

UTILIZATION OF FLATFISH CAUGHT BY OREGON
TRAWLERS IN 1974

by
Neil TenEyck
and
Robert Demory

INFORMATIONAL REPORT 75-3

Oregon Department of Fish and Wildlife

August 1975

UTILIZATION OF FLATFISH CAUGHT BY OREGON TRAWLERS IN 1974

INTRODUCTION

This report deals with utilization of five species of flatfish caught in the Oregon trawl fishery for human food. Utilized fish are those kept and marketed (saleable) from the total catch. Discarded fish are small flatfish and unmarketable species. Herrmann and Harry (1963) reported nearly half the catch was of negligible value and was discarded at sea, including all species caught. Since fishery statistics are readily available only for marketed (landed) fish, utilization rates are a means of converting landed catch to the catch at sea (discarded and kept). Also a realistic model of the fishery should reflect the effects of discard since discards are a part of fishing mortality.

In the summer of 1974 sampling at sea was undertaken to estimate utilization rates. The objective was to determine age-specific utilization rates by sex, for the following flatfish species: Dover sole, English sole, petrale sole, rex sole, and Pacific sanddab.

Similar sampling has been done previously. Herrmann (unpublished FCO data) established a data base for discard of petrale, English and Dover sole, based on unsexed length frequencies from 1959-61. However, gear changes and the need for more sophisticated data severely limit the usefulness of that data. Herrmann and Harry (op cit.) described the composition of catches prior to sorting, aboard trawlers in 1950.

METHODS

Catch Sampling

Commercial catches were sampled at sea aboard the following trawlers:

Vessel	Date	Cod End Mesh Size, Stretched measure, between knots, inches
F/V Betty A	June 25-26, 1974	4.5
F/V Dare II	July 18, 1974	4.4
F/V Marion F	Aug. 29-30, 1974	4.5
F/V Midnight Sun	Aug. 21-22, 1974	5.3 and 6.0 (two nets)
F/V Nel-Ron-Dic	June 14, 1974	4.5
F/V Rose Ann Hess	July 31 - Aug. 1, 1974	3.6
F/V Storm	Aug. 14-20, 1974	3.9
F/V Western	July 13-15, 1974	4.4

Two sampling designs were used. With the first, the discarded flatfish were sampled systematically at a rate that varied from all to one-tenth of the discard. All tows were sampled if possible and hours fished were recorded. Reliable hauls (estimates) of fish kept and discarded were essential with this method since not all species could be sampled per tow and some tows could not be sampled.

The second sampling design was more direct. Unsorted catch was sorted and weighed to establish the ratio of discards to market fish in the catch by species. All tows were sampled if possible and hours fished were recorded.

Age Sampling

Discarded and landed fish were sampled similarly in both designs. Lengths were recorded to the nearest centimeter on plastic measuring strips (Davenport and Harling, 1965). Age structures collected were interopercles from English sole and otoliths from all other species. To eliminate the need for taking otoliths or interopercles at sea, heads were severed, put in plastic bags by tow and sex and returned to the laboratory for processing. Landings were sampled, incompletely in most cases, at the dock when a trip was finished.

Data Analysis

Utilization is the ratio of landed catch to the gross catch, by age. The gross catch is the sum of the discarded and landed fish. Catch was reduced to numbers of fish caught per hour.

Before catch rates could be calculated, the total numbers of fish landed and discarded has to be estimated. Landed weight was converted to number of fish landed using length-weight keys. The numbers of fish discarded were calculated by tow and accumulated by trip. In some cases, all the discard of a small catch was sampled. In the case of a systematic sample the number of fish sampled was multiplied by the sampling rate to estimate total numbers. By either method the number caught by sex was obtained.

When a species was not sampled on a tow or a tow was not sampled, the weight of discard was estimated visually. Total weight was then converted to weight by sex via length-weight keys from samples of discard obtained from previous tows. The weight by sex was then converted to number by mean weight.

Age frequencies were used to apportion the discard catch, in numbers per hour, into age groups by trip. All trips were then combined. Sample size ranged from 123 to 1,224 fish (Table 1). Because all landings were not sampled, age composition of the landed catch was determined from a composite age frequency of market samples taken during the period of sampling. Sample size varied from 16 to 1,139 fish.

Table 1. Sample size of composite age frequencies, by species, sex and use.

Species	Sex	Discarded	Marketed
Dover sole	Male	699	508
	Female	557	1,139
English sole	Male	792	98
	Female	223	935
Petrale sole	Male	179	365
	Female	123	245
Rex sole	Male	912	120
	Female	1,224	321
Pacific sanddab	Male	241	16
	Female	400	246

RESULTS AND DISCUSSION

Age specific utilization showed significant differences between species and, in some cases, between sexes within species. Dover sole males and females did not reach full utilization until age 12, but females were very near full utilization at age 10. English sole males were not fully utilized until age 16 whereas females were fully utilized by age 13. Anomalies were apparent in male English sole utilization (Figure 2) at age 14 and were probably caused by the few observations plus

the fact that the males seldom reach age 14. In any case few male English sole reach acceptable size at any age. Petrale sole reached full utilization at the earliest age, age 9 for males and females (Table 2). Rex sole males approached full utilization only at maximum age while sanddab males never exceeded a 0.21 utilization rate. Females of rex sole and sanddab achieved full utilization only near maximum age. Utilization curves, fitted by eye, are shown in Figures 1-5.

Overall utilization (market catch divided by gross catch) rates ranged from 0.82 for English sole females to just 0.04 for sanddab males. With the exception of petrale sole the females of all species were more heavily utilized than males. Only males of Dover sole and petrale sole achieved utilization of greater than 0.50 while males of English, rex sole and sanddabs were less than 0.25 utilization (Table 2).

Age at 50% utilization was also quite variable ranging from 3.6 years for English sole females to 9.0 years for rex sole males. In all species the age at 50% utilization was less for females than it was for males (Table 2).

Mesh size is a source of variation in utilization rates. Mesh size in the cod end ranged from 3.6 to 6.0 inches stretch measure between knots. However, the mesh size most often used was about 4.5 inches. Best (1961) found that size of fish caught was a function of mesh size. Utilization rate would therefore be correlated with mesh size.

A second potential source of variation was the effect of a strong year class upon fishermen's size selections. This is somewhat apparent for petrale sole and rex sole females at age 3.

A third source of variation was inherent in the sampling method. Any method that must rely on visual estimates of weight may be highly variable.

The second sampling design was superior because tows were independent of further sampling. The first sampling design relied on sampling all tows in a trip, but night tows, rough seas, or unusually large catches disrupted this sampling design.

Table 2. Age Specific Utilization Rates, Overall Utilization, and Age at 50% Utilization of Flatfish Caught by Oregon Trawlers in 1974. Based on Numbers Caught per Hour.

Age	Dover sole		English sole		Petrale sole		Rex sole		Sanddab	
	M	F	M	F	M	F	M	F	M	F
	0	0	0	0	0	0	0	0	0	0
	0	0	0.04	0	0	0	0	0	0	0
3	0	0	0.01	0.32	0	0.07	0	0.23	0	0
4	0.22	0	0.04	0.62	0.03	0.03	0.11	0.11	0	0
5	0.11	0.14	0.05	0.81	0.29	0.36	0.18	0.41	0.02	0
6	0.28	0.29	0.03	0.94	0.64	0.78	0.24	0.39	0.03	0.15
7	0.29	0.53	0.06	0.93	0.92	0.92	0.25	0.56	0.04	0.49
8	0.56	0.70	0.12	0.95	0.99	0.97	0.39	0.69	0.05	0.61
9	0.88	0.99	0.19	0.96	1.00	1.00	0.55	0.82	0.21	0.70
10	0.95	0.98	0.17	0.95	1.00	1.00	0.59	0.83	0.10	0.89
11	0.98	0.98	0.22	0.97	1.00	1.00	0.82	0.85	-	0.74
12	1.00	1.00	0.18	0.82	1.00	1.00	1.00	1.00	-	0.68
13	1.00	1.00	0.21	1.00	1.00	1.00	0.56	0.97	-	1.00
14	1.00	1.00	0	1.00	1.00	1.00	-	-	-	1.00
15	1.00	1.00	0	1.00	1.00	1.00	-	-	-	-
16	1.00	1.00	1.00	1.00	-	1.00	-	-	-	-
17	1.00	1.00	1.00	1.00	-	1.00	-	-	-	-
18	-	1.00	-	-	-	1.00	-	-	-	-
19	-	1.00	-	-	1.00	1.00	-	-	-	-
20	-	1.00	-	-	-	1.00	-	-	-	-
>20	-	1.00	-	-	-	1.00	-	-	-	-
Overall utilization	0.62	0.78	0.07	0.82	0.67	0.63	0.25	0.59	0.04	0.39
Age at 50% utilization ^{1/}	7.4	6.9	-	3.6	5.6	5.1	9.0	6.3	-	7.1

^{1/} Values lifted from eye-fitted curve of Figures 1-5.

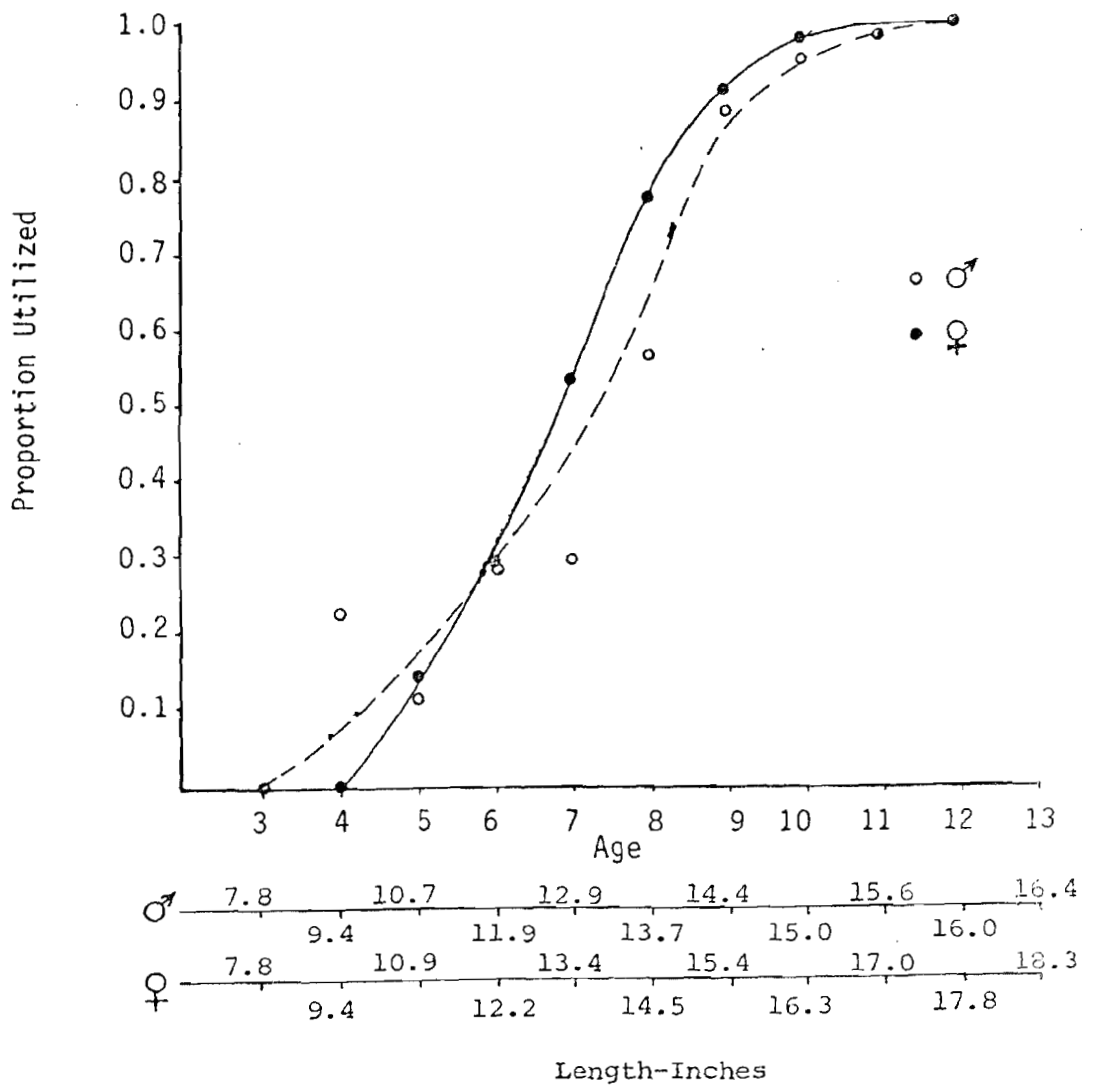


Figure 1. Utilization of Dover sole caught by Oregon trawlers in 1974

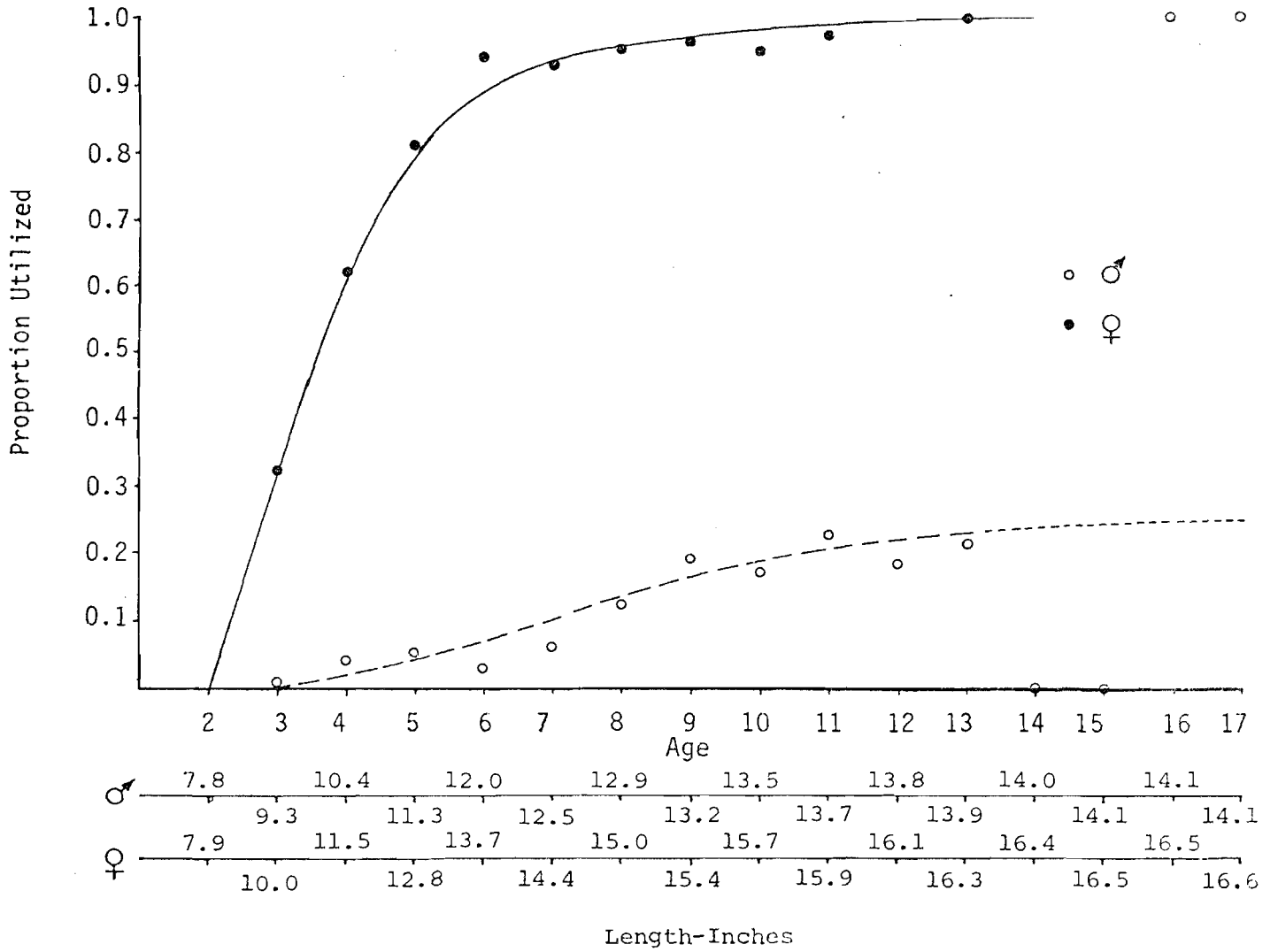


Figure 2. Utilization of English sole caught by Oregon trawlers in 1974

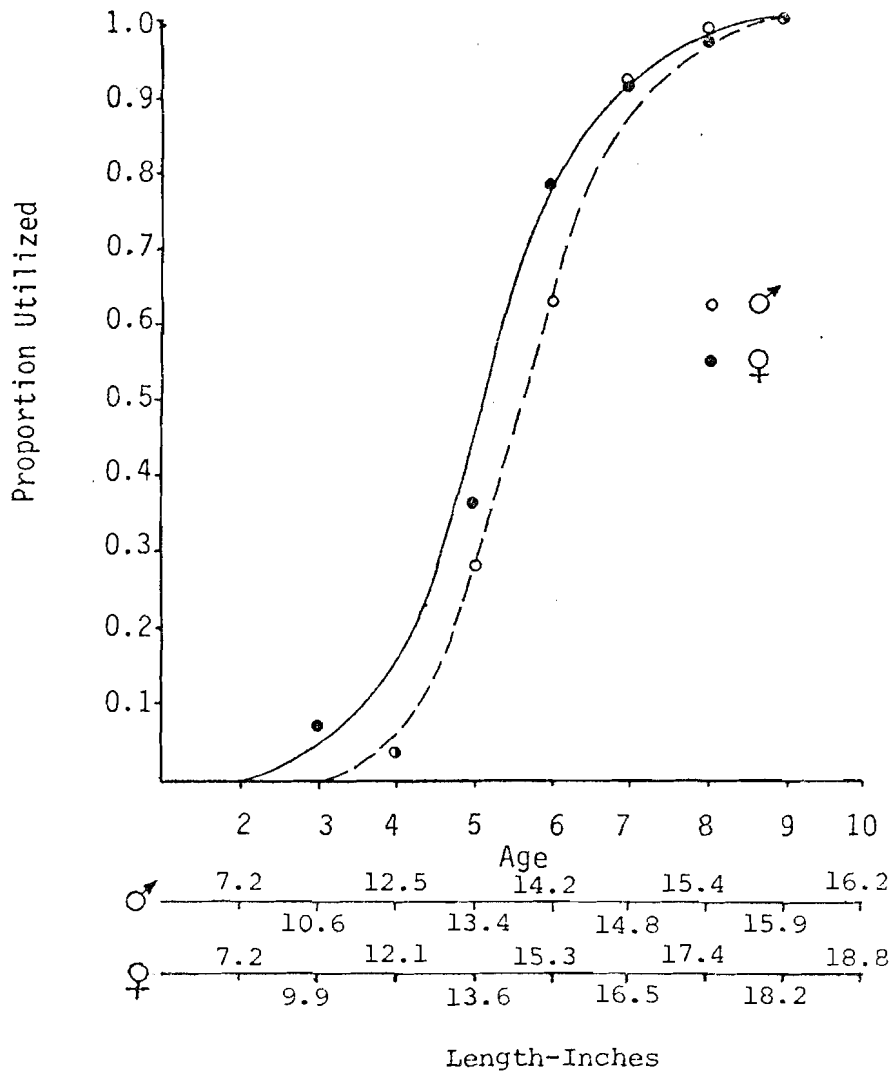


Figure 3. Utilization of Petrale sole caught by Oregon trawlers in 1974

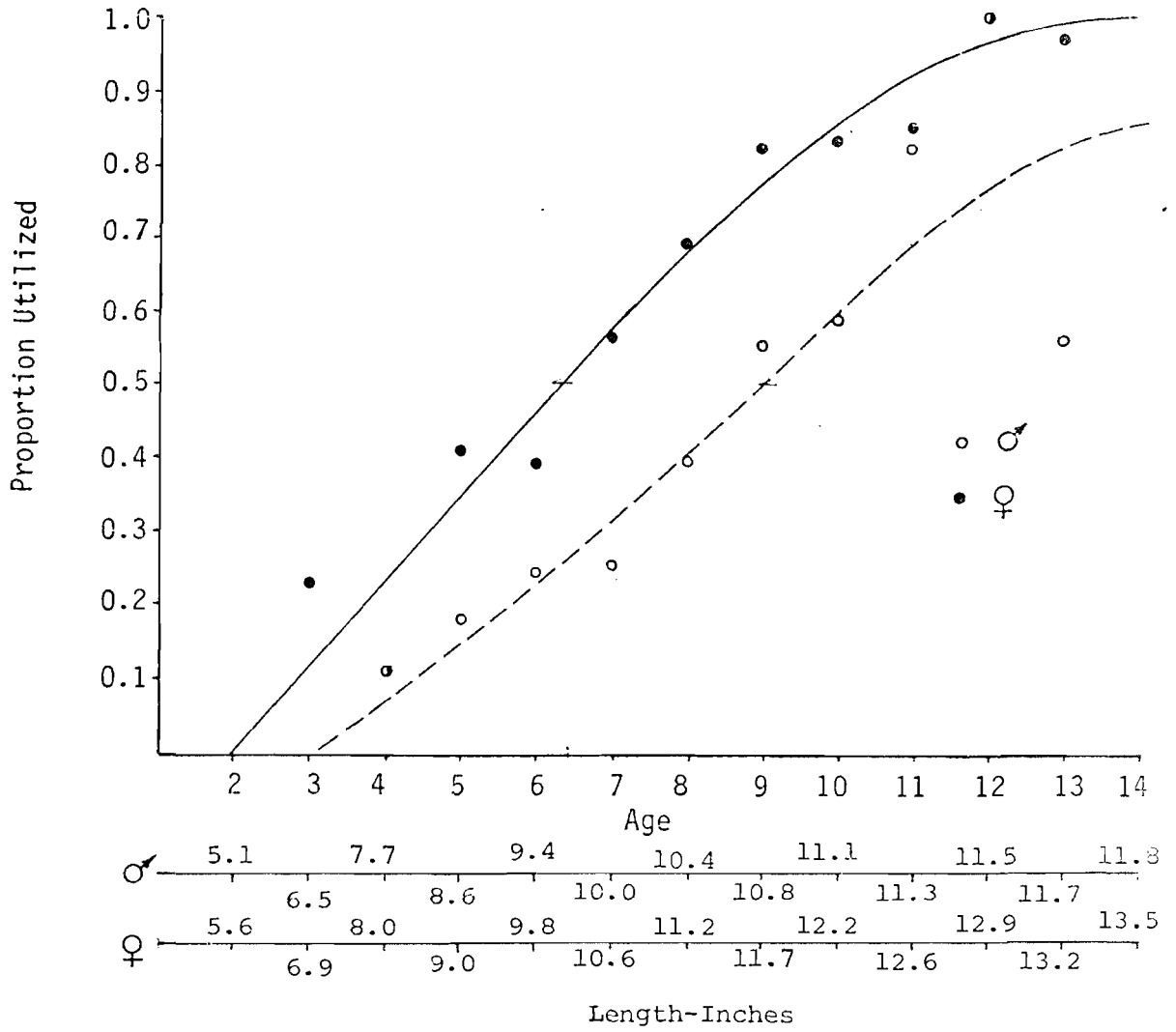


Figure 4. Utilization of Rex sole caught by Oregon trawlers in 1974

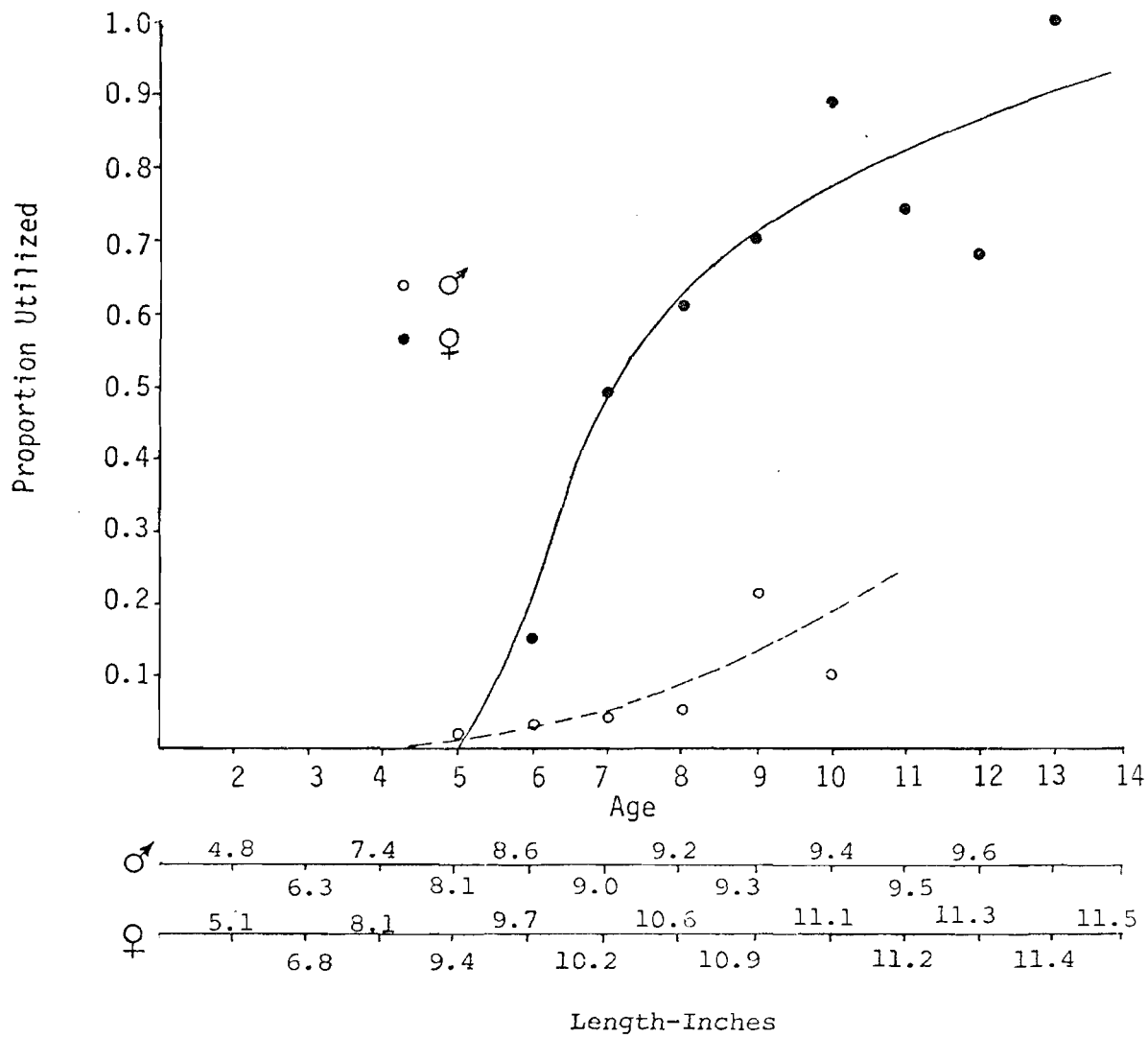


Figure 5. Utilization of Pacific sanddab caught by Oregon trawlers in 1974

Furthermore, samplers were obligated not to obstruct regular fishing. The more rigorous design of the first sampling effort is more applicable to chartered vessels.

The discard problem deserves more serious study than this preliminary work. A cooperative Oregon State University, Sea Grant and Fish Commission of Oregon utilization study will be initiated during 1975-1976.

Acknowledgments

We would like to acknowledge the efforts of Bill Barss, Ed Niska, and Harry Flesher for sampling at sea. The primary accomplishment of the project was theirs. Mike Hosie assisted in laboratory work-up, aging and computations.

LITERATURE CITED

- Best, E.A. 1961. Saving gear studies on Pacific Coast flatfish. Pac. Mar. Fish. Comm. Bull. 5: 25-47.
- Davenport, D. and W.R. Harling. 1965. Method of rapid measurement for large samples of fish. J. Fish. Res. Bd. Canada, 22:1309-1310.
- Herrmann, R.B. and G.Y. Harry, Jr. 1963. Results of a sampling program to determine catches of Oregon trawl vessels. Pac. Mar. Fish. Comm. Bull. 6: 39-51.