MEAT AND BONE BY-PRODUCTS

MEAT MEAL AND MEAT SCRAP, TANKAGE, BONE MEAL, BLOOD MEAL, FISH MEAL

An Investigation towards the Establishment of Standards

BY

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DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE

BULLETIN No. 49—NEW SERIES

DIVISION OF CHEMISTRY
DOMINION EXPERIMENTAL FARMS

Printed by direction of the HON. W. R. MOTHERWELL, Minister of Agriculture,
Ottawa, 1925

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BY

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This bulletin presents for the first time in Canada a detailed review of those highly nitrogenous feeds—the output for the most part of the packing house. These are necessarily high-priced feeds and for this reason if for no other a knowledge of their composition and nature is essential to their economic purchase and use.

The feeding-stuffs on the market which may be considered under this heading are for the most part by-products of the packing house, slaughter house and fish canneries. They include meat and blood meals, tankage, bone meal, fish meals and a number of other related materials and consist of varying proportions of meat, fatty tissue, blood and bone, according to their source and method of preparation. As a class, they are highly nitrogenous concentrates, with great variation in their percentages of bone and fat. These concentrates constitute a valuable source of protein and bone-making material and are especially useful in the feeding of swine and poultry. It is essential that they should be prepared from fresh materials and as purchased should be sweet and sound, free from rancidity and mould. From the foregoing it is obvious that these feeding-stuffs should be purchased always on guaranteed analysis.

Much confusion exists in respect to the meaning attached to the names under which these materials are sold. For example, at present there is no clear understanding as to what constitutes a meat scrap as distinguished from tankage. In order to classify these products and obtain data for the establishment of much-needed standards, it was decided, as a preliminary step, to make an analytical survey of these materials as at present manufactured in Canada.

For co-operation in this work, and more particularly in the collection of the samples, the Division is indebted to the Seed Branch and the Health of Animals Branch, Department of Agriculture.

The samples are, we believe, fairly representative of the several classes of these animal products and include meat meals and scraps, digester tankages, meat and bone meals and scraps, digester meal and bone tankages, bone meals, blood meals, cracklings and edible fish meals. In the tentative classification which has been adopted for the presentation of the data, the composition of the material has been the determining factor.

MEAT MEAL, MEAT SCRAP

In the Regulations made in pursuance of the Feeding Stuffs Act, "Meat meal and meat scrap are the ground residues from animal tissues exclusive of hoof and horn. If they bear a name descriptive of their kind, composition or origin, they must correspond thereto." They are distinguished from meat and bone meal, and meat and bone scrap by containing less than 10 per cent of phosphoric acid.

The series analysed comprises nine samples, the products of three Canadian firms. Two of these products are sold under brand names which are not in conformity with the present classification, though they are high-class materials in every respect.

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Eight of the nine samples analysed contain 50 per cent or more of protein and therefore, while this product will always carry its guaranteed analysis, it would seem reasonable to expect a minimum protein content of 50 per cent for products labelled meat meal or meat scrap.

The fat content in the series ranges from 5·31 to 15·55 per cent. It would seem desirable, in order to enhance keeping qualities, that this constituent should be kept below 15 per cent.

All the samples conform to the tentative limit with respect to phosphoric acid.

Important as the percentages of the nutrients are in valuing these products it is of equal importance that they should be sound and wholesome, that is, free from the taint of rancidity and decomposition. A low moisture content is undoubtedly conducive to good keeping qualities and it would seem, from the present inquiry, that the moisture content should be kept below 10 per cent. This we believe would be in the interest of both manufacturer and consumer.

DIGESTER TANKAGE

The definition for this product as laid down in the aforementioned Regulations is "Digester tankage is the residue from animal tissues, exclusive of hoof and horn, specially prepared for feeding purposes by tanking under live steam, drying under high heat and suitable grinding." It is distinguished from digester meat and bone tankage by containing less then 10 per cent of phosphoric acid.

The series comprises eight samples, from four Canadian firms. One sample (No. 63494) is wrongly named, according to the Regulations, since the word "bone" is used in the brand name and it contains less than 10 per cent of phosphoric acid. It might possibly be considered that the use of the term "blood meal" in the brand name of No. 63496 is not in conformity with the present definitions.

With one exception (No. 63316), all the samples contain between 55 and 60 per cent protein. This series gives no support to the view that the protein content of any class of digester tankage should be placed lower than 50 per cent.

There is a very large range in the fat content of the series and the remarks made respecting this constituent in discussing meat meal (meat scrap) are here equally applicable.

All the samples conform to the tentative limit with respect to phosphoric acid.

The condition as to sweetness and freedom from rancidity was quite satisfactory throughout the series. Although digester tankage as produced is no doubt sterile, its keeping qualities will no doubt be in some measure determined by its moisture content. Probably a maximum limit of 10 per cent might be suggested.

TABLE I.—MEAT MEAL: MEAT SCRAP: 1923

Lab'y No.	Trade Name or Brand	Manufacturer	Reg. No.	Moisture	Protein	Fat	Ash	Phosphoric acid (P_2O_5)	Phosphoric acid calculated as bone phosphate	Guarantee		Description
										Protein	Fat	
				p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	
63315	Gunn's "Big Sixty" Meat Scrap.	Gunn's Limited, Toronto, Ont.	142	8·57	53·87	11·65	25·68	4·44	9·70	.....	.....	Brownish in colour, consisting of brown powder with bits of clear gelatinous material; sound and wholesome.
63347	Swift's Meat Scrap..	Swift & Co. U.S.Y., West Toronto, Ont.	363	12·09	55·42	11·13	18·56	7·38	16·12	60·00	6·00	Brown in colour, coarsely powdered; odour of spoiling meat.
63348	" "	" "	547	10·94	49·33	10·81	24·92	8·54	18·65	50·00	6·00	Similar in appearance to No. 63347 but not of such a strong odour.
63414	"Harab" Meat Meal	Harris Abattoir, Ltd., Est. No. 7.	313	15·00	53·22	5·31	22·69	7·80	17·04	60·00	10·00	Dark brown in colour; finely granular with fine particles of white and clear gelatinous material; strong odour of ammonia.
63420	"Harab" High Protein Meal.	" "	689	9·66	55·68	8·96	25·01	7·52	16·43	60·00	10·00	Brownish in colour; coarsely powdered, with a large proportion of yellow gelatinous material, sound and wholesome.
63421	"Harab" High Protein Scrap.	" "	690	11·45	55·88	7·76	22·55	6·59	14·40	60·00	10·00	Very coarsely granular; consisting of fragments of the gelatinous material; little bits of bone, dried meat; sound and wholesome.
63422	"Harab" Beef Meat Meal.	" "	1100	8·18	54·59	15·55	21·81	5·72	12·49	60·00	6·00	Brownish in colour; coarsely powdered; fairly homogeneous in character; sound and wholesome.
63423	"Harab" Beef Meat Meal—sample product before being processed by Ontario Fertilizers.	" "	1100	7·75	60·19	11·84	11·48	.....	.....	.....	.....	Brownish substance in irregular shaped cakes; pressed out of apparently finely ground material; almost odourless.
63478	Swift's Meat Scrap..	Swift & Co. Est. 18 B, Edmonton, Alta.	.....	9·81	47·21	13·26	20·99	5·76	12·50	50·00	6·00	Greyish brown, coarsely powdered material, very badly moulded.

Maximum	Protein: 60·19	Fat: 15·55	Phosphoric acid (P_2O_5) 8·54
Minimum	" 47·21	" 5·31	" " " 4·44
Average	" 53·93	" 10·69	" " " 6·72

TABLE II.—DIGESTER TANKAGE: 1923

Lab'y No.	Trade Name or Brand	Manufacturer	Reg. No.	Moisture	Protein	Fat	Ash	Phosphoric acid (P_2O_5)	Phosphoric acid calculated as bone phosphate	Guarantee			Description
										Protein	Fat	Phosphate	
				p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	
63314	Gunns' "Shurgain" Digester Tankage 60 per cent.	Gunns, Limited, Toronto, Ont.	824	6·35	58·61	6·40	21·87	6·56	14·33	60·00	12·00	.....	Reddish brown substance, coarsely powdered with what appear to be charred particles throughout; sweet and wholesome.
63316	Gunns' "Shurgain" Digester Tankage 40 per cent.	" "	825	2·81	51·00	9·27	27·92	9·29	20·29	40·00	9·00	.....	Almost identical in appearance to No. 63314 but with fewer black particles; also sweet and wholesome.
63349	Swift Digester Tankage..	Swift & Co. U.S. Y., West Toronto, Ont.	545	9·13	59·24	9·00	21·06	7·98	17·43	60·00	8·00	16·00	Almost identical in appearance with No. 63314 and 63316 but darker brown in colour.
63416	"Harab" Digester Tankage.	Harris Abbattoir, Ltd., Est. No. 7.	319	14·34	56·93	4·52	21·27	8·98	19·62	60·00	8·00	12·00	Greyish brown in colour consisting chiefly of brown pulpy material with a small proportion of white and black flecks; sound and in good condition.
63491	Burn's Standard Poultry Food—Digester Tankage.	P. Burns & Co., Calgary, Alta.	643	11·15	55·62	14·91	17·60	7·75	16·92	50·00	8·00	6·00	Light brown coarsely powdered sample; sound and wholesome.
63494	Burn's Ideal Poultry Food Tankage and Bone Meal.	" "	346	6·94	55·75	12·73	22·50	8·50	18·57	50·00	8·00	10·00	Light brown coarsely powdered; sound and wholesome.
63496	Burn's Digester Tankage and Blood Meal.	" "	559	6·29	54·44	11·87	25·00	8·07	17·63	50·00	8·00	6·00	Same as No. 63494 in appearance, etc.
63535	Burn's Meat Meal Digester Tankage.	" "	.....	6·12	57·40	15·02	21·16	7·92	17·30	50·00	8·00	6·00	Light reddish brown in colour; coarsely powdered; sound and wholesome.

Maximum	Protein:	59·24	Fat:	15·02	Phosphoric acid (P_2O_5)	9·29
Minimum	"	51·00	"	4·52	" " "	6·56
Average	"	56·12	"	10·46	" " "	8·13

MEAT AND BONE MEAL, MEAT AND BONE SCRAP

This product is the same as meat meal (meat scrap) in respect to source and manufacture but differs from this material in containing more than 10 per cent of phosphoric acid.

Three of the four samples constituting this series are correctly named, one (No. 63346) is designated meat meal, whereas its phosphoric acid content would place it rightly in the class under consideration here.

The range in protein content is practically from 45 to 53 per cent; that of fat from 5 to 8 per cent; and of bone phosphate from 20 to 35 per cent.

The bone phosphate in this product has an important nutritive function, especially when the material is used for pigs, calves and poultry. It would therefore seem desirable that the phosphate content should not only be stated in the guarantee but recognized in the establishment of standards for the grouping into grades or classes of the several sorts of meat and bone out-puts now on the market.

DIGESTER MEAT AND BONE TANKAGE

This product carries the same definition as digester tankage with the exception that the insertion of the words "meat and bone" calls for a phosphoric acid content of more than 10 per cent.

Table IV presents the composition of four samples grouped under this heading. Sample No. 63477 has been included for the reason that it contains more than 10 per cent phosphoric acid, although the brand name would place it with the group, digester tankage. It may be noted that this sample contained a very high percentage of moisture and, as a result of its poor keeping qualities, had badly moulded.

Leaving out of consideration the aforementioned samples, the protein content of the series lies between 50 and 55 per cent and the fat between 10 and 15 per cent with a phosphoric acid content between 10 and 11 per cent—approximately 22 to 24 per cent of bone phosphate.

Attention may be directed to the low moisture content of samples Nos. 63505, 63533-4, a factor undoubtedly conducive to the sweet and wholesome condition in which the samples were received. All very satisfactorily meet their guarantee.

BONE MEAL

Bone meal as intended for feeding purposes, otherwise known as feeding bone and poultry bone, may be described as consisting of animal bones which have been cooked in open kettles and ground to a suitable size. It has been suggested that the standard for this product be protein, not less than 25 per cent, and phosphoric acid not less than 24 per cent.

The series examined consists of ten samples, from four firms.

Seven of the samples carry a guarantee, which in respect to protein is fully met in each case. The one sample (No. 63415) which is slightly below its guarantee in phosphate possesses a relatively high protein content and is to be regarded as a pure bone meal.

The maxima and minima data indicate a very desirable degree of uniformity in composition throughout the series.

TABLE III—MEAT AND BONE MEAL: MEAT AND BONE SCRAP, 1923

Lab'y. No.	Trade Name or Brand	Manufacturer	Reg. No.	Moisture	Protein	Fat	Ash	Phosphoric Acid (P_2O_5)	Phosphoric Acid calculated as Bone Phosphate	Guarantee		Description
										Protein	Fat	
				p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	
63317	Gunns' "Shurgain" Meat & Bone Scrap	Gunns, Ltd., Toronto, Ont.	480	8·42	44·73	7·93	38·50	14·33	31·30	40·00	10·00	Coarsely granular and consists of fragments of bone; clear gelatinous material and brown particles, probably meat; sound and wholesome.
63346	Swift's Meat Meal..	Swift & Co., U.S.Y., West Toronto, Ont.	546	9·78	52·65	7·88	29·68	13·20	28·83	46·00	4·00	Finely powdered brown material with a fair proportion of white particles throughout.
63418	"Harab" Meat and Bone.	Harris Abattoir Co., Ltd., Est. No. 7.	315	10·85	46·10	7·90	33·11	9·43	20·60	40·00	10·00	Very similar in appearance to No. 63317 but more finely ground: badly moulded.
63419	"Harab" Meat and Bone Scrap.	" "	314	11·61	45·67	5·04	37·54	15·75	34·42	40·00	10·00	Consists of particles about the size of small pebbles of bone-gelatinous matter and brown particles probably meat: odourless.

Maximum	Protein: 52·65	Fat: 7·93	Phosphoric acid (P_2O_5) 15·75
Minimum	" 44·73	" 5·04	" " " 9·43
Average	" 47·28	" 7·18	" " " 13·18

TABLE IV—DIGESTER MEAT AND BONE TANKAGE: 1923

Lab'y. No.	Trade Name or Brand	Manufacturer	Reg. No.	Moisture	Protein	Fat	Ash	Phosphoric Acid (P_2O_5)	Phosphoric Acid calculated as Bone Phosphate	Guarantee			Description
										Protein	Fat	Phosphate	
				p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	
63477	Swift's Digester Tankage.	Swift & Co., Est. 18 B. Edmonton, Alberta.	.....	15·34	43·88	4·02	33·31	13·98	30·54	.....	.....	.....	Fine homogeneous grey powder: badly moulded.
63505	Burns' Ideal Poultry Food Digester Tankage and Bone.	P. Burns & Co., Ltd., Vancouver, B.C.	346	5·17	52·30	9·96	30·22	11·06	24·14	50·00	8·00	.....	Light brown, coarse powder: sweet and wholesome.
63533	Burns' Ideal Poultry Food Digester Tankage and Bone Meal.	P. Burns & Co., Ltd., Edmonton, Alberta. Est. 23 A.	.....	6·33	54·91	14·07	25·25	10·02	21·89	50·00	8·00	10·00	Light brown coarsely ground powder: sweet and wholesome.
63534	Burns' Digester Tankage and Bone Meal.	P. Burns & Co., Ltd., Edmonton, Alberta, Est. 23 A.	.....	7·05	51·54	9·60	25·79	10·46	22·84	50·00	8·00	6·00	Greyish brown powdery sample with small particles of charred material and white bone-like material.

Maximum	Protein:	54·91	Fat:	14·07	Phosphoric acid (P_2O_5)	13·98
Minimum	"	43·88	"	4·02	" " "	10·02
Average	"	50·66	"	9·41	" " "	11·38

TABLE V—BONE MEAL: 1923

Lab'y. No.	Trade Name or Brand	Manufacturer	Reg. No.	Moisture	Protein	Fat	Ash	Phosphoric Acid (P_2O_5)	Phosphoric Acid calculated as Bone Phosphate	Guarantee			Description
										Protein	Fat	Phosphate	
				p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	pc..	p.c.	
63313	Gunn's Shurgain Poultry Bone.	Gunn's, Ltd., Toronto, Ont.	211	8·33	25·48	2·75	60·43	24·99	54·59	.....	.....	.....	White, coarsely granular or crushed.
63350	Swift's Poultry Bone.....	Swift & Co., U.S.Y., Toronto, Ont.	548	9·35	25·42	1·00	65·16	25·69	56·10	25·0	5·0	50·0	Slightly creamy in colour: very coarsely granular.
63385	Swift's Lay-More Poultry Bone.	Swift's Can. Co., Winnipeg, Man.	912	1·83	26·54	3·70	68·01	27·13	59·27	25·0	5·0	50·00	White very coarsely granular or crushed.
63386	Swift's Raw-Bone Meal...	" " ..	913	3·73	26·34	5·76	62·61	25·90	56·57	25·0	5·0	50·00	Cream coloured powder.
63413	Harab Poultry Bone.....	Harris Abbattoir Co., Ltd., Est. No. 7.	310	9·21	25·91	1·89	63·69	25·12	54·87	25·0	5·0	55·00	White pieces the size of small pebbles.
63415	Harab Poultry Bone Meal	" " ..	317	8·00	27·13	2·63	54·88	23·88	52·17	25·0	5·0	55·00	Very coarsely powdered.
63479	Swift's Poultry Bone.....	.....	.....	8·13	24·79	2·70	64·39	25·49	55·67	.....	.....	.....	White, finely granular.
63493	Burn's Poultry Bone.....	.....	.....	7·28	27·32	2·12	63·63	24·15	52·74	.....	.....	.....	White, coarsely granular.
63495	Burn's Bone Meal.....	P. Burns & Co., Ltd., Calgary, Alberta.	645	6·08	27·43	2·32	62·26	25·45	55·59	25·0	5·0	50·0	Greyish in colour: coarsely powdered.
63504	Burn's Poultry Bone.....	P. Burns & Co., Ltd., Vancouver, B.C.	367	5·00	25·01	2·73	63·98	25·95	56·69	25·0	5·0	50·0	Creamish, coarsely powdered.

Maximum.....	Protein:	27·43	Phosphoric acid (P_2O_5)	27·13
Minimum.....	"	24·79	" " "	23·88
Average.....	"	26·14	" " "	25·37

BLOOD MEAL

It has been suggested that the definition for this product should read, " blood meal or blood flour is ground dried blood and must contain not less than 70 per cent of protein and not more than 4 per cent of ash."

The composition of four samples, from four firms, is presented in table VI.

The range in protein content is from 60 to 75 per cent, three of the samples containing practically 70 per cent or over. No. 63318 may be considered as of very good quality, by reason of its high protein and low ash. One sample in the series (No. 63417) would not meet the requirements of the proposed definition; it is 10 per cent too low in protein and excessively high in moisture and ash.

Three of the samples bear guarantees in respect to protein content; one only (No. 63492) meets its guarantee satisfactorily.

CRACKLINGS

The following is a suggested definition for this animal product: " Cracklings is the residue from permitted animal tissues after partially extracting fat and oils by cooking in open kettles, and which contains over 15 per cent of fat. It must be free from blood or stick."

The series examined comprised three samples, from two firms. One of these (No. 63411) bore simply a brand name and was placed in this group by reason of its fat content. Of the remaining samples, one is labelled " beef " and the other " pork " cracklings.

The range in protein is practically from 25 to 50 per cent; in fat, practically from 40 to 70 per cent.

In the case of one sample (No. 63387) the guarantee respecting protein is not met but as regards fat it is exceeded by nearly 8 per cent. No. 63388 satisfactorily meets its guarantee. All the samples were free from rancidity.

The use of cracklings as a feeding stuff is rather restricted; its employment is practically confined to the rations of poultry, dogs and foxes.

EDIBLE FISH MEAL

Fish meal is a feeding-stuff product obtained by the utilization of surplus fish and fish offal, the process of manufacture comprising the reduction of the fish or offal by steam cooking, the separation by skimming and pressure of the larger proportion of the oil and the drying and grinding of the residue. The fish and fish wastes employed must be fresh and sound and the several operations carefully and thoroughly carried out, if a wholesome, palatable meal with good keeping qualities is to result. Unsound fish or waste will result in unwholesome and rancid products, unpalatable to stock, likely to produce scouring and other digestive troubles and apt to cause tainted meats, milk and eggs.

The composition of fish meal varies greatly, depending on the nature of the raw product—whole fish or offal—and the thoroughness with which the several steps in its preparation have been carried out. It appears to be essential to the keeping qualities of the meal that the oil should be extracted fairly thoroughly, and the high-grade meals are those with a low oil content.

Fish meal, though usually containing a notable amount of oil, is essentially a nitirogenous concentrate containing as a rule, from 50 per cent to 60 per cent protein. There is frequently present, especially if fish offal has been used, a high percentage of phosphate of lime. This feature may be a valuable one from the feeder's point of view, especially for young stock and also in enhancing the fertilizing value of the resultant manure.

The series examined comprised seven samples, the product of four firms operating on the Pacific coast.

TABLE VI—BLOOD MEAL: 1923

Lab'y. No.	Trade Name or Brand	Manufacturer	Reg. No.	Moisture	Protein	Fat	Ash	Guarantee Protein	Description
				p.c.	p.c.	p.c.	p.c.	p.c.	
63318	Gunn's Shurgain Blood Meal..	Gunn's Limited, Toronto, Ont..	212	10·76	74·52	1·24	3·94	.....	Finely ground powder of chocolate brown with fine shreds of fibre throughout: sound and wholesome.
63384	Swift's Blood Meal.....	Swift's Can. Co., Ltd., Est. 18, Winnipeg, Man.	359	12·15	69·47	1·03	12·74	77·00	Also finely ground powder of chocolate brown colour but much more fibrous than No. 63318: sound and wholesome.
63417	"Harab" Blood Flour.....	Harris Abattoir Co., Ltd., Est. No. 7.	318	21·75	60·08	1·41	12·55	70·00	Finely ground powder of dark brown shade with numerous fine white flecks throughout: sound and wholesome.
63492	Burns' Blood Meal.....	P. Burns & Co., Ltd., Calgary, Alberta, Est. No. 23.	644	20·02	68·95	1·27	8·49	60·00	Fine chocolate coloured powder small proportion of fibrous material: sweet and wholesome.

Maximum.....	Protein: 74·52	Ash: 12·74
Minimum.....	" 60·08	" 3·94
Average.....	" 68·25	" 9·43

TABLE VII—CRACKLINGS: 1923

Lab'y No.	Trade Name or Brand	Manufacturer	Reg. No.	Moisture	Protein	Fat	Ash	Guarantee Protein	Guarantee Fat	Description
				p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	
63387	Beef Cracklings.....	Western Packing Co., Winnipeg, Man.	.....	4·92	24·43	69·38	1·37	31·4	61·7	Large irregular-sized lumps almost entirely of fat; some of the rind still attached; sweet and wholesome.
63388	Pork Cracklings.....	" "	.....	5·16	37·90	53·88	1·78	35·00	53·7	Same appearance as No. 63387.
63411	"Makemla" Poultry Food No. 1.	Gainers Ltd., Edmonton, Alta.	.....	8·67	48·48	41·05	2·24	.....	.....	Crumbly, brown, fatty, appearance; sound and wholesome.

TABLE VIII.—EDIBLE FISH MEALS: 1923

Lab'y No.	Trade Name or Brand	Manufacturer	Reg. No.	Moisture	Protein	Fat	Ash	Phosphoric acid (P_2O_5)	Phosphoric acid calculated as bone phosphate	Guarantee		Description
										Protein	Fat	
				p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	p.c.	
67440	Hius Kookum Branch Fish (Salmon) Meal.	Rendez Vous Fisheries Ltd., Rendez Vous Island, B.C.	255	5·82	59·08	20·22	12·81	5·54	12·10	65·0	10·0	Orange-yellow powder with small bone-like particles.
67441	Dog Fish Meal.....	" "	.....	5·93	61·41	16·42	13·67	5·26	11·49	.....	.....	Dark yellowish-brown coarse powder with a few bone-like particles.
67442	Salmon Fish Meal..	Todds Cannery, Esquimalt, B.C.	.....	6·16	59·52	8·89	17·57	7·81	17·06	.....	.....	Coarsely granular product; dark brown in colour; almost odourless.
67443	Dog Fish Meal.....	" "	.....	7·14	56·54	16·09	13·27	5·54	12·10	.....	.....	Dark brown powder, finely granular; odourless.
67444	Halibut Fish Meal..	Rupert Marine Products Ltd., Prince Rupert, B.C.	.....	4·92	62·93	11·92	19·63	8·21	17·93	.....	.....	Yellow; finely shredded material with large lumps of bone through it; decidedly fishy odour but sweet.
67445	Salmon Fish Meal..	" "	.....	6·10	60·12	10·98	19·44	8·56	18·69	.....	.....	Brownish-coloured product consisting of large amount of fibrous or shredded material along with small lumps of gelatinous material.
70275	Dog Fish Meal.....	Nanaimo Fish Meal and Oil Refinery Ltd., Nanaimo, B.C.	28	7·61	61·97	17·63	12·99	5·02	10·96	60·0	10·0	Dark yellowish-brown coarse powder with bone-like particles.

Maximum.....	Protein	62·93	Fat	20·22	Phosphoric Acid (P_2O_5)	8·56
Minimum.....	"	56·54	"	8·89	"	5·02
Average.....	"	60·22	"	14·59	"	6·56

Laboratory No. 67440.—This " salmon meal " is manufactured from heads, fins, tails and entrails, in the cannery, by digestion, with separation of oil. The cooked material is pressed, dried and ground. While not meeting its guarantee in respect to protein, it exceeds it in fat, which reaches the high figure of 20 per cent. It contains about 12 per cent of bone phosphate.

Laboratory No. 67441.—This is " dogfish meal ", the whole fish being used in its manufacture.

Laboratory No. 67442.—This meal is made from salmon offal, the process consisting of digestion with live steam, separation of the oil, pressing and drying of the residue. In protein content it is very similar to No. 67440—another salmon meal—from which it differs, however, in containing less oil and more bone phosphate.

Laboratory No. 67443.—Dogfish meal, made from the entire fish, the process of manufacture being that already outlined for No. 67442. It differs from the other two dogfish meals of the series in having a lower protein content; all three are very similar in regard to oil and bone phosphate.

Laboratory No. 67444.—Halibut meal. This is made exclusively from halibut heads, which are digested with live steam under pressure, the material removed and subjected to hydraulic pressure to remove oil, dried and ground.

It possesses the highest protein content in the series and the second highest percentage of bone phosphate.

Laboratory No. 67445.—Salmon meal. Made from salmon offal of the canneries, in the same manner as described in the preceding paragraph.

It closely resembles the other two salmon meals of the series in protein content; in respect to oil and bone phosphate its results approximate those of No. 67442.

Laboratory No. 70275.—Dogfish meal. The fish is cooked in large steam-jacketed kettles, the contents emptied into filter cloths and subjected to hydraulic pressure for the removal of the oil. The residue is dried, ground and bagged.

In composition, as in appearance, this sample is very similar to No. 67441.

This series throughout consisted of meals of excellent quality—rich in protein, oil and bone phosphate; they were all sweet, sound and wholesome.

It is desirable in the manufacture of edible fish meals that the raw material be *fresh* and that the moisture and oil in the finished product be kept sufficiently low to ensure good keeping qualities.

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