

FRI-UW-7413
October 1974

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

ACOUSTIC SURVEY OF HAKE
IN PORT SUSAN AND VICINITY DURING 1974


by

Richard E. Thorne

Final Report
Service Contract No. 573
Washington Department of Fisheries
1974

Submitted: October 24, 1974

Approved


Acting for the Director

ACOUSTIC SURVEY OF HAKE IN
PORT SUSAN AND VICINITY DURING 1974

INTRODUCTION

Acoustic surveys have been conducted annually on the hake population in Port Susan and vicinity since 1969 as part of a cooperative program between the Washington State Department of Fisheries and the University of Washington Sea Grant Marine Acoustics Program. Results of the surveys during 1974 are described in this report.

MATERIALS AND METHODS

Two surveys were conducted, the first aboard the R/V Commando February 14 to 15, and the second aboard the WSDF R/V Research I on April 25. Both surveys used the University's 105 kHz data acquisition system (Thorne, Nunnallee and Green, 1972). The surveys covered five areas: Port Susan, Possession Sound, Port Gardner, an area immediately south of Possession Sound, and the southern part of Saratoga Passage (Fig. 1). The survey design for both surveys was the same as that used in April 1973 except that three extra transects were run in Port Susan during the February 1974 series.

The acoustic data were processed with the University's digital integration system (Thorne, 1973a) as in all surveys since 1971. Calibration of the system was based on the net haul series done during March 1973 (Fig. 3, Thorne, 1973b). Two net hauls were made during the February 1974 series as a precautionary check on the system performance.

RESULTS AND DISCUSSION

The vertical distribution of adult hake during the February series was similar to that observed in previous years, and was confined to the depth range between 60 m and 140 m. Typically, 90 to 95% of the biomass in this depth range is comprised of adult hake. The density of fish between 60 m and 140 m expressed in pounds per square meter of surface area is listed in Table 1 for each 5-min section of each transect during the February survey. The mean density and population in each of the five regions is summarized in Table 2. The fish were primarily located in Regions B-D (Fig. 1). The total population, 62.2×10^6 lbs, represents

a considerable increase over the 20.0×10^6 lbs observed in the same area during April 10 to 11, 1973, and the estimate of 52.5×10^6 lbs in Regions B-D is a considerable increase over the total of 15.9×10^6 lbs observed with the 105 kHz system for the same area during March 5 to 7, 1973.

The survey in April 1974 was conducted much later in the month than during the previous years. The vertical distribution of fish was considerably changed; concentrations of targets resembling adult hake in echo trace characteristics were observed above 60 m. Thus, observations were divided into two depth ranges, 20 to 60 m and 60 to 140 m. Biomass in the 60 to 140 m range can be assumed to be primarily adult hake. However, the concentrations in the 20 to 60 m range probably include a large percentage of immature hake and possibly include significant numbers of herring.

The density of fish in the two depth ranges is given in Table 3 for each 5-min section of each transect. The mean densities and populations in each depth range for the five regions is summarized in Table 2. The total population estimate was 70.1×10^6 lbs, but the majority (45.4×10^6 lbs) were located in the upper depth interval where the uncertainty concerning composition is greatest. The results indicate that the surveys should be conducted earlier in the month or accompanied by midwater trawling in order to accurately estimate the stock size of adult hake.

The surveys this year were the first to be based entirely on acoustic calibration of the system. In previous years, the system was calibrated to density by direct comparison with net hauls made each year. Two net hauls were made during 1974 as a check on the system performance. During the first haul, the integrator system predicted a catch of 770 lbs and the actual catch was only 390 lbs. On the second haul, a catch of 1,485 lbs was predicted, and the actual catch was 1,690 lbs. Thus, the total catch was 2,080 lbs compared to a predicted 2,255 lbs. The agreement was very good, considering the many sources of variability that affect the net catch.

LITERATURE CITED

- Thorne, R.E. 1973a. Digital hydroacoustic data-processing system and its application to Pacific hake stock assessment in Port Susan, Washington. NMFS Fisheries Bulletin 71:837-843.
- Thorne, R.E. 1973b. Acoustic survey of hake in Port Susan and vicinity during 1973. Univ. Wash., Fisheries Research Institute, Report 7311 (Final report service contract No. 522, Wash. Dept. Fish) 10 p.
- Thorne, R.E., E.P. Nunnallee and J.H. Green. 1972. A portable hydroacoustic data acquisition system for fish stock assessment. Wash. Sea Grant Publ. 72-4, 14 p.

px

Tig I

out for Res in
Fisheries

12/20/74

Table 1. Densities of fish observed during acoustic surveys of Port Susan and vicinity during February, 1974.

Transect	Section	Region	Density (lbs/m ²)	Transect	Section	Region	Density (lbs/m ²)
1	1	A	0.29	9	1	D	0.53
	2		0.18		2		1.71
	3		0.13		3		0.42
	4		0.14		4		0.13
2	1		0.30	10	1		0.12
	2		0.16		2		0.10
	3		0.13		3		0.08
	4		0.18		4		0.10
	5		0.30		5		0.09
3	1	B	0.60		6		0.14
	2		0.32		7		0.17
	3		0.16	11	1	E	0.07
4	1		0.59		2		0.06
	2		0.34		3		0.06
	3		0.24	12	1		0.08
	4		0.42		2		0.08
	5		2.74		3		0.09
5	1		0.13		4		0.10
	2		0.08	13	1		0.07
	3		0.13		2		0.07
	4	C	0.29		3		0.06
	5		0.47		4		0.08
	6		0.46		5		0.08
6	1		0.39	14	1	D	0.20
	2		0.40		2		0.14
	3		0.40		3		0.10
7	1		0.42		4		0.15
	2		0.18	15	1		0.16
8	1		0.18		2		0.36
	2		0.58		3		0.33
	3		2.59		4		0.13
	4	D	3.67	16	1		0.19
	5		0.91		2		0.45
	6		0.39		3		0.92

Table 2. Mean densities and populations of fish observed in various regions during acoustic surveys of Port Susan and vicinity, February and April, 1974

Date	Region (see Fig. 1)	Surface area(10^6m^2)	Mean density (lbs/m ²)		Population (10^6 lbs)	
			20-60m	60-140m	20-60m	60-140m
Feb. 74	A	30	--	0.199	--	5.98
	B	40	--	0.387	--	15.50
	C	30	--	0.600	--	18.01
	D	40	--	0.475	--	19.00
	E	50	--	0.074	--	3.68
	Total	--	--	--	--	--
Apr. 74	A	30	0.56	0.10	16.8	3.0
	B	40	0.13	0.14	5.3	5.6
	C	30	0.19	0.12	5.6	3.5
	D	40	0.18	0.24	7.2	9.6
	E	50	0.21	0.06	10.5	3.0
	Total	--	--	--	--	45.4

Table 3. Densities of fish observed during acoustic surveys of Port Susan and vicinity during April, 1974

Transect	Section	Region	Density (lbs/m ²)		Transect	Section	Region	Density (lbs/m ²)	
			20-60m	60-140m				20-60m	60-140m
1	1	A	0.83	0.12	6	1		0.11	0.23
	2		0.47	0.19		2		0.31	0.08
	3		3.17	0.16		3		0.20	0.26
	4		0.30	0.07		4		0.11	0.10
	5		0.18	0.11	7	1	0.33	0.28	
	6		0.42	0.05		2	0.33	0.14	
	7		0.48	0.04		8	1	0.61	0.11
2	1	0.05	0.04	2	0.13		0.15		
	2	0.13	0.05	3	0.17	0.15			
	3	0.16	0.10	4	D	0.21	0.18		
	4	0.39	0.09	5	0.15	0.10			
	5	0.13	0.14	6	0.14	0.12			
3	1	B	0.18	0.33	9	1		0.06	0.04
	2		0.26	0.11		2		0.20	0.40
	3		0.18	0.19		3		0.26	0.52
	4		0.13	0.16		4		0.15	0.27
	5		0.27	0.11		5		0.13	0.22
4	1	0.39	0.06		6	0.11	0.34		
	2	0.09	0.18		7	0.29	0.21		
	3	0.10	0.11		8	0.83	0.60		
	4	0.20	0.21	10	1	0.37	0.28		
	5	0.10	0.09		2	0.16	0.42		
	6	0.01	0.0		3	0.20	0.28		
5	1	0.09	0.04		4	0.06	0.37		
	2	0.07	0.05		5	0.06	0.17		
	3	0.04	0.04		6	0.03	0.03		
	4	0.05	0.05		7	0.01	0.01		
	5	0.05	0.03		8	0.01	0.01		
	6	0.04	0.05		11	1	E	0.27	0.02

Table 3 - continued

Transect	Section	Region	Density (lbs/m ²)		Transect	Section	Region	Density (lbs/m ²)	
			20-60m	60-140m				20-60m	60-140m
5	7	C	0.05	0.06	2			0.53	0.04
	8		0.11	0.07		3		0.29	0.02
	9		0.09	0.07		4		0.15	0.29
	10		0.09	0.01		5		0.25	0.03
	11		0.06	0.02					
	12		0.06	0.0					
12	1	E	0.33	0.0					
	2		0.10	--					
	3		0.09	0.01					
	4		0.10	0.03					
	5		0.11	0.07					
	6		0.11	0.12					
	7		0.20	0.03					
13	1		0.30	0.06					
	2		0.24	0.03					
	3		0.25	0.04					
	4		0.17	0.08					
	5		0.17	0.12					
	6		0.09	0.09					