PROXIMATE COMPOSITION OF GULF OF MEXICO INDUSTRIAL FISH

Part 1 - Winter and Spring of 1958 Studies

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ABSTRACT

The protein, oil, ash, and moisture contents of 11 species of industrial fish commonly taken in the winter and spring in the Gulf area are reported. Included also are length and weight data.

INTRODUCTION

The fish-meal, cat-food, and other animal-food industries have a need for data on the protein, oil, ash, and moisture contents (proximate composition) of the various species of industrial fish. Several of the newly-established industries on the Gulf Coast that use industrial fish need such information. Unfortunately, with the exception of the analyses of Lee, Nilson, and Clegg (1955), which were made primarily in connection with a thiaminase study, little information is available on the proximate analyses of the various species of industrial fish taken in the Gulf area. The present project was initiated to obtain the required knowledge.

The protein, oil, ash, and moisture contents of fish vary from individual to individual, from species to species (even though closely related), from geographical area to geographical area, from season to season, and from year to year. (Mangan, Geo. et al 1958; Sanford 1958; Stansby 1953 and 1954; and Thurston et al 1958.) The oil content and moisture content tend to vary in the greatest degree. In most species, the oil content falls to a low level in the winter, rising to a peak in the late spring, summer, or early fall.

It is thus evident that a study of the proximate composition of the industrial fish in the Gulf area must be extensive and must cover a considerable period of

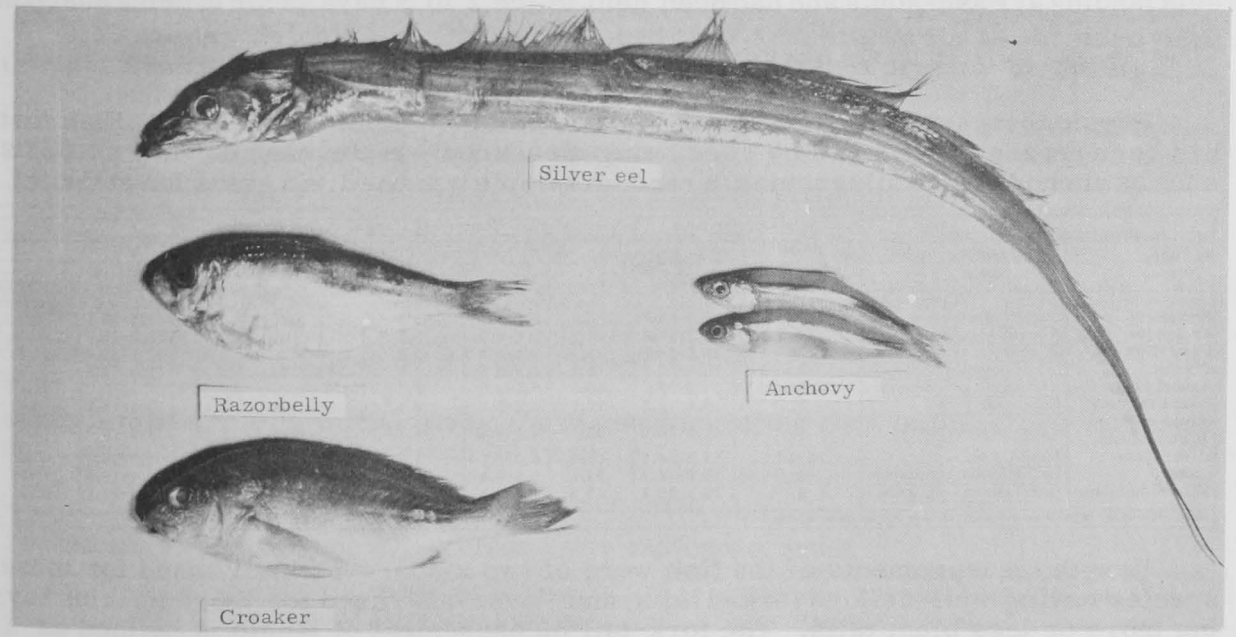

Fig. 1 - Four of the most common species of industrial fish caught in the Gulf of Mexico on a year-round basis.

time if it is to furnish a complete picture of the nature of these variances. The in-

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dustry, however, has an immediate need for the data. Results are therefore being published as they are accumulated, even though it is recognized that the data in any one report will necessarily be incomplete.

The approach used in this study is to determine the proximate analyses of the common industrial species season by season. For this purpose, the months in the various seasons have been designated as follows: winter--December, January, and February; spring--March, April, and May; summer--June, July, and August; and fall--September, October, and November. This division of months has been chosen as most closely following the meteorological conditions in the area.

SAMPLES

All of the samples of fish for the analyses reported in this paper (with the exception of the spots and butterfish caught in the spring) were taken by the U. S. Bureau of Commercial Fisheries exploratory fishing vessel Oregon during cruises in the North Gulf in the winter and spring of 1958. These fish, including the spots and butterfish caught in the winter, were placed in 5-pound waxed cartons and frozen aboard the Oregon immediately after capture. They were kept frozen until the time of analysis. The spring-caught spots and butterfish were obtained from fishing vessels landing at Pascagoula and had been held in ice 2 to 3 days prior to being analyzed.

Table 1 - Location of Catch and Physical Measurements of Industrial Fish Commonly Caught in the Winter

Common Name	Scientific Name	Caught (1958)	Location	No. of Fish in Each Sample	Type of Measurement	Length		Weight	
						Range	Average	Range	Average
						(Centimeters)		(Grams)	
Anchovies	Anchoa sp.	Feb.	Miss. Sound	72-93	Forktail	5.0- 7.0	6.0	1.4- 4.0	2.5
Anchovies	Anchoa hepsetus	Feb.	Miss. Sound	12-13	Forktail	10.9-12.9	11.7	13.3- 25.1	19.0
Butterfish	Poronotus triacanthus	Feb.	Miss. Sound	2	Forktail	12.5-16.8	14.7	53.5-100.0	75.4
Croaker	Micropogon undulatus	Feb.	Miss. Sound	2	Forktail	18.6-21.1	19.8	61.0-116.0	77.2
Razorbellies	Harengula pensacolae	Feb.	Miss. Sound	6	Over-all	13.1-15.9	14.8	21.0- 42.5	35.4
Round herring	Etrumeus teres	Feb.	Miss. Sound	3	Forktail	14.5-17.1	15.6	35.5- 59.0	47.0
Silver eels (Cutlassfish)	Trichiurus lepturus	Feb.	Miss. Sound	4	Over-all	36.7-45.8	42.8	25.4- 48.6	37.6
Silversides	Menidia sp.	Feb.	Miss. Sound	26-28	Forktail	7.5- 9.8	8.7	4.4- 9.2	6.3
Spots	Leiostomus xanthurus	Feb.	Miss. Sound	2	Forktail	18.8-20.2	19.5	81.4- 90.2	85.8
Thread herring	Opisthonema oglinum	Feb.	Miss. Sound	4	Forktail	13.4-15.4	14.3	36.8- 52.8	43.8

Note: Data on the proximate composition of these fish are given in table 2.

PHYSICAL MEASUREMENTS

Physical measurements of the fish were obtained prior to analysis. Fish that had been frozen were thawed before being measured. In the case of very small fish, such as anchovies and silversides, a random sample was used as a criterion of the lot.

Table 2 - Proximate Composition of Industrial Fish Commonly Caught in the Winter

Common Name	Scientific Name	No. of Fish in Each Sample	Protein		Oil		Ash		Moisture	
			Range	Average	Range	Average	Range	Average	Range	Average
						(Percent)				
Anchovies	Anchoa sp.	72-93	16.3-16.7	16.4	3.3-3.9	3.5	3.33-3.53	3.45	75.6-76.1	75.9
Anchovies	Anchoa hepsetus	12-13	16.3-17.9	17.3	2.5-2.8	2.6	3.44-3.76	3.53	75.3-76.3	75.7
Butterfish	Poronotus triacanthus	2	14.6-16.2	15.1	1.6-3.4	2.2	2.56-3.26	2.82	77.1-80.3	79.3
Croaker	Micropogon undulatus	2	14.5-15.8	15.2	1.6-2.8	2.2	4.59-6.42	5.98	75.9-78.5	77.2
Razorbellies	Harengula pensacolae	6	18.2-19.7	18.9	6.5-9.3	7.7	6.1 -8.1	7.1	66.2-68.0	67.1
Round herring	Etrumeus teres	3	18.3-19.3	18.9	2.2-2.7	2.5	3.39-4.09	3.82	73.6-74.1	73.8
Silver eels (Cutlassfish)	Trichiurus lepturus	4	17.9-18.2	18.1	4.1-4.4	4.3	2.63-3.23	2.96	75.0-75.8	75.4
Silversides	Menidia sp.	26-28	17.2-17.6	17.4	5.6-6.1	5.9	7.74-8.84	8.23	67.1-68.1	67.5
Spots	Leiostomus xanthurus	2	13.8-14.2	14.1	5.5-5.5	5.5	3.96-4.21	4.09	76.4-76.5	76.5
Thread herring	Opisthonema oglinum	4	18.5-19.2	18.9	7.8-8.3	8.1	2.57-3.66	3.24	68.4-70.1	69.3

Note: Data on the physical measurements of these fish are given in table 1.

Length measurements of the fish were of two kinds: "forktail" used for those species having well-defined forked tails; and "over-all" used for those species having more or less blunt tails. The fork-tail measurement of length is defined as being from the tip of the mouth to the apex of the angle formed by the two sides of the tail. The over-all measurement was from the tip of the mouth to the farthest end of the tail.

Measurements of weight of the fish were made by means of a double-beam pan balance.

The data obtained on the physical measurements of the fish are given in tables 1 and 3.

Table 3 - Location of Catch and Physical Measurements of Industrial Fish Commonly Caught in the Spring

Common Name	Scientific Name	Caught 1958	Location	No. of Fish in Each Sample	Type of Measurement	Length		Weight	
						Range	Average	Range	Average
						(Centimeters)		(Grams)	
Anchovies	Anchoa hepsetus	March	North Florida	13-14	Forktail	9.5-11.7	10.8	10.6- 20.6	15.0
Butterfish	Poronotus triacanthus	May	Chandeleur Sd.	37-41	Forktail	5.8- 9.7	6.7	3.8- 16.3	6.0
Shad	Pomolobus chrysochloris	March	North Florida	2	Forktail	18.6-21.7	20.0	82.6-128.2	106.7
Spots	Leiostomus xanthurus	May	Grand Isle	2	Forktail	19.0-21.0	20.0	109.8-143.5	125.0
Thread herring	Opisthonema oglinum	March	North Florida	2	Forktail	17.0-19.6	18.3	77.2-115.5	95.6

Note: Data on the proximate composition of these fish are given in table 4.

PROXIMATE COMPOSITION

After the fish were measured, they were washed and drained. From each lot 4 to 6 samples of fish, with an aggregate weight of between 150 and 200 grams (5.3-7.1 ounces) of fish per sample, were selected at random, and each of these samples was ground separately in a General Food Grinder, Model H. Each sample was reground twice. Portions for analysis then were taken from each ground sample.

The methods of proximate analyses used were contained in an unpublished manuscript, Current Proximate Analysis Procedures, from the Bureau's Fishery Technological Laboratory, Seattle, Wash. These methods were the Official Methods of Analysis of the Association of Official Agricultural Chemists (1955) modified as follows:

1. Moisture: 20 grams of white sand was measured into aluminum dishes, replacing asbestos fiber in gooch crucibles.

2. Ash: Vycor crucibles replaced platinum ones; moistening the ash with water and re-ashing was not deemed necessary.

3. Protein: Selenium granules replaced HgO or metallic Hg as the catalyst; therefore sulfide or thiosulfate solution was not needed to precipitate the Hg.

The data obtained on the proximate composition of the fish are given in tables 2 and 4. The number of samples and the number of fish in each sample was necessarily limited in this initial study. A discussion of the data is therefore deferred until additional observations can be reported.

Table 4 - Proximate Composition of Industrial Fish Commonly Caught in the Spring

Common Name	Scientific Name	No. of Fish in Each Sample	Protein		Oil		Ash		Moisture	
			Range	Average	Range	Average	Range	Average	Range	Average
						(Percent)				
Anchovies	Anchoa hepsetus	13-14	16.9-17.1	17.0	2.9-3.2	3.0	3.21-3.43	3.36	75.0-75.9	75.6
Butterfish	Poronotus triacanthus	37-41	14.1-15.0	14.4	2.1-2.5	2.3	2.85-3.31	3.06	80.5-80.9	80.7
Shad	Pomolobus chrysochloris	2	19.4-19.6	19.6	2.0-4.4	3.2	2.01-3.23	2.52	72.7-74.9	73.6
Spots	Leiostomus xanthurus	2	15.5-16.2	15.8	16.0-16.8	16.5	3.27-4.17	3.74	63.3-64.4	63.9
Thread herring	Opisthonema oglinum	2	19.4-19.4	19.4	4.8-5.4	5.0	4.46-4.94	4.59	69.9-70.8	70.4

Note: Data on the physical measurements of these fish are given in table 3.

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CALIFORNIA EXPERIMENTS WITH THE PLANTING OF FRESH-WATER SHRIMP FROM FLORIDA

A trial planting of fresh-water shrimp from Florida has been made in the Colorado River near Lake Havasu by the California Department of Fish and Game.

The Department is trying to expand the food supply of sport fish in the river, which now lacks invertebrate food organisms.

This fresh-water shrimp (Palaemonetes paludosus) is considered a boon to sport fish in Florida and the Department has hopes it will prove to be of equal benefit to Colorado River fish.

Little is known of the life history of this shrimp. It probably breeds once a year, in the spring, and grows to a maximum size of about two inches. It does not exist in trout waters. It poses no problem of competition with sport fish for food since it does not feed on insects. It converts detritus algae directly into food and becomes food itself for such species as catfish, bass, crappie and bluegills.

The first shipment--225 shrimp--was merely for testing purposes to determine whether the animals would survive the long airplane flight from Florida and the automobile trip across the desert to the Parker Dam area. They survived both in good shape.

Planted in a pond near Parker Dam, they will be observed by the Department to determine how well they adapt themselves to their new environment and whether they will reproduce there. The Department has asked for another 1,000 for testing purposes.