

**Vol. IV, No. 29. Washington, D. C. Oct. 1, 1884.**

**216.—ON MANUFACTURED FOOD FOR TROUT AND CARP.\***

**By Dr. C. O. HARZ.**

FOOD-FLOUR (*Futtermehl*).—The component parts are the same as in the food cylinders (*Futter zylinder*), but its looks indicate a less degree of decay and worthlessness. Here, likewise, the presence of articulates can easily be proved. The meat-flour (*Fleischmehl*) does not play such a prominent part, and after the food has been weighed several times, it may possibly form one-third of the whole. Peas and corn can easily be distinguished and considerable quantities of other cereals can be noticed. On the basis of my extensive and careful examinations I think I can state with certainty that the two kinds of food in question are composed of the following ingredients:

1. The cylinder-food consists of:

	Parts.
Ground meat (including articulates).....	60 to 65
Rape or linseed.....	5 to 10
Corn.....	9 to 10
Peas.....	9 to 10
Flour, among it some oat-meal.....	5 to 10
Cooking-salt.....	10

2. The food-flour (*Futtermehl*) consists of:

	Parts.
Ground meat.....	30 to 35
Rape or linseed.....	19 to 21
Corn.....	9 to 10
Peas (or vetches).....	18 to 22
Flour and oats.....	18 to 22
Cooking-salt.....	1 to 2

For the preparation of fish-food I would (on the basis of the analysis of the food referred to above) recommend the following receipts:

1. For cylinder-food, take—

	Pounds.	Price of the best quality.
Ground meat.....	65	9.75
Ground linseed.....	3	30
Rape seed flour.....	2	20
Coarse corn flour.....	10	65
Peas.....	10	80
Coarse flour (if possible, wheat).....	10	95
	100	12.65 [\$3 10]

\* *Ein Fischfutter für Forellen und Karpfen.* From the *D. F.-Z.*, Vol. VII, No. 14. Stettin, April 1, 1884. Translated from the German by HERMAN JACOBSON.

This mixture, with the addition of 10 pounds of cooking-salt and water, is kneaded into a stiff, tough paste, and by means of a sausage-squirt, with an opening the size of a thick lead-pencil, laid out on boards which are sprinkled with flour, and there allowed to dry. It is possible that an addition of ground cockchafers will make the food more enticing for the fish and it is worth while to try it. In that case one might use 50 pounds of ground meat and 15 pounds of cockchafers. The corn might be replaced by peas or field beans, which are cheaper and much more nutritious, and the food would doubtless be improved thereby.

2. For the food-flour (*Futtermehl*) take—

	Pounds.	Price of the best quality.
		<i>Marks.</i>
Ground meat .....	30	4.50
Linseed flour .....	5	50
Rape-seed flour .....	15	75
Corn .....	10	65
Peas .....	20	1.60
Grain, flour .....	20	1.90
	100	9.90 [\$2 33]

To every 100 pounds of the mixture as much as 10 pounds of common salt should be added.

If we examine the quality of the articles of food analyzed above, as to their chemical composition, and especially as to the quantity of particularly valuable substances contained in them, we arrive at the following result:

There are contained in—

	A.—Cylinder-food.	B.—Feed-flour.
	<i>Per cent.</i>	<i>Per cent.</i>
Proteins .....	53	35
Fat .....	10	12
Hydrates of carbon .....	16	30

According to Dr. E. Wein, the practical value is as follows:

A.  $[(53 + 10) \times 16] + [16 \times 3.2] = 10$  marks, 59 pfennigs [\$2.52].

B.  $[(35 + 12) \times 16] + [30 \times 3.2] = 8$  marks, 48 pfennigs [\$2.01].

But, as was stated above, when we buy the ingredients we must pay 12.65 marks [\$3.01] for cylinder-food, and 9.90 [\$2.33] for feed-flour. We refer here, of course, to the best quality, for an inferior article may be bought from dealers for 22 marks [\$5.23]. Under these circumstances there is of course no prospect of making it pay to raise fish on these substances.

In food suitable for fish-culture one looks, of course, for a certain percentage of albuminous matter, fat, and hydrates of carbon; but in using

the different ingredients one should see to it that there is not too great a difference between their practical value and their price. It will be found to be exceedingly injudicious to use corn for this purpose. For corn, oats, or rye may be at any time substituted to advantage; for, according to Dietrich and König, there are, on an average, contained:

	Proteine.	Fat.	Hydrate of carbon.
	<i>Per cent.</i>	<i>Per cent.</i>	<i>Per cent.</i>
In corn.....	8.09	3.5 to 4.05	65.43
In rye.....	13.31	1.96	65.16
In barley.....	12.09	2.00	64.97
In oats.....	12.66	6.00	54.30

Corn costs at present about 6½ marks (\$1.54) per 100 pounds, while the other three cereals may be bought for from 4 marks 30 pfennigs (\$1.02) to 5 marks (\$1.19).

Instead of linseed or rapeseed, sesame cake may be used to advantage, which costs only 5 marks (\$1.19) per 100 pounds, and contains 33 per cent. albumen, 13 per cent. fat, and 24 per cent. substances free from nitrogen. A pound of fat or a pound of albumen would therefore cost only 10 pfennigs (2.3 cents), and a pound of hydrates of carbon only 2 pfennigs. In order to make the mixture more binding it will be found advantageous to add a few kilograms of linseed cake per 100 pounds.

Peas may be entirely omitted, or the cheaper vetches may be substituted for them. A portion of the ground meal might also be omitted, or be replaced to advantage by cockchafers. Dried cockchafers can easily be procured for 9½ marks (\$2.26) per 100 pounds, while ground meal costs 15 or 16 marks (\$3.57 to \$3.80) per 100 pounds. The composition of both these articles is very similar.

According to Dittman, dried cockchafers contain—

	<i>Per cent.</i>
Proteine.....	66.5
Chitine.....	4.52
Fat.....	16.06
Particles of ashes.....	4.52

while ground meal contains, according to Dietrich—

	<i>Per cent.</i>
Water.....	8.86
Proteine.....	75.06
Fat.....	12.30
Ashes and sand.....	2.30

According to Pott—

	<i>Per cent.</i>
Water.....	10.48
Proteine.....	72.46
Fat.....	12.42
Ashes and sand.....	4.88

And according to J. Lehmann—

	Per cent.
Water .....	10.14
Proteine .....	73.52
Fat.....	12.70
Ashes and sand .....	3.77

As with domestic animals, so with fish, favorable results can be looked for only if the food is fresh and of the very best quality. The outlay for this food should be as little as possible, for otherwise, taking into consideration the great difficulties connected with the raising of fish, the use of artificial food will hardly repay the trouble.

I would, therefore, advise fish-culturists to buy the necessary ingredients and mix their own food; then they will know what they have and can draw correct conclusions from the results, and, if necessary, make improvements in the food. Food bought at random has always two great defects. In the first place one does not know its component parts, and in the second place it is possible that the component parts are of the most inferior quality.

I would strongly recommend to fish culturists the following mixture:

FORMULA.

	Pounds.	Percentage of—		
		Proteine.	Fat.	Hydrates of carbon.
Ground meat .....	60	44.50	7.20	0.90
Sesame cake .....	20	6.60	2.60	4.60
Linseed cake .....	4	1.12	0.30	1.30
Oats .....	16	1.92	0.96	8.64
<b>Total .....</b>	<b>100</b>	<b>54.14</b>	<b>11.06</b>	<b>15.44</b>

TABLE OF COST.

Practical value.			Value in marks.	Cost in marks.
Ground meat, 60 pounds, containing	{ 44.5 per cent. albumen	= 44.5 × 16 = 7.12	8.29	9.30
	{ 7.2 per cent. fat	= 7.2 × 16 = 1.15		
	{ 0.9 per cent. hydrates of carbon	= 0.9 × 3.2		
Sesame cake 20 pounds, containing	{ 6.6 per cent. proteine }	= 9.2 × 16 = 1.47	1.61	1.00
	{ 2.6 per cent. fat }	= 4.6 × 3.2 = 0.14		
	{ 4.6 per cent. hydrates of carbon }	= 1.42 × 16 = 0.22		
Linseed cake, 4 pounds, containing	{ 1.12 per cent. protiene }	= 1.3 × 3.2 = 0.04	.26	.40
	{ 0.3 per cent. fat }	= 3.22 × 16 = 0.51		
	{ 1.3 per cent. hydrates of carbon }	= 8.64 × 3.2 = 0.27		
Oats, 16 pounds, containing	{ 1.92 per cent. proteine }	0.78	0.78	1.07
	{ 0.96 per cent. fat }			
	{ 8.64 per cent. hydrates of carbon }			
<b>Total .....</b>			<b>10.94</b> [\$2.60]	<b>11.77</b> [\$2.80]

The difference between the practical value and the price is therefore very small, and the expense can be still further reduced if a portion of the ground meat is replaced by cockchafers and a portion of the oats by cheap flour.

**217.—ON MANUFACTURED FOOD FOR TROUT AND CARP.\***

**By CARL NICKLAS.**

There has lately been published an article by Prof. C. O. Harz, giving the results of his microscopic examination of my food for trout and carp manufactured by Louis Goos, of Heidelberg. These results astonished me, for Dr. Harz has found in this food, with the exception of ground meat, all sorts of ingredients except those of which it is composed. The following sentence is characteristic of the entire examination: "I was not able to arrive at any definite results as to the presence or absence of linseed."

In order to be absolutely certain that Goos had manufactured the food in strict accordance with my receipt, I informed him of Dr. Harz's examination, requesting him to have the food, which had already been chemically examined at Marburg, also analyzed microscopically. I give below the result of this analysis:

MARBURG, *May 9, 1884.*

Mr. LOUIS GOOS, *Heidelberg:*

The specimen of fish-food transmitted November 3, 1883, by the Association for Furthering Fish-culture in the district of Kassel (Mr. Georg Seelig, in Kassel), when examined March 25, 1884, was found to contain—

	Per cent.
Water .....	13.34
Proteine substances.....	46.75
Fat .....	10.50
Hydrate of carbon.....	16.87
Wood-fiber .....	1.60
Mineral substances.....	10.83

This fish-food, according to the microscopical examination, is mainly a mixture of ground meat (meat-flour), an article of food which at present is used very extensively in agriculture, and flour prepared from the fruits of leguminous plants (probably vetches); its ingredients are, therefore, highly nutritive. Wheat and oats occur in small quantities, and indeterminate substances in exceedingly insignificant quantities.

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\* "Ein Fischfutter für Forellen und Karpfen." From the *Deutsche Fischerei-Zeitung*, vol. vii, No. 23; Stettin, June 3, 1884. Translated from the German by HERMAN JACOBSON.