



Oregon's Sardine Fishery
2001 Summary

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INTRODUCTION

Background

Sardines are managed under the Pacific Fishery Management Council's Coastal Pelagic Species Fishery Management Plan (FMP). Under the FMP, the biomass of sardines is estimated each year and a coast-wide harvest guideline is established. The harvest guideline is then allocated 2/3 to the southern California fishery and 1/3 to the northern California, Oregon, and Washington fisheries. The division between northern and southern areas is Point Piedreas Blancas (35°40' N). Any portion of the harvest guideline that is unused by October may be re-allocated 50/50 between the northern and southern areas.

Except for the coast-wide harvest guideline, management of sardines north of 39° N continues under state management as long as the management measures are consistent with the FMP. In Oregon, sardines are managed under the Developmental Fishery Program which limits the number of harvest permits. Prior to 2001, 15 permits were allowed and all were issued in 1999 and 2000. Fourteen permits were renewed from 2000 and we received 35 applications for the remaining one permit which was issued through a lottery in February. In April 2001, five additional permits were added (for a total of 20) to encourage an increase in processing capabilities. The first five names on the waiting list from the lottery in February were offered permits which were issued by the end of May.

Goals and Objectives

The goals for this year's work were to continue to gather information on sardines off Oregon to improve the coast-wide stock assessment of sardines and document the extent of by-catch in the fishery.

Objectives include:

- Collect size, age, and distribution data of adult sardines off Oregon, from both the harvest areas and outside harvest areas.
- Document bycatch, in terms of species, amount, and condition. Recommend management measures to reduce by-catch if necessary.
- Document harvest methods, distribution of harvest, and catch per unit of effort.

FISHERY DESCRIPTION

Landings / Effort

The first directed landings of sardines into Oregon since 1948 occurred in 1999 for a total of 1.7 million pounds (775.7 mt) by three vessels. In 2000, just over 21 million pounds (9,524 mt) were landed by 14 vessels.

In 2001, over 28.2 million pounds (12,798 mt) were landed. Eighteen vessels targeted sardines using seine gear, six vessels landed a small amount as incidental catch in the whiting fishery with

trawl gear and a small amount was also harvested from Winchester Bay for a local bait market. The seine vessels made 453 landings averaging 62,260 lb per landing. The incidental and estuary harvest totaled approximately 11,000 lb. Table 1 compares details for the 1999, 2000, and 2001 fisheries.

Of the 18 vessels targeting sardines, seven made 90 % of the landings (Figure 1). Each of these seven worked during 13 - 17 weeks of the fishery. Three vessels worked during 4 -7 weeks and eight vessels worked during 1 -2 two weeks of the fishery. Six vessels made only one landing; just enough to qualify their permit for renewal.

In the three years of the fishery, landings began in early to mid-June and continued through mid-September through mid-October (Figure 2). Ocean conditions and weather that allow effective operation of the gear are a major factor determining the start and end of the fishery. In late August, a storm prevented fishing for several days, the fish dispersed, and fishing halted for over two weeks until the fish were again available. After the terrorist attacks of September 11, the spotter planes were grounded for nine days. Several boats left the fishery, others used sonar to locate fish. Once the planes were able to fly again, foggy weather reduced flying and fishing. Final landings were made in early October.

Markets

In 2000, processing capacity was a major factor in determining landings. Three processors bought sardines in 2000; one of the three did not continue in 2001. To encourage investments by processors, five additional harvest permits were added in 2001. Three additional plants bought fish in 2001 for a total of five processors. Average ex-vessel price was \$0.06 per pound (\$120 per ton), compared to \$0.05 per pound in 1999 and 2000.

Table 1. Comparison of 1999, 2000, and 2001 Oregon sardine fisheries.

	1999	2000	2001
pounds landed (metric tons)	1,709,686 (776)	21,005,311 (9,528)	28,214,988 (12,798)
permits issued	15	15	20
vessels targeting sardines	3	14	18
landings by target vessels	23	349	453
average landing (lb)	74,306	60,183	62,260
start date	6/21	6/14	6/4
end date	9/15	10/12	10/5
processors	1	3	5
average ex-vessel price	\$0.05	\$0.05	\$0.06

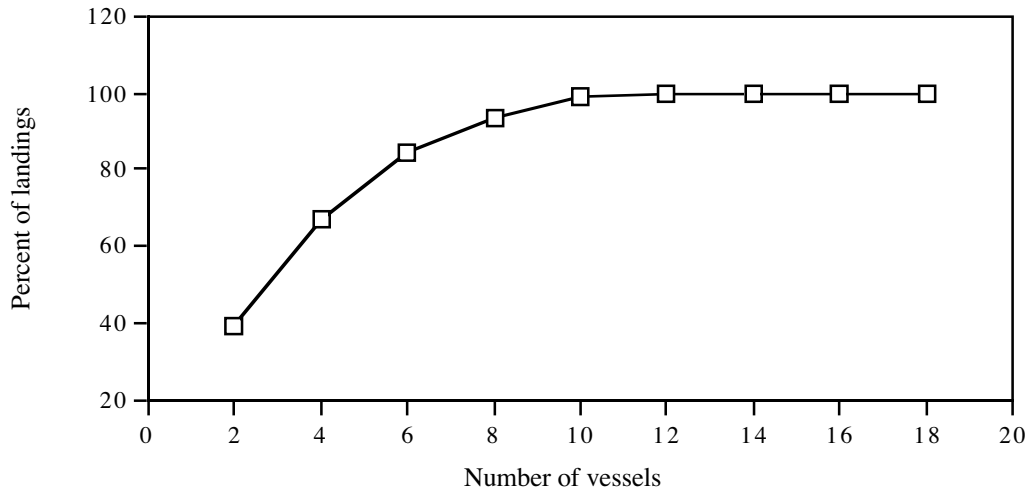


Figure 1. Cumulative percent of landings of sardines into Oregon, 2001.

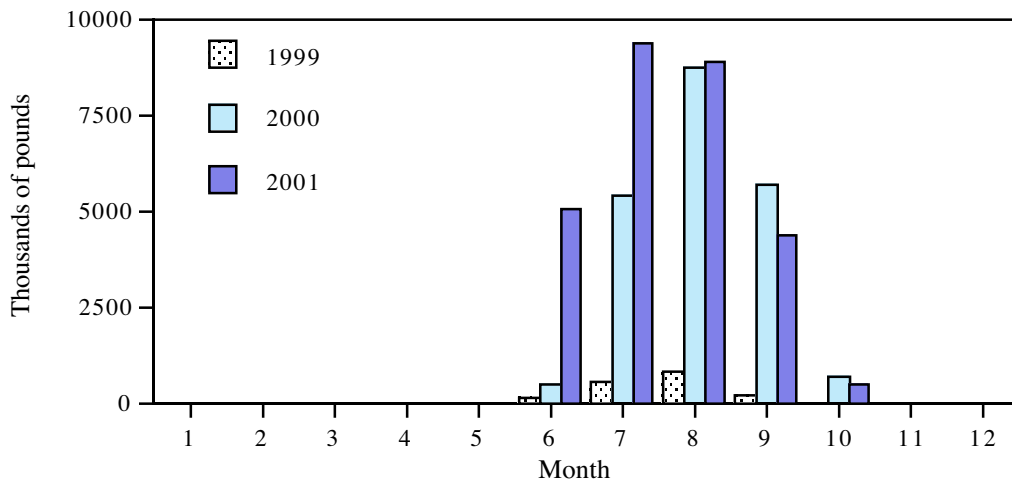


Figure 2. Monthly landings of sardines into Oregon, 1999-2001.

Area of catch

Logbooks are required as a provision of the permit. Logs turned in by November 15 accounted for 92 % of the landings. The area of catch in 2001 was approximately 15 nm north and 25 nm south of the Columbia River and out to approximately 25 nm off shore (Figure 3). This area is similar to the area fished in 2000, but extends slightly farther to the south. Depths in the harvest area ranged from 5 fm to over 285 fm, with an average of 49 fm. Based on log data, 73 % of the pounds landed were taken off Oregon and 27 % off Washington.

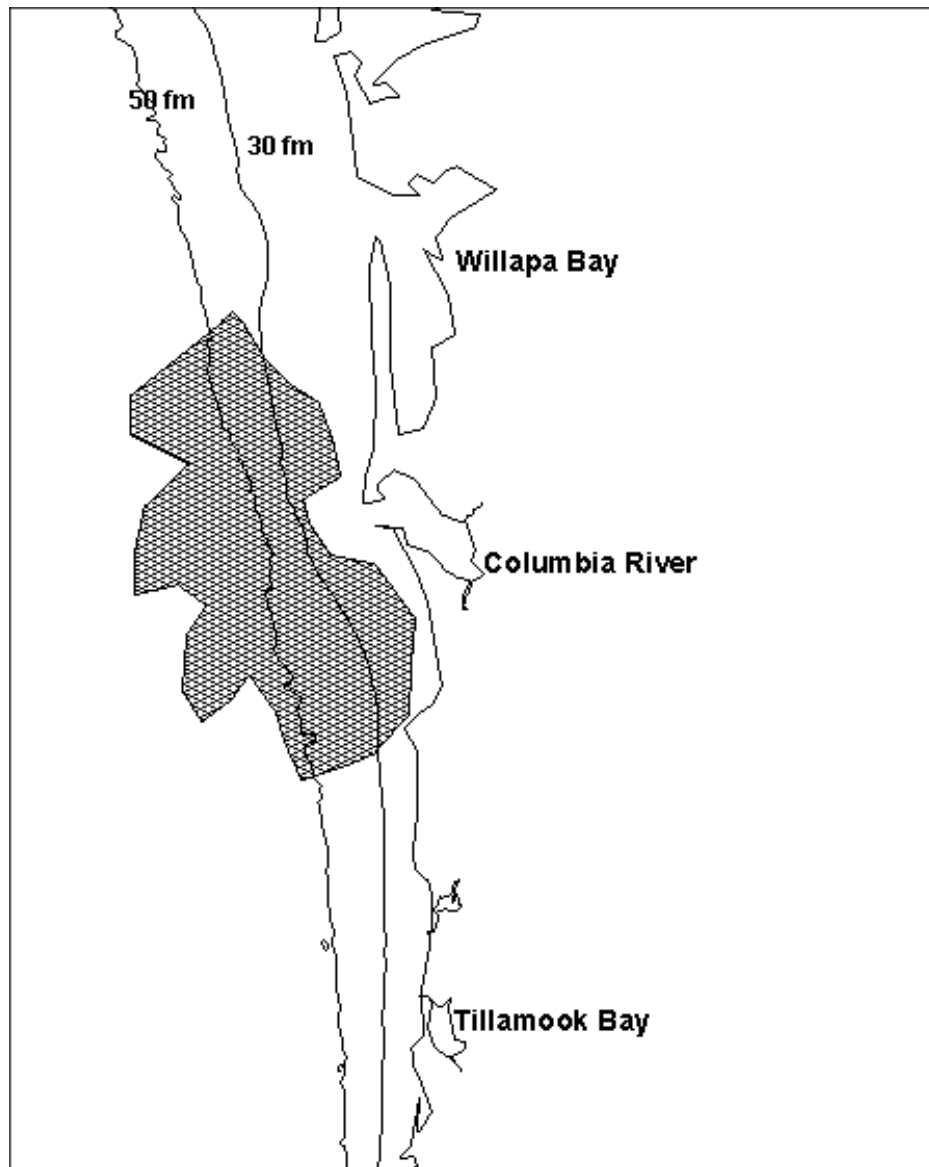


Figure 3. Area of harvest for Oregon's sardine fishery, 2001.

NON-TARGET SPECIES

Bycatch

A seasonal employee was hired for the main purpose of riding along on sardine vessels and observing bycatch of non-target species. Twenty one trips were observed (4 % of the total trips landed in Oregon). Vessel skippers also were required to record all species caught in the logbook. Logs turned in by November 15 accounted for 92 % of the landings.

Based on both observer and logbook data, bycatch was low. Bycatch (species caught but not landed) included chinook, coho, and pink salmon, dogfish, blue, and thresher sharks, and herring (Table 2). Numerous jellyfish were also observed in the net and pumped into the hold but not quantified. Salmon was the major species of concern. The species of salmon was usually not recorded on the log sheets and they were occasionally released before the observers could determine the species. Observed salmon averaged 1.0 salmon per trip, with 64 % being released alive. The estimated total catch of salmon for the fishery, based on observer data, is 491 salmon (0.038 salmon/mt), down from an estimated 663 (0.070 salmon/mt) in 2000 (Table 3).

Table 2. Observed and reported catches of non-target species caught in Oregon sardine fishery, 2001.

Species	Logbook data	Observer data	
	# Caught	# Released Alive	# Dead
Dogfish shark	20	1	1
Blue shark	1		
Thresher shark	1		
unknown shark	1		
Pink salmon		1	
Chinook salmon		2	2
Coho salmon		9	6
Salmon (unknown)	472 (311-alive; 161-dead)	2	
Herring		50,000 lb	
Mackerel	275,165 lb		16,400 lb
Jellyfish			undetermined

Table 3. Observed and expanded total number of salmon caught in sardine fishery, 2000-2001. Expanded total is based on salmon/trip.

	Chinook		Coho		Pink	Unknown		Total		Grand total
	alive	dead	alive	dead	alive	alive	dead	alive	dead	
2001 observed	2	2	9	6	1	2	-	14	8	22
2001 expanded total	45	45	201	134	22	45	-	313	179	491
2000 expanded total	43	72	159	43	-	303	43	504	159	663

Incidental catch

Incidental catch (landed non-target species) recorded on fish tickets consisted of 52.8 mt of Pacific mackerel and 1.2 mt of jack mackerel, for a total of 0.4 % of the total catch (Table 4).

Table 4. Recorded incidental catch (mt) in Oregon sardine fishery, 2000-2001 (from fish ticket data).

Species	2001		2000	
	mt landed	percent of catch	mt landed	percent of catch
Pacific mackerel	52.8	0.4	27.3	0.3
Jack mackerel	1.2	< 0.1	18.2	0.2

BIOLOGICAL SAMPLES

Staff collected 40 biological samples of 25 sardines, each for a total of 1000 fish. Two of the samples were from incidental catch of the whiting fishery. The rest were from seine vessels targeting sardines. Data collected from each fish included weight (gm), standard length (mm), sex, and maturity. Otoliths were extracted and sent to California Department of Fish and Game (CDFG) for age-reading. Other data included on the data sheets were vessel, date, and location and depth of catch. Sex and maturity were determined using the CDFG Sex and Maturity Stages of Pacific Sardine, *Sardinops sagax*, and Pacific Mackerel, *Scomber japonicus*. Sexual maturity codes 1-5 were used for the sardine samples (Table 5). Appendix Table A summarizes the data for each sample collected in 2001.

Table 5. CDFG sex and maturity stages of Pacific sardine.

Code	Description
1	Virgin individuals.
2	Maturing virgins or recovering spent.
3	Sexual organs becoming swollen.
4	Ovaries and testis nearly filling 2/3 of ventral cavity.
5	Ovaries and testis filling ventral cavity.
6	Roe and milt running.

The weight of individual fish ranged from 46 gm to 241 gm, with an overall average of 154 gm. Standard length ranged from 145 mm to 256 mm, with an overall average of 212 mm. Eighty percent of the individuals were between 198 mm and 227 mm in length (Figure 4). As seen in 2000, females averaged slightly larger than males (Table 6). Average length and weight did not show the gradual decline over the season as seen in 2000 (Figure 5). However, fishers commented on the large amount of very small fish (3 - 4 in) the latter half of the season. These small fish were not captured in the biological samples as the harvesters tried to avoid them. They were small enough to be a nuisance by becoming gilled in the web of the seine nets.

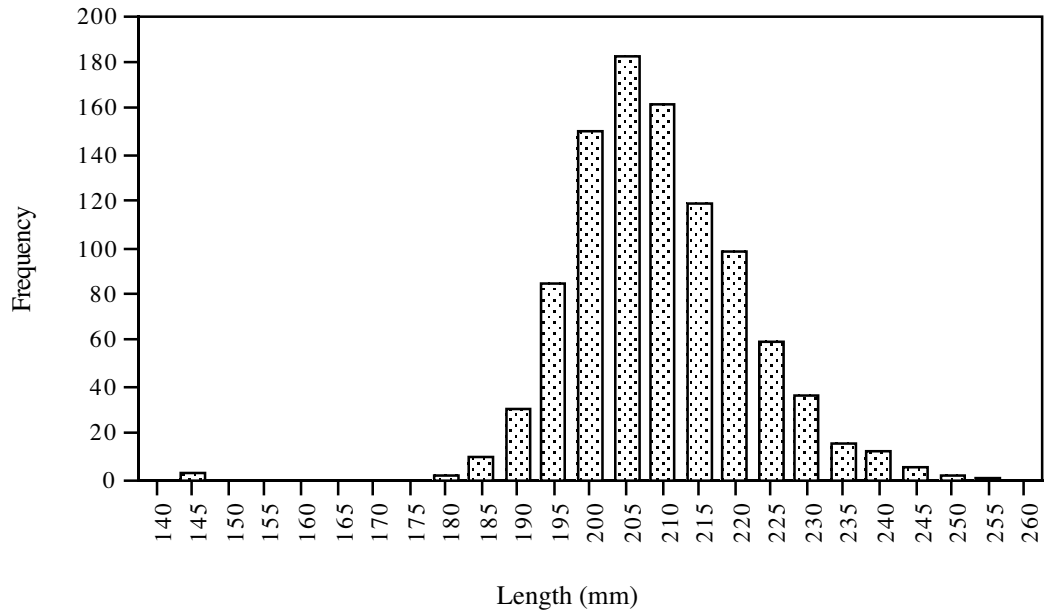


Figure 4. Length frequency of all sardines sampled in 2001.

Table 6. Average and range of weight (gm) and length (mm) of sardines sampled from Oregon sardine fishery, 2001 and total for 2000.

		unknown	Males	Females	Total 2001	Total 2000
Weight (gm)	average	46.8	152.8	155.1	153.8	153.4
	range	46.4-47.1	90.8-238.0	95.3-241.0	46.4-241.0	79.9-273.3
Length (mm)	average	147	212	212	212	209
	range	145-149	187-246	184-256	145-256	118-257

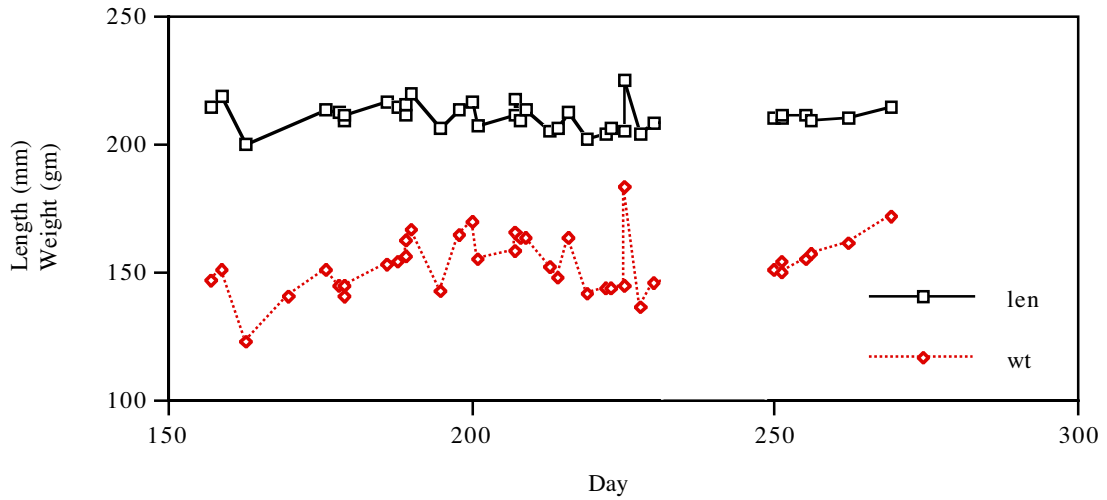


Figure 5. Average standard length (mm), and weight (gm) of sardines, over time, 2001 (N=975).

Age data returned from CDFG show a similar overall age composition as in 2000 (Figure 6). However, the age composition throughout the season was more evenly distributed in 2001 than in 2000 (Figures 7 & 8). In 2000, ages 1 and 2 made up a very small percentage of the samples until the latter half of the season. Average length-at-age in 2001 was similar to 2000 (Figure 9).

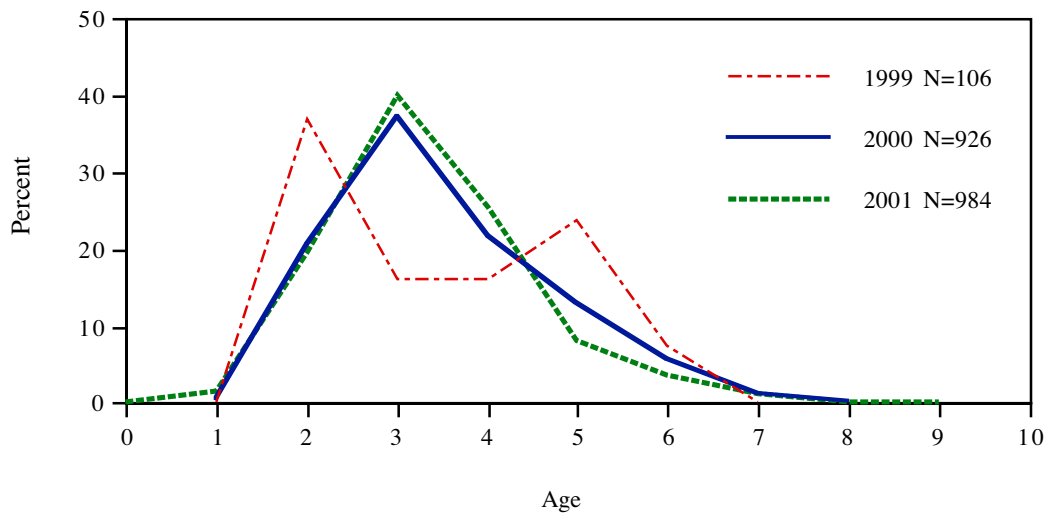


Figure 6. Age composition (%) of sardines samples in Oregon, 1999 - 2001.

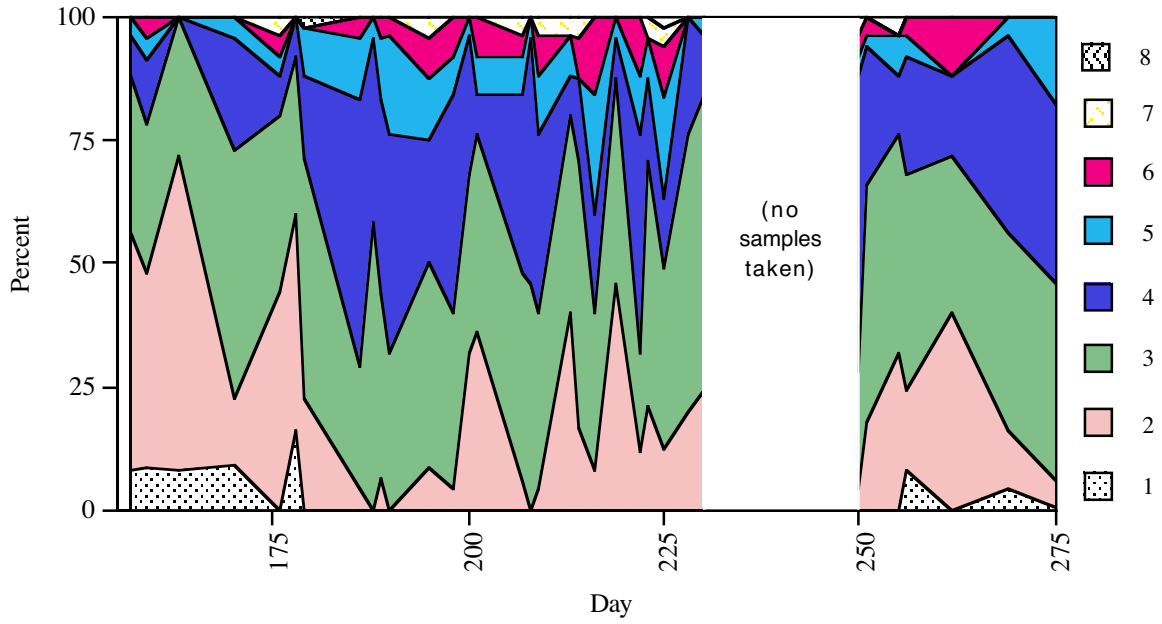


Figure 7. Age composition (%) over time, of sardines sampled in 2001.

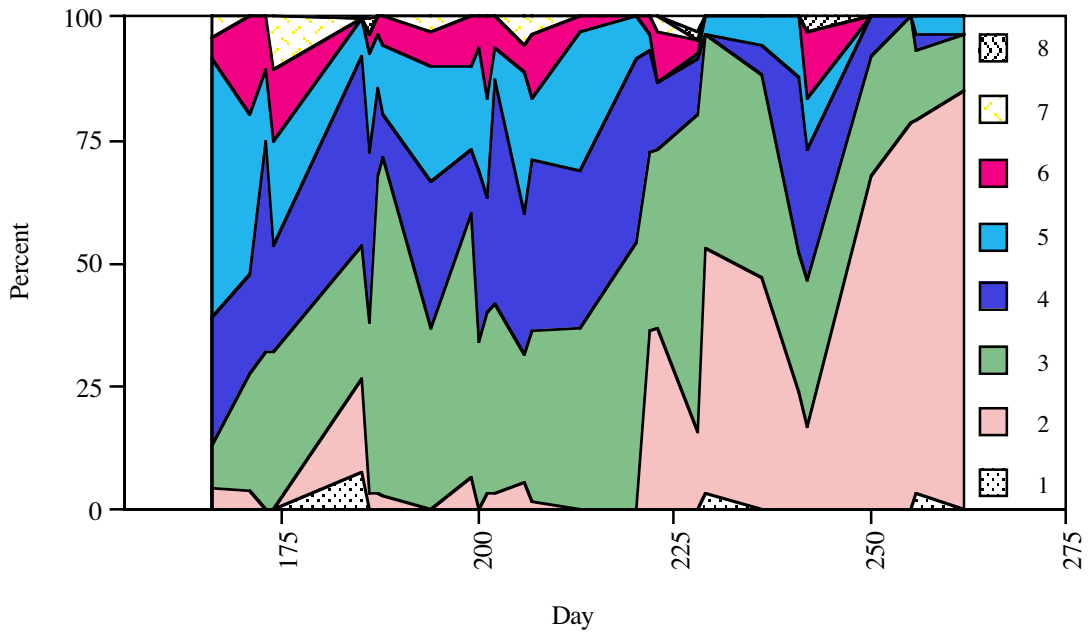


Figure 8. Age composition (%) over time, of sardines sampled in 2000.

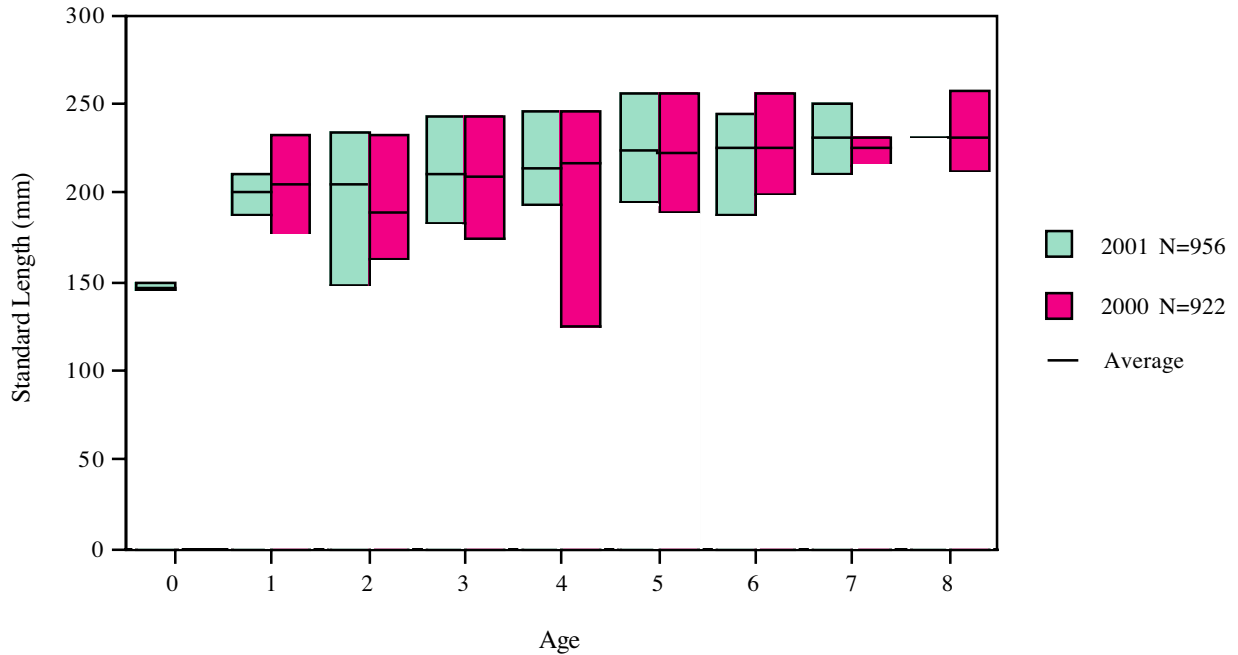


Figure 9. Average, minimum, and maximum standard length (mm) by age of sardines sampled, 2000-2001,

The sex composition of samples ranged from 16 % males to 60 % males, with an over all M/F ratio of 41/59. The majority of fish samples were of maturity condition 2. Most condition 3's and 4's were seen at the beginning of the season and condition 1's toward the end of the season (Figure 10), as was the case in 2000. Most all fish of condition 1 were small than 220 mm and conditions 3-5 were larger than 220 mm (Figure 11).

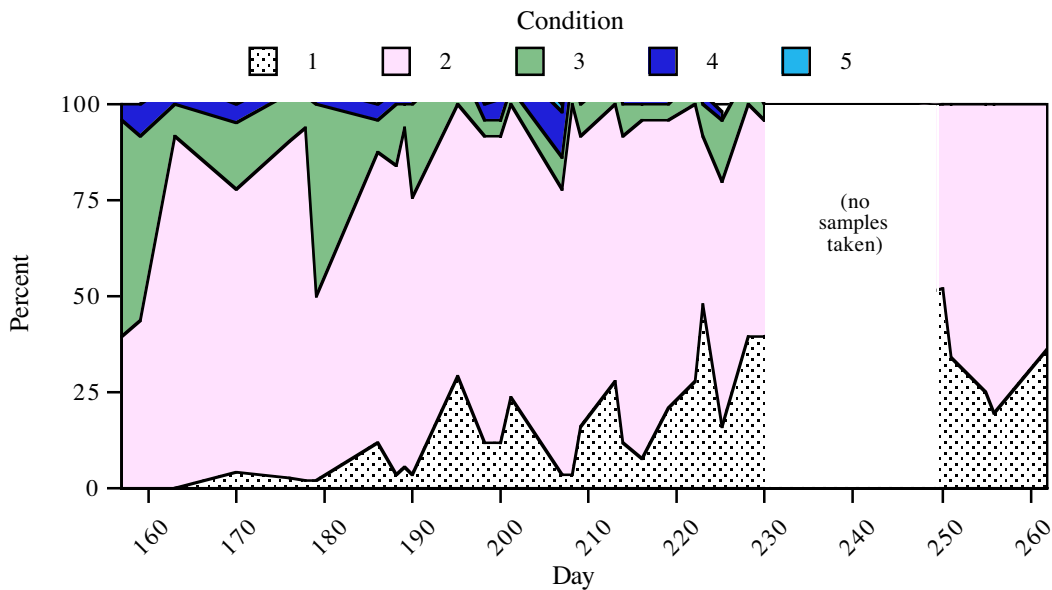


Figure 10. Maturity condition composition (%) of sardines, over time, 2001.

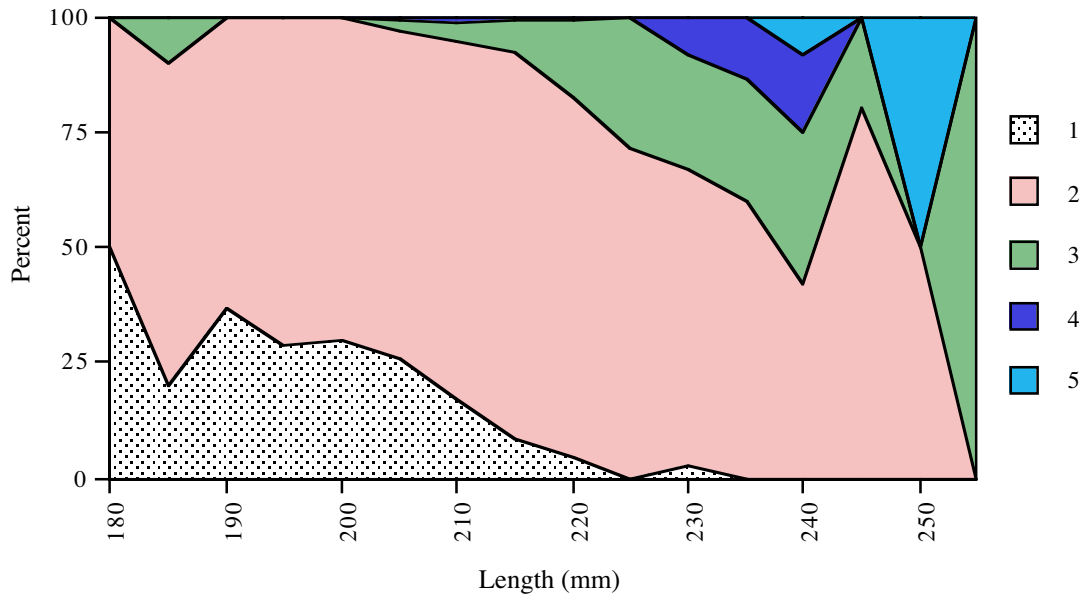


Figure 11. Maturity condition composition (%) by length (mm), of sardines collected in 2001.

OIL CONTENT

One processing plant, Astoria Pacific Seafoods collected oil content data from most of their landings in 2001. Each sample consisted of four fish of similar size and weight that were headed and gutted. Oil content of individual samples ranged from 3% at the beginning of the season to 23% taken on 9/22/01 (Table 7).

Table 7. Average oil content from samples by Astoria Pacific Seafoods, 2001.

Catch No.	Date	Oil Content	
1 to 5	June 9 to June 14	3%	
6 to 14	June 15 to June 23	5%	
15 to 21	June 16 to June 30	6%	
22 to 26	July 1 to July 6	8%	
27 to 50	July 7 to July 21	Average 13.78 %	(51 oil tests)
51 to 64	July 22 to July 31	Average 17%	(21 oil tests)
65 to 84	Aug 1 to Aug 15	Average 17.01%	(55 oil tests)
85 to 91	Aug 16 to Aug 20	Average 19.23%	(13 oil tests)
	Aug 21 to Sept 4	no fish due to weather	
92 to 106	Sept 5 to Sept 22	Average 18.4	(27 oil tests)

FUTURE ISSUES / RECOMMENDATIONS

From a management perspective, the sardine fishery in 2001 went smoothly. Bycatch was low and no major conflicts arose. For 2003, we plan to continue the at-sea observations for bycatch and a similar biological sampling program.

Presently, the landing requirement to renew permits is low compared to an average daily landing. With the high degree of interest in obtaining permits, there is interest in increasing the renewal requirements to make them more representative of average landings and to allow some turn-over in the permits. However, processing capability continues to be a factor limiting landings.

ACKNOWLEDGMENTS

Many big thanks go to: Morgan Grobe for his observer work at-sea and for collecting most of the samples and data; others at the Astoria office for collecting samples and general assistance; Keith Matteson for working up the biological samples; Darrin Bergen and CDFG for the age reading work; Astoria Pacific Seafoods for providing their oil content data; and all the vessel skippers and crew members for their cooperation.

Appendix Table A. Data summary for 2001 Oregon sardine biological samples.

Sample date	Julian day	No. of males	No. of females	Ave. wt (gm)	Ave.len (mm)	% Maturity code				
						1	2	3	4	5
6/6/01	157	10	15	147.8	215		40	56	4	
6/8/01	159	12	13	151.9	219		44	48	8	
6/12/01	163	13	12	123.0	201		92	8		
6/19/01	170	10	13	141.4		4.3	73.9	17.4	4.3	
6/25/01	176	15	10	151.8	214		88	12		
6/27/01	178	12	13	145.5	213		92	8		
6/28/01	179	7	18	141.5	210		92	8		
6/28/01	179	9	16	145.6	212	4	4	92		
7/5/01	186	12	13	153.6	217	12	76	8	4	
7/7/01	188	11	14	155.1	215	4	80	16		
7/8/01	189	8	17	156.5	212	4	88	8		
7/8/01	189	13	12	162.8	216	8	88	4		
7/9/01	190	8	17	167.3	220	4	72	24		
7/14/01	195	11	16	143.6	207	29.6	70.4			
7/17/01	198	13	12	165.5	214	12	80	4	4	
7/19/01	200	12	13	170.6	217	12	80	4		4
7/20/01	201	15	10	156.0	208	24	76			
7/26/01	207	10	15	159.1	212	8	88	4		
7/26/01	207	11	14	166.6	218		60	12	24	4
7/27/01	208	13	12	164.2	210	4	96			
7/28/01	209	11	14	163.7	214	16	76	8		
8/1/01	213	8	17	152.1	206	28	72			
8/2/01	214	12	13	148.0	207	12	80	8		
8/4/01	216	13	12	163.9	213	8	88	4		
8/7/01	219	10	14	141.7	203	20.8	75	4.2		
8/10/01	222	5	20	144.0	205	28	72			
8/11/01	223	8	17	144.7	207	48	44	8		
8/13/01	225	6	18	145.5	206	33.3	66.7			
8/13/01	225	15	10	183.9	225		64	32	4	
8/16/01	228	7	18	137.1	205	40	60			
8/18/01	230	4	21	146.4	209	40	56	4		
9/7/01	250	11	14	151.6	211	52	48			
9/8/01	251	11	14	154.9	211	20	80			
9/8/01	251	8	17	150.2	212	48	52			
9/12/01	255	7	17	155.9	212	25	75			
9/13/01	256	11	14	158.0	210	20	80			
9/19/01	262	8	17	161.7	211	36	64			
9/26/01	269	9	16	172.0	215	24	76			
10/3/01	276	14	11	152.9	210	12	88			
na	na	10	15	154.4	210	44	56			
Total		413	584	153.8	212	17.1	71.3	10.0	1.3	0.2