PREPARATION OF 'GALONGONG' (*DECAPTERUS MACROSOMA*) FISH MEAL AND ITS NUTRITIVE VALUE[1]

By O. N. Gonzales, S. V. Bersamin and J. I. Sulit
Of the Philippine Fisheries Commission

One Text Figure

The manufacture of fish meal from various species of fish of minor commercial importance can help reduce the amount of fish meal importation into this country. In view of the increasing poultry and livestock industries, our fish meal importation of 260,754 kilograms in 1949 was increased to 1,812,041 kilograms in 1953, showing an increase of approximately 700 per cent in a period of four years. In spite of this importation and the great need of fish meal, not much work has been done in the manufacture of this product in this country. This may be due to lack of practical knowledge of the technique in fish meal manufacture or of information on the utilization of the product.

Because of the high protein and low crude fibre content, fish meals have been known (Nelson 1951)[2] to be valuable in the feed of poultry and other animals. Petersen, *et al.* (1952) reported that with 5 per cent fish meal in the ration of poultry, the maximum hatchability was obtained. The old method of drying fish meal by direct flame process has been discouraged because high temperature lessens the nutritive value of the product. Pottenger, *et al.* (1935) claimed that drying of fish meal at high temperature destroys the most important essential aminoacids, namely, tyrosine, tryptophane and cystine. Clandinin (1949), revealed that fish meals dried in vacuum at 10 or 16 inches have very much higher nutritive value than those dried by the heat method of 220°F.

The aim of the present work has been to develop the heat methods of preparation of fish meal adaptable for home industry in fishing centres, and determine the comparative

[1] Presented at the Indo-Pacific Fish Council Meeting, 1955.
[2] Numbers in parentheses refer to references cited.

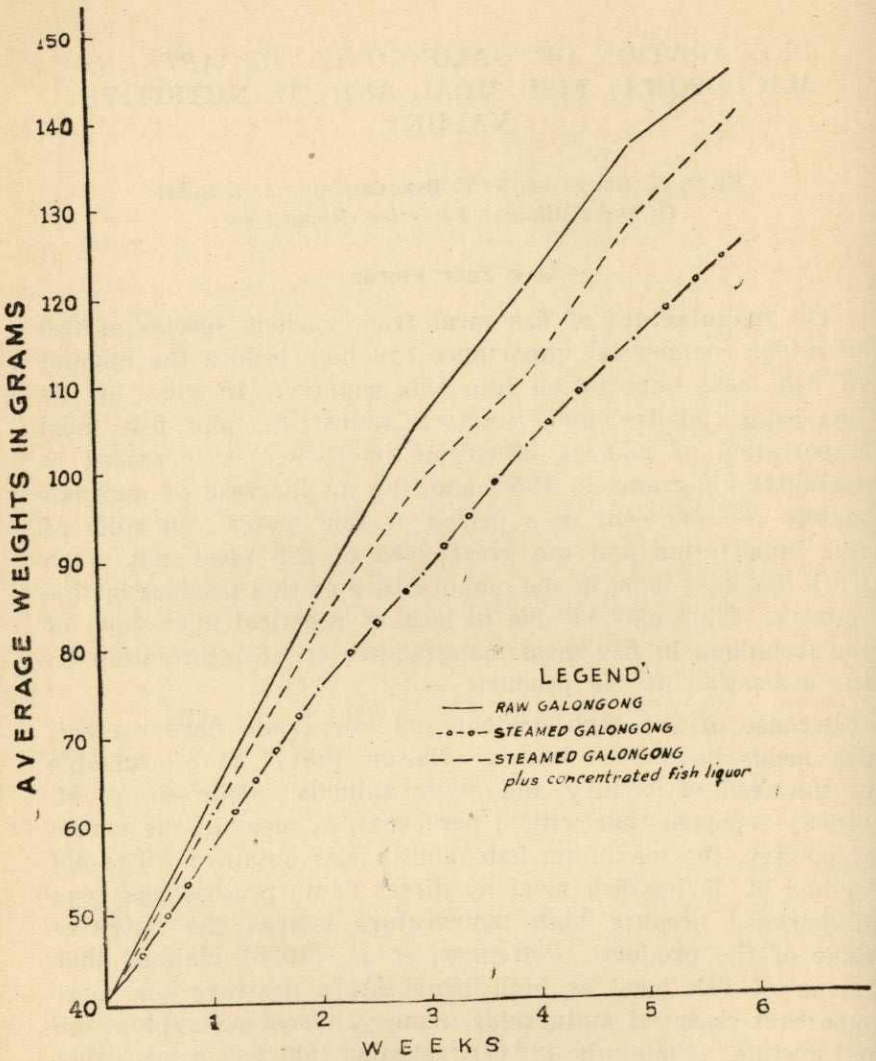

FIG. 1. AVERAGE WEEKLY WEIGHT OF RATS FED WITH DIFFERENT DIETS

nutritive value of the corresponding fish meals by means of chemical and bio-assay studies.

Preparation of fish meals.—The galongong (*Decapterus macrosoma*) was chosen because of its high protein and low fat content (Sulit, *et al.* 1953) and because of its abundance in many of the Philippine marine waters, being one of the cheapest kind of fish found in the market. Twelve kilograms of the fresh fish were divided into three parts of four kilograms each. The first portion was cut into small pieces and then dried directly at 45°–60°C. When thoroughly dried the product was ground, weighed and placed in an air-tight container. The second and third portions were steamed for thirty minutes, after which they were reduced to small pieces and then dried at 45°–60°C. When thoroughly dried the fish meal was ground, weighed and placed in air-tight containers.

Preparation of the concentrated fish liquor.—The expressed liquor resulting from the steaming process of the second set of galongong was concentrated to 50 per cent of its original volume to produce a thick syrup. This product is similar to the fish soluble concentrate which is known to contain the vitamin B_{12} and the growth promoting compound (Bohstedt, 1950; Singsen, 1952; Tiliman, *et al.* and Pensack, *et al.* 1949).

The fish meals and the concentrated fish liquor prepared according to the aforementioned methods were analyzed chemically for their protein, fat, carbohydrates (calculated by difference), ash and mineral content (Table 2). The value for growth studies of the products was determined by utilizing the biological method. The percentage (Table 1) yields of the products were also recorded.

Physical properties of the fish meals and concentrated fish liquor.—The color of fish meal prepared from raw galongong is slightly darker than that processed by the steam method. The former has a slight putrid odor, which could be attributed to the partial decomposition of the fish during the process of drying. The color of the fish meals prepared by the steam method is light brown and it exhibits a characteristic fishy odor. The physical appearance of the latter is very much better than the former.

The concentrated fish liquor obtained by dehydration is a thick syrup, dark brown in color and having the usual pre-

Chemical analysis.—As shown in Table 1, the percentage yield of fish meal prepared from raw galongong is 26.87 per cent as compared with 22.39 per cent in the steam-cooked product. The amount of concentrated fish liquor produced is 9.86 per cent.

TABLE 1.—*The percentage yield of fish meal and concentrated fish liquor.*

Products	Per cent
1. Raw fish meal galongong	26.87
2. Steamed fish meal galongong	22.39
3. Concentrated fish liquor	9.86

Table 2 shows the proximate chemical composition and mineral analysis of the fish meals and the concentrated fish liquor. The protein content of the two fish meals of galongong are extraordinarily high, considering the fact that there is still an ideal amount of 5 per cent moisture in the final products. The protein content of the prepared concentrated fish liquor is slightly lower. However, a similar product, the fish soluble concentrate, is known to contain the growth

TABLE 2.—*The proximate chemical composition and mineral content of galongong fish meals and the concentrated fish liquor.*

	Raw Galongong	Steamed Galongong	Concentraed fish liquor of galongong
	Per cent	*Per cent*	*Per cent*
Protein	74.17	75.04	70.08
Fats	6.74	9.54	2.21
Carbohydrates	.33	.08	.12
Ash	13.05	9.99	8.57
Moisture	5.26	5.35	19.02
Calcium	4.08	3.37	.39
Phosphorus	2.14	1.83	.67

promoting factor needed in the poultry and livestock industry (Petersen, *et al.* 1952). The calcium and phosphorus contents of the raw fish meal are slightly higher than those of the steam cooked fish meal.

Thirty albino rats of about the same weight

28 to 30 days old, litter mates were divided into three groups of ten rats each, such that there would be a good distribution of males and females, and the total group weights would be about the same. The experimental diets were prepared so that the final composition contained 18 to 20 per cent protein derived from the fish meals and the added concentrated fish liquor in the amount of 2 per cent of the mixture or the diet (Tables 2 and 3).

The rats were placed individually in separate cages with raised screen bottoms provided with paper towels to prevent the loss of spilled food. Ordinary room temperature was maintained throughout the bio-assay period. Periodic weights were recorded and observations on the health or any abnormal developments of the rats were made daily.

Table 3 shows the composition of the experimental diets used. The fish meals and concentrated fish liquor constituted the major source of protein in feeding the experimental rats and water was given *ad libitum*.

TABLE 3.—*Composition of experimental diets using the corresponding amount of fish meals and concentrated fish liquor.*

	Group I	Group II	Group III
	Per cent	*Per cent*	*Per cent*
Corn starch	68	69	69
Lard	3	3	3
Sodium chloride	1	1	1
Calcium carbonate	2	2	2
Yeast	2	2	2
Cod liver oil	4 drops	4 drops	4 drops
Fish meal (raw galongong)	24	—	—
Fish meal (steamed galongong)	—	23	21
Concentrated galongong fish liquor	—	—	2

As shown in Table 4 and Figure 1, the average increase in weight of experimental rats fed with raw galongong fish meal is significantly high as evidenced by the weekly gain in weights. It is followed by the increase in weight of rats fed with steam-cooked galongong plus 2 per cent of the concentrated fish liquor. The third best were shown by rats fed with steam-cooked fish meal.

TABLE 4.—*Average weekly weight of rats fed with different diets mentioned in Table 3.*

No. of Rats	Protein Supplement	Initial Weights	Weekly Average Weights						Average increase in weight
			1	2	3	4	5	6	
		gm	*gm*	*gm*	*gm*	*gm*	*gm*	*gm*	
10	Raw galongong	41	63.4	85.6	106.4	120.8	138.4	147.7	107
10	Steamed galongong	41	58.9	75.1	89.0	100.9	114.3	127.2	86
10	Steam galongong plus 2% concentrated fish liquor	31	60.8	82.1	99.4	111.9	128.9	142.7	102

All the rats fed with the three kinds of fish meals showed no indication of abnormalities as they were all in good health, as shown by their active movements. All the experimental rats at the end of the experiments have well rounded and plumb bodies and significantly clear eyes.

DISCUSSION

Sulit, *et al.* (1953) reported that galongong contains approximately 72 per cent of edible portion. The present study revealed that in the manufacture of galongong fish meal, a yield of approximately 25 per cent was obtained.

Of the three kinds of fish meals prepared, raw galongong fish meal gave, as shown above, the highest rate of growth, followed by steamed galongong fish meal plus the concentrated fish liquor and thirdly, by the steamed galongong fish meal alone.

Because of the putrid smell of raw galongong fish meal, it is recommended that preliminary steaming of the fish be undertaken before drying. It is further recommended to add at least two per cent of the concentrated liquor to the fish meal to improve its nutritive food value.

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ILLUSTRATION

TEXT FIGURE

FIG. 1. Average weekly weight of rats fed with different diets.