

Utilization of Shark Meat for Processed Products

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ABSTRACT

In the present study, shark meat was utilized by mixing it with most commonly eaten meat products, mainly those made of pork, in order to conceal the fish flavor. Such products were ham, sausage and chorizo (smoked or seasoned sausage); in addition, products such as pate, bologna and salami were also prepared.

The raw material studied was shark meat from Mustelus sp. (cazon, tibuorn mamon), Sphyrna sp. (cornuda, tiburón maratillo) and Heterodontus sp. (cabeza de toro) because they are captured frequently in this area.

A series of recipes was used in the preparation of ham, with the most accepted one (95.5% acceptance level) having proportions of 80% shark meat and 20% pork. The technique used was the massage method for cooked ham, with a final smoking. For the preparation of sausage the recipe was 60% shark meat, 30% pork, and 10% pork fat, and this had a 93.3% acceptance level. The technique used was that for vienna sausage, followed by smoking. For chorizo (smoked seasoned sausage) the proportions were 50% shark meat, 20% pork and 30% pork fat; the acceptance level was 90% and the technique used was that established for Spanish chorizo.

Analysis of the shark ham, the principal product, showed the following: protein 26.2%; fat 6.1%; water 62.7%, and ash 4.6%.

In general, all products derived from shark meat, had a frequency of acceptance of 8.3 on a point scale of 1-9 (deviation 0.84).

INTRODUCTION

Shark meat, as with that from other fish, constitutes a potential source of protein (Kreuzer and Ahmed, 1978; Tishin, 1969). In 1976, the catch of sharks was about 307,000 tons with 3,014 tons estimated for Mexico (Kreuzer and Ahmed, 1978) representing an important resource for the country. Sharks have not yet reached maximum exploitation because the biology, distribution and taxonomy of Mexican sharks is not well known (Pleasant *et al.*, 1979) (15 out of 80 species are known to be of economic importance). Usually sharks are captured in order to use their skin, fins or oil, while the meat is thrown away due to the inadequate technology for its preservation and processing into palatable food products.

The flesh of sharks up to 1.5 m is known as 'cazon' and is found in markets in the form of fresh fillets, or is salt-dried

(similar to cod). However, some of the characteristics of shark meat resulting from the urea content, such as acid taste and smell, remain, thus reducing its acceptability. The present study, as a result of the above, had the objective of developing techniques that would allow the maximum utilization of this resource, and obtaining in this way food products with acceptable organoleptic characteristics and regular consumption patterns, the same as for meat products.

MATERIALS AND METHODS

The shark used in the preparation of these products were captured at San Pedro Island, Gulf of California, and were supplied in the form of frozen whole trunks by the different fishing organizations in Guaymas. The initial procedures were filleting followed by washing exhaustively in order to reduce the urea content. These steps were done with minimum time of exposure at ambient temperature. The pork came from qualified institutions in Hermosillo, Sonora.

The basic processing technique used was the massage method for cooked ham, followed by smoking (Fig. 1).

METHODS

The recipe for shark ham is given in Table 1. Shark ham was obtained using the normal process for pressed and cooked ham, the massage method (Fig. 1), followed by smoking. The conditioning of the shark meat has been mentioned previously. For the pork, conditioning consisted of eliminating bone, fat and tendons. Both raw materials were cured, moulded and cooked at a temperature rising to 68°C in the geometric center of the piece while keeping the cooking water at a constant 80°C. The smoking temperature was 62°C for four hours.

Table 1. Recipe for shark ham.

Raw Materials

Shark meat	80%
Lean pork	20%

Other Ingredients

Curing salts
Salt
Sugar
Sodium poliphosphate
Condimento California
Pepper
Garlic Salt
Water

The recipe for shark sausage is given in Table 2. The technique used for making shark sausage was the same one used for vienna sausage, followed by smoking (Fig. 2). The conditioning of the shark meat was as before but the pork was used together with the fat. Grinding was done separately for the shark meat, pork and pork fat. Following emulsification, cooking was for 15 minutes, followed by smoking where the temperature was kept at 47°C for one and a half hours.

Table 2. Recipe for shark vienna sausage.

Raw Materials

Shark meat	60%
Pork	30%
Pork fat	10%

Other Ingredients

Ice
 Starch
 Salt
 Sodium phosphate
 White pepper
 Sugar
 Dehydrated garlic
 Ginger
 Sodium ascorbate
 Flor de macis
 Mejorana
 Sodium nitrite
 Sodium nitrate
 Commercial seasoning
 Spanish pepper
 MSG

The recipe for shark chorizo is given in Table 3. The technique used for shark chorizo was the same as that used for Spanish chorizo (Fig. 3). In this case, the smoking process was two hours long at a temperature of 47°C.

The recipe for shark pate is given in Table 4. The preparation of shark pate is based on the traditional method with some variations (Fig. 4).

Table 3. Recipe for shark chorizo (smoked seasoned sausage).

Raw Materials

Shark meat	50%
Pork	20%
Pork fat	30%

Other Ingredients

Chile ancho
Black pepper
Wild marjoram
Cumin
Vinegar
Garlic
Curing salt
Commercial seasoning
Salt

Table 4. Recipe for shark pate.

Raw Materials

Shark meat	75 %
Queso Chihuahua	12.5%
Queso Ana	12.5%

Other Ingredients

Salt
Laurel leaves
Wild marjoram
Garlic
Whole black pepper
Cooked green pepper
Pimiento morron
Jalapeno pepper
Mayonnaise
Cream

The conditioned meat was cooked in boiling water for fifty minutes with all seasonings, followed by grinding and mixing with the rest of the raw materials.

The recipe for shark bologna is given in Table 5. The method was based on the usual process for the preparation of bologna. Shark meat has to be conditioned for this process and the pork was used together with the fat. Grinding was done separately

for this product (Fig. 5). Cooking time was that necessary to raise the internal temperature to 68°C while keeping the cooking water at 80°C.

Table 5. Recipe for shark bologna.

Raw Materials

Shark meat	88%
Pork cuts	12%

Other Ingredients

Salt
Sugar
Garlic
Sodium isoascorbate
Curing salt
Ice
MSG
Sodium phosphate
Pimiento morron
Flor de macis
Onion
Ice
Seasoning

The recipe for shark salami is given in Table 6. The technique is that one used for semi-dry salami. Raw materials were conditioned in the same way as for previous products, and the process is indicated in Figure 6. Smoking was carried out at 38°C for four hours, and the maturing period was 20 days at 27°C.

RESULTS

The recipes mentioned above (Tables 1-6) resulted from many experimental combinations of shark meat and pork and variations in the techniques used.

The recipes were evaluated in different sectors of the population (shopping centers, schools and homes).

It should be mentioned that this work focused on those products with the highest levels of consumption. In the case of ham (proportions were shark meat 80% and pork 20%), the product had a general acceptability of 95.5%, and was described as palatable and juicy. This result is confirmed when determining the frequency of consumption using the point scale from 1 to 9 (where 9 = I would buy this product each time I had the opportunity to do so and 1 = I would buy it if I was forced to do it) which showed a mean of 8.69 (deviation 0.60). This product - shark-pork ham - had a protein content of 26.2%, fat 6.1%, water 62.7%, and ash 4.6% (Table 7). The cost of production was 46% lower than for traditional ham.

Table 6. Recipe for semi-dry shark salami.

Raw Materials

Shark meat	75 %
Pork	12 %
Beef	5.5%
Bacon	7.5%

Other Ingredients

Salt
 Whole black pepper
 Curing salt
 Dry milk
 Lactic culture
 Wheat flour
 Commercial seasoning
 Black pepper
 Meajorana
 Dry garlic
 Sodium isoascorbate
 Flor macis
 Nuez moscada
 Dehydrated onion

Table 7. Chemical analysis of shark-pork ham (80%-20% mix).

Protein	26.2%
Fate	6.1%
Water content	62.7%
Ashe	4.6%
Carbohydrates	0.4%

Acceptability of shark sausage was 93.3% and the frequency of consumption was 8.4 (deviation 0.81) on the 9-point scale and shark chorizo had an acceptability of 90% and the frequency of consumption was 8.1 (deviation 1.1). One of the products that was not very popular was pate, which reported an acceptability of 84.7% and a frequency of consumption of 7.6 (deviation 1.3).

CONCLUSIONS

1. During the present study, it was observed that the application of good processing technology, such as in curing, can result in the maximum use of shark meat.

2. Products made with shark meat in a greater proportion than pork were generally well accepted (93%) by the consumers.

3. Protein value was higher than in traditional meat products and thus shark-meat products would contribute to the supply of highly nutritious foods.

4. Shark-pork meat products turned out to be very economic since their price was 46% lower than traditional hams and even lower for the rest of the meat products, except pate.

LITERATURE CITED

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Pleasantes, A. et al. 1979. Los tiburones mexicanos. Ed. Unica: SEP. Subsecretaria de Educacion e Investigacion Tecnologica. Direccion General de Ciencia y Tecnologia del Mar. Mexico, D.F.

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Appendix 1

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Sensory Evaluation Questionnaire

Do you enjoy _____
Evaluated Product Yes No

If Yes then proceed

Name _____ Date _____ Sample _____

Factor Very Good Good Regular Bad Very Bad

General
appearance

Color

Smell

Texture

Juiciness

General
acceptance

Observations

Suggestions

SHARK HAM, SAUSAGE, CHORIZO & PATE ACCEPTABILITY TEST

1. DIRECTED AT HOUSEWIVES: Good morning/afternoon/evening.
My name is _____. I study at ITESM. We're carrying out an evaluation of our products by housewives. May I ask you some questions?

A. Do you buy and use the following products:

_____ Sausages _____ Instant coffee
_____ Cake mix _____ Wheat flour

No _____ conclude here

Yes _____ continue

B. Which product do you buy most often

_____ Ham _____ Chorizo
_____ Sausage _____ Pate

C. Which of the previous products do you enjoy most

_____ Ham _____ Chorizo
_____ Sausage _____ Pate

2. Invite housewife to try the samples and answer the test.

A. How much would you pay for these products?

Ham \$ _____
Chorizo \$ _____
Sausage \$ _____
Pate \$ _____

3. How often would you give your family this product?

_____ More than once a week
_____ Once a week
_____ Once a month
_____ 2-3 times a month
_____ Less than once a month
_____ Don't know

4. Finally, I have some background questions I would like to ask you for statistical purposes.

A. In which of the following age groups are you?

_____ 18-24 _____ Over 49
_____ 25-34 _____ You don't want to answer
_____ 35-49

B. Which is the highest school degree you achieved?

_____ Lower school _____ University
_____ Junior High School _____ Other
_____ High School _____ Did not answer

C. Approximately how much do you spend weekly for food?

\$ _____
\$ _____ or more
_____ Don't know

5. Now, please try this product and mark with an "X" the expression that applies best to what you think about it

_____ I would buy this product each time I had an opportunity to do so

_____ I would buy it very often

_____ I would buy it frequently

_____ I would buy it once in a while

_____ I would buy it if it were available, but I would not cook for it

_____ I don't like it, but I would buy it occasionally

_____ I would hardly buy it

_____ I would buy it if there weren't other products to choose from

_____ I would buy it if I were forced to

If you marked one of the last four choices, why didn't you like it or why wouldn't you buy this product?

_____ Bad taste
_____ Bad appearance
_____ Fish-like taste
_____ Other

This is the end of the test. Thank you very much for your time and interest.

Figure 1. Preparation of Shark Ham.

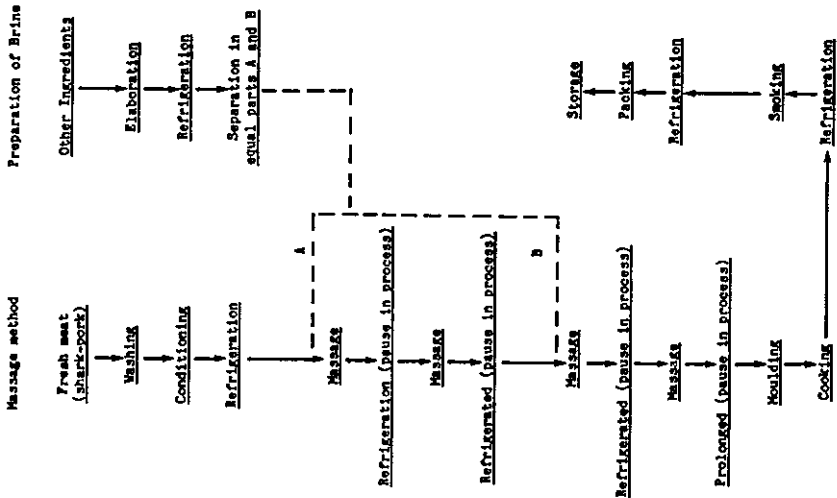


Figure 2. Preparation of Shark Vienna Sausage.

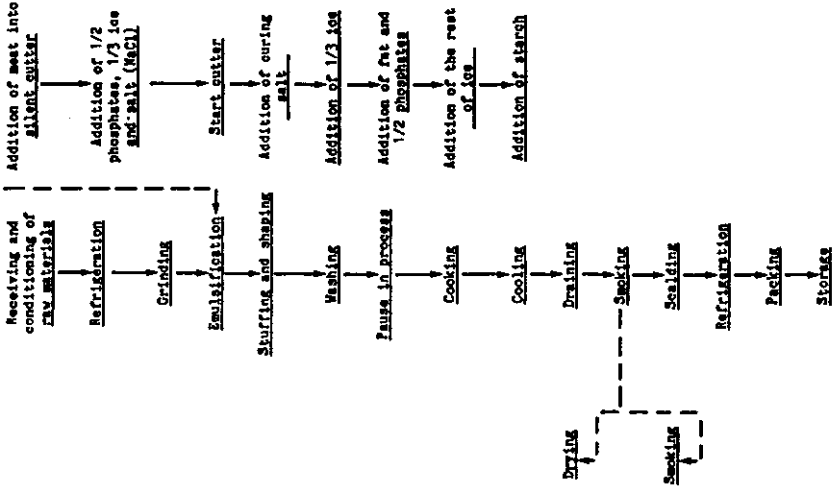


Figure 3. Preparation of Shark Chorizo (Spanish Type).

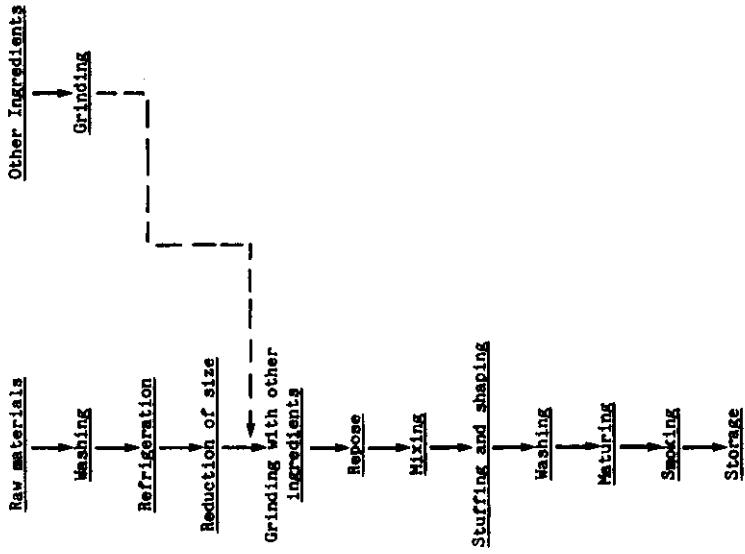


Figure 4. Preparation of Shark Pate.

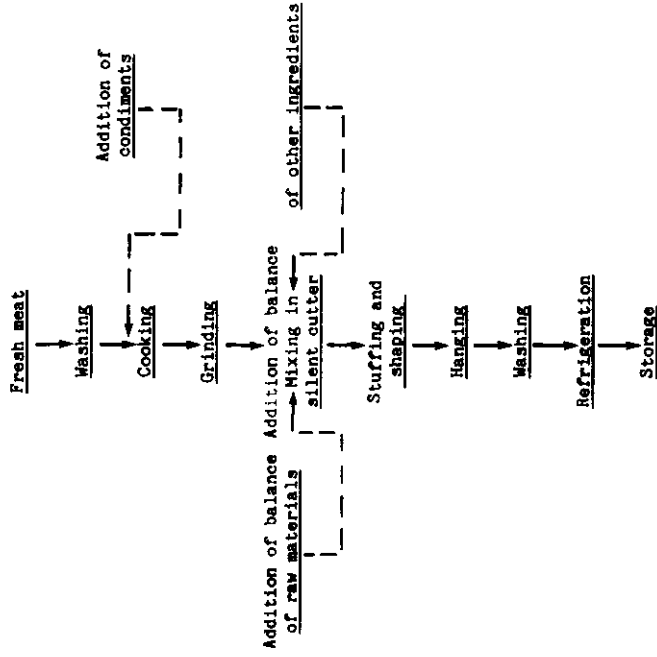


Figure 5. Preparation of Shark Bologna.

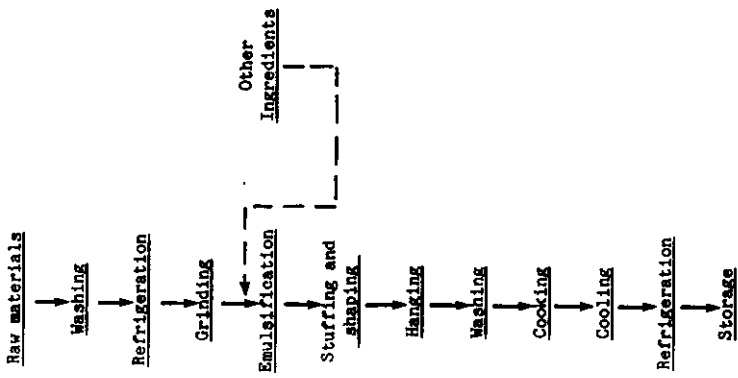


Figure 6. Preparation of Semi-dry Shark Salami.

