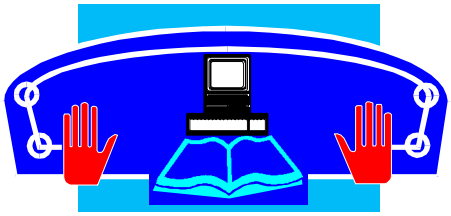

Report On The Processing Of Ringed Seal Meat

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SCIENCE SYSTEMS

Research and Development

REPORT ON THE PROCESSING OF RINGED SEAL MEAT

INDEX

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REPORT ON THE PROCESSING OF RINGED SEAL MEAT

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SCIENCE SYSTEMS

Research and Development

Those involved with Science Systems in this project.

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Fred Scholl - Master Chef, Professor Sheridan College,
Gold metal winner at Frankfurt Food Olympics.
Dr. Ron Usborne – University of Guelph Meat Science Dept.
Chairman Meat Science Dept.
Dr. Demann - University of Guelph
Dr. Bruce Holub - University of Guelph
Joe Netser - Professional Hunter and Guide, Coral Harbour, N.W.T.

Outside Companies.

Zenon Environmental Inc.
Diversified Research Laboratories Ltd.
Standard Biological Laboratories Inc.
Demann Food Technology Services Inc.
Mann Testing Laboratories Ltd.

Science Systems greatly appreciates the co-operation and assistance from Sheridan College, Brampton, Ontario.
The University of Guelph, Meat Science Dept., Ontario.
The numerous persons that provided their assistance in the tasting of the numerous products and their candid and honest opinions. Without their opinions it would not have been much more difficult to fine tune some of the products and arrive at some of the quality products that were made.

The direction and assistance from Syd Kirwan of the Government of the N.W.T was also very appreciated and important to this project.

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REPORT ON THE PROCESSING OF RINGED SEAL MEAT

Introduction:

The following report is the findings and results of Phases I, II, & III that have been determined and tested regarding seal meat utilization.

The mandate given was to develop as complete as possible utilization of seal carcasses. In the original proposal we had indicated that at least ten different types of products would be made from seal meat. Once the process of creativity had begun curiosity overcame the original proposal and at least twenty nine different products or combinations and mixes were made with the meat.

The following is a list of most of the products.

1. Reconstituted Seal Ham (with soy isolates)
2. Reconstituted Seal Ham (without soy isolates)
3. Reconstituted Seal Pastrami
4. Seal Ham
5. Smoked Seal Ribs.
6. Basic seal emulsion.
7. Seal Kolbassa.
8. Seal Pepperoni.
9. Seal & Caribou Cooked Salami
10. Seal and Beef Fat Pepperettes (cooked)
11. Caribou Pepperettes
12. Seal Liversausage (with seal fat)
13. Seal Liversausage (without seal fat)
14. Fermented Seal Salami
15. Fermented Seal Pepperettes.(13mm & 16mm casings)
16. Fresh Seal and Pork sausage
17. Seal Meat and Mushroom pies
18. Seal Meat and Seal Kidney Pies.
19. Seal and Vegetable Pies.
20. Galantine
21. Seal Liver Pate.
22. Seal Consomme (from the bones)
23. Seal Meat Ravioli
24. Deodorized Seal Oil
25. Pepperoni
26. Seal & Caribou Cooked Pepperettes
27. Cured and Dried Seal Jerky.
28, Smoked Seal Loin (cured)
29. Smoked Seal Loin (uncured)
30. A variety of other products.

The Phases of the Project.

Phase I was a literature search of existing information regarding utilization of seal products other than the skin.

Phase II the collection and transportation of the seal meat to the research facilities.

Phase III, the development of products from seal. The seals being investigated were harvested while they were at their lowest body fat of the year. This was at the end of June.

Phase IV, this sector has yet to be done. This phase will be a repetition of the most successful products from Phase III with seal meat from high body fat seals. The seals will be harvested in late September or October.

Phase I: The Literature Search.
(More complete information is in the Literature Search appendix)

The literature search although interesting offered little direction in the area of meat utilization.

One of the best reports was from Norway in which they reported having made sausage products. The meat was used as replacement meat in some low cost products. The products seemed to have some acceptability but with draw backs as to their shelf life. They had developed, in addition to some processed seal products, an ensiled seal meat product to be used as fur farm feed. This procedure is now being started in Newfoundland for fur farm feeding.

The writer of the Norwegian report suggests that their organization will not be proceeding with the seal meat products for human food but would proceed with the fur farm feed option.

The only company in Canada producing seal meat is in Newfoundland and they are producing a canned seal meat although they have been investigating various seal sausage products. It is interesting that they are selling seal meat in cans at close to the price of dog food.

A nutritionist in Nova Scotia who has worked on seal meat for a few years was contacted, but declined to provide any information and was not interested in working with Science Systems on this project. She has apparently developed a pepperoni and a Black Forest type ham product. She stated that she was working with the approach of producing a low cost processed meat for the Inuit.

1'

A general feeling in the literature and personal communications was that seal meat was looked at as an inexpensive meat source. They were trying to produce products that would undersell other meat products in price. In general this approach has not been of terrific success in Norway or Newfoundland. This was useful information and aided in our direction as to product line. This aspect is more fully explained in the Phase III section.

All information found was regarding the Harp seal. According to the Inuit there is a distinct difference between the taste of Harp seal and Ringed seal. The result is that the information found in the literature being quite sparse was of limited value and the information that was available was not very encouraging regarding the development of a variety of top class products.

With this information as back Up we decided to proceed as if it was a brand new meat with little if any information available regarding the meat. In retrospect this approach turned out to be the best choice.

Phase II: The Harvesting of the Seal Meat and Fat.

Originally it was proposed that the meat would be collected and sent down to Science Systems for processing. It was suggested by Syd Kirwan that David Ladd go up to Coral Harbour and assist in the hunting and collection of the seals. This turned out to be much more informative and useful than was originally anticipated by Science Systems. By going out with the hunter, some of the basic facts and realities regarding the harvest of seals were learned.

It became very apparent after the first few kills that some of the other researchers that had worked with seal meat had never been present on a seal hunt, as the recommendations in their reports were just not practical. It was also very informative regarding the information generally available to the public from Green Peace and like groups.

Initially a harvesting protocol was written based upon other slaughter practices for other animals, A copy of the recommendations for slaughter written before the hunt and after the hunt have been included at the end of this sector. It can been seen what the differences are between the presumed theory based upon the literature and the reality of seal harvesting.

'l'his whole project would have been far less useful and would have been much less applicable to reality had it not been for Syd Kirwans' direction in this area.

When seal are harvested for meat processing they should be handled differently than they would be handled for general usage. For example during the skinning process as little fat as possible should be left on the meat. When seal meat is processed, seal fat in the products shortens shelf life and produces off flavours. The fat should be removed from the skin as soon as possible afer collection and processed to remove the oil.

It seems impossible to bleed a seal as one would bleed a regular animal. This means that processing procedures and methods must account for a high level of blood in the meat. With this high level of blood in the meat it means that handling procedures to inhibit bacterial growth is very important.

Once the seal is slaughtered it is important to lower the temperature of the meat quickly. When ice or snow is available the body cavity should be packed with snow or ice immediately.

Depending upon the situation and location of the processing plant in relation to the harvesting it may be better to have the hunter freeze the whole carcass once the fat and skin are removed. The processing facility can then thaw and bone the meat,

The meat should be frozen to at most -15° C or lower as soon as possible Once frozen the meat should be left frozen long enough to allow for a kill of any parasites that may be present.

Procedure for Slaughter and butcher of Seal for Meat.

NOTE: (Original procedure postulated for slaughter.
Once slaughter commenced some changes were required)

Major Steps:	Sequential Operations
Hunting:	a. The seals taken will be Ring seals.
Slaughter:	a. The Seal will be shot by a professional Inuit hunter.
Sticking:	a. After being shot the seal will be bled by inserting a knife in front of the breastbone and severing the jugular vein and carotid arteries. b. When blood is to be collected from the animal for processing purposes a tube will be inserted into the neck wound to collect the blood into a sanitized bucket.
Eviscerating:	a. The seal will have its belly opened with a skinning knife with the skinning knife held with the blade pointing outward exposing the visceral. b. A cut will be made around the bung. c. The skin will be cut to the chin exposing the breastbone and chest. d. The breast bone will be cut. e. A photograph will be taken of the lungs and visceral, a number will be placed on the animal for the photo. This number will be used for future identification of the animal and its meat. e. The visceral will be removed.
Skinning:	a. The seal will be skinned on the ice and stored separate from the meat a visceral and meat.
Butchery:	a. The meat will be hot boned and placed in poly lined boxes. b. Small samples of each animal will be placed in smaller bags in the box.
General:	a. Organ meat and visceral that is to be saved will be packaged separately in poly bags in the box. b. Each seal will be packed separately in its own box with the same identification number used in the photograph. c. Care will be taken to only harvest seals that are healthy. d. If there is any question as to the health of the animal after it has been opened nothing from that animal will be used. e. Knives and tools will be washed and disinfected in iodine after and before each kill and butchery.

Revised Procedure for Slaughter and butcher of Seal for Meat.

NOTE: Once slaughter commenced some changes were required these changes are noted below as compared to the original proposed procedure.

Major Steps:	Sequential Operations
Hunting:	a. The seals taken will be Ringed seals.
Slaughter:	a. The Seal will be shot by a professional Inuit hunter.

Sticking:

Regular bleeding techniques that would work on traditional animals were not effective the blood in the neck coagulated almost immediately upon death. It is recommended that the animal be opened up as quickly as possible exposing its chest cavity. The heart keeps beating for a while after the animal is dead. There are arteries running to the front flippers they can be cut easily once the animal has had its chest cavity opened. This is achieved by running the knife between the chest meat and the shoulder muscle. There is another main artery that runs to the back flippers that can be cut once the intestine has been removed. These arteries are more difficult to find and there is a danger of cutting the visceral in the process until proper procedure is found. By cutting these arteries and veins we seemed to achieve the best bleed possible.

Eviscerating:

A cut will be made from the neck to just before the bung.
This cut will be through the skin and blubber exposing the chest muscle and stomach muscles.
The skin opens up exposing the meat.
The chest cavity is cut open exposing the heart and lungs.
The seal will have its belly opened with a skinning knife with the skinning knife held with the blade pointing outward exposing the visceral.
The bleeding operation will be carried out as outlined above.
Once a bleed has occurred, the visceral is removed as follows.
The diaphragm muscle is cut releasing the internal organs.
The esophagus and wind pipe is cut as close to the throat as possible.
If the animal has food in its intestines then the bung should be tied before cutting around it for its removal.
The bung should be cut before the visceral is removed.
In a female the pelvic bone can be opened to cut out the bung.
In a male the pelvic bone needs to be cut or the bung cut out from the back.
When this is done the whole visceral can be removed in one action without getting any body fluids onto the body cavity. Depending upon the process it is recommended that the kidneys be left in place and not removed with the visceral. The visceral should be placed remote from the body for removal of organ meat.

Organ meat.
Heart - Removed and rinsed of blood.
Intestine - Removed, squeezed out by running through the fingers then braided and bagged.
Liver – The liver should be cut out last in case the bile contaminates any of the meat or desired organ meat.
The bile duct in a seal liver is quite large for the size of the animal. It does not seem to be as simple to remove as in other animals. It is recommended that the bile duct be removed with some of the liver attached. The bile does not seem to be contained only in the visible duct, it is also contained in the tubes that run into sections of the liver.
This is a procedure that is difficult to describe but comes quite quickly with practice.
The internal cavity of the animal should be rinsed out with sea water then the cavity packed with snow.

Skinning:
It is recommended that the animal not be skinned until it is in a position to be butchered and bagged. This allows for a more sanitary handling of the meat. When skinning the animal the blubber will be removed with the skin. Care should be taken to remove as much of the fat as possible during the skinning process as the fat and oil change the flavour of the meat.

Care should be taken so that the skin surface does not come in contact with the meat. Once skinned the meat should be moved to an area that is clean and has not been in contact with unskinned seals.

Removal of blubber.
The fat that is removed from the skin should be stored ready for processing or frozen for future use.

Butchery:
The whole carcass can be frozen and stored for future use or boned or butchered according to the requirements for the meat.

General:
a. Organ meat and visceral that is to be saved should be packed separately at time of eviscerating.
b. Each seal will be packed separately in its own box or bag identifying its organ meat to the body meat with an identification number this will enable the discarding of relevant organ meat if the meat is condemned.
c. Care will be taken to only harvest seals that are seemingly healthy. If there is any question as to the health of the animal after it has been opened nothing from that animal should be used.
d. Knives and tools should be washed and disinfected after and before each kill and butchery.

Butchery of the meat. (It is described in the video presentation.)

The procedure of butchery will be dependent upon the end use of the meat. There are five main meat areas of the animal.

1. Front flippers.
2. Back flippers.
3. Loin.
4. Body meat.
5. Rib Cage.

In general – For some one used to boning other types of animals the boning of seals is quite different until the skeletal structure is known. Rapid boning of meat is something that is done by feel as much as by sight. Until the butcher becomes aware of the differences in the skeleton the process can be quite slow and awkward. Once accustomed to the differences the process is quite quick.

The front flippers:
These can be removed quite easily. There is a small kidney shaped gland between the flipper and the body. It is easy to see and remove. It is recommended that it be removed.

For processing into sausage or other products the meat from the shoulder blade and upper main bones should be removed. The wrist section does not really have enough meat to be removed and should be severed leaving the meat so that it can be smoked or used for other products.

The back flippers:
These can be easily boned once the differences in skeletal structure is learned. It is useless to describe in detail as it is a process that is best learned with a knife in hand and a seal on the table. The meat from the back flippers is best used in sausage type products.

The loin:
The loin provides the largest single muscle on the seal and should be used in products requiring large muscle meat such a cured and smoked meat. For processing the stomach wall connected to the loin should be removed and used in other products.

Body meat:
The meat taken from the back and from the ribs is best used in sausage type products, The thicker meat of the back could be used in pies and like products. This meat can also be cured and dried as a jerky. The meat is removed from the ribs as from any other animal.

Ribs:
The ribs can be brined and smoked as whole rib cages or have the meat cut from between the ribs and the strips cured and dried into a jerky. The structure of the meat from between the ribs is different than the rest of the meat and is best used in a jerky type product. It may also be useful in many dried or fermented type sausage products.

Phase III: The Processing of the Seal Meat

Introduction to Phase III.

It was apparent from information obtained in Phase I that past endeavors at processing seal meat looked at taking the seal meat and producing a low cost meat source.

Science Systems took the approach that in order for any potential processing plant to be successful it would need to be economically viable. With this approach the processor could afford to pay the harvesters of the meat prime prices for good quality product. With good prices being paid for the meat, quality would be rewarded and better controlled. In addition the high costs of energy and doing business in the N.W.T. could be covered such that a successful processing facility could be run.

With this approach it became quite apparent that the original proposal and attitude of just making sausage type products was insufficient to achieve this end. The result was that the scope of the project was expanded to include and develop higher value added products. The additional time requirements resulting from this approach was not billed as part of the contract, nor added to the contract as it was Science Systems decision to develop these products.

It is felt that this was a good direction as some of the products developed should enable a small processing plant to be economically viable and result in good utility of the seal meat resource.

Initially a variety of products were made using standard formulations and spice mixes. Once these products were made and tested then variances were done on the products with spices and types of products,

For an effective evaluation of the seal meat, standard meat science technology and spice mixes were used to determine the limitations and advantages of the meat.

This was an constructive sector as we found that many standard practices did not produce the desired results. Many of the initial products made were so bad that they were inedible, these were mostly the products containing seal fat. Once some of the significant limitations were determined progress was made into a variety of products.

The investigation process was basically to determine what spices, flavours and processing methods were best suited to the advantages and limitations of seal meat.

In investigating the utilization of products we looked at the possible end utility of the products. The three major areas of utility being:
General consumer type products; Snack-type foods; Products that could be marketed to the restaurant and hotel trade.

The video presentation covers some of the procedures in this project.

Characteristics of Seal Meat.

Seal meat is not similar in taste to any standard meat on the market. A description of its flavour package would be 5% background liver taste, 10% background fish taste, 5% blood taste. The remaining 80% of the flavour package is a definite meat flavour that is different from any standard commercial animal.

The background tastes of liver, fish and blood can be enhanced or lowered depending upon processing technique and spices used.

Liver Flavour:

It was interesting that people who hated liver noticed the liver flavour very strongly in some products and to some extent in all products. People who did not like liver but liked pate however did not notice the liver flavour in some products.

It became apparent that "Liver Haters" would never be a good market for many seal products. The exception to this was the consomme, even ardent "Liver Haters" liked this product.

By adjusting procedures and spices it was possible to enhance the liver taste or reduce it in the flavour package of the product. This however, was not possible in all products.

Fish Taste:

The fish taste of the product function in a similar manner to the liver taste. It was an easier flavour to control than the liver taste.

It is assumed that the strength of the fish taste in the meat may vary with species of seal, the location of the seal, and the time of year it was harvested. This aspect of its flavour package is assumed to be open to the most variation so a great deal of time and effort was spent trying to control and manage this flavour in the products.

Part of the fish taste is related to the amount of seal fat that ends up in the product. Products with seal fat in them developed a strong fish taste that was not even pleasant to fish lovers. This is most apparent in cooked products. This is caused by the oxidation of the fat during the heating process into fatty acids structures that have a strong fish taste. Once these fats oxidize the product develops rancidity quite quickly.

It is important in the preprocessing of the meat that as much of the fat is removed as possible before the meat goes into products. It was found that this was facilitated by removing the fat when the meat was frozen. The fat does not freeze solid and is relatively soft when the meat is frozen. This makes the process much faster and effective.

The fish taste that is left in the meat can be pleasant in the right product or lessened in its intensity for other products.

The Blood Taste:

This taste was only noticeable in some of the products and generally was not apparent. It was only apparent in products that had a spice mix that was related to a blood pudding spice mix. Those that liked blood pudding found this flavour interesting.

In general it was not tried to enhance this flavour in products. It could however be enhanced if desired for certain speciality items.

As a controllable flavour, blood taste was easier to control than the liver and fish flavours.

General Flavour and Taste:

Seal meat has a unique flavour and taste, The main flavour of seal is not similar to any other meat in the same manner as lamb, beef or pork all have theri unique flavours.

This basic flavour gives seal the potential of being presented as a gourmet type food. It was found that processing procedure and spice mixes were the key to bringing out this basic flavour.

With any meat it is imperative to develop a “feel” for what can be done with the basic meat. With seal past endeavors have been to try and recreate existing foods using seal such as the reproduction of other existing products made from pork or beef with seal such that they taste like the product made from beef or pork. This is an essential starting point as it initiates the “feel” for the meat. It is by no means an ending point. It is like taking beef and producing a product that tastes like smoked ham.

Once the initial work was done on the seal by producing standard type products additional work was done with flavours that complemented the natural seal taste. In the flavour profile in the next section there were certain spices and flavours that complemented the seal rather than conflicted with the flavours.

Although products were developed enhancing the natural flavour of the seal as well as products that were similar to other products on the market the direction of product development will be a function of the preferences of the end consumer.

Developing a “feel” for the meat and the kinds of products that could be made, has been achieved. It seems very possible to adjust the flavours of the seal meat products to the particular preferences of the end market. The development of flavour mixes and improved products with seal meat should be an ongoing process.

Texture:

The texture of seal meat is very acceptable for its use in processed meats. Some allowance needs to be made in some products for certain textural qualities, however this is of no great concern.

Descriptive Sensory Analysis of Seal Meat or Flavour Profile

(Testing and analysis done at Rector Foods Limited.)

NOTE: This testing procedure was not covered in the original proposal. It became important after it was found that certain spices did not react well with the unique flavours of seal meat.

A flavour profile is conducted on meats and foods to indicate how specific spices or family of spices interact with the specific flavours of a meat.

Objective:

To determine the compatibility of various herbs and spices on the flavour characteristics of seal meat.

Method:

Descriptive Sensory Analysis was chosen to determine the initial acceptability of the spice groups. A descriptive flavour profile was performed detailing the overall impression, flavour alterations, flavour masking, aftertaste and other pertinent observations.

Procedure.

Loin meat was taken and cubed into pieces approx. 1/2 inch square. The meat cubes were marinated for 5 min. in a spice oil solution.

Marinate:
Spice oils: 0.5 grams
Water: 50 ml.
Tween 80: 2 grams. (emulsifier.)

The marinated meat cubes were then fried in a hot skillet for 5–7 min. until cooked.

The cubes were then tasted and judged as to the applicability of the spice to the distinct flavours of seal meat.

The spice was judged as to its usability with seal meat on a scale of 1 to 10. (1 being unacceptable and 10 being very acceptable.)

Spices tested were:

Dillweed, Cumin, Anise, Clove, Nutmeg, Coriander, Ginger, Onion, Garlic, Sage, Lemon, Bay.

Comments are listed from two tasters, A & B.

A - Eaten seal often and enjoys the taste of seal and seal products.

B – Never tasted seal before, does not care for the basic taste of seal or seal products. Is a professional working with spices and spice mixes.

Dillweed: - Dill is used mainly in pickles& marinates and in fish recipes. Dill is very volatile with strong aroma characteristics.

The first test with dill was too strong and it was decided to lessen the concentration from 0.5 grams in 50 ml to 0.25 grams.

Rating: 4 to 5.

A) Dill does not add anything significant to seal meat.
It is definitely not a lead spice to be used with seal meat.
It would be an acceptable spice as a back–up flavour to other spices, however used in small amounts relative to other spices.

B) The flavour characteristics do not compliment seal. The dill flavour and aroma overpower the seal flavour and the flavorings are objectionable when mixed together.

Cumin: - Typically middle eastern spice used in Indian & Mexican recipes including curries.

Rating: 9

A) Compliments the flavour of seal well. The meat retains its seal taste while lessening the objectionable fish taste. There is a meshing of the flavour of the seal and cumin. It provides a pleasant but not overpowering taste. Would be judged as an acceptable spice to use in seal meat products.

B) The flavour characteristics of cumin blend in with seal meat creating a uniform blend. The cumin notes do not overpower but compliment the seal, it also downplays the fishy notes without masking the flavour.

Anise: – Anise has a spicy and sweet flavour typically used in alcoholic drinks. It is often included in curies and pepperoni spice blends.

Rating 6:

A) The anise overpowers some of the basic seal tastes. Yet the seal taste still remains. The spice does not mesh with the meat but results in a identifiable anise and seal taste. Interesting, however would only recommend anise in seal products if the anise flavour is desired.

B) The flavour characteristics slightly overpower the fishy notes of the seal meat. The anise does not blend in with the seal flavour. However together they are acceptable.

Cloves: - Sweet and pungent spice used in sweet and savory dishes. Similar to cinnamon and allspice. Should be used sparingly due to its high potency.

Rating: 7

A) The cloves augment the seal taste to a limited extent. There is little meshing of flavours. The spice does not seem to disappear in the meat. There is a limited masking of the seal taste with the cloves.

B) The flavour characteristics of clove do not blend with the seal flavour. The clove tends to overpower seal and mask the flavour. The clove flavour however is not objectionable.

Nutmeg: - Nutmeg has a nutty, warm and sweet flavour. It is typically used in meat seasoning.

Rating 6

A) Some meshing of flavours of nutmeg and seal found the spice seems to change a little when mixed with seal. It masks a little-and changes the seal taste a little. It is a spice that should definitely be considered in relative small amounts and as background for other spices.

B) The nutmeg flavour is slightly overpowering but compliments the seal characteristics. If used sparingly nutmeg would be a favorable match for seal.

Coriander: - Coriander is used in pickling spice and curries, has a mild and pleasing flavour and aroma.

Rating 9

A) Coriander has a milding effect upon the seal, does not overpower. It buffers the liver and blood taste of the seal leaving a pleasant seal taste. In general a pleasant spice and recommended to be used with seal.

B) Coriander compliments the seal flavour characteristics, it blends in well without overpowering. Coriander allows the seal flavour to be smoothed out without dominating or masking.

Ginger: - Ginger has a very distinctive flavour and is used widely in all types of recipes in various countries.

Rating 8

A) Ginger has mild masking of seal taste however leaves the basic seal taste. It seems to back up the favorable flavors of the seal. It is not an offensive spice and could be used as a back up spice in seal products as it would be used in many meats.

B) The pungent ginger characteristics blend over the fishy notes of the seal. Ginger is not particularly compatible with the seal characteristics but may function well as a background flavour.

Onion:

Rating 9

A) Onion has a strong flavour covering ability. It produces a very pleasant over taste however it is the onion that provides this pleasant taste. It changes the flavour of the meat to an onion flavour. It is more overpowering than most of the other spices. It leaves the blood and liver taste while covering the fishy taste quite effectively. Because of the acceptability of onion as a spice it is recommended to use onion in relation to seal meat. It does produce a pleasant result.

B) Onion flavour characteristics blend very well with seal. Onion smooths out the harsh flavour of seal without overpowering the flavour.

Garlic: - Garlic has a strong flavour and is used in a variety of meats. It has an unique flavour that is either loved or hated.

Rating 7

A) The garlic overpowers the seal taste, leaving little of the basic taste. It is not as overpowering as the onion. There is as much meshing of tastes as in onion however. It is a pleasant taste but only to those who like garlic.

B) Garlic flavour characteristics compliment seal meat. It blends well and only dominates as an aftertaste.

Sage: – Traditional British herb with strong, overpowering flavour characteristics.

Rating 6

A) Overpowers basic seal taste. It is an acceptable taste it does result in some meshing by producing a little bit of a new flavour when combined with the meat that is neither sage nor seal. Sage goes well with seal but not as well as sage goes with pork.

B) The sage flavour notes are too pungent for seal meat. The strong flavour competes with the seal rather than complementing.

Lemon Powder: - Used in many fish products to chemically alter the fishy taste.

Rating 10

A) Brings out and enhances the taste of seal. It lessens the taste of blood and liver in the meat and removes the aftertaste of seal. It lessens the objectionable fishy taste. It is recommended as a good flavoring to be used with seal. The results were very pleasing,

B) Lemon powder greatly enhances the seal flavour. The lemon flavour is not noticeable, it is concealed by the seal flavour. The strong flavour produced by the lemon may be perceived as harsh.

Bay: – Bay is used as a background flavour in sauces, soups and marinates.

Rating 6

A) Interesting flavour by itself does not seem that powerful. It mellows the taste of the seal a little and would be very nice as a back up spice in certain types of products. A definitely useful spice with seal for certain products.

B) Bay flavour characteristics do not compliment nor is it objectionable when used with seal meat. Bay could be used as a background flavour but is not exciting as a main flavour.

Comments and Recommendations:

A) In general this flavour profile and other testing indicate that certain spices and flavours go better with seal than others. It has been found that for many spices it takes a great deal more spice to create an effect than it would with other meats. The seal seems to be able to overpower many spices. It is recommended that more work be done in this area to derive some of the guidelines for seal meat. An example of this was a product made in which 0.2% garlic powder was added to a product. This percentage in beef or pork this would have produced a strong garlic flavour. In the seal product the garlic was only barely detectable. The process of spicing and flavoring is very important for any product line and will also be imperative in a seal product line. This and other work has been a very good initial directive but is by no means complete.

B) The most acceptable flavorings that compliment the flavour characteristics of seal meat are; Cumin, Coriander, and Nutmeg. Strong pungent seasonings tend to conflict with the strong seal flavour. These would include Sage, Clove, and Dillweed. Onion and Garlic tend to smooth out the seal flavour and compliment it at the same time. Lemon Juice can be used to strengthen and enhance the flavour. Bay and Ginger used sparingly are good background flavours.

Proximate Analysis of Seal Meat and Seal Oil.

The following is a proximate analysis for seal meat and seal oil.
(Tests done by Diversified Research Laboratories Ltd.)

Tests done by

	Seal Meat	Seal Oil
Ash (ref :1119)	1.2%	0.0%
Calories (ref: 1139)	111 kcal/100 gm.	900 kcal/100 gm.
Fat	0.2% (ref: 1161)	100% (ref :1153)
Free Fatty Acid (ref: 1156)	Sample size required for test was to large.	0.32% as oleic
Moisture (ref: 1168)	71.2%	0.1%
pH (ref: 1183)	5.76 pH	
Protein (ref: 1187)	27.4%	0.03%
Carbohydrates (ref: 1234)	0%	o%

Comparison of Other Lean Muscle Tissue to Seal Meat.

Species	Composition (%)			
	Water	Protein	Lipid	Ash
Beef	70-73	20-22	4-8	1
Pork	68-70	19-20	9-11	1.4
Chicken	73.7	20-23	4.7	1
Lamb	73	20	5-6	1.6
Cod	81.2	17.6	0.3	1.2
Salmon	64	20-22	13-25	1.3
Seal Meat	71.2	27.4	0.2	1.2

Characteristics of Seal Fat:

Initially in the product formulation it was tried to incorporate the seal fat into products in the same manner as one would include other animals fats in the products. It became quite apparent that with the addition of soy isolates the quality of the products were not acceptable. In addition the potential of the oil oxidizing in the product made the shelf life of the products unacceptable.

As a general principle it is recommended that all the seal fat be removed from the meat before processing. The fat and oil should be used in alternative products or processed such that the oxidation problem is solved before its addition to meat products.

When fats are required to be used in products either pork or caribou fat should be used. Beef fat was tried in one product and resulted in unacceptable results. It might be acceptable in a product that is served hot however much better results were obtained from the use of caribou or pork fat.

It was not feasible to use the seal fat in the meat products so tests were done on the oil itself to determine its limitations and benefits.

It was tested as a cooking oil and other uses.

Seal oils like, fish oils, are oils that contain a high percentage of polyunsaturated fatty acids with 2 to 6 double bonds. These oils are different from vegetable oils where the polyunsaturated fatty acids contain only 2 to 3 double bonds. The more double bonds in the fatty acid molecule the more the oil is susceptible to oxidation. Once oxidation has started it is difficult to arrest, since this oxidation is a chain reaction which form free radicals which attack other double bonds. At the start of the oxidation peroxides are formed. These are measured by a peroxide value test. Breakdown products of peroxides cause unpleasant odours, especially fishy odors. Breakdown products are estimated by the TBA test.

Oxidation is accelerated by heating, exposure to air, metals and especially, exposure to sunlight, Freezing neither stops not prevents oxidation. Oxidation can be slowed down by antioxidants.
There is a reference to this in the back up literature regarding the use of antioxidants on seal skins to prevent the fur of marine animals from yellowing without impairing the quality. " Selection of effective antioxidants for seal oil.”

Antioxidants should be added before oxidation has started. Adding of antioxidants after oxidation has begun does little to prevent further deterioration especially when oils are highly unsaturated as-is the case of seal and fish oils. An oil’s stability to oxidation can be estimated by means of an accelerated test (AOM test), which is expressed in hours. Vegetable oils should have an AOM value of 18 hours.

Experimental Results:

Tests were done on seal oil to determine its process ability and relevant values.

The peroxide Value of the oil was 1.6 meg/kg. This value is not very high, however highly unsaturated fatty acids arc very labile and break down rapidly into secondary products. A TBA value would have given additional information. The AOM test indicated that the oil was very susceptible to oxidation. The AOM value was 2 hours as compared to vegetable oil at 18 hours.

The oil received 3 different treatments.

1. Vacuum filtering
2. Bleaching
3. Bleaching and deodorization (Steam purging under Vacuum)

Bleaching consists of treating the oil with 2% Ben Root and 2% Trisyl under vacuum at 140° C for 15 min. followed by vacuum filtration.

Steam purging under vacuum – also called deodorization– took place at 240° C for one batch and at 22(.)°C for another batch. Vacuum filtering resulted in clear yellowish oil. Bleaching removed most of the yellowish colour. After steam purging the oil remained nearly colorless.

Peroxide value after filtering remained 1,6. After bleaching the peroxide value was reduced to 0.5, but after the steam treatment it increased to 1.0. The odor of the oil slightly decreased after bleaching and only minimally after steam purging.

After each treatment the following antioxidants were added at the permitted levels:

BHA - Butylated hydroxy anisole @ .01%
BHT - Butylated hydroxy toulene @ .01%

After adding the antioxidants all the oils were tested again for their oxidative stability.

Treatment and addition of antioxidants had not increased the oxidative stability, Possible reasons are that oxidation was well advanced and could not be reversed or stopped, metal contamination which requires a chelating agent or different combinations of antioxidants.

Recommendations:

Removal of the fat from the seal tissue should be done with the use of stainless knives or appropriate utensils. Avoid exposure to metals. If drums are used they should be coated with food grade plastic lining. Avoid exposure to air. Add antioxidants right after or during rendering. Filtering with or without an absorbent may be the step that the oil will tolerate. If deodorization is required temperature should not be above 220° c.

It is very doubtful that the seal oil can be used in salad dressing as salad dressings require stable oils.

As far as margarine manufacturing is concerned the oil contains too high a percentage of 22 carbon fatty acids (9%). Rapeseed contains from 22 to 45% 22 carbon fatty acids. This oil is banned for food consumption in the U.S.A. and Canada. The new rapeseed oil called "canola" contains less than 1% of 22 carbon fatty acids.

Further research is required into the stability of different antioxidants, combinations of antioxidants and chelating agents.

In order to fully maximize the utilization of a seal it would be important to develop uses for the seal fat. The research that was done indicates that it is unacceptable in the meat products. The chemical structure of the oil allows it to oxidize and proceed to rancidity quickly. This will make it difficult to use in most any product unless appropriate antioxidants are tried and tested. The aspect of the 22 carbon fatty acids should be of concern and may be correctable with processing. This type of work was beyond the scope of this project.

The strong fishy taste that develops upon processing of the seal oil is a result oxidation. The product develops a “Cod Liver Oil” type taste. This taste may be acceptable for some applications, however it does severely limit it utility. It may be possible to remove the fishy taste but it will require basic research and testing.

It was tried as a cooking oil but the fishy odor gave the products limited appeal.

The following page is a fatty acid profile of the seal meat as well as the seal fat.

FATTY ACID COMPOSITION OF SEAL MEAT & SEAL FAT (MOL.%)

	SEAL MEAT					SEAL FAT				
Fatty Acid	SM1	SM2	SM3	MEAN	+/- SE	SF1	SF2	SF3	MEAN	+/- SE
16:0	18.2	18.1	17.2	17.8	+/- .3	3.4	2.0	/	1.8	+/- 1.0
16:1n7	10.1	10.9	11.6	10.9	+/- .4	23.5	24.5	27.9	25.3	+/- 1.3
18:0	10.9	10.2	9.0	10.0	+/- .6	/	/	/	/	
18:1n9	28.2	28.3	27.5	28.0	+/- .3	24.4	24.1	24.8	24.4	+/- .2
18:2n6	2.7	2.6	3.0	2.8	+/- .1	1.8	2.2	1.9	2.0	+/- .1
18:3n3	/	/	/	/		.5	.5	.5	.5	+/- .0
18:4n3	.2	/	.2	.2	+/- .2	1.4	1.5	1.5	1.5	+/- .03
20:0	.3	.3	.4	.3	+/- .03	/	/	/	/	
20:iso	5.0	5.2	5.7	5.3	+/-.2	8.7	8.5	8.2	8.5	+/- .1
20:2n6	.3	.4	.4	.4	+/- .03	.2	.1	.1	.1	+/- .03
20:3n6	/	/	/	/		.1	.1	.1	.1	+/- .0
20:4n6	3.8	3.6	3.5	3.6	+/- .1	.2	.1	.2	.2	+/- .03
20:3n3	/	/	/	/		.1	.1	.1	.1	+/- .0
20:5n3	7.6	8.2	6.6	7.5	+/- .5	9.4	9.6	10.2	9.7	+/- .2
22:0	/	/	/	/		/	/	/	/	
22: iso	.7	.6	.7	.7	+/- .03	.7	.7	.6	.7	+/- .03
22:2n6	/	/	/	/		.5	.5	.6	.5	+/- .03
22:3n3	/	/	/	/		/	/	/	/	
22:6n3	5.6	5.6	6.0	5.7	+/- .1	7.2	7.7	7.9	7.6	+/- .2
24:0	/	/	/	/		/	/	/	/	
24: iso	.5	/	.5	.5	+/- .2	/	/	/	/	
unknown	5.9	6.0	7.9	6.6	+/- .7	17.9	17.7	15.4	17.0	+/- .8
ug Fat	75.6	65.1	97.6	79.4	+/- 9.6	1,276.3	1,202.0	1,263.4	1,247.2	+/- 22.9

mg./100gm	SEAL MEAT					SEAL FAT				
Tissue	SM1	SM2	SM3	MEAN	+/- SE	SF1	SF2	SF3	MEAN	+/- SE
gm tot fat	.8	.6	1.0	.8	+/- .1	61.3	57.7	60.6	59.9	+/- 1.1
mg/ 100 gm	835.0	590.2	960.6	795.3						
mg EPA	67.9	51.9	67.9	62.6	+/- 5.3	6,321.0	6,064.4	6,748.1	6,377.8	+/-199.4
gm EPA						6.3	6.1	6.7	6.4	
mg DHA	54.7	38.4	66.5	53.2	+/- 8.1	5,184.9	5,233.7	5,609.3	5,342.6	+/-134.1
gm DHA						5.2	5.2	5.6	5.3	
mg AA	34.2	23.0	35.9	31.0	+/- 4.0	113.2	91.4	106.5	103.7	+/- 6.4
gm AA										
mg Sat F.A	234.1	160.9	243.0	212.7	+/-26.0	1,918.7	1,079.9	/	1,499.3	+/-
gm Sat F.A						1.9	1.1			
mg Mono	370.9	264.7	442.0	359.2	+/-51.5	35,157.8	33,297.4	36,890.9	35,115.4	+/- 1037
Unsat F.A.						gm 35.2	33.3	36.9	35.1	
mg Omega 3	124.1	90.3	135.9	116.8	+/-13.7	12,780.3	12,543.7	13,654.4	12,992.8	+/-337.8
gm Omega 3						12.8	12.5	13.7	13.0	

Product Evaluation:

Many of the products were made at the beginning of July with expectations that presentation of these products would be during the third week of August. This presentation date was postponed resulting in product that was near the end of its shelf life.

This created an opportunity as well as a potential problem. The opportunity was that microbiological tests could be done on stored product to give us a guideline. of its potential shelf life. It also meant that unless the products were tested for their microbiological counts they could not be presented to anyone.

These tests were not originally budgeted for in the proposal.

The following is the results of those tests.
(The laboratory copy is in the appendix on tests)

* All of the results are within the acceptable levels for food products.

	Reconstituted Ham	Liverwurst	Pastrami
Total Plate count	29,000/g	900/g	500/g
Yeast & Mold	1,200 M <lo Y	N/A	N/A
Coliforms	<lo/g		
Fecal Coli	<lo/g	<lo/g	<lo/g
Staph aureus	<50/g		
Salmonella sp.	absent in 11 g.	absent in ll g.	absent in 11 g.
Lactobacillus	290/g		
Toxicity	non-toxic		

These results were better than expected given the time of holding these products. They were from 6 - 7 weeks old at the time of testing.

Because of the expected extended holding of these products they were frozen after these tests were taken in order that their quality did not deteriorate from when the tests were taken. This was considered unfortunate since the freezing of hams and similar products does affect their textural quality.

Taste Tests:

The following taste test and product evaluation was conducted on some of the products.

PRODUCT EVALUATION

Judging was done on products with 1 as poor and 5 as excellent.

The tasting panel was made up of 9 persons.
3 of which work in food processing and had tasted the seal products previous to the taste test.
2 who had tasted only a few of the products before.
4 Who had never tasted the seal products before.

The ratings are given below for the products tested.

Tundra Consomme 5, 5, 4, 5, 5, 5, 5, 5, 5 average 4.85

Comments.
- Very nice flavour
- Excellent
- Very good
- Marvelous
- Excellent, delicious
- First class product
- Aroma Excellent, excellent taste
- Excellent, smooth, velvet

Sauerkraut & Flippers 2, 2, 2, 3, 1, average 2.0

Comments.
- Too salty and fishy
- Too fish tasting
- Fishy
- Did not like meat
- Too tough
- Could be sauerkraut, don't like it

Meat & Mushroom Pie 5, 5, 5, 4, 5, 5, 5, 4, 5 average 4.8

Comments.
- Meat held well, good taste
- Real flavour, meat chunks hang together well.
- Hint of fish, meat a little chewy but good.
- Excellent
- Nice sauce and pastry
- Excellent taste

Smoked Loin 5, 4, 5, 5, 3, 3, 3.5, 4, 2. average 3.7

Comments
- No seal taste
- Good, but a little bland
  slices well, excellent texture.
- Good but salty.
- Salty
- Salty, good texture

Pepperettes (Cooked) 4, 4, 3, 4, 4, 4, 4, 3, average 3.75

Comments
- Good flavour but too soft
- Would prefer a firmer texture, good flavour
- Could be a little firmer
- Soft bite

Pepperettes (Cured) 5, 4, 5, 3, 5, 5, 5, 3, 5 average 4.4

Comments
- Pleasant product
- Nicely spiced, very good
- Don't like pepperettes, but like these better than most.
- Little more spices
- Could be a little spicier

Pate 5, 5, 5, 4, 5, 4, 3 average 4.43

Comments
- Excellent
- Excellent
- There is more flavour in this pate
- Good but prefer goose
- prefer it to regular pate

Salami (Seal& Caribou) 4, 4, 5, 3, 3, 4, 3, 4, 3 average 3.7

Comments
- Flavour has changed over time
- Excellent flavour, Not as oily as regular salami
- Needs more spice
- Could be spicier
- Fishy flavour
- Somewhat fishy in flavour
- Good texture, nicely spiced, not overpowering

Pastrami 3, 3, 3, 2, 3, 2, 3, 2, 1 pastrami 2.4

Comments
- Has lost some of its original flavour
- Good Texture
- A little bland
- Too mild
- Bland
- Very flat

Galantine 4, 4, 3, 4, 5, 4, 4, average 4

- Fishy but not unpleasant
- Very acceptable

Jerky 4, 5, 3, 5, 4, 4, 5, 4, average 4.25

Comments
- Dry but smooth, heavier smoke would be nice
- Tasty excellent spice
- Good texture not dry

General comments on products:
Quotes of the comments written at the end of the taste test by the panel.

- Pate is an excellent marketable product, consomme is also excellent. The original salami and pastrami had more flavour and were a better product.
- If products with a fishy taste were presented with fish they may be more acceptable.
- Market that consomme !! excellent, meat pie excellent.
- The consomme was probably the most pleasing to the palate and could have excellent commercial possibilities. The ham was good and also could have commercial use.
  Other products in order of commercial possibility would be Salami, Jerky, Pate. I thank you for the opportunity to taste this cuisine

Observations of the panel:

The persons that had tasted seal meat as regular cooked meat were pleasantly surprised as to what the processing had done to the meat.

The persons that had never tasted seal or any seal products were impressed, one actually went to the his Chamber of Commerce restaurant and let him taste some of the products. The chefs response was that he would put it on the menu if it were available.

The panel was a good cross section of persons that knew food and had trained palates and outsiders that viewed the processed meats as general consumer.

The most favoured products was the consomme and meat pies. The pate was more of a taste preference type product. Those that liked pate in general found it exceptional. Those that did not have a personal preference to pate in general liked it but did not rate it as high.

Observations of other persons tasting the products.

The Honoury President of the Canadian Chef Association tasted the consomme and commented that it could be served in the top clubs and hotels in Canada, He also recommended that some of the products were good enough to present to the Chef de la Cuisine of Canada.

In general the reception to the products was very good. There were some products that generally did not meet with a good reception as they had a strong fishy taste. This taste may be accepted differently on the Northern palate as those who had tasted seal often did not seem to mind some of the fishy taste in the products.

There were always comments about the colour of the meat in regard to it being so dark. This colour bothered some people to the point of them not wanting to taste the product. Others were not bothered by the colour once they had tasted the products or had exlained why it was so dark.

Mineral and Pesticide Levels:

Tests were run at Zenon Environmental Inc. in Burlington.

Tests were run on the seal to determine if there was a potential problem with any of the products as a result of environmental contamination.

In general the test levels are below acceptable tolerance levels.

Acceptable Tolerance Levels are levels based upon consumption everyday for life.

The results are presented on the next page and the lab report is in the appendix. There was one level for a-benzenehexachloride (a-BHC) in the blubber that was abnormally high and was not expected. A high level of a-BHC usually corresponds with a high level of Lindane, yet Lindane was below detectable levels. The tests were run twice in two different methods and the same result was obtained.

This could be an extraneous reading, but does cause a concern. Another test will be run in a different lab after this report is written in order to rule out equipment error or bias. If the reading is accurate the oil may not be acceptable as a food source as the acceptable tolerance level for a-BHC is .1 ug/g while the reading is 1.2 ug/g. Since seal oil is quite different than other oils in addition to the reading not being consistent with the other readings, it is important to cross check this reading.

It is important to point out as well that this was just one test on the blubber from one seal chosen at random. Even though unlikely the possibility of external contamination does exist. Given that the oils in the body are the storage medium for pesticides etc. it will be important to test for these levels on a regular basis and on a region basis if the oils are to be used as a food source.

The blubber was taken from seals when they were at their lowest body fat level. Blubber taken from seals during high body fat season may well be quite different in their levels.

The mercury content of the liver is .47 the tolerance level is .5 the liver is close to tolerance however it is acceptable. Another important factor is that the liver products made involve only a percentage of liver in the product so that the product reading of a pate that was 50% liver would be significantly lower than acceptable tolerances. Given the closeness of the mercury level to tolerance it would be important to check some seal livers from different regions before they are used in processing in general. It might be that only livers from certain regions would be acceptable for processing. Given the present test there is not any problem of mercury content for use of the liver in processed foods.

CHLORINATED ORGANICS (ug/gm) Laboratory report in Appendix - Tests

ND = NOT DETECTED, * = iNTERFERENCE IN THE CONFIRMING COLUMN

	Meat	Liver	Blubber
HEXACHLOROBENZENE	.0110	ND	.0450
a-BENZENEHEXACHLORIDE	.0066	.0670	1.2000
LINDANE	ND	.0022	ND
HEPTACHLOR	ND	ND	ND
g-CHLORDANE	ND	ND	ND
a-CHLORDANE	ND	ND	ND
p,p'-DDE	ND	ND	<14
p, p , '-DDD	ND	.0150	ND
o,p,'-DDT	ND	ND	ND
p , p , ' -DDT	ND	.0100	ND
METHOXYCHLOR	ND	.0420	ND
MIREX	ND	.0080	.0410
PHOTOMIREX	ND	*.0079	*.064
TOXAPHENE	ND	ND	ND
TOTAL PCB	ND	ND	ND
SURROGATE RECOVERY (%)	67%	86%	125%

METALS ANALYSIS

	MEAT	LIVER	BLUBBER
ARSENIC	<0.60	<0.60	<0.60
MERCURY	<0.06	0.47	<0.06
CALCIUM	75	94	27
MAGNESIUM	250	230	11
SODIUM	620	1000	470
POTASSIUM	3300	2400	290
ALUMINUM	<lo	<lo	<lo
BARIUM	<1	<1	<1
BERYLLIUM	<0.5	<0.5	<0.5
BORON	<lo	<lo	<lo
CADMIUM	<1	<1	<1
CHROMIUM	<3	<3	<3
COBALT	<3	<3	<3
COPPER	<3	28	<3
IRON	75	1300	<3
LEAD	<15	<15	<15
MANGANESE	<2	2.9	<2
MOLYBDENUM	<3	<3	<3
NICKEL	<5	<5	<5
PHOSPHORUS	2100	3000	300
SILICON	<15	<15	<15
SILVER	<3	<3	<3
STRONTIUM	<1	<1	<1
SULPHUR	2000	2800	270
THALLIUM	<20	<20	<20
TITANIUM	<3	<3	<3
VANADIUM	<3	<3	<3
ZINC	69	55	<3
ZIRCONIUM	<3	<3	<3

PRODUCTS MADE FROM SEAL MEAT IN PHASE III

The following is a list of products made will be covered individually in this report. The basic materials used will be covered as well as the process or procedure used in making the product. In addition each product has observations as to its acceptance as a product, its drawbacks and general notes regarding the product.

1. Reconstituted seal ham (with soy isolates)
2. Reconstituted seal ham (without soy isolates)
3. Reconstituted seal pastrami
4. Seal ham
5. Smoked seal ribs.
6. Basic seal emulsion.
7. Seal Kolbassa.
8. Seal Pepperoni.
9. Seal & Caribou Cooked Salami
10. Seal and beef fat Pepperettes (cooked)
11. Caribou Pepperettes
12. Seal Liversausage (with seal fat)
13. Seal Liversausage (without seal fat)
14. Fermented seal salami
15. Fermented seal pepperettes.(13mm & 16mm casings)
16. Fresh seal and pork sausage
17. Seal meat and mushroom pies
18. Seal meat and seal kidney pies.
19. Seal and vegetable pies.
20. Galantine
21. Seal liver pate.
22. Seal consomme (from the bones)
23. Seal meat Ravioli
24. Deodorized seal oil
25. Pepperoni
26. Seal & Caribou cooked pepperettes
27. Cured and dried seal Jerky.
28. Smoked seal loin (cured)
29. Smoked seal loin (uncured)
30. A variety of other products.

1. Reconstituted Seal Ham (with soy isolates)

Material: Seal Meat preground through Kidney plate.
(Loin and larger muscle meat was used)
Seal Meat preground through 3 mm plate.
(Rib trim and smaller pieces were used)
Ham Pickle (35%)

Processing:

The Ham Pickle was made in a silent cutter at high speed for approximately 2 minutes. All of the meat was put into a vacuum tumbler and then the pickle added to the meat. The tumbling process was done in two steps.

The meat was then stuffed into moisture proof coated casings "Teepack" of a caliber 90. It was then cooked in a water bath at 73°C to an internal temperature of 70°C.

The product was water cooled immediately for approximately 1.5 hours at a water temperature of approx 15 -18°C. It was then placed in a cooler at 2-4°C. The product was firm with no juice or water loss.

The water cooling after cooking is important so that the casings do not break after cooking. It is important to lower the temperature by this manner when cooking this type of product.

General observations:

The product had an acceptable taste and a shelf life of about 1.5 months in a cooler. It was found however that the soy isolates did provide a minor background taste of soy and should only be added if a lower price product is desired.

The structure was acceptable in that it held processing water at an acceptable level. Juiciness was acceptable, the sugar content was a little high and could be lowered. The flavour held reasonably well over two months. While in its casing the microbiological quality of the product stayed acceptable. Once exposed to air the shelf life shortened dramatically, as quickly as regular cold cuts. As a cold cut item for sandwiches it was acceptable.

2. Reconstituted Seal Ham (without soy isolates)

Material: Seal Meat preground through Kidney plate.
(Loin meat and larger muscle meat were used)
Seal Meat preground through 3 mm plate.
(Trim and smaller pieces used)
Ham Pickle (30%)

Processing:

The processing procedure was identical to the reconstituted seal ham with soy isolates.

This mix did however produce different results.
Immediately after the cooking process, some juice could be felt at the ends of the casings. This juice remained in the casing over the period of the refrigerated storage of the product.

This occurred even though at the end of the tumbling the meat felt dry and tacky before being put in the casing. This juice was obviously a result of not using the soy isolates.

The product produced in this manner had better basic flavour than the one with the isolates. The juice in the casing would be unacceptable under general processing. This could be solved by a few different methods.

1. The product be removed from the casing before sale and the juice discarded (not preferable, because once the casing is removed the shelf life will be shortened.)
2. Perhaps an extension of the tumbling time at temperatures not exceeding 4–5°C. with a 30–40% added brine.

In order to develop a procedure not using soy isolates more work and tests would need to be conducted to find the most suitable technology.

General observations:

By using the mix that would be used with a ham, the flavour was acceptable, but it is recommended that a brine containing less sugar be used. The meat by itself develops a sweet taste and the addition of sugar does not always enhance the flavour. The actual brine used requires some adaptation for use with seal meat. In this product it is a minor aspect and will greatly depend upon the taste preferences of the consumer group. It seemed to hold its flavour reasonably well over two months.

3. Reconstituted Seal Pastrami.

Material: Seal Meat preground through Kidney plate.
(Loin meat and larger muscle meat were used)
Seal Meat preground through 3 mm plate.
(Trim and smaller pieces used)
Pastrami Pickle (50%)
Soya isolates

Processing:

The pickle was made in a silent cutter at high speed for approximately 2 minutes. All of the meat was put into a vacuum tumbler and then the pickle added to the meat. The tumbling process was done in two steps.

The meat was then stuffed into moisture proof coated casings "Teepack" of a caliber 90. It was then cooked in a water bath at 73°C to an internal temperature of 70°C.

The product was water cooled immediately for approximately 1.5 hours at a water temperature of approx 15 –18°C. It was then placed in a cooler at 2–4°C. The product was firm with no juice nor water loss.

General observations:

The pastrami was firm and provided a good pastrami taste. The spices could have been a little more, but that would be a function of taste. The product held its texture over time and while in the casing had an acceptable shelf life. The flavour was decreased over time. If the product was to be kept for a while in storage before marketing, it is recommended that the amount of pastrami spice be increased.

4. Seal ham

Material: Large pieces of seal meat - the loin being most acceptable.
Ham pickle

Processing:

The pickle was dissolved in the silent cutter for 2 min. at high speed. The whole pieces were put into a vacuum tumbler and the brine. Tumbling was done in two segments.
1. Two hours
2. 24 hour rest for meat
3. Two hours tumbling

After tumbling the hams were smoked un-netted.

General observations:

The ham pickle although providing an interesting flavour to the meat seems to fight the natural flavour of the meat. Seal is not pork and this product seem, to again show that the spice mixes should be specific to seal rather than using off the shelf mixes. The product was acceptable from a taste point. Smoke seems to complement the seal taste quite well.

The product was smoked in an un-netted form to give it a wild game type look. This seemed like a good idea at the time and did produce a wild game type look, however the smoking flavour varied in the product as the thicknesses varied to much. In the future it is recommended that the product be netted. Latter products were netted and provided much more even cooking results. Un-netted product might be acceptable for specific market or presentations. The wastage is also more on un-netted products.

It was also discovered as a result of this product and a later produced smoked loin, that pumping of the meat produces a more succulent product than just tumbling.

5. Smoked seal ribs.

Material: Seal ribs after the rim trim was removed. The meat was left between the ribs.
Cover Pickle
Pastrami seasoning was used in the cover pickle.

Processing:

Some of the ribs were soaked in the brine for 24 hours and others were soaked for 48 hours. They were then smoked.

General observations:

The ribs were smoked in order to develop a product that would use the ribs. The ones soaked for 24 hours were preferable to those soaked for 48 hours. (The 48 hour soak was saltier).

This product is interesting and does have some application. The pastrami spice used in the cover pickle could be changed as the smoke flavour mixed with the pastrami flavour in addition to the seal taste could have been a little better. The product was liked by a few people and had a definitely different taste.

The product was kept under refrigeration and dried out with storage. This drying out produced a product a little more like a smoked jerky.

It is felt that the removal of the meat from between the ribs to make jerky strips may be a better end use for the rib meat. A variety of methods were tried to present the ribs including a honey, lemon and garlic glaze. This was interesting but was not well received by the taste panel.

For use in production the meat structure from between the ribs is quite different than the rest of the seal and lends itself well to jerky type products, be that jerky on the rib itself or removed form the bone.

6. Basic seal emulsion.

Material: Seal Meat Chilled, 3mm ground
Seal blubber, whole, frozen
Ice
Soy Isolates
Superbinder
Nitrite cure

Processing:

In order to utilize the Soy Isolates to their fullest extent and in order to limit the surface area of the seal fat,(which during cutting in the processing equipment turns to oil) a separate emulsion was made out of the seal fat, the ice and all the ingredients.

Ice was put into the silent cutter first, then the salt. This was cut until a temperature of 4°C was reached. At this temperature the fat and all the ingredients were added and everything cut for approx. 10 min.

After 10 min a relatively stable, white looking fat emulsion was created. To this fat emulsion, the 3mm preground seal was added and further cutting as done until a good blend was reached and a bind could be felt. Final cutting temperature +12°C.

The finished emulsion was stable but very weak. It was used in a the Kolbassa and pepperoni. The result was that the structure of the products was very poor.

It was initially felt that soy isolates might overcome the inherent limitations of using seal blubber in processed meat products. The making of this basic seal emulsion is something that needed to be done to determine if the soy isolates could be used to bind the seal oil in products. The result of this and other trials indicate that seal blubber or oil in its present form should not be used in processed meats in any significant amount.

7. Seal Kolbassa.

Material: Seal meat preground through kidney plate
Basic seal emulsion
Kolbassa Seasoning
Soy isolates
Water

Processing:

The preground seal meat was tumbled with all ingredients then placed into the silent cutter.

Basic seal emulsion was added and everything was cut for 6 –7 bowl turns in order to get the typical Kolbassa granulation.

During this cutting process, a definite weakening of the basic emulsion was experienced, due to enlargement of the seal fat surface area.

The product felt mushy and stringy in the cutter. The Kolbassa was then stuffed into casings. The casings were cooked in hot water at 74°C to an internal temperature of 70°C. The product was air cooled.

There was not any juice or fat separation, however the product felt mushy and did not have good bite and texture. Other product was processed in a smoke house.

The product from the smoke house was quite unacceptable in taste, to the point of being offensive. The heating of the oil in the emulsion produced very strong fish flavours. The texture was soft and mushy and the product had very poor mouth feel. The product was kept to see how it reacted to time. With time it just got worse, The result was never tasted again as even the most adventurous tasters found the odor and texture to offensive to try tasting the product. It also went bad quite quickly.

General observations:

The production of a Kolbassa may be acceptable from seal meat but with the addition of seal emulsion or seal fat it is doubtful that it would be acceptable anyone.

Seal fat in any quantity in processed meat needs much more work. It may be acceptable in fermented products that do not require the heating or cooking of the product but cooked products change the seal oil structure giving it a strong fishy taste.

8. Seal Pepperoni. (first try)

The seal pepperoni was made in the same manner as the Kolbassa except pepperoni spices were added instead. The results were basically the same.

The product lacked structure. The product was tasted after being smoked and it was offensive and very fishy tasting. It went bad quickly and was discarded within 3 weeks.

9. Seal & Caribou Cooked Salami

Material: Caribou lean
Caribou fat
Seal meat 3mm ground
Ice
Cure
Bierwurst Spice

Processing:

The caribou meat was cut together with all of the ice and spices in the silent cutter to a temperature of 4°C.

The fat was added, cut to granulation and finally the preground seal meat was mixed under. The product was then stuffed into casings and smoked.

The product felt good in the cutter and had an excellent bind.

General observations:

Only sufficient caribou fat was obtained to make one product. The caribou fat is excellent to use with seal. Caribou fat is superior to beef fat and goes very well in processed products. Caribou and seal go together very well the flavours seem to complement each other.

In general the salami was a very acceptable product. It could have had more spice added and a second making of the product would recommend an increased spice level. The product was good, the structure was excellent and the mouth feel did not have the tallow feel characteristic of beef fat.

The use of seal in conjunction with caribou and caribou fat were successful and it is recommended that it be used again in other formulations. It was received well by tasters.

The combination of caribou and seal provides a colour differentiation in the product that is quite pleasing to the eye.

There was little if any criticism of this product.

During storage under refrigeration it dried out quite a bit producing a very firm salami.

A good product and one that is recommended to be reproduced in later work.

10. Seal and beef fat Pepperettes (cooked)

Materials: Seal meat 3mm ground
Beef fat trimmings
Cure
Pepperoni spice
Soy isolates
Smoke powder

Processing:

All the preground materials were mixed together by hand and then stuffed into casings. They were cooked in dry heat at 80°C for 1 hour to an internal temp. of 70°C.

General observations:

When the product first came out of the oven it was superb. It did require a higher level of seasoning but it was very acceptable. It was taken to a bar and offered to people without telling them what the meat was. The reaction was very good and most everyone liked the product.

Once the product cooled it started leaving a tallow feel in the mouth. This was caused by the beef fat. Given the success of the caribou and seal salami and the lack of additional caribou fat, beef fat was tried to see if similar results could be obtained. There does seem to be a definite difference between the mouth feel of caribou fat and beef fat. Caribou fat is much superior.

In general it was a very acceptable product and could be made with caribou or pork fat. It was tried later with pork fat and produced an acceptable product.

This is a product that can be made with little training and with minimal equipment and it is recommended that it be made again and used as one of the lead products if production is to be done on products in a commercial operation.

11. Caribou Pepperettes

Materials and process.
The materials and processing were identical to the seal and beef fat pepperettes except that caribou and caribou fat were used.

Given the response of the seal and caribou together it was felt that a separate caribou product should be made to determine what just caribou alone would be like as compared to being mixed with seal. The product was very acceptable and had a very pleasant flavour.

As a result of this product it could be determined that the addition of caribou to the seal was not simply taking one very good tasting meat and mixing it with one less preferred and producing a product that was acceptable. There is actually a good flavour combination achieved when the caribou and seal are mixed together.

12. Seal Liversausage (with seal fat)
    and
13. Seal Liversausage (without seal fat)

These products were made the same way except that the first had the addition of seal fat, whereas the second was made without seal fat.

Materials: Seal Liver raw
Pork skin cooked
Hot water
Seal trim, lean, cooked, hot.
Pork fat cooked, hot
Seal fat, raw (only used in #12)

Processing:

Raw seal liver was cut in the silent cutter together with the nitrite cure and it produced a good bind.

The pork skin, pork fat, and seal trim were cooked for 25 min at 85*C and immediately put into cutter. Raw seal fat was added after at which time the hot water and spices were added. When the total mix was 32° to 35°C the mix was removed and put into moisture proof casings and the sausages cooked in a waterbath at 74°C to an internal temp of 70°C.

General observations:

The flavoring was acceptable and the taste of each product was different. The sausage with the seal fat used a calfsliverwurst spice, whereas the spice in the second was Home Style Liverwurst Seasoning.

The seal fat product - A characteristic of liver is that it tolerates oils and fats very well and it was felt that if the seal fat went in any product it might go well in the liverwurst. Initially the seal fat product was acceptable however having a definite fishy taste as it aged, it developed a stronger fishy taste. This may be counteracted by the addition of other spices but would take more work.

The structure of the seal fat sausage was poor and it did not hold together as a liverwurst should.

The second product without the seal fat started out tasting quite good and kept its flavour very well over storage and freezing and thawing.
The flavour was accepted by those that tasted it and was well received. The structure was perfectly acceptable and it could be considered a successful product.

The basic spice mix was very acceptable however it may take some fine tuning in some of the minor spices.

14. Fermented seal salami
15. Fermented seal pepperettes.(13mm & 16mm casings)

Materials: Seal meat
Pork fat
Spices
Culture

Processing:

The fermentation process:

A starter culture is added to the meat mix. This bacteria lowers the pH of the meat to the point that other bacteria do not grow in the product resulting in a product that does not need refrigeration. This is an very old method of processing meat.

A fermented product can be a uncooked product with specific flavours imparted particular to the starter culture used.

Fermentation was tried on the seal meat for two reasons.
1. To provide a non refrigerated product.
2. Acidification of the meat produced acceptable results.

Processing:

The salami and pepperettes were made in the same manner as regular salami and pepperettes except the culture was added for fermentation and the products were not cooked,

- The meats were ground and mixed with the spices and starter culture.
- The meat mix was stuffed into casings, small diameter casings for the pepperettes, larger size casings for the fermented salami.
- The product was then placed in a chamber at 80°F and 90% R.H. and left for 20 hours.
- The product was then removed and placed in a drying chamber at 55°F and 65% R.H.

General observations:

The pepperettes were ready for eating within a few days as they were smaller in diameter and dried at a more rapid rate. The salami would take from 60 to 90 days of drying before they will be ready for eating. This is a function of the diameter size of the product.

Additional work should be done with different cultures and spice mixes to determine the optimum results. The present results are acceptable and indicate that this type of product should definitely be considered by anyone processing seal meat.

16. Fresh seal and pork sausage

Materials: Seal meat
Pork fat
Custom spice mix

Processing:

The fat and meat were ground separately then added together with the spices and ground again.

The meat mix was then put into hand link sausage casings and frozen.

General observations:

The fresh seal sausage produced was an acceptable product, with a characteristic seal taste, with sufficient fat provided from the pork fat to provide a juicy feel. The product was cooked on a Bar-B-Que. Pieces were offered to approximately 100 people at a gathering. Out of those that tasted the product about 40% liked the product very much and were quite impressed; 30% liked the product and found it quite acceptable; 20% were glad they had tried the product but were not really impressed with the seal taste as it was new to them and felt that they would need to become accustomed to the taste; 10% found the product had a liver type taste.(Most of these people were “liver haters” and generally indicated that they did not like liver or anything that even remotely tasted of liver.)

It was interesting that everyone that was offered the sausage was told it was seal meat. Only two people mentioned their feelings regarding the killing of seals and Green Peace. It was also interesting that both of these people later tried the product and found it quite acceptable. Outside of these two people there was not any noticeable negative reaction to the fact that it was seal meat. This was surprising as a negative reaction was expected from quite a few of the people.

Fresh seal sausage is a product that will take some more work to come up with the ideal spice mixes and ratios of fat, meat and water. From the present work done it indicates that a fresh seal sausage would be an acceptable product. It is believed that the basic seal taste is more conducive to a Bar-B-Que type product rather than a breakfast type product, however this may be different for different taste preferences.

17. Seal meat and mushroom pies
18. Seal meat and seal kidney pies.
19. Seal and vegetable pies.

Materials: Seal meat
Onion
Kidney or Mushrooms or vegetables,
Butter
Bread flour
Stock
H.V.P.
Sherry
Spices

Processing:

The filling was prepared basically in a manner similar to a regular meat pie. The spice mixes and pre-preparation of the meat, however, were different to account for the specific differences inherent in seal meat.

The pie crust was a spiced pie crust which was different than a normal pie crust. The filling was placed in the pie shells, covered and frozen.

For presentation the pies are cooked in a regular or convection type oven.

General observations:

The meat pies were accepted by everyone that tried them. The meat and kidney pie had a definite kidney taste which was not as strong as a beef kidney taste, but still quite evident. Those that liked steak and kidney pie liked the kidney pies whereas those that did not like a kidney taste gave it low preference.

The meat and mushroom pie was the most generally accepted pie. The basic flavour was definitely seal yet without a strong evidence of the fish or liver taste.

This product would be a very good value added product and should also receive definite consideration as a commercial product.

20. Galantine

Material: Seal meat
Caribou
Onions
Bacon
Spices

Processing:

The seal meat was used in larger pieces whereas the caribou was finely ground to be the back up meat on the product.

The galantine was made in a regular manner with differences being in some of the spicing of the meat.

General observations:

The colour differentiation created by using the caribou and seal together were as expected and provided a good visual appearance. The flavour combination was acceptable and it is suggested that it be presented with a gelled cranberry sauce to give it a tartness.

21. Seal liver pate.

Materials: Seal Liver
Seal Meat
Onions
Bacon
Spices
Cognac

Processing:

The pate was made in the same manner as a goose liver pate would be processed. Some of the spicing used was varied to compliment the particular flavours of the seal liver.

The liver, onions and bacon was cooked in a oven, then the cooked result was ground. The spices and flavoring were added while the liver was still warm and before the product was ground. The product was put through successive grinds and mixing to produce the desired consistency.

It was the put in forms and frozen.

General observations:

The pate was very well received by all those that tasted the product as long as they were not “liver haters”.

It was rated by pate lovers as preferable to any other pate they had tasted. As a product it was exceedingly successful. It has a distinct flavour that is strong yet very pleasant. The product is relatively simple to make and sustains freezing and thawing well. It will definitely be a speciality item. To those who have tried the pate it would seem to be a product that would be acceptable to the gourmet palate. It has a rich and robust flavour leaving a pleasant after taste. It was compared to other pates purchased in local stores. The seal product was superior in quality and flavour.

The liver used in a pate superior in results to the liver being used in a liverwurst. It is recommended that when production is developed that the as much of the liver as possible go into a range of pate like products.

Althouugh the product has had limited exposure there has already been an offer to market the product across Canada and a restaurant that has inquired about having it on its menu. As a product it was more successful than hoped or expected.

22. Seal consume (from the bones)

Materials: Seal Bones
Water
Spices

Processing:

The consomme was made in similar fashion to regular consomme with some adjustments made to account for the particular characteristics of seal meat.

General observations:

Of all the products tried this was the most surprising. It was originally created as a result of a brain storming session. Uses for as many parts of he seal as possible was being discussed. The bones were boiled to determine what the results would be obtained. The first the results were far from being acceptable. The chef worked for hours and hours trying different procedures to account for the particular characteristics of seal.

The credit goes 100% to the genius of the chef for coming up with this product. The product received top rating from all those that tried the consomme. There were offers to present it to the top chefs of Canada. It has a very rare characteristic of leaving a “body taste” this is a taste that your feel in the chest and stomach.

At the beginning of the project it was hoped that at least one product would be developed that could only be made from seal. One that-was not a reproduction of a product made from beef or pork. From the feed back from the various persons that have tasted the consomme the product is only rivaled by top quality turtle soup.

The product is so acceptable that it should before being marketed have its own name. The team that has worked on this project are especially proud of this product as not only is it a very acceptable product but it was made from materials that would have been of little if any value or utility had it not been for this product.

In order to put this product into production it will take more formulation work etc. in order to take it from a stove top product to a commercial run. This has been discussed and is not viewed as a problem.

An added bonus is that the residual bones and meat left from the production may be an acceptable input to a dog food product. No work has been done on this area but is presented as a direction.

23. Seal meat Ravioli

Materials: Seal Meat, Spices, Egg, Pasta

Processing:

The meat mix was made dry and finely ground so that it would be usable in the ravoli equipment. The meat mix used in the ravoli equipment as a filler for the ravoli.

General observations:

The ravoli product was developed for a variety of reasons.
1. A product was wanted that appealed to children.
2. A product was wanted that could be a general product that could be related to by everyone and a pasta type dish is that type of product.
3. A product was wanted that offered some white colour to compliment the blackness of the meat.

After the Ravoli was made it was tested on children the written response to the ravoli is included after this page it is not very technical but it is felt that their feelings in their own words and style is the most effective manner of expressing their feelings. The children had never had seal meat before and knew that they were eating seal meat.

Ravoli and that type of product are high value added products. A small amount of meat goes a very long way when making Ravoli. The colour differences that exist between the white of the Ravoli and the darkness of the meat is quite interesting in this product.

The taste of the product is acceptable although some work might be done on the fine tuning of the spice mixes used in the meat. The meat was a little dry as there was not any fat in the meat just lean. This may want to be changed a little for some markets. The tomato sauce spicing could be adjusted little to account for the taste differences of the seal.

In general the product is acceptable and provided the results that were wanted. It met the criteria set forward at the beginning for the kind of product that was desired. As with any new product it requires additional adjustments to account for market taste etc. It is the type of product, however, that is easy to adjust.

The making of this product for this contract had additional motives. Seal Ravoli and other pasta type products could be the basis of a separate processing facility that could service the Northern community. There is not any reason that additional pasta type products could not be made such as caribou, musk-ox, hare or just beef or pork based products. Fresh and frozen pasta is a product that has achieved success in the food market. The making of pasta is a relatively easy process and can be quite lucrative as a small business. It is a process that uses eggs in its manufacture. It is understood that in the N.W.T. there is now the availability of Northern produced eggs.

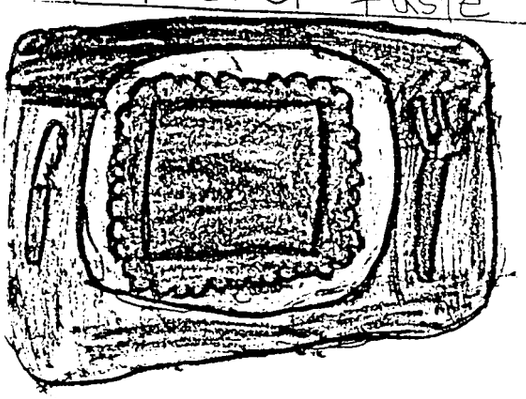
Kim. Dewison.

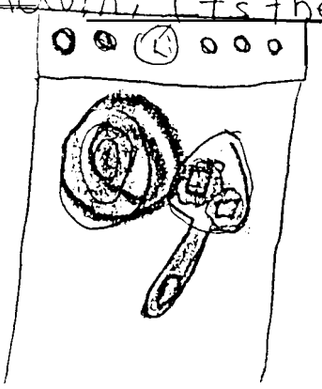
Ravioli

I like the Ravioli. It was nice. I like the seal meat. It was dark seal meat. It taste funny when i frist taste it. The Ravili taste better then Chesbowaredee.

I like the sape of the Ravioli. It is a funny sape, I like the sauce. too. But most of all i like the seal meat.

I Never taste better Ravili, It's the best





24. Deodorized seal oil

Materials: Seal blubber

The process and results and observations of this product are covered quite extensively in the 'Characteristics of Seal Fat.'

Within the constraints of this contract the oil was investigate to the point of knowing that the oil has the potential to be made into a high value product. The research and development that will be required was way beyond the scope of this project. In order to make the oil an acceptable product it will entail a separate contract with some different and some additional members of the research and development team. It is strongly recommended that more work be done on this oil.

25. Pepperoni

Materials: Seal Meat
Pork Fat
Spices.

Processing:

The processing procedure was the same as the other procedure for making pepperoni except that seal fat was not used.

General observations:

The product was tried on a commercial pizza. The results were interesting and acceptable. The original goal of this product was to produce a product that could be used on a pizza, such that an Arctic or Tundra Pizza could be offered in the North. The goal of obtaining a product identical to pepperoni was not achieved, however a product that is quite interesting and acceptable on a pizza was. The product was a mixed success.

As a result of this work and other work on other products it is recommended that a processed meat product be made that could be used on pizza but one that took advantage of the particular flavours inherent in seal. The direction of trying to reproduce pepperoni completely is not felt to be as desirable as it was at the beginning of the project.

Some of the basic spices used in pepperoni could be used but the addition of more or less or changes in some of the spices seems to be the best direction. This is based upon the reception of the products. Products that were reproductions or others were judged as better or worse than the original product. New products that were judged on their own merit were much better received.

26, Seal & Caribou cooked pepperettes

This product was as reproduction of the caribou pepperettes and the seal pepperettes and using pork fat.

General observations:

This is what could be called a second generation product. It was made based upon the results of a previous product. The combination of seal and caribou is definitely a nice mix. It is a flavour mix that is quite acceptable and the flavours compliment each other very well.

The addition of pork fat produces a juiciness not achieved by caribou fat. Recommendations would be to retain at least some of the pork fat and add some caribou fat to the mix. Some additional spice work is needed as the new flavours created by mixing seal and caribou demand some adaptations from a normal pepperette mix.

From a production point this product is very easy to make and will take a small facility could make them. This is a product that would be almost be conducive to a cottage type industry. It is felt that a producer would develop a end mix that would be acceptable to the particular market they serviced.

Many of the other aspects of cooked pepperettes have already been covered in a previous description.

27. Cured and dried seal Jerky.

Materials: Seal Meat
Dry Cure

Processing:

The seal meat was cut in strips and rolled in a dry cure. The product was left with the cure for 48 hours. It was then produced into jerky in the smoke house.

General observations:

The jerky was very well received. The salt and spice levels could be varied a bit but that will be a function of the market. The product is very easy to make. The meat from between the ribs is very acceptable and preferable in a jerky to a smoked rib. The labour for removal is higher but it is felt that it is worth the additional production cost.

This product can be stored at room temperature is a known type product in the North.

It was found that the jerky when sliced very thin was a very pleasant addition to a salad in the same manner as one would use bacon bits. This may have application in the hotel and restaurant trade.

28. Smoked seal loin (cured)

Materials: Seal Loin, Brine cure

Processing:

Two products were made, one that was pumped and one that wasn't. Neither of them were tumbled as was tried in a previous product. After being cured they were netted and smoked.

General observations:

This product was second generation product. The product quality of a untumbled product was superior to the one that was tumbled. The spice mix was adjusted as a result of the observations made from the first product. Some new spices were added and many removed. The most significant being the sugar.

The taste of the product was very good. It was a product designed and made in its own right and not as a copy of a standard product. The spice mix was designed based upon the characteristics of seal and not upon a standard ham mix. It was interesting that once products made have evolved into their own products using the seal taste as a directive they were accepted as their own products and not judged as being better or worse than standard products.

It was imperative to progress to this point in the progressive generation approach and it is felt that the process was taken far enough with some of the products to indicate that it is a definite direction to follow with many other products.

The basic spice mix would be used again however certain flavours would be enhanced a little. It is a product that does not compare to anything else on the market. An interesting flavour aspect occurred in this product. The background fish and liver taste that characterized many of the products is not really evident in this product. The basic flavour that comes through is the meaty and pleasant flavour of seal.

This product was judged a success and very worthy of additional work.

29. Smoked seal loin (uncured)

Raw seal meat uncured was smoked along with other products. It was made so that a base line would be known of what the meat was like smoked without processing, spices etc. It can be best described as a working product that was made in order to learn some of the basic characteristics of seal.

As a production product it might be acceptable to a very few people that are very hungry. Those that tasted it very rarely finished chewing what they had tried. As a product it was essential to make so as to develop a better feel for the meat. It might be made again for the same reasons with seal meat from Phase IV being heavier seals. It is recommended that the product not be considered as a commercial product as it would be a waste of good meat.

30. A variety of other products

Other products were tried that were designed for the hotel a restaurant trade. For buffet type presentations such as sausage rolls, Seal sausage wrapped in caribou strips, meat balls etc.

The scope of this area is open and the products were made to determine the structure and taste limitations of seal in an hors d’oeuvre presentation.

As a general comment seal meat is an acceptable hors d’oeuvre and a variety of products could be made using complimentary spices and flavours.

Summary

The original mandate of Phase III was to develop a feel for seal meat as to its potential in valued added meat processing. In addition it was desired to use as much of the seal as possible. The original proposal was to make approximately 10 different products.

A good feel for the seal meat has been achieved as to its potential use in products and what its inherent advantages and limitations are for meat processing.

The literature search although interesting was essential but did not solve any problems. There was not the kind of work published that would be published on other meats. Much work on meat analysis was done by those looking at the seal being eaten by Polar Bears or as fur farm food. The results included bones and sometimes total organ meat etc. The work was well done but not applicable to work on meat processing for human food production. The literature was most informative from the fact that little if any good information existed that was applicable to the setting up of a processing plant for Ringed Seal.

The seal carcass itself was completely used. The liver & heart were used in the Liversausage. The bones were used to make a consomme and the meat was used for a wide variety of products using different muscles for different types of products. The goal of 10 different products was more than achieved with over 30 products tried.

Seal meat can be made into products that are quite unacceptable, acceptable or top quality products. The procedure of formulation and processing is more important than it would be with other meats. This is because of the various back flavours in seal of fish, liver and blood that spicing and procedure are essential.

It was also found that flavoring products as one would flavour beef or pork products generally did not produce top class results. The second and third generation products were generally much more acceptable than the original ones. As a meat it is very interesting and challenging to work with, because of some of the subtile differences that are very important.

From the beginning of the project the approach was taken that this would be the ground work for the eventual setting up of production facilities to process seal meat in the N.W.T. With this in mind it was important to work on products that would service the various markets that are addressed by a production facility. The retail trade is only a part of a meat processors business. The Hotel, Restaurant and Institutional (H.R.I) trade is a very significant sector. The meat pies would be geared for that trade as well as the pate and consomme.

Seal meat accepts the flavour of smoke quite well and it compliments its flavours in conjunction with certain spices. Some types of spice mixes used on pork and beef productsdonotseemto Complement- sealmeataswellas others. In general sweet products did not come out as well as non sweet products. The process of fermentation of seal meat produces very favorable results and further work should be done in that area.

Conclusions:

1. Seal meat definitely has potential as a processed meat.
2. It has some basically very acceptable flavours if they are complemented by spices and procedure.
3. It cannot be treated as if it were pork, beef or fish. It is its own meat with its own characteristics. To treat it like a standard meat is to lower its potential as a top class product.
4. There are products that can only be made with seal. This is very good as the exclusivity of a flavour is one of the fundamentals of a gourmet or speciality type product.
5. Seal goes very well with caribou in mixes. They compliment each other and more work should be done in this area.
6. The seal meat resource could be a significant resource. The potential return form processed meat could be much more than that from the skin.

Recommendations:

1. In Phase IV a smaller range of products should be chosen from the wide variety made and work done only on them.
2. Given the success of seal and caribou it would be beneficial to try seal with other Northern meats such as fish.
3. The possibility of setting up a processing plant should be considered as the limited amount of work done so date indicates that it that it should do quite well.
4. Costing regarding labour, materials etc. should be done on some of the key products so that the economics of a production plant can be determined.
5. Investigation into the potential of using by products as an ingredient in a formulated dog food should be investigated.
6. The possibility of export of products should be investigate.
7. The processing etc. should be done in the North so that maximum economic return is derived for the areas from which the resource is harvested.
8. An economic evaluation of what the potential economic return could be by processing the seal meat should be done. This should be done only after Phase IV. The planning for it however should start very soon. It would be beneficial to know if an economic evaluation will be done so that Phase IV results could be geared to that evaluation.
9. Continue with the present directive of utilization of the seal meat resource. All indications from the evaluation to date are that it is a meat with a good potential. Some of the products are first class and could be considered gourmet quality.

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Research and Development

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4. Effect of sex, age and carcass cut on composition of harp seal (Phoca groenlandica) meat.
5. Chemical composition of meat and sensory quality of canned meat and frozen meat from harp seal (Phoca groenlandica) in molting and pre-molting condition.
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