institute of the University of Washington has provided data analysis services for surveys of herring stocks conducted by Alaska Department of Fish and Game (ADF&G). Results of analysis of data collected during the fifth year are detailed in this contract report. In addition, several modifications of data collection and survey procedures are recommended.

METHODS

Data Acquisition

Surveys were conducted by ADF&G personnel primarily aboard the M.V. *Kittiwake* or M.V. *Auklet* in various locations throughout Southeastern Alaska from September 29, 1974 to March 27, 1975. In addition, a single survey was made from the M.V. *Montague* at Green Island in Prince William Sound. The systems aboard all three vessels are Ross 200A hydroacoustic data acquisition systems as used in previous years and described in previous contract reports.

Data Analysis

During initial operations in 1971 and 1972, echo amplitudes from herring schools were estimated visually by use of an oscilloscope (CRT). However, this technique was found to work adequately only for large, well-defined herring schools. During the past three years, the more precise digital echo integration systems (Thorne 1973*a*) have been utilized for the data analysis. Calibration of the estimation procedure is based on target strength measurements originally conducted in Carroll Inlet

during 1972 and is similar to the calibration relationship used for Puget Sound herring studies (Thorne 1973*b*).

RESULTS AND DISCUSSION

The results of analysis of all surveys are given in Table 1. Thirty-seven surveys were conducted in 12 areas and included the largest population yet observed, 72.4 million lb at Green Island.

Considering the operation of three systems and a total period of six months, the data are surprisingly meager. Further, some of the data were collected with inadequate or incorrect survey procedures. For example, past surveys in Southeastern Alaska have indicated that herring may rapidly disperse outside survey boundaries at dusk, and that wherever maximum bottom depths are sufficient for daytime pelagial distribution, surveys should be conducted during day. Yet many of the surveys this past year were conducted after significant dispersal had occurred, rendering the results valueless as a measure of total population.

The magnitudes of the areas covered during surveys were also questionably small. The total surveyed area for all of Alaska this year was only 125 million m^2, considerably less than the area routinely covered in northern Puget Sound on a one-day survey. Thus, there is considerable potential for significant populations to be missed by the surveys.

The seasonal coverage is unquestionably inadequate in most cases. Virtually all populations and especially prespawning aggregations are subject to immigration and emigration. Weekly surveys are required over a period of five to six week to delineate the peak abundance of the prespawning population in northern Puget Sound, during which time the abundance typically varies by a factor of 10. In contrast, the most

intense seasonal coverage in Alaska was three surveys, a month apart, in Scow Bay.

CONCLUSIONS AND RECOMMENDATIONS

The herring-management program of the Washington Department of Fisheries, including acoustic surveys and spawning ground surveys, appears to work effectively, and could be justifiably valued at a half-million dollars yearly in increased harvests. The potential in Alaska is greater by at least a factor of 10. In order to begin to realize this potential, survey efforts need to be both increased and focused. Acoustic assessment techniques for herring in general are well established. However, each fishable population has unique distributional characteristics in both time and space which can only be documented by a systematic survey program. Increased research effort on major herring stocks is economically justifiable, but the effort must be systematically planned and conducted or the resulting data will have questionable value for management.

In conclusion, the following actions are recommended.

1) Existing information on the location, timing, and magnitudes of fished or spawning populations should be reviewed to form the basis of a systematic survey program.

2) The survey program should be designed well in advance of the field season in order to most efficiently allocate existing vessel, equipment, and manpower resources.

3) Surveys should include sufficient resolution in time to delineate peak population abundance.

4) Area coverage should be increased either through greater effort or by addition of sonar to increase searching capability.

5) Field personnel should be extensively trained in the nature and use of hydroacoustic systems.

6) The data base should include spawning ground surveys as well as hydroacoustic surveys and catch records.

LITERATURE CITED

Thorne, R. E. 1973*a*. Digital hydroacoustic data-processing system and its application to Pacific hake stock assessment in Port Susan, Washington. NMFS Fish. Bull. 71(3):837-843.

Thorne, R. E. 1973*b*. Acoustic assessment of Pacific hake and herring stocks in Puget Sound 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 for herring in Alaska from September 29, 1974 to March 27, 1975

Location	Date	Vessel	Run	Time	Density (lb/m^2)	Biomass (10^6 lb)	Comment
Scow Bay	9/29/74	*Kittiwake*		1940	0.19	0.40	
	10/27/74	*Kittiwake*		0907	0.39	1.13	
	12/6/74	*Kittiwake*		1355	0.18	0.72	
George Inlet	11/4/74	*Auklet*		1633	2.41	1.10	
	11/22/74	*Auklet*	1	1705	4.70	2.14	
	11/22/74	*Auklet*	2		1.91	0.87	
	11/22/74	*Auklet*	3	1820	0.70	0.32	
	12/22/74	*Auklet*	1	Dusk	17.43	8.33	
	12/22/74	*Auklet*	2	Dusk	12.45	5.95	
Port Camden	11/14/74	*Kittiwake*	1	1330	0.38	5.07	
	11/14/74	*Kittiwake*	2	1507	0.47	6.22	
	11/15/74	*Kittiwake*	3	0910	0.48	6.35	
	12/4/75	*Kittiwake*	1	1300	0.43	3.09	
	12/4/74	*Kittiwake*	2	1423	0.29	2.47	
Anita Bay	12/11/74	*Kittiwake*	1	1200	0.21	1.39	
	12/11/74	*Kittiwake*	2	1531	1.59	0.58	
	12/11/74	*Kittiwake*	3	1557	1.28	0.44	
Seymour Canal	12/17/74	*Kittiwake*		1045	0.12	0.79	
Fritz Cove	1/15/75	*Auklet*			7.00	1.96	
	1/15/75	*Kittiwake*		1610	0.74	0.41	Saturated
Auke Bay	1/15/75	*Auklet*			1.37	9.71	
	1/16/75	*Auklet*	1	1500	1.30	2.08	
	1/16/75	*Auklet*	2	1607	0.32	0.50	Saturated
	1/16/75	*Auklet*	3	1715	2.10	14.92	Perfect
	1/16/75	*Kittiwake*	1	1455	0.40	0.65	
	1/16/75	*Kittiwake*	2	1554	0.71	1.13	
	1/16/75	*Kittiwake*	3	1830	0.06	0.42	
Lisianske	1/19/75	*Kittiwake*		1726	0.16	1.65	
Stag Bay	1/20/75	*Kittiwake*	1	Not logged	0.55	0.82	
	1/20/75	*Kittiwake*	2	1645	0.51	0.77	
Nakwasima	2/11/75	*Kittiwake*	1	None logged	10.4	4.5	
	2/11/75	*Kittiwake*	2	None logged	4.2	1.8	Echogram on incorrect scale
Green Island	2/20/75	*Montaque*	2	1600	7.1	72.4	
Katlian Bay	3/6/75	*Kittiwake*	1	2000	0.5	1.06	Dispersed
	3/6/75	*Kittiwake*	2	2100	0.15	0.5	
	3/27/75	*Auklet*	1	1800	9.1	10.1	
	3/27/75	*Auklet*	2	1843	12.7	12.8	