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Production of Vienna Type Sausage from Squid Pulp (Dosidicus gigas).

Elaboration of Vienna-type Sausage from Jumbo squid pulp (Dosidicus gigas)

Richard Smith Gutierrez Huayra [1]*

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* Corresponding author.

Summary.
Squid (Dosidicus gigas) is an abundant marine resource of high nutritional value, with great potential to diversify the food industry through the development of innovative value-added products. The objective of the research was to analyze the feasibility of making a Vienna type sausage using squid pulp, optimizing its formulation and evaluating its sensory acceptance. We worked with three formulations that incorporated 5%, 8% and 10% starch. The technological process included conditioning, leaching, grinding, homogenization, stuffing, blanching, cooling and refrigeration. The preference evaluation was carried out with a panel of 30 judges not trained using the Friedman statistical test. Likewise, chemical, nutritional and microbiological analyses were carried out to determine both the nutritional value and the safety of the product. The formulation with 8% starch showed the best acceptance in the attributes of flavor, appearance and texture. The optimal processing conditions were: emulsification at 10 °C, cooking at 70 °C for 23 minutes and cooling at 2–4 °C for 5 minutes, with lower energy consumption compared to other formulations. Each 100 g of product provided 17.4 g of protein, 1.2 g of fat, 1.3 g of carbohydrates and 125 Kcal, with a healthier profile than the control sausage. Microbiological analyses confirmed the safety of the product, as low aerobic counts and absence of pathogens were recorded. In conclusion, the production of Vienna sausages from squid pulp is a viable alternative that provides nutritional, sensory and health benefits, contributing to the diversification of products derived from fishing.

Keywords.
Squid (*Dosidicus gigas*), Vienna sausage, Fishery products, Food safety, Value added.

Abstract.
The jumbo squid (*Dosidicus gigas*) is an abundant and nutritious marine resource with the potential to diversify the food industry through value-added products. The study aimed to evaluate the feasibility of producing a vienna-type sausage using jumbo squid pulp, optimizing its formulation and sensory acceptability. Three formulations with 5%, 8%, and 10% starch were developed. The process included conditioning, leaching, grinding, homogenization, stuffing, blanching, cooling, and refrigeration. Acceptability was evaluated by a panel of 30 untrained judges using the Friedman test. Chemical-nutritional and microbiological analyses were conducted to determine the product's nutritional value and safety. The formulation with 8% starch received the highest acceptance in flavor, appearance, and texture. The optimal processing parameters were: emulsification at 10 °C, cooking at 70 °C for 23 min, and cooling at 2–4 °C for 5 min, resulting in energy savings compared to other formulations. Per 100 g, the product contained 17.4 g protein, 1.2 g fat, 1.3 g carbohydrates, and 125 Kcal, with lower fat and calorie content than the control sausage. Microbiological analyses confirmed its safety, showing low aerobic counts and absence of pathogens. The production of Vienna-type sausage based on jumbo squid pulp proved viable, offering nutritional, sensory, and sanitary, advantages for the diversification of fishery products.

Keywords.
Jumbo squid (*Dosidicus gigas*), Vienna-type sausage, Fishery products, Food safety, Value–added.

1. Introduction

The growing global demand for high-quality, sustainable protein foods has driven research into unconventional sources and the holistic use of marine resources [1]. In this context, the giant squid (Dosidicus gigas) represents one of the most abundant cephalopod resources in the Eastern Pacific Ocean, with significant catch volumes that support important fisheries in countries such as Peru and Mexico [2]. Despite its abundance and high nutritional value, much of its technological potential remains underutilized, being mainly destined for export markets as a frozen product or in derivatives with low added value [3]. Squid pulp, characterised by its high protein and low fat content, presents an exceptional opportunity for the development of new value-added food products, such as functional meat sausages [4]. This work explores the feasibility of using the pulp of Dosidicus gigas as the main raw material in the production of Vienna sausages, a product of high demand and acceptance in the market.

1.1 The Potato (Dosidicus gigas)

1.1.1 Classification and description

Dosidicus gigas (d'Orbigny, 1835), commonly known as squid, giant cuttlefish or Humboldt squid, is a neritic-oceanic cephalopod mollusk belonging to the family Ommastrephidae [5]. Its complete taxonomic classification is as follows: Kingdom: Animalia, Phylum: Mollusca, Class: Cephalopoda, Order: Oegopsida, Family: Ommastrephidae, Genus: Dosidicus, Species: D. gigas [6]. It is a large invertebrate, being able to reach more than 1.5 meters in mantle length and 50 kg in weight, which makes it one of the largest cephalopods in the world [7].

[1] National University of Callao; rsgutierrezh@unacvirtual.edu.pe ; https://orcid.org/0009-0009-1786-4837 ; Lima – Peru.

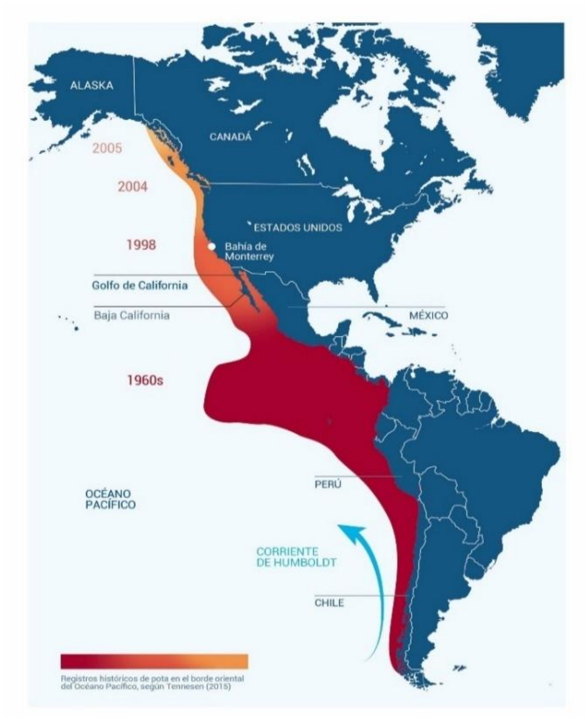

Figure 1. Presence of Squid in the Pacific Ocean.
Source:[8].

1.1.1 Biology and Anatomy.

It is a pelagic organism that performs extensive daily vertical migrations, inhabiting the water column at depths that can exceed 800 meters during the day [7]. It is characterized by a short life cycle (1-2 years), extremely fast growth and high fecundity, which gives it great resilience as a fishery resource [9]. Their diet is very varied, including mesopelagic fish, crustaceans and other cephalopods [10]. Anatomically and technologically, the mantle is the portion of greatest interest for processing, representing the main source of edible muscle [4].

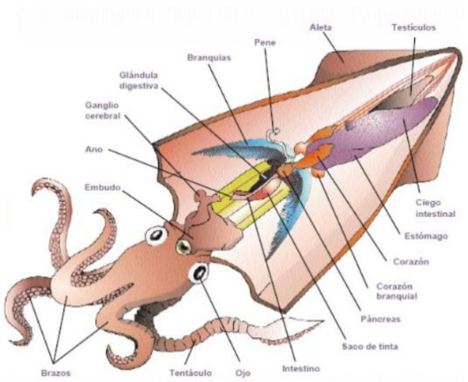

Figure 2. Anatomy of the squid.

1.1.2 Chemical, nutritional and mineral composition.

The pulp of Dosidicus gigas is recognized for its excellent nutritional value. Its average proximal composition consists of high humidity (~80%), high protein content of high biological value (16-20%), and low lipid content (<2%) [4, 10]. This composition makes it an ideal lean raw material for the formulation of healthy products. Squid protein is rich in essential amino acids and its mineral profile includes significant amounts of phosphorus, potassium, and selenium, although the content of heavy metals such as cadmium can be a concern in large organisms, requiring monitoring [10, 11].

1.1.3 Non-protein nitrogen.

A relevant biochemical characteristic in cephalopods is their high content of non-protein nitrogen compounds (NPNs), which they use for osmoregulation and buoyancy [12]. These compounds include free amino acids (taurine, arginine, proline), betaines, and, notably, ammonium chloride in the tissues of some deep-sea squid species [12, 13]. From a technological point of view, a high concentration of ammonium can generate bitter tastes and undesirable odors in the pulp, which makes it necessary to apply washing and conditioning treatments to ensure the sensory quality of the final product [13].

1.2 Lean muscle proteins.

The technological functionality of squid pulp for the production of emulsified sausages lies in the ability of its proteins to form gels and stabilise emulsions. Muscle proteins are classified, according to their solubility, into three main fractions [14].

1.2.1 Myofibrillar proteins.

They constitute the most abundant fraction (65-75% of the total protein) and important from a functional point of view [13, 14]. They include the contractile proteins actin and myosin. They are soluble in salt solutions of high ionic strength (≥0.5 M NaCl) [15]. Myosin is primarily responsible for heat-induced gelation, forming a three-dimensional matrix that traps water and fat, which defines the texture, juiciness, and cohesiveness of sausages [16].

1.2.2 Sarcoplasmic proteins.

They account for 20-30% of the total protein and are soluble in water or saline solutions of low ionic strength [13]. This fraction includes enzymes and myoglobin (in species that possess it). In the case of surimi and similar products, they are often removed by washing, as they can make it difficult for a strong gel to form and affect the color and flavor [17].

1.2.3 Stromal proteins.

They make up connective tissue and represent a minority fraction in the muscle of fish and cephalopods (2-5%) (14). They mainly include collagen. The low collagen content and its high thermolability compared to that of mammals contribute to the tender texture of squid meat, but its role in the emulsion structure is limited [18].

2. Research design and experimental methodology for the production of Squid Sausage.

The study on the production of Vienna-type sausage from the pulp of (*Dosidicus gigas)* employed a specific research design and a detailed experimental methodology, which included sensory and microbiological analyses, and the application of the Friedman test.

2.1 Research design.

The study was developed under an experimental approach, which consisted of manipulating the independent variable (percentage of starch in the formulation) in order to evaluate its effect on dependent variables such as sensory characteristics, nutritional profile and microbiological quality of the squid sausage. This design allowed the establishment of the processing parameters and the contrast of the results obtained in each formulation.

2.2 Experimental methodology.

The research combined practical tests and laboratory analysis. The sausages were made at the MICROBAC – Laboratorios E.I.R.L. facilities., while the sensory evaluation was carried out at the Faculty of Fisheries and Food Engineering of the National University of San Luis Gonzaga (UNICA).

3. Materials and methods.

3.1 Materials, equipment, instruments and reagents.

3.1.1 Materials.

The process used a steel pot (5lt. capacity) (LUISSANT), canvas sieve (60x30cm), plastic strainers, cutting board (45x30 cm), Teflon pan (24 cm diameter) (UNCO), wick, stainless steel knives and disposable cups (7 oz.).

3.1.2 Equipment.

The process used a semi-industrial pot (SURGE), a manual press, a freezer (COLDEX) and a meat grinder (HENKEL).

3.1.3 Instruments.

The measuring instruments included a pH meter (POCKET), a 150°C thermometer (OMROM), a hygrometric balance, an analytical balance, and a commercial balance.

3.1.4 Reagents.

Lactic acid and baking soda were used as reagents.

3.2 Technological process of squid sausage.

Reception of raw materials.
The squid pulp was acquired in the Pisco fishing terminal market and the inputs respectively in the market N°2 - Pisco.

Conditioning.
The squid coat was skinned, the cartilage removed, washed and frozen at 4-6 °C [8]. Due to the acidic and bitter taste of the *squid*, which comes from the non-protein nitrogenous compounds (NNPs), a separation process was carried out that involved four washes.

Chopped.
The squid was cut into cubes to facilitate grinding and obtain a surimi-type paste.

Grinding.
Once the squid has been chopped, it is taken to the grinding machine to produce the paste, which is received in a container at the exit of the grinder.

Leaching process (preparation of surimi).
This process followed the acid-saline leaching methodology in four stages:

First wash.
The ground *squid* was placed in a solution of 0.5% lactic acid and 0.15% salt (2:1 ratio between solution and meat) for 10 minutes under constant manual pressure, keeping the temperature of the solution below 10 °C, and then sifting it.

Second and Third Wash.
These washes were carried out only with cold water (below 10 °C) for 10 minutes, in constant manual pressing and subsequent sieving for the next wash.
Laundry room.
Neutralization was achieved using a 0.1% sodium bicarbonate solution (below 10 °C) for 10 minutes in constant manual pressing, followed by sieving and pressing on a tocuyo cloth.

Frozen.
The resulting surimi paste was frozen in an extended form.

Heavy.
The conditioned *squid* pulp , ingredients and additives were weighed according to calculations to obtain 500 g of finished product.

Table 1. Veal sausage control formulation.

Ingredients	grams (g)
Beef	350
Pork fat	150
Ice	250
Cornstarch	50
Phosphate	2.5
Salt of cure	2.0
Salt	15
Garlic	2
Pepper	1
Cumin	1
Ajinomoto	2
Nutmeg	0.4
Hot Dog Flavor	2
Smoke Flavor	0.2 ml
Strawberry red dye	0.1 ml

Table 2. Formulation of Squid Sausage (*Dosidicus gigas*)

Ingredients	Quantity (g) 5% - Starch	Quantity (g) 8% - Starch	Quantity (g) 10% - Starch
Meat	560	560	560
year	14	14	14

Pepper	1.1	1.1	1.1
Cumin	1.1	1.1	1.1
Ajinomoto	2.2	2.2	2.2
Nutmeg	0.6	0.6	0.6
Flavoring	2.2	2.2	2.2
Coloring	-	-	-
Ice	140	140	140
Starch	28	44.8	56

Homogenization.
The dry ingredients (seasonings) were homogenized in a polyethylene bag.

Mixed.
The squid paste (surimi) was added to a processor, followed by the dry ingredients, then the crushed ice, and lastly, the starch percentage.

Embedded.
The homogeneous mixture was placed in a stuffing machine and the cellulose casing was filled under pressure.
Tied up.
After the cellulose casing was stuffed, they were tied into individual units of standard size.

Blanching.
The sausages were blanched for 20 min, making sure that they were completely submerged in water and that the water temperature did not exceed 80 °C.

Cooling.
The sausages were cooled for 5 min in water at over 10°C.

Refrigeration.
The product was stored at refrigeration temperature (4 – 8 °C) for preservation.

See Annex 1.- Flow diagram for obtaining squid paste (surimi).
Source: Authors.

See Annex 2.- Fig. 4. Flow chart for obtaining Squid Sausage.
Source: Authors.

4. Analysis and Interpretation of Results.
4.1 Friedman's test for sensory evaluation.
To determine the acceptability of the squid sausages, Friedman's non-parametric test was applied, which allowed identifying whether there were significant differences in the judges' preferences based on the percentage of starch incorporated in the formulations.

Three formulations were evaluated:
-Sausage with 5% starch.
-Sausage with 8% starch.
-Sausage with 10% starch.

Evaluators.
The evaluation involved a panel of 30 untrained judges, ranging in age from 20 to 25.

Procedure.
Acceptability was measured using a numerical scale, in which judges ranked samples from 1 (most preferred) to 3 (least preferred) based on smell, aroma, and taste.

4.2 Hypothesis Test.
The null hypothesis (Ho) stated that there were no significant differences in preferences between samples, while the alternative hypothesis (Ha) stated that at least one sample had a different preference. The significance level (α) was set at 0.05.

4.3 Friedman's nonparametric test.
The results of the extended reference test are taken for the following sensory characteristics:

Table. 3. Results of the extended preference test. "Flavor."

Judges/Evaluators	Sample codes for "Squid Sausage"		
N°	124	242	375
1	3	3	3
2	2	2	3
3	2	2	2
4	3	1	1
5	1	1	1
6	3	1	3
7	2	2	1
8	2	1	2
9	2	1	1
10	2	1	1
11	1	1	2
12	3	2	2
13	3	1	3
14	2	3	1
15	2	2	1
16	1	1	2
17	2	1	1
18	2	1	2
19	3	2	2
20	3	2	1
21	3	1	2
22	2	1	3
23	2	1	1
24	3	2	2
25	3	1	1
26	3	1	2
27	3	1	1
28	2	1	2
29	3	2	1
30	2	1	1
Total	70	43	51

Code Assignment:
124 (X): 5% starch.
242 (Y): 8% starch.
375 (Z): 10% starch.

Table 4. Results of the extended preference test. "Appearance".

Judges/Evaluators	Sample codes for "Squid Sausage"

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No.	100	200	300
1	1	2	2
2	2	1	2
3	1	2	3
4	1	1	3
5	1	2	2
6	1	2	3
7	2	3	3
8	1	3	3
9	1	1	3
10	2	2	2
11	1	1	3
12	1	2	2
13	1	3	3
14	1	2	2
15	2	1	3
16	1	3	2
17	2	2	2
18	1	3	2
19	1	1	3
20	1	1	3
21	2	1	3
22	1	3	3
23	2	2	2
24	2	1	3
25	2	2	2
26	1	2	3
27	2	2	3
28	1	2	3
29	1	1	3
30	1	2	3
Total	**40**	**56**	**79**

Code Assignment:
100 (X): 8% starch.
200 (Y): 10% starch.
300 (Z): 5% starch.

Table 5. Results of the extended preference test. "Texture".

Judges/Evaluators	Sample codes for "Squid Sausage"		
No.	**114**	**224**	**305**
1	3	2	2
2	2	2	2
3	3	2	2
4	2	3	2
5	2	3	2
6	2	3	1
7	2	2	2
8	2	3	2
9	2	2	2
10	2	3	1
11	3	2	2
12	2	3	1
13	2	2	2
14	2	2	1
15	3	2	2
16	3	3	2
17	2	3	2
18	2	3	2
19	2	3	2
20	2	3	1
21	3	2	1
22	2	3	2
23	3	2	1
24	2	3	2
25	3	2	1
26	2	3	2
27	3	3	2
28	2	3	1
29	2	2	2
30	2	3	1
Total	69	77	50

Code Assignment:
114 (X): 10% starch.
224 (Y): 5% starch.
305 (Z): 8% starch.

Hypothesis:
Ho: There are no significant differences in sample preferences.
Ha: At least one of the samples has a different preference with respect to the others.

Table 6. Preference test results on "Appearance, taste, texture of squid sausage".

Sample	Appearance	Taste	Texture
5% Starch	2.33±0.66b	2.63±0.49b	2.57±0.50b
8% Starch	1.43±0.63a	1.33±0.48a	1.66±0.48a
10% Starch	1.70±0.75a	1.87±0.73a	2.30±0.47b

(XLSTAT – Statistical Software for Excel)

A greater preference was reported for sausages with 8% starch substitution, followed by those with 10% and below for inclusion at 5%. This according to the consumer's perception according to appearance, flavor and texture, important attributes in this category of blanched sausages.

4.4 Statistical results and decision.

The calculated Friedman statistic (X^2C) was compared to the tabular critical value (X^2T). In the three attributes evaluated (taste, appearance and texture), the calculated values exceeded the critical value, which led to the rejection of the null hypothesis. Therefore, the existence of significant differences in the preferences of judges was confirmed.

This finding supports that the optimal formulation was 8% starch, which presented the lowest sum of ranges, reflecting the highest preference in the evaluation scale.

5. Result of the chemical-nutritional analysis.

This analysis provided information on the macronutrient and vitamin content of *squid* sausage, and the optimal formulation showed specific values for each 100 g edible serving.

Table 7. Result of nutritional chemical analysis of squid sausage/ 100 g. edible portion.

Description	Sausage Control	Squid Sausage
Energy (Kcal)	351	125
Water (g)	48,5	49,2
Protein (g)	14,8	17,4
Fat (g)	29,5	1,2
Carbohydrates (g)	1,5	1,2
Vitam. A (mg)	-	-
Tiamina (mg)	0,03	0,03
Riboflavin (mg)	0,07	0,07
Niacin (mg)	3,7	3,7

Vitam. C (mg)	-	-

Source: Microbac Laboratories E.I.R.L.

6. Result of the microbiological analysis.

Microbiological testing was performed on the optimal formulation of *squid* sausages to ensure that it met acceptable safety parameters. The results were compared with the Sanitary Standard that establishes the microbiological criteria for food safety.

Table 8. Result of microbiological analysis of squid sausage.

Sample	Total aerobic count Ufc/g	Coliforms	Staphylococus aureus Ufc/g	Salmonella 25 g.
Squid Sausage	1,200	0	0	Absence

Source: Microbac Laboratories E.I.R.L.
Reference – Sanitary Standard that establishes the microbiological criteria of sanitary quality and safety for food.
NTS No. 071 – MINSA/DIGESA – V.01 Ministry of Health 2010.

7. Discussion.

The present research demonstrates the technical and sensory feasibility of making Vienna sausages using giant squid pulp (Dosidicus gigas), positioning this marine resource as a promising raw material for the development of functional meat products with added value. The results obtained are aligned with current trends that seek to diversify protein sources and offer healthier alternatives to the consumer [19, 20].

The central finding of the study is the sensory superiority of the formulation with 8% starch, which obtained the greatest acceptance in taste, appearance and texture. This result suggests a crucial technological break-even point. On the one hand, a starch concentration of 5% may have been insufficient to form a gel network fully integrated with the protein matrix, affecting cohesiveness. On the other hand, 10% starch may have resulted in an excessively firm or rubbery texture, a phenomenon documented in surimi products with high concentrations of this hydrocolloid [21, 22]. The starch, when gelatinized during cooking (70 °C), interacts with the myofibrillar proteins of the squid, forming a mixed and stable gel structure that retains water and fat, improving both texture and juiciness [23]. The mechanism involves the formation of a three-dimensional network where the swollen starch granules are embedded in the protein matrix, reinforcing the overall structure of the gel [24].

From a nutritional point of view, the optimised squid sausage has a noticeably healthier profile than conventional commercial sausages, with a high protein content (17.4 g/100 g) and a low intake of fat (1.2 g/100 g) and calories (125 Kcal/100 g). This profile is consistent with the inherent muscle composition of D. gigas and underscores its potential for the formulation of functional foods aimed at health-conscious consumers [25]. The substitution of animal fats for lean squid protein not only reduces the caloric content, but also modifies the fatty acid profile, increasing the proportion of beneficial polyunsaturated fats such as EPA and DHA, characteristic of marine products [26].

The textural quality of the final product depends fundamentally on the gelling capacity of the myofibrillar proteins of the squid (myosin and actin). Heat treatment at 70°C is key to denaturing these proteins and allowing them to form a cohesive three-dimensional network [27]. Recent studies on D. gigas proteins confirm that their gelling is a complex process that can be modulated by additives. Niu et al. [28] demonstrated that the addition of other proteins, such as egg white protein, can inhibit unwanted self-aggregation of myosin molecules and promote a more orderly and stronger gel network. Analogously, the starch in our formulation not only acts as a filler agent, but as a functional ingredient that positively modifies the rheology of the system, improving the water-holding capacity and firmness of the final gel [24].

The safety of the product, confirmed by the low microbiological counts and the absence of pathogens, is a result of utmost importance. This success is attributed to the quality of the raw material, good manufacturing practices and, crucially, the leaching process, which reduces the initial microbial load in addition to removing non-protein nitrogen (NNP) compounds that cause undesirable tastes [29]. Microbiological stability and shelf life extension are significant challenges in squid products due to their high water activity and enzyme potential. Recent research has shown that D. gigas protein hydrolysates possess intrinsic antioxidant and antimicrobial properties, capable of extending the shelf life of squid sausages by up to 95% by inhibiting microbial growth and oxidation [30]. Although hydrolysates were not used in our study, the positive microbiological results provide a solid basis for future innovations in this line.

In conclusion, the discussion of the results, contrasted with recent scientific literature, confirms that squid sausage is a viable and nutritionally superior alternative. Optimizing starch concentration is key to achieving an acceptable texture, while controlling the process, from leaching to cooking, ensures product safety and quality. This work provides concrete evidence for the valorization of Dosidicus gigas, an abundant resource that can contribute significantly to food safety and innovation in the seafood industry.

8. Conclusions.

The present study establishes the optimal processing parameters for the production of Vienna sausage from squid pulp (Dosidicus gigas), determining that the concentration of 8% of potato starch constitutes the technological equilibrium point that maximizes the sensory acceptability and physicochemical properties of the product. This optimized formulation, processed by leaching (three washes with cold water), emulsification with vegetable fat and cooking at 70 °C for 30 minutes, generates a functional meat product with high protein content (17.4 g/100 g), low fat intake (1.2 g/100 g) and low caloric value (125 Kcal/100 g), complying with the microbiological standards established by Peruvian regulations.

This concrete contribution positions squid as a viable and nutritionally superior raw material for the emulsified meat products industry, contributing to the diversification of marine protein sources and the valorization of abundant fishery resources in the Eastern Pacific.

The results obtained demonstrate that the synergistic interaction between the myofibrillar proteins of the squid and the starch during heat treatment is essential for the formation of a cohesive and stable gel matrix, which gives the final product the desired textural and sensory characteristics. The water retention capacity, firmness and juiciness of the optimized product show the technological potential of this species for applications in the food industry, overcoming the limitations traditionally associated with cephalopod processing. These findings provide a solid scientific basis for technology transfer to the productive sector, facilitating the implementation of standardized and reproducible processes on an industrial scale.

It is recommended that future research be focused on three priority directions: first, to carry out shelf life studies under different conditions of refrigerated storage and in a modified atmosphere to determine the microbiological, physicochemical and sensory stability of the product during its commercialization; second, to optimize the flavor profile by evaluating different combinations of spices, seasonings and masking agents that minimize possible residual notes characteristic of squid, thus improving consumer acceptance; and third, to develop scale-up studies at the pilot and industrial level that validate the reproducibility of the process, evaluate the economic viability of mass production and establish the critical quality control parameters.

Additionally, it would be valuable to explore the incorporation of squid protein hydrolysates with antioxidant and antimicrobial properties, as well as the formulation of analogous products with different nutritional profiles aimed at specific market segments, such as sports consumers, older adults or people with dietary restrictions.

9. Author Contributions (Contributor Roles Taxonomy (CRediT))

1. Conceptualization: Richard Smith Gutierrez Huayra.
2. Data curation: Richard Smith Gutierrez Huayra.
3. Formal analysis: Richard Smith Gutierrez Huayra.
4. Acquisition of funds: N/A.
5. Research: Richard Smith Gutierrez Huayra.
6. Methodology: Richard Smith Gutierrez Huayra.
7. Project management: Richard Smith Gutierrez Huayra.
8. Resources: Richard Smith Gutierrez Huayra.
9. Software: Richard Smith Gutierrez Huayra.
10. Supervision: Richard Smith Gutierrez Huayra.
11. Validation: Richard Smith Gutierrez Huayra.
12. Visualization: Richard Smith Gutierrez Huayra.
13. Writing - original draft: Richard Smith Gutierrez Huayra.
14. Writing - revision and editing: Richard Smith Gutierrez Huayra.

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Appendix 1.- Flow diagram for obtaining squid paste (surimi).

FLOW PROCESS DIAGRAM					
CONCEPTO DIAGRAMADO: Pasta (Surimi)				**DIAGRAM NO.: 1**	
METHOD DIAGRAM: Current				**DATE:**	
DIAGRAM BEGINS: Selection of squid meat					
UNIT TIME (Min.)	**SYMBOL**	**DESCRIPTION OF THE PROCESS**	**UNIT TIME (Min.)**	**SYMBOL**	**DESCRIPTION OF THE PROCESS**
5	1	Inspection of the squid mantle.	**10**	7	3° Washing the squid paste, it is done only with cold water at a temperature below 10 °C. In constant manual pressing
4	2	The skin and cartilage are removed from the squid mantle.	**10**	8	4° Wash the squid paste in a solution of 0.1% baking soda, at a temperature below 10 ºC.
2	1	The squid mantle is washed.	**3**	1	A quality control is carried out on the finished product.
4	2	The squid mantle is frozen at 4 - 6 °C.	2	2	The squid paste is weighed on an electronic scale.
2	1	Slicing of the squid mantle.	30	2	Freezes from 0 to -4 °C.
6	3	The squid meat is ground in a meat mill.			
7	4	There is a delay after grinding.			
20	5	1° Wash the paste in a solution of 0.5% lactic acid and 0.15% salt, at a temperature below 10°C.			
5	6	2° Washing the pasta is done only with cold water at a temperature below 10 °C. In constant manual pressing.			

ABSTRACT		
TIME	**NUMBER**	**EVENTS**
63	8	Operations
6	2	Inspections
3	1	Combined activity
70	2	Storage
2	1	Delays

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Annex 2. Flow chart for obtaining Squid Sausage.

Flow Process Diagram					
Concept Diagrammed: Sausage				**Diagram No.: 2**	
Method Diagram: Current				**Date:**	
Diagram Begins: Meat Selection					
Unit Time (Min.)	**Symbol**	**Description of the process**	**Unit Time (Min.)**	**Symbol**	**Description of the process**
5	1	Inspection of pota paste (surimi).	**4**	1	A quality control is carried out on the finished product.
4	2	The squid paste and ingredients are weighed on an electronic scale.	**5**	1	It is refrigerated from 4 – 8 °C.
2	1	The dry ingredients are homogenized.	**2**	1	It is expected to continue with the analyses.
4	2	The meat is ground in the processor.			
2	1	There is a delay after grinding.			
6	3	Emulsion, the required ingredients are added.	**ABSTRACT**		
7	4	The paste is stuffed into a manual stuffer.	**TIME**	**NUMBER**	**EVENTS**
			44	6	Operations
20	5	Blanch for 20 minutes at a temperature of 80 °C.	9	2	Inspections
			4	1	Combined activity
5	6	Let it cool for 5 minutes at more than 10 °C.	5	1	Storage
			4	2	Delays