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ORIGINAL: ENGLISH

Expert Group Meeting on Fish Protein
Concentrate Production

Agadir, Morocco, 14 - 18 December 1969

HISTORY AND PRESENT TRENDS
IN FISH PROTEIN CONCENTRATE PRODUCTION ✓

by

Oswald A. Roels
Marine Biology Division
Lamont-Doherty Geological Observatory
of Columbia University
Palisades, New York, USA

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United Nations Industrial Development Organization

Distr
LIMITED
ID/WG.48/1 SUMMARY
7 November 1969
ORIGINAL: ENGLISH/FRENCH

Expert Group Meeting on Fish Protein
Concentrate Production
Casablanca, Morocco, 15 - 19 December 1969

SUMMARY
HISTORY AND PRESENT TRENDS
IN FISH PROTEIN CONCENTRATE PRODUCTION

by
Gerald A. Smith
Marine Biology Division
Lamont-Doherty Geological Observatory
Palisades, New York, USA

The paper discusses a series of topics selected by UNIDO.

Introduction

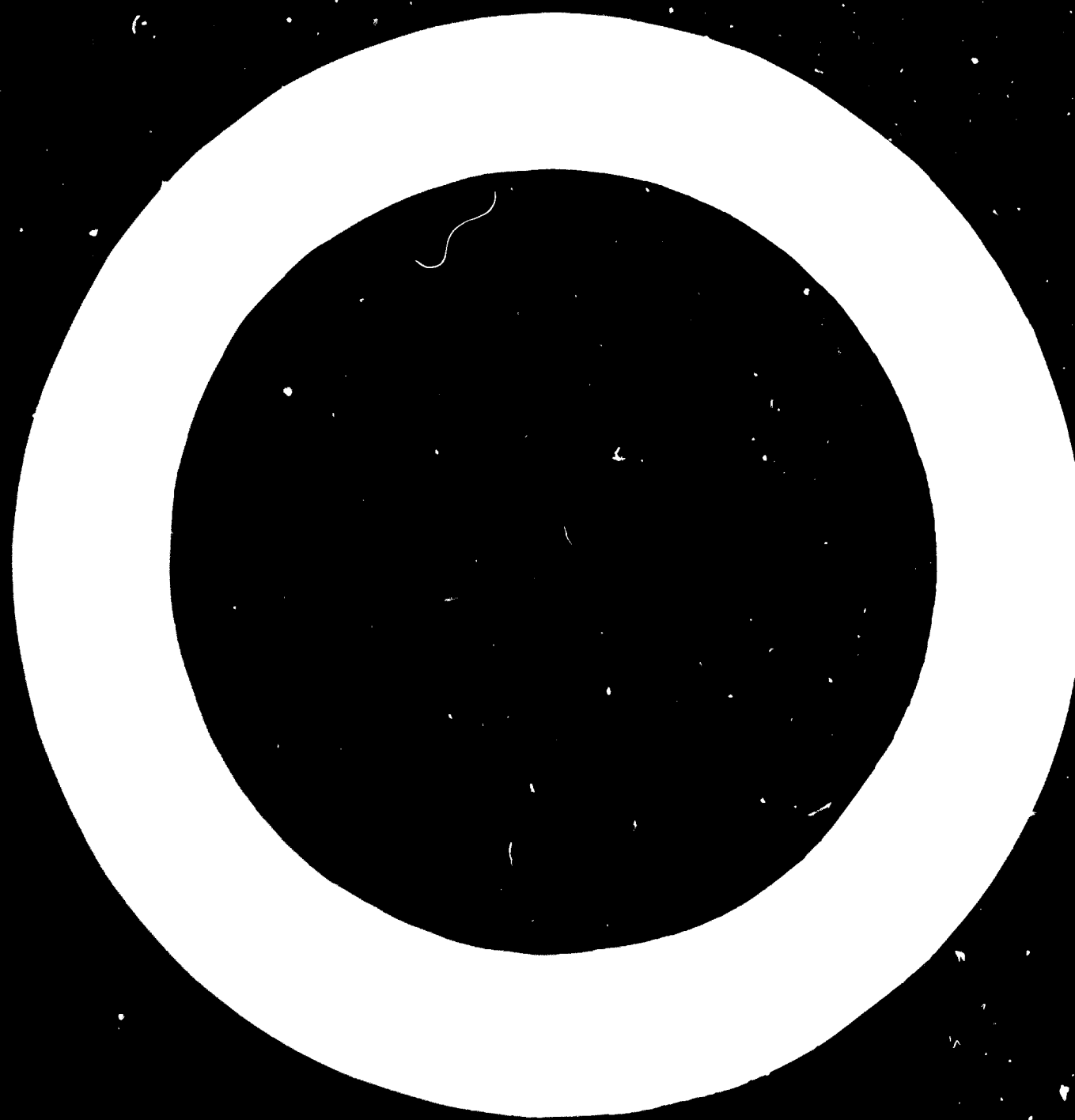
There is an acute shortage of fish-protein concentrate in the world. This shortage is being met by utilizing fatty fish — the world's largest fisheries — as a source of fish-protein concentrate. This paper discusses the history and present trends of fish-protein concentrate production.

History of fish-protein concentrate production

The history of fish-protein concentrate production is closely related to the history of fish-protein concentrate production. The first fish-protein concentrate was produced in 1900 in the United States. It was made from cod fish. The first fish-protein concentrate was made from cod fish. The first fish-protein concentrate was made from cod fish. The first fish-protein concentrate was made from cod fish.

Present trends in fish-protein concentrate production

Present trends in fish-protein concentrate production are characterized by a shift from cod fish to other species of fish. This shift is due to the depletion of cod fish stocks. The shift is also due to the increasing demand for fish-protein concentrate. The shift is also due to the increasing demand for fish-protein concentrate. The shift is also due to the increasing demand for fish-protein concentrate.



Political changes resulting in economic upheavals in Africa brought these developments to a standstill.

Solvent-Extracted Fish and Fish Meal: Fish Protein Concentrate

A great number of processes to prepare defatted fish protein concentrate by solvent extraction were developed in several countries: the Union of South Africa, Chile, the U.S.A., Canada, Morocco, Peru, Sweden, Germany and Britain. In these processes, whole fish is extracted with one or more solvents to remove most of the lipids. The resulting defatted fish is dried and ground. The biological value of these products is generally excellent, but they have no 'functional' properties. They are bland and are best incorporated in bread, cookies, macaroni and the like. Solvent extraction processes may be quite expensive. Punitive legislation in the U.S.A., including restriction of the preparation to fish or fish-like fishes, and a limitation on the size of the packages to one pound, make the product rather expensive.

Fish Protein Hydrolysates

Several processes have been developed, and others are under development, to produce fish protein hydrolysates by chemical, enzymic or microbial hydrolysis of fish to prepare water-soluble fish protein hydrolysates.

Newer Developments

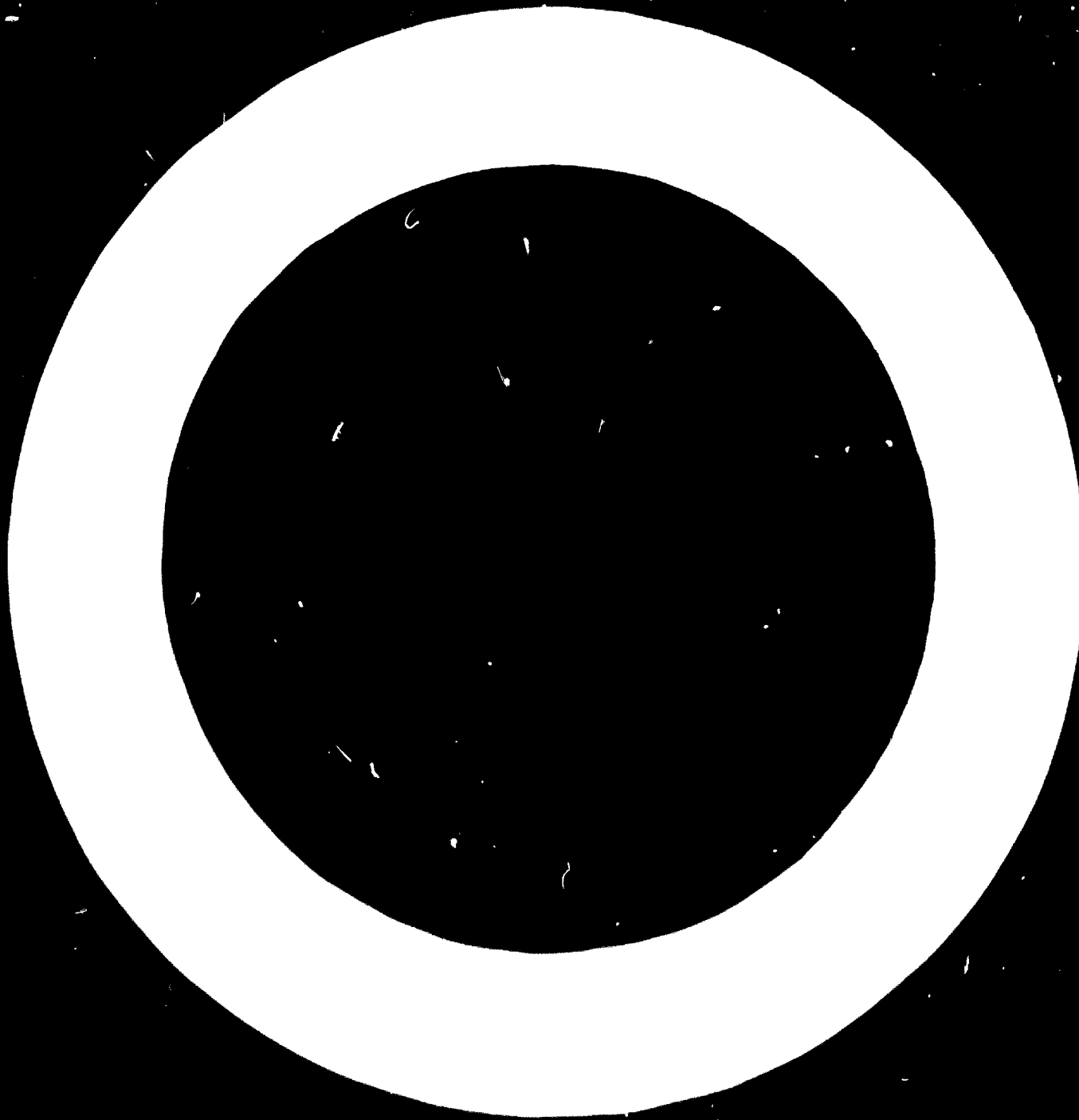
Other fermentation processes using lipolytic micro-organisms to convert the fish oils into microbial protein, carbohydrates and lipids, leaving the original fish protein unchanged, are under development.

A method in which fish is fermented with a micro-organism which prevents peroxide formation in the fish oil has been developed and is beginning to find small-scale application.

New Marine Protein Resources

Artificial upwelling of deep water can produce high yields of marine proteins, thereby avoiding erratic fish catches which may

adversely influence the economics of the operation of fish plants and Fish Protein Concentrate production. In this process, nutrient-rich deep water is pumped from the nutrient maximum in the sea—usually at 500-800 meters depth -- to the surface, thereby fertilizing the "euphotic" zone where photosynthetic algae can grow. This creates a plankton bloom, capable of sustaining populations of filterfeeding organisms, such as shellfish and certain types of fish. The process is most easily applicable in areas where deep water is close to shore.



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Introduction

1. Food production per capita is declining in the developing countries.

Despite an estimated increase of world food production by about three percent in 1967, food production per capita in the developing countries as a whole averaged about three percent less in 1965-1967 than in the preceding three-year period (1).

2. The shortage of high-quality protein is acute.

The Advisory Committee on the Application of Science and Technology to Development reported to the Economic and Social Council of the United Nations in 1968 that "the quality (notably protein) of the food consumption pattern is even more critical than the quantity of food (calories), which is already causing considerable concern in many areas throughout the developing world. For over one-third of the present population in the developing countries, the protein-calorie balance of the diet is inadequate. The Advisory Committee has not tried to calculate the size of the protein gap.

Various methods have been devised in attempting to do so. Although there may be wide differences in the resulting figures, they all indicate that such a gap exists, and experts are unanimous in emphasizing that a gap is undeniable and increasing.

"The gap between the nutritional requirements and the actual consumption of protein by the greater part of the populations in the developing countries is widening rapidly. Protein deficiency already has serious consequences for the health and working efficiency of the populations of developing countries. If the situation worsens, the physical, economic, social and political development of the populations involved may be completely arrested. Protein-calorie malnutrition not only increases susceptibility to acute and chronic infections, but also causes a compensatory reduction in the capacity for physical activity and promotes apathy. These direct effects on adult populations impede the economic productivity and development of countries which are desperately in need of improving the status and potential of their peoples, quite apart from the human suffering involved.

"The growing nutritional deficiencies have even greater impact on young children in developing countries. In some countries, as many as one-third die before reaching school age, and for most of the survivors physical growth and development are impaired. Moreover, there is increasing evidence of associated retardation in mental development,

learning and behaviour, due in particular to malnutrition in early childhood. Thus, the nutritional deficiencies existing at the present time in many developing countries already are jeopardizing the future for many millions of the world's people."

"The resources required to close the protein gap and then maintain adequate per capita production and consumption of protein are very large. While the land available and existing technology permit the world to feed adequately even larger populations than at present, improvement of conventional agriculture in the developing countries is not taking place rapidly enough, nor can it be expected to on the basis of presently projected efforts. It must be supplemented by protein-containing foods of unconventional origin, such as oil-seed meal, fish-protein concentrate, single-cell cultures and the effective use of synthetic essential amino acids and non-specific nitrogen sources. In order to achieve the improved utilization of these sources, there must be greater emphasis on nutrition education and on the processing, marketing and promotion of food products." (2)

3. Present fisheries resources, particularly fatty fish, are utilized inefficiently in long food chains.

The animal protein shortage could be filled readily by a more efficient use of present fisheries resources. The annual fish catch represents currently about fifty million tons of fish, containing about ten million tons of animal

1. 研究目的及意義

本研究旨在探討我國企業在國際市場上的競爭力，並分析影響競爭力的主要因素。

研究目的在於了解我國企業在國際市場上的競爭力，並分析影響競爭力的主要因素。

研究意義在於為我國企業提供參考，並為政府制定相關政策提供依據。

本研究將採用文獻分析法、問卷調查法及專家訪談法等研究方法。

研究範圍將涵蓋我國主要出口企業，並分析其在國際市場上的競爭力。

研究對象為我國主要出口企業，包括製造業、服務業及貿易業等。

研究時間範圍為2010年至2020年，以了解我國企業競爭力的變化趨勢。

研究地點將涵蓋我國主要出口企業，並分析其在國際市場上的競爭力。

研究內容將包括我國企業在國際市場上的競爭力現狀、影響因素及提升策略等。

研究結果將為我國企業提供參考，並為政府制定相關政策提供依據。

研究結論將指出我國企業在國際市場上的競爭力現狀，並提出提升策略。

研究建議將包括加強企業自身競爭力、提高產品質量及加強國際合作等。

研究展望將包括進一步探討我國企業在國際市場上的競爭力，並分析影響競爭力的主要因素。

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THE HISTORY OF THE UNITED STATES OF AMERICA

FROM THE EARLIEST PERIODS TO THE PRESENT

BY CHARLES C. SMITH

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1. **Историческое значение** (Historical significance) (Историческое значение)

2. **Образование и развитие** (Education and development) (Образование и развитие)

3. **Экономическое значение** (Economic significance) (Экономическое значение)

4. **Культурное значение** (Cultural significance) (Культурное значение)

5. **Социальное значение** (Social significance) (Социальное значение)

6. **Политическое значение** (Political significance) (Политическое значение)

7. **Научное значение** (Scientific significance) (Научное значение)

8. **Эстетическое значение** (Aesthetic significance) (Эстетическое значение)

9. **Символическое значение** (Symbolic significance) (Символическое значение)

10. **Религиозное значение** (Religious significance) (Религиозное значение)

11. **Юридическое значение** (Legal significance) (Юридическое значение)

12. **Экологическое значение** (Ecological significance) (Экологическое значение)

13. **Моральное значение** (Moral significance) (Моральное значение)

14. **Этическое значение** (Ethical significance) (Этическое значение)

15. **Психологическое значение** (Psychological significance) (Психологическое значение)

16. **Социально-психологическое значение** (Sociopsychological significance) (Социально-психологическое значение)

17. **Политико-экономическое значение** (Economic-political significance) (Политико-экономическое значение)

18. **Культурно-историческое значение** (Cultural-historical significance) (Культурно-историческое значение)

19. **Социально-политическое значение** (Sociopolitical significance) (Социально-политическое значение)

20. **Экономико-политическое значение** (Economic-political significance) (Экономико-политическое значение)

21. **Культурно-экономическое значение** (Cultural-economic significance) (Культурно-экономическое значение)

22. **Социально-экономическое значение** (Socioeconomic significance) (Социально-экономическое значение)

23. **Экономико-социальное значение** (Economic-social significance) (Экономико-социальное значение)

24. **Культурно-социальное значение** (Cultural-social significance) (Культурно-социальное значение)

2. Fish stocks and fish catches concentrates could
control the fishery's structure.

The general aim of fish stocks for human consumption

is to provide a sustainable fishery which should therefore aim to:

1. maintain or increase available fisheries resources--
by converting the fatty fish into an
alternative source of food.
2. reduce the cost of fish stocks by cutting out
the most expensive and wasteful operations.
3. provide a comprehensive and detailed and correct
fish stocks and catches point of view.

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number of countries a flavorless fish flour would be preferred, whereas in a number of other countries, such as in South East Asia and Africa, fish flour with certain flavors might be preferred."

"In the meantime, a great number of nutritionists, government officials, etc., all over the world became interested in the great possibilities of edible fish flour and UNICEF and FAO are arranging for a series of acceptability tests in different countries in cooperation with local fisheries and nutrition people. In Malaya, Indonesia and the Philippines, a number of government workers have embarked on these experiments themselves. It is interesting to note that adults in Indonesia preferred a local fish flour of selar (*Caranx spp.*) with a rather pronounced flavor to a flavorless fish flour. According to information received, small children and infants do not show this preference, however." (4)

The development of fish flours with full fish flavor for human consumption is based on hard economic facts: the wholesale price of fish meal for animal food is currently (1969) about 4.6 U. S. cents per pound. Since this fish meal contains 65% protein, the cost of the protein in the meal is approximately 7 U. S. cents per pound. If such protein could be utilized directly for human consumption with relatively little increase in cost, few other available proteins could compete with it. Moreover, the biological value of fish meal is well established. Therefore, several attempts were made in the 1950's to produce inexpensive fish flours for human consumption.

All these products had strong fish flavors. It was for this reason that they were accepted and bought by the consumers. In these African countries, the staple food is usually a bland starch, and the fish flour was used to prepare a sauce which added flavor to this food.

It should be realized that in many underdeveloped areas, the population groups which most require high-quality protein supplementation of their diet live essentially in a subsistence economy; they grow and produce their own food and have a very low monetary income available for buying food. In the African countries where I have had experience, most of the regular purchases made was salt. When the fish flour could be presented as another type of supplement to salt flours to the diet, it sold well, even in areas such as Senegal and Burundi where the population was traditionally vegetarian.

1. Ghana

In Ghana, the Fisheries Service of the government built a pilot plant in Accra in 1951 to produce fish flour for human consumption (5, 6). The fish used was generally mackerel caught in the coastal waters from June to September. The product was prepared by autoclaving the frozen fish, cooking it to remove part of the oil, and drying the resulting cake; it was sold at twenty-one cents per kilo in 1952 and the small pilot plant could never produce enough to satisfy the demand. A larger fish flour factory was therefore included in the construction plans for future expansion.

This approach can obviously also be used to produce fresh-water fish.

The first part of the document discusses the importance of maintaining accurate records and the role of the auditor in this process. It emphasizes the need for transparency and accountability in financial reporting.

The second part of the document outlines the specific procedures and standards that must be followed during the audit process. This includes the selection of samples, the use of statistical methods, and the documentation of findings.

The third part of the document addresses the challenges and risks associated with auditing, such as the potential for fraud and the complexity of modern financial instruments. It provides guidance on how to identify and mitigate these risks.

The fourth part of the document discusses the ethical responsibilities of auditors and the importance of maintaining objectivity and integrity throughout the audit process.

The fifth part of the document provides a summary of the key points discussed and offers recommendations for improving the audit process and enhancing the reliability of financial reporting.

The following table provides a detailed breakdown of the data collected during the audit process. Each row represents a different category of data, and the columns show the results of the audit.

Category	Item 1	Item 2	Item 3	Item 4
Category A	100	200	300	400
Category B	150	250	350	450
Category C	200	300	400	500
Category D	250	350	450	550
Category E	300	400	500	600

The data shows a consistent upward trend across all categories, indicating a positive overall performance. The findings are consistent with the expectations set at the beginning of the audit.

1. South Africa

One of the early efforts in this area was undertaken by the "Fishing Industries Research Institute" of South Africa in collaboration with a private firm, "Marine Oil Refineries of Africa." This group prepared a leucorized fish protein concentrate by extraction of whole fish (*Sardina maderensis*) with methanol (13, 14). This leucorized, defatted fish flour was incorporated into 25% of all the bread baked in Johannesburg. It was then found that the population groups who operated the productive equipment most did not buy bread in the first place. This highly anticipated government-sponsored project was therefore abandoned.

United States

Research and development of this concept in South Africa was the result of interest of a United Nations-sponsored Food Research Commission. The first in this subject (1) reported that the main obstacle to the realization of this idea in America is the cost of the fish.

Research of the leucorized fish protein concentrate with an edible sugar fructose which was developed by the Fisheries Research Institute of South Africa, was reported in a paper presented at the 1964 meeting of the American Fisheries Society in Washington, D.C. The leucorized fish protein concentrate was found to be a valuable source of protein and amino acids for the nutrition of the young of many species of fish. The leucorized fish protein concentrate was also found to be a valuable source of protein and amino acids for the nutrition of the young of many species of fish. The leucorized fish protein concentrate was also found to be a valuable source of protein and amino acids for the nutrition of the young of many species of fish.

2. the "fish consciousness" of the population and authorities of Chile is very high after the work of an FAO Technical Assistance Expert in Fisheries Propaganda, and of others;

3. the FAO Regional Office in Santiago has the services of a Nutrition and of a Fisheries Officer;

4. at present, the Chilean diet is short in animal protein;

5. official authorities and a number of interested nutritionists and other workers are eager to give their full cooperation.

"In preparatory experiments the fish flour was mixed into a number of foods such as vegetable soup, potato soup, tagliarini (alimentary paste), cochayuyo (edible algae), fried potatoes and lettuce, beet leaves pie, beans, beef stew, boiled potatoes, cocktail crackers, coffee cake and white bread.

"In the preliminary tests, these combinations were judged by a limited number of persons, who found the preparations generally acceptable, except for the tagliarini, the cochayuyo and the beef stew, about which the main complaint was that the texture was not normal (this may be overcome by using a more finely milled fish flour). The beet leaves pie, the crackers (25% fish flour), the coffee cake (10% fish flour) and the bread (10% fish flour) were unanimously accepted.

"Based on these preliminary results a large scale trial was started involving 140 school children, 5 to 14 years old, who every day during six weeks, as part of their school lunch each received an 80-gram bread roll made at a commercial bakery, which used flour containing 10% fish flour. Compared with normal bread, the only difference was a slightly darker color; smell, taste, form and consistency of crust and crumb being normal.

"The bread was very well accepted by the children. There was not a single case of rejection or complaint. No digestive trouble traceable to the bread occurred.

"Each bread roll contained 6.1 g fish flour, which provided a child with a daily supplement of: 4.4 g protein, 115 mg calcium, 120 mg phosphorus, and 3 mg iron, where the roll itself supplies 6.5 g protein.

"The same type of fish-flour-fortified flour was used during a short period in bread given to young men in a military camp. Here also this type of bread was very well accepted.

"After these results had been obtained, the Chilean Government sent a request to UNICEF and FAO to help them in setting up a plant for the manufacture of edible fish flour to be used mainly in supplementary feeding schemes."

Later on, UNICEF assisted the government of Chile in the production of Fish Protein Concentrate by providing the supervisory engineering services and the necessary processing equipment which was installed at the ISPSA (Industria Pescera

de Altamar) plant at Quintero in Chile. A report on the operation of the plant, the biological value of the product, and all cost details was prepared by Layton E. Allen, the senior engineer for the United Nations Children's Fund, and published in Fishing News International in January, 1963 (12). The plant used fresh hake (merluzza), which is a lean, edible fish. The process uses a combination of hexane and ethanol extractions for fat removal and deodorization. The plant used a horizontal, steam-jacketed, air-swept, raw fish dehydrator with scraper, agitator and condenser; a horizontal steam-jacketed rotary extractor with integral cloth filters and the necessary connections for a vacuum solvent flow and steam stripping; a solvent recovery and storage system; an alcohol purification system; a hammer mill for the dehydrated meal; a hammer mill, flour sieve and packing arrangement for the deodorized product; and the necessary hoppers, conveyors, bucket elevators and cyclones to transport the materials between operations. In this plant the raw fish is first heat-dried in air and the so-obtained meal is extracted with ethanol or with hexane/ethanol. Drying of the raw fish is accomplished in a steam-jacketed horizontal vessel, agitated by a steam-heated cage of cubes. Meal-drying temperature can be controlled over a range of 70-100°C by adjustment of rate of air circulation. Under these conditions, drying requires about six hours per batch of two tons of whole, fresh merluzza, including time for charging and discharging. Defatting and deodorizing of the ground meal are accomplished

by solvent extraction of batches of the dried meal in a jacketed rotary extractor vessel by successive washings with batches of solvent. Most of the solvent is removed from the drained meal by agitation and heating under vacuum. The partially dried meal is then stripped of residual solvent with reduced-pressure steam under vacuum. Maximum temperature during this operation is 80°C. The yield of dried, demethylated product is about 14% of the initial fresh fish. The product contained, on an average, 1.5-17% moisture, approximately 80% protein (N x 6.25), 1.6-13% fat, with the rest ash. The fluoride content varied from about 150 to 200 parts per million, and the lysine content approached 2%. Total processing costs, including the price of raw fish, the fish oil recovered, electricity, steam, water, labor, solvents and packaging supplies, were estimated to be 268 U. S. dollars per metric ton of defatted and deodorized fish flour, with the hexane/ethanol process, based on prices in Quintero, Chile, in December, 1961.

In a recent publication describing the Quintero Fish Protein Concentrate (13), it was stated that the product was sold at 35 to 55 U. S. cents per kilogram, but that the exact cost of this product was hard to calculate since the plant was built with the technical and financial aid of UNICEF, is owned by the Chilean government, and is operated by private industry. The Chilean government is expected to favor Fish Protein Concentrate produced locally in Chile for

The process described herein concerns the production of a fish meal product which is free of the odor and taste of fish.

1. First Extraction

a. Process

In order to obtain the fish meal, the fish is first cleaned and then the head and tail are removed. The fish is then cut into small pieces and placed in a large tank. The fish is then cooked in a large tank with steam. The fish is then pressed in a large tank to remove the oil. The fish is then dried in a large tank. The fish is then ground in a large tank. The fish is then screened in a large tank. The fish is then packed in a large tank. This first extraction yields a product with approximately 70% protein content, 10% fat, 0.5% crude fiber, and 1.5% moisture when fish is used. This product is now offered as a milk replacer in animal feeds, and sells for about fifteen cents per pound (March 1969) when bought in fifteen ton lots.

The advantage of this type of partially defatted fish protein feed is that it can be used to feed chickens, pigs, etc., right until slaughter without impairing the flavor of the meat. Regular fish meal cannot be fed to animals for several weeks prior to slaughter because it gives a fishy flavor to the meat.

VIOBIN utilizes a second extraction of the ethylene-dichloride-extracted product with isopropanol to remove the last traces of fat and the flavor.

● **Положение дел в области культуры и искусства**

Вопросы культуры и искусства являются одними из наиболее важных в жизни нашего народа.

В настоящее время в нашей стране наблюдается быстрый рост культуры и искусства.

Важнейшим направлением является развитие народного искусства.

Народное искусство является основой культуры и искусства нашего народа.

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1. The first part of the document discusses the importance of maintaining accurate records of all transactions and activities. It emphasizes that proper record-keeping is essential for transparency and accountability, particularly in financial matters. The text outlines various methods for organizing and storing data, including digital databases and physical filing systems. It also mentions the need for regular audits and reviews to ensure the integrity and accuracy of the information.

2. The second part of the document focuses on the implementation of internal controls and risk management strategies. It describes how these measures can help prevent fraud, reduce errors, and protect the organization's assets. The text provides examples of effective control mechanisms, such as segregation of duties, approval processes, and regular monitoring. It also discusses the importance of a strong corporate culture that promotes ethical behavior and compliance with applicable laws and regulations. The document concludes by highlighting the ongoing nature of these efforts and the need for continuous improvement and adaptation to changing circumstances.

of view of protein supplementation of the diet (14). The Bureau of Commercial Fisheries uses a multi-stage isopropanol extraction process to remove both water and oil from the fish, and obtains a bland and finely ground product. A very detailed description of the multi-stage isopropanol extraction process developed by the Bureau of Commercial Fisheries is given in the brochure "Marine Protein Concentrate," published by the United States Department of the Interior, Fish & Wildlife Service, Bureau of Commercial Fisheries, Fishery Leaflet 534, Washington, D.C., April, 1966 (14).

After intensive toxicological and biological evaluation, the FDA passed a regulation on February 2, 1967, admitting the wholesomeness of the product, but restricted its preparation to fish protein concentrate made from whole hake and hake-like species of fish prepared by solvent extraction of fat and moisture with isopropanol or with ethylene dichloride, followed by isopropanol (15).

The Food and Drug Administration's specifications for fish protein concentrate are the following:

1. It must be made from hake or hake-like fish.
2. It should have a minimum protein content of 75%.
3. It should have a maximum water content of 10%, a maximum fat content of 0.5%, a maximum fluoride content of 100 parts per million, a maximum isopropanol content of 250 parts per million, a maximum ethylene dichloride content of 5 parts per million.

4. It should be free of pathogenic organisms.

The Food & Drug Administration has stated that fish protein concentrate is supposed to be an additive intended for use in the household only as a nutrient supplement. This additive must be packed in containers of a size and construction one pound in weight. This regulation effectively prohibits the use of FPC in formulated feeds at the manufacturing level. The U. S. Food and Drug Administration approval of whole FPC, achieved through the laboratory efforts of the U. S. Bureau of Commercial Fisheries, was considered extremely important despite its position against our domestic firms in the United States and outside are now seriously considering the production of protein feeds utilizing whole fish (16).

The Bureau of Commercial Fisheries has been recently awarded a two-million-dollar contract to Southern Engineering, Inc., to build a pilot demonstration plant at Aberdeen, Washington, U.S.A. The plant will be operated by Free Fish Foods, Inc., and will use the improved process developed in the Bureau of Commercial Fisheries.

e. Cardinal Proteins

The "Cardinal Proteins Co." is building a plant in Canada which will use the U. S. Bureau of Commercial Fisheries process for the production of thirty tons of fish protein concentrate per day from red hake. This process is to debone the fish with a specially developed deboning machine prior to isopropanol extraction. This should bring

一、總論
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（二）研究之動機及意義
（三）研究之方法
（四）研究之步驟
（五）研究之結論

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四、研究之方法
（一）研究之方法
（二）研究之步驟
（三）研究之結論

1. 總論

本報告之目的在於探討我國經濟發展之現狀與未來趨勢，並提出相關政策建議。

我國經濟近年來呈現穩定增長之態勢，主要得益於政府積極之財政與貨幣政策。然而，在國際經濟環境日益複雜化之背景下，我國經濟發展仍面臨諸多挑戰。例如，全球貿易保護主義抬頭，導致我國出口貿易受到一定程度的影響。此外，國內經濟結構調整亦在進行中，傳統產業與新興產業之競爭日益激烈。未來，我國應進一步深化改革，擴大開放，提高經濟競爭力，以應對日益嚴峻之挑戰。

2. 經濟現狀

根據最新數據顯示，我國國內生產總值（GDP）持續增長，經濟增長率保持在較高水平。同時，物價指數亦趨於穩定，顯示物價水平得到良好控制。在就業市場方面，我國已實現充分就業，失業率維持在較低水平。此外，我國對外貿易亦保持穩定增長，進出口貿易額均有顯著增加。總之，我國經濟發展呈現良好態勢，為實現經濟長期穩定增長奠定了堅實基礎。

3. 未來趨勢

未來我國經濟發展將面臨諸多機遇與挑戰。一方面，隨著全球經濟一體化程度之不斷加深，我國將進一步融入全球經濟體系，為我國經濟發展提供更多機遇。另一方面，國際經濟環境之日益複雜化亦將給我國經濟發展帶來更多挑戰。例如，全球貿易保護主義之抬頭將給我國出口貿易帶來一定壓力。此外，國內經濟結構調整之深入亦將給我國經濟發展帶來更多挑戰。未來，我國應進一步深化改革，擴大開放，提高經濟競爭力，以應對日益嚴峻之挑戰。同時，我國亦應加強與國際社會之合作與交流，共同推動全球經濟發展與繁榮。

product contains 97-99 protein, 13-150 minerals, 5-10 water and less than 1% lipid. The product has high biological value. Extensive nutritional evaluation of the product was made, by both animal and human testing.

7. Germany

A process was developed in Germany during World War II in which ground whole fish was stirred in 9.5% acetic acid. This slurry was then pressed and the press cake extracted with ethanol. Following ethanol extraction, the press cake was hydrolyzed with alkali and filtered. This yielded a protein solution which was neutralized with acetic acid and spray-dried. The product is a milk white, water soluble powder which was used as an egg white substitute during World War II in Germany. The product was manufactured on a large scale in that period.

German patent 897,100 was issued to Vogel and Company in Germany to extract fish with ethanol after acid or alkali treatment. The fish is subsequently re-extracted with acetone and dried in vacuo.

8. Britain

Cavanagh and Innes obtained British patent 61,609,130 for the production of fish protein concentrate by extracting fish with solvent mixtures of acetone, ethyl acetate, and ethanol.

C. Other Improvements

Some research has been undertaken recently in our own laboratory and in several others to try to improve these methods (14).

1. Fish Protein Hydrolyzates

a. Chemical Hydrolyzates

As you know, there is a process which yields a product which is very rich in fish protein, extremely low in oil (less than 1%), and the product is water soluble up to 20% w/w. The process uses a chemical hydrolysis yielding a product which is low in oil and of good biological value. The process follows a number of very simple steps: chemical hydrolysis is followed by filter press separation of the protein mass from the oil and this oil free phase, the protein extract is then evaporated and the resulting liquid is spray dried.

b. Enzymatic Hydrolyzates

Apparent trends of various hydrolyzates are also under study. The use of enzymes of different character in the fish protein hydrolysis process has been the subject of a study of the effect of various enzymes on the hydrolysis of fish protein. The results of this study are being published in a paper in the Journal of the Food and Nutrition Society. The results of this study are being published in a paper in the Journal of the Food and Nutrition Society. The results of this study are being published in a paper in the Journal of the Food and Nutrition Society.

mass is desludged in a centrifuge and the aqueous and oily phases are separated. The aqueous phase is then dried by various means, yielding a protein hydrolysate consisting essentially of fish amino acids and small peptides.

Tryptophan tends to be low in fish protein hydrolysates.

The Rohm & Haas Company in Philadelphia, Pa., U.S.A., has developed an experimental proteolytic enzyme which hydrolyzes solvent extracted, completely deodorized and defatted Fish Protein Concentrate. Their enzyme is called "experimental enzyme 56." Its pH optimum is 10.0. Rohm & Haas claim that up to 33% of the original protein nitrogen can be solubilized by incubation of solvent-extracted FPC with this enzyme. They recommend a temperature of 60°C for the enzymic digestion. The resulting enzymic digest is filtered and the filtrate, containing small peptides and free amino acids, is spray dried. The product is colorless and almost tasteless, and contains 37% protein. The biological value and the cost of the process are not known to the author.

1. Preparation Processes

a. Proteolytic microorganisms

The Institute of Zoology of the University of Uruguay has developed a method to produce a fish protein hydrolysate using a proteolytic yeast, *Saccharomyces cerevisiae*. Mince is added to the whole ground fish. The mixture is then inoculated with the yeast culture and fermented for 18-20

hours at 30°-32° with slow stirring. A primary filtration removes scales and bones and a centrifugation step removes the oil. The product is concentrated by low temperature evaporation until it reaches 50% solids, followed by spray drying. This yields a product containing 70-72% protein, 5-6% moisture, 12-14% ash and approximately 5% fat. A pilot plant utilizing this process is now in operation in Uruguay.

The Reliance Chemicals Corp. has obtained U. S. Patent #3,170,794 for the production of protein meal from fish by utilizing fungal enzymes to digest and liquefy the fish and to neutralize the fish taste and odor. The fish meat is cooked for 5-15 minutes at 60°-70°C. The fungal proteolytic enzyme is added with wheat bran, brewer's yeast and sugar. The fermentation is carried on for 8 hours at 32°-36°. The product is then heated to 70° and dried.

The Central Food Technological Research Institute in Mysore, India, has prepared protein hydrolysates from fish using pancrein as the proteolytic enzyme.

Israeli Patent #11,912 was issued to the Prolix Company to prepare a fish protein hydrolysate by fermenting fish with *Candida utilis* in a culture medium containing rye bran, ground barley, wheat bran, grass meal and carrot fines. *Candida utilis* has high proteolytic activity at pH 4.

B. Lipolytic microorganisms

Another process now under development in my own laboratory attempts to produce acceptable human foods from abundant and inexpensive fatty fish, by fermentation with lipolytic microorganisms capable of reducing the fat content of the fish by about 50% and producing a pleasant flavor reminiscent of certain foodstuffs commonly acceptable in Western society (20). The object of our fermentation program was:

1. To utilize an abundant and inexpensive fish product not much consumed by man
2. To produce a food with pleasant aroma and flavor;
3. To maintain or increase the protein content of the product without impairing its nutritional value;
4. To reduce the fat content of the raw material, thereby increasing the shelf life of the product.

The best results were obtained with an indigenous fungus, *Cochytrium sporobolus*, in ferment fish. This fungus shows very considerable lipolytic activity when incubated which has a high fat content. In fermentation with this microorganism the fermentation product has a great odor like butter and has very remaining trace of the smell of the starting material although there was flavor removed. There was about a 50% reduction of the fat content of the material during fermentation.

Section 1: General Information and Purpose

This document is intended to provide a comprehensive overview of the project's objectives and scope.

The primary goal of this initiative is to enhance operational efficiency and reduce costs.

The project will be managed in accordance with the following key principles:

Transparency, Accountability, and Collaboration are essential for the success of this project.

Regular communication and reporting will ensure all stakeholders are kept informed.

The project team is committed to delivering high-quality results on time.

Section 2: Project Objectives and Deliverables

The project aims to achieve the following key objectives:

1. Increase productivity by 20% within the next six months.

2. Reduce operational costs by 15% through process optimization.

3. Enhance customer satisfaction scores by 10% over the project duration.

4. Implement a new software system to streamline data management.

5. Conduct thorough training for all staff members on the new system.

6. Establish a robust risk management framework to mitigate potential issues.

7. Ensure all project activities are documented and tracked effectively.

8. Maintain open lines of communication with all project stakeholders.

9. Regularly review progress and adjust the project plan as needed.

10. Provide a final report detailing the project's outcomes and lessons learned.

11. Celebrate the team's achievements and contributions throughout the project.

Section 3: Project Organization and Roles

The project is organized into several key roles and responsibilities:

Project Manager: Oversees the overall project and ensures it stays on track.

Team Lead: Manages the day-to-day activities of the project team.

Stakeholders: Individuals or groups who have an interest in the project's success.

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1. 1950年10月1日，中华人民共和国中央人民政府成立，标志着新中国的诞生。

2. 1954年9月，第一届全国人民代表大会第一次会议在北京召开，通过了《中华人民共和国宪法》。

3. 1956年，中国完成了对农业、手工业和资本主义工商业的社会主义改造，确立了社会主义制度。

4. 1957年，中国共产党八届十二中全会通过《关于整风运动的决定》，开展了整风运动。

5. 1958年，中国掀起了“大跃进”运动，导致了严重的经济困难。

6. 1960年，中国开始实施“调整、巩固、充实、提高”的方针，以应对经济危机。

7. 1962年，中国共产党八届十二中全会通过《关于进一步巩固人民公社集体经济、促进农业生产的决定》。

8. 1966年，中国开始了“文化大革命”，这是一场全国性的政治运动。

9. 1971年，中国恢复了在联合国的合法席位，这是中国外交史上的重大胜利。

10. 1976年，中国结束了“文化大革命”，进入了新的历史时期。

11. 1978年，中国共产党十一届三中全会召开，确立了改革开放的方针。

12. 1982年，中国共产党第十二次全国代表大会召开，提出了“三步走”发展战略。

13. 1987年，中国共产党十三次全国代表大会召开，提出了社会主义初级阶段理论。

14. 1992年，中国共产党十四次全国代表大会召开，确立了社会主义市场经济体制的改革目标。

15. 1997年，中国共产党十五次全国代表大会召开，提出了“三个代表”重要思想。

16. 2002年，中国共产党十六次全国代表大会召开，提出了科学发展观。

17. 2007年，中国共产党十七次全国代表大会召开，提出了构建社会主义和谐社会。

18. 2012年，中国共产党十八次全国代表大会召开，提出了全面建成小康社会。

19. 2017年，中国共产党十九次全国代表大会召开，提出了新时代中国特色社会主义思想。

20. 2022年，中国共产党二十次全国代表大会召开，提出了全面建设社会主义现代化国家。

THE UNIVERSITY OF CHICAGO
DEPARTMENT OF CHEMISTRY
RESEARCH REPORT

REPORT NO. 1000

BY [Name]

ADVISOR: [Name]

DATE: [Date]

ABSTRACT: [Abstract text]

INTRODUCTION: [Introduction text]

EXPERIMENTAL: [Experimental text]

RESULTS: [Results text]

DISCUSSION: [Discussion text]

CONCLUSIONS: [Conclusions text]

REFERENCES: [References text]

ACKNOWLEDGMENTS: [Acknowledgments text]

APPENDICES: [Appendices text]

INDEX: [Index text]

TABLES: [Tables text]

FIGURES: [Figures text]

NOTES: [Notes text]

FOOTNOTES: [Footnotes text]

REFERENCES: [References text]

ACKNOWLEDGMENTS: [Acknowledgments text]

APPENDICES: [Appendices text]

INDEX: [Index text]

TABLES: [Tables text]

FIGURES: [Figures text]

NOTES: [Notes text]

FOOTNOTES: [Footnotes text]

REFERENCES: [References text]

the energy necessary to raise the water about 10 feet--
i.e., to overcome the friction in the pipes, since there
is a 'pressure differential' between the deep
water and the surface water.

It is hoped that this "hydraulic pump" project will, in
the long run, contribute very significantly to increase the
amount of fish resources from the sea, and that the development of
suitable forms of fish preservation will eradicate certain
obstacles.

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1. The first part of the document is a list of names and addresses of the members of the committee. The names are listed in alphabetical order and include the following: [Illegible names and addresses]

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7. The seventh part of the document is a list of names and addresses of the members of the committee. The names are listed in alphabetical order and include the following: [Illegible names and addresses]

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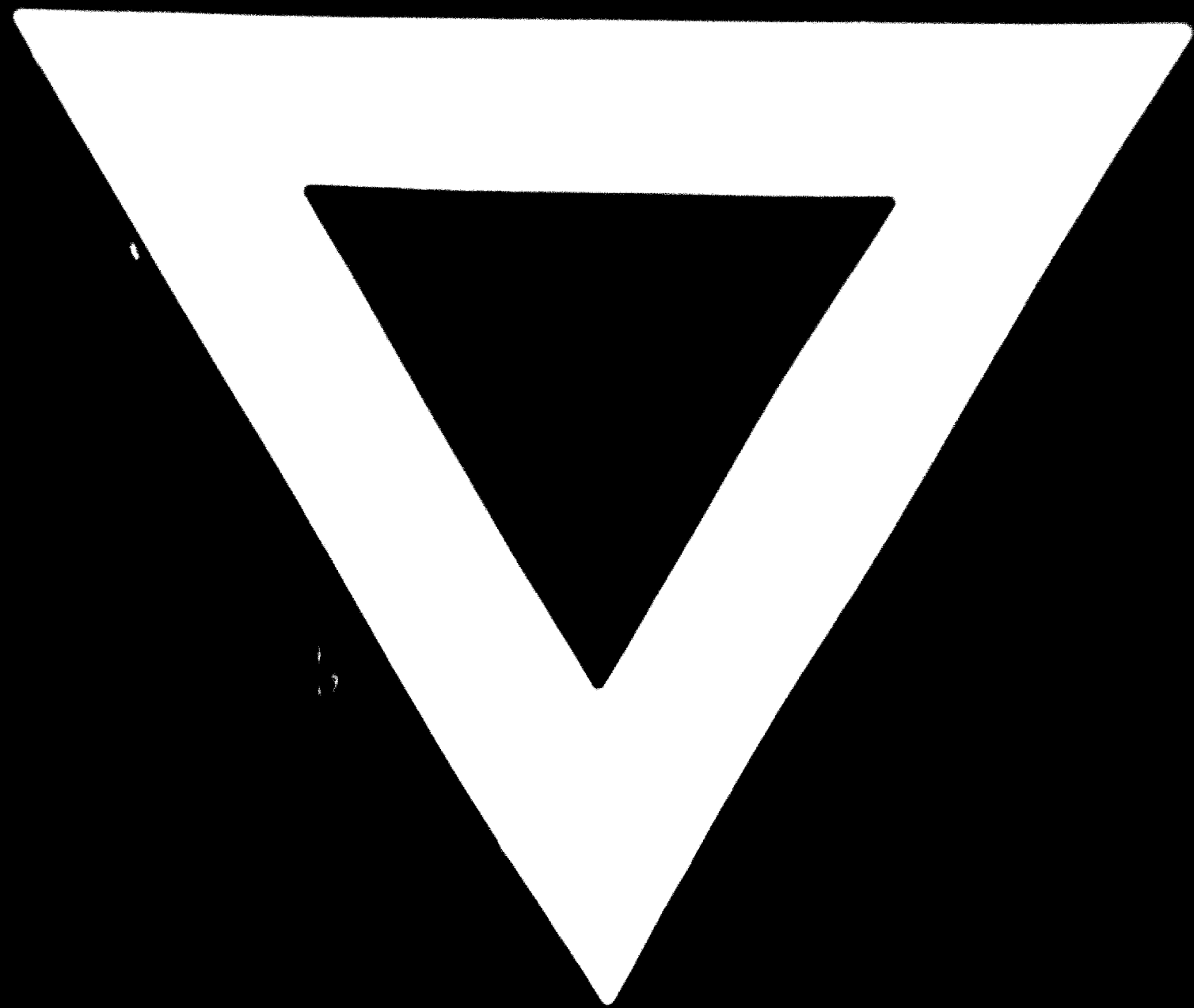
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