# NEW PRODUCT DEVELOPMENT OF SCALLOPS AND MUSSELS:

# FINAL REPORT

BY

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## 1. TERMS OF REFERENCE OF THE PRESENT INVESTIGATION.

When the application for the present project was developed (towards the end of 1984) it reflected the perceived needs of two segments of the Victorian fishing industry at that time, namely:

(i) The iminent realisation of crops of cultivated mussels from several of the leases set up in Port Phillip Bay and the competition which this product faced both from imported cultivated mussels, and from locally-produced, dredged mussels.

(ii) The consideration that the Victorian scallop industry might be required to operate under radically reduced volumes of production.

The application, then, sought to carry out Research and Development in two areas, that R&D effort to concentrate on the development of a range of mussel-based and scallop-based products. The former would, in its simplest form, set out to find market niches for cultivated mussels; the latter would attempt to maximise the reduced landings of scallops by promoting the value-added concept.

In addition, it was suggested that, should landings of Pecten alba be significantly reduced, then the smaller, doughboy scallop, Mimachlamys asperrimus might become a substitute for scallop fishermen. Some R&D effort was therefore targeted for this species.

## 2. REALISATION OF THE TERMS OF REFERENCE.

As regards the R&D effort for mussel-based products the terms of reference were able to be closely adhered to; for scallops, however, there were severe problems within the catching sector which made adherence to the original terms of reference impossible:

(i) The collapse of the scallop fishery at Lakes' Entrance during 1985, coupled with the closing of the Port Phillip Bay fishery for long periods during the past fifteen months has meant that scallops have become both rare and extremely expensive in Victoria.
Early costings for scallop-based products were based on the (then) price of around $10/kg on a "dry" basis. By early 1987 this price had almost doubled on a wholesale basis and, in retail stores such as Myer of Melbourne the March price is $32.50/kg (there is no indication whether this product is "wet" or "dry").
Pecten alba, then, during the tenure of this investigation, became far too expensive to use as a raw material for value-added products which could compete with imported products.

(ii) Procuring the doughboy scallop became almost impossible since scallop fishermen were loth to go to sea under difficult economic circumstances. It was possible to obtain only token quantities of doughboy scallops with the co-operation of the Tasmanian Fisheries Development Authority (as it then was).

## 3. CONDUCT OF THE PRESENT INVESTIGATION.

The investigation proceeded through several phases:

Phase 1: Market evaluation. The impact of imported mussel, and scallop-based products was monitored.

Phase 2: Product development programme. A range of scallop and mussel products was developed.

Phase 3: Consumer evaluation. A series of consumer evaluations was carried out.

Phase 4: Market evaluation. The retail and food service trades received the product range for evaluation.

Phase 5: Industry Day. An industry day was held to attempt to effect processing "marriages" between producers, processors, packaging companies etc.

Phase 6: R&D work with industry. Several specific projects were carried out with local processors.

Phase 7: Facilitating commercial production of products. At least three scallop and mussel products progressed from development to commercial reality.

Detail of each work phase will be provided in this report. However, a summary insight can be gained by perusing the paper produced by Catharine Prattley and John Sumner for participants at the Industry Day held March 18, 1986. This paper "Import Competition, and Opportunities with Local Raw Materials" contains a summary of much of the R&D work carried out.

# IMPORT COMPETITION, AND OPPORTUNITIES WITH LOCAL RAW MATERIALS.

by

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Traditionally, in common with other agriculture-based industries, the Australian Fishing Industry has been production, rather than consumer, oriented. In recent times, however, diminishing markets for meat, fruit and vegetables have served as catalysts for change in these industries, changes embracing the conversion of primary produce into value-added, further processed forms. Value-adding, as well as providing employment opportunities, is a source of added revenue for the processor, and fills the increasing consumer wants of greater variety and convenience.

The Australian Fishing Industry, by contrast, has barely embraced the concept of further-processing, particularly for domestic consumption. For example, while Australia has the expertise to export virtually its entire crop of abalone in canned form , an industry worth A$20+m, we also import, for domestic consumption more than A$ 50 m of canned fish. Processors will talk of lack of resource while fishermen will wax lyrical on the thousands of tonnes of pilchards in Port Phillip Bay which they would catch if only someone would buy at a stable price.

That a market for processed fish products exists in Australia is chillingly obvious; Australian Bureau of Statistics data for 1984-85 highlight the A$70m of "Prepared and Processed Fish" imported into this country, from caviar to fish balls to canned salmon. Another ABS category lists imported molluscs at almost A$7m.

It was against this background that the Food Technology Unit, RMIT sought Federal funding via the Fishing Industry Research Trust Account (FIRTA) to undertake research and development (R&D) into two Victorian products, scallops and mussels. Paradoxically, the scallop processors of Victoria have their own quaint way of value-adding, by simply soaking scallops so that the sell-weight is grossly inflated. As consumers know, the cook-weight is rapidly reduced as the scallops drop their added water during cooking. It is possible that soaking of scallops, except for sousing (pickling) will fall foul of Weights and Measures and we may, once more, be able to buy a succulent "dry" scallop.

A work programme since July, 1985 has been carried out along the following lines:

(i) An assessment of the current market for scallops and mussels in Victoria, both domestically-produced, and imported.

(ii) The development of a range of products likely to be utilised by the local Food Service Industry.

(iii) The "targeting" of imports most vulnerable to replacement by local processing.

(iv) The monitoring of quality of locally-produced and of imported products by consumer "shoot-outs".

The underlying long-term strategy was that more local produce could be processed in Victoria, and that mussel farmers could be able to utilise the proven proclivity of the Bay to enhance and develop their leases.

The current market for mussels (Table 1) has proved difficult to accurately assess, specifically because of the range of processed mussel products imported.

Table 1. The Victorian market for mussels.

| Format | Quantity (tonnes) |
|---|---|
| Dredged mussels | 900 |
| Cultured mussels | 250 |
| Tasmanian mussels | 15 |
| Imported processed mussels | 400* |

Thus, in the 1985 harvest of cultured mussels from the Bay, some 250t were marketed. The Bay also yielded some 900t of dredged mussels.

Data for imported mussels are scarce and the quantity of 400t has been converted from a weight of imported mussel meat of around 80t ( scale-up of 5:1 whole mussels:meat has been used). The range of imported products involves at least 27 product lines priced from $0.70 (Korean canned mussels) to $3.5(Canned mussels in the shell, from Holland).

In Table 2 an attempt has been made to evaluate the value of processed mussel imports.

Table 2. Imports of processed mussels into Victoria.

| Format | quantity (t) | total value ($) |
|---|---|---|
| Chilled meat (NZ) | 32 | 320,000 |
| Frozen meat (NZ) | 8 | 80,000 |
| Chilled halfshell (NZ) | 4 | 28,000 |
| Frozen halfshell (NZ) | 1 | 7,000 |
| Whole chilled (NZ) | 4 | 12,000 |
| Whole frozen (NZ) | 1 | 3,000 |
| Smoked canned (JW brand) | 24 | 250,000 |
| Smoked canned (Seakist) | 20 | 150,000 |
| Smoked canned (Admiral) | 0.4 | 4,000 |
| Soused | 2 | 11,000 |
| Bottled (Denmark) | 10 | 60,000 |
| | | $920,000 |

It must be emphasised that the data in Table 2 are probably gross underestimations of the range and scale of importation. The data were gained by telephone enquiries from importers several of whom were, understandably, loth to part with information regarding their livelihood.

Of obvious importance, however, is the impact made by NZ mussel meat in a variety of forms. Barely 10 years old, the NZ mussel industry based mainly in the Marlborough Sounds of the the South Island has grown to an export size of 1910 t ( A$ 10.5 ) by the end of 1984 with exports to Australia of 348t (A$1.4m).

In the early stages of the current R&D work a common statement was that "NZ mussels are better quality than Victorian" (a statement applied equally to both dredged and cultured mussels). Clearly, if this statement had any factual basis, then the local industry would be at a devastating disadvantage. A series of taste panels were therefore set-up in which 50 consumers were invited to lunches in which mussels were the menu. Panelists sat down to three lunches in the RMIT bistro, each lunch comprising two plates of basically the same meal, except one plate had NZ mussels and the other local mussels, For each meal both NZ greenlips and local blue mussels were "disguised" so that no visual identification were possible. Thus, mussel marinara, battered mussels and mussel vol au vent were on the menu and consumers were asked to state a preference.

In all cases (Table 3) consumers expressed a solid preference for local mussels. Positive attributes for local mussels were "delicate flavour", "tender texture". NZ mussels, by difference, were assessed as "tougher, more rubbery" than local. It should be emphasised that, to be absolutely fair to the NZ greenlip chilled local meat was aged in the refrigerator so that it was the same age as the import. Naturally, local mussels have a great freshness advantage over the imported competitor.

Table 3. Consumer preferences for local and NZ mussels.

| Mussel dish | % preference | |
|---|---|---|
| | Victorian | NZ |
| Battered, deepfried | 59 | 41 |
| Mussel marinara | 67 | 33 |
| Vol au vent in white sauce | 74 | 26 |

In another taste panel"shoot out" canned smoked mussels from Korea (Admiral brand marketed by Riviana Australia Pty Ltd) were compared with samples processed locally. Of 37 consumers 24 (65%) were able to correctly pick a difference, but preferences were equally divided between import and local product.

Thus, product "shoot-outs" unambiguously monitor consumer preferences and negate industry comment about imports having "higher quality" than local material. In reality, such comments often reflect quality to the importer, which invariably means factors such as consistency, continuity of supply and a stable (not necessarily cheap) price.

The results of the present work provide great encouragement for local mussel growers - they have a product considered superior by consumers.

Targeting of imports vulnerable to local competition revealed two categories of imports:

Category 1: Standard wholesale and retail lines produced for the bottom end (low price/high volume) market e.g. John West smoked mussels, Admiral smoked mussels, Seakist smoked mussels, Frionor seafood kebabs and crumbed frozen scallops.

Category 2: Up-market gourmet products which are highly (if not over-) priced, and are distributed typically through specialty outlets. These products are aimed at the more discerning consumer with a greater disposable income e.g. mussel hors d'ouveres, mussel salade a la catalane (Marina Danish Seafood Co. Denmark).

A total of 5 scallop imports and 27 mussel imports comprise the above categories; can any be targeted for replacement?
A series of cost analyses involving raw material and ingredient costs, processing costs, manufacturing and retail margin costs has been carried out. It is improbable, given present import prices, that the local industry could compete with Category 1 imports. For example, local mussels would retail at approximately $1.67/100g can compared with Korean mussels (Admiral brand) retailing at $0.67. The Korean import has radically lower processing costs, and, even if local mussels were supplied gratis it is unlikely that the empty can could reach the supermarket shelves at much cheaper than $0.67!

For Category 2 products, however, the outlook is much brighter. For example, a scallop pate manufactured locally could retail at $1.50/100g compared with the NZ Lochland brand which retails at $3.65/100g.

An alternative to the "me-too" marketing approach is that of "gap analysis". This involves scanning the market for areas which are not presently serviced and targeting product development accordingly. In Australia, in general, and Victoria in particular, there is a continuing trend towards meals consumed away from home. As a result the Food Service Industry (Mr. Keating notwithstanding!) is an expanding one, and should be viewed as a large and lucrative market for pre-prepared/processed seafoods.

During 1985 the Food Technology Unit, RMIT developed a range of mussel and scallop products targeted at the Food Service sector:

Mussel marinara
Mussel chowder
Mussel salade - marinade
Mussel mornay
Mussels in garlic butter
Mussel pate
Mussels smoked
Mussels soused (pickled)

Scallop bisque
Scallop pate
Scallops battered and breaded
Scallops pickled
Scallop and mussel kebabs

A "test-kit" in which the full range of products packaged for Food Service use was distributed to more than 20 operations, from restaurants serving the middle and upper-middle market segment, to large-scale caterers e.g. Dennis Catering.

Based on their responses a nucleus of products was selected for further development. These products, in a range of packaging formats, will be presented for your evaluation today. Preliminary costings indicate that all products could provide suitable margins both for processors and Food Service proprietors.

It must be emphasised, however, that costs of locally-produced mussel meat are high; chilled mussel meat from NZ can be purchased for A$5.0/kg compared with prices for local product of close to A$10.0/kg. So far, the local industry has serviced the restaurant trade, and the price has been a reflection of what that trade can afford. In order to compete with imports the local culture industry will be required:

(i) To radically increase the volume of production.

(ii) To rationalise the pricing structure of mussels so that a component of the harvest is sold at a "processing price", such a price differential is commonplace in other farming industries e.g. liquid milk.

In summary, the local market for mussels is considerable, as is the interstate market. At present, both markets have a sizeable import component. The keys to development of the local mussel culture industry are:

(i) The replacement of imports with locally-processed products.

(ii) The use of product development to broach the retail and food service trades.

The present R&D programme is about 50% completed, and we plan to devote more effort to scallop products and to packaging formats. It may be that further work will be required for assessing the potential for freezing and storing mussel meat to supply out-of-season needs. Based on your responses today we shall evaluate our R&D programme for the last 9 months of the project.

PHASE 1. Market evaluation.

Some five scallop-based products were located which were produced outside Victoria, ranging from battered products from West Australia, to canned pate from New Zealand.

In terms of volume the battered product, Finessa brand, from Perth was the largest import, at 56t/y (Plate 1).

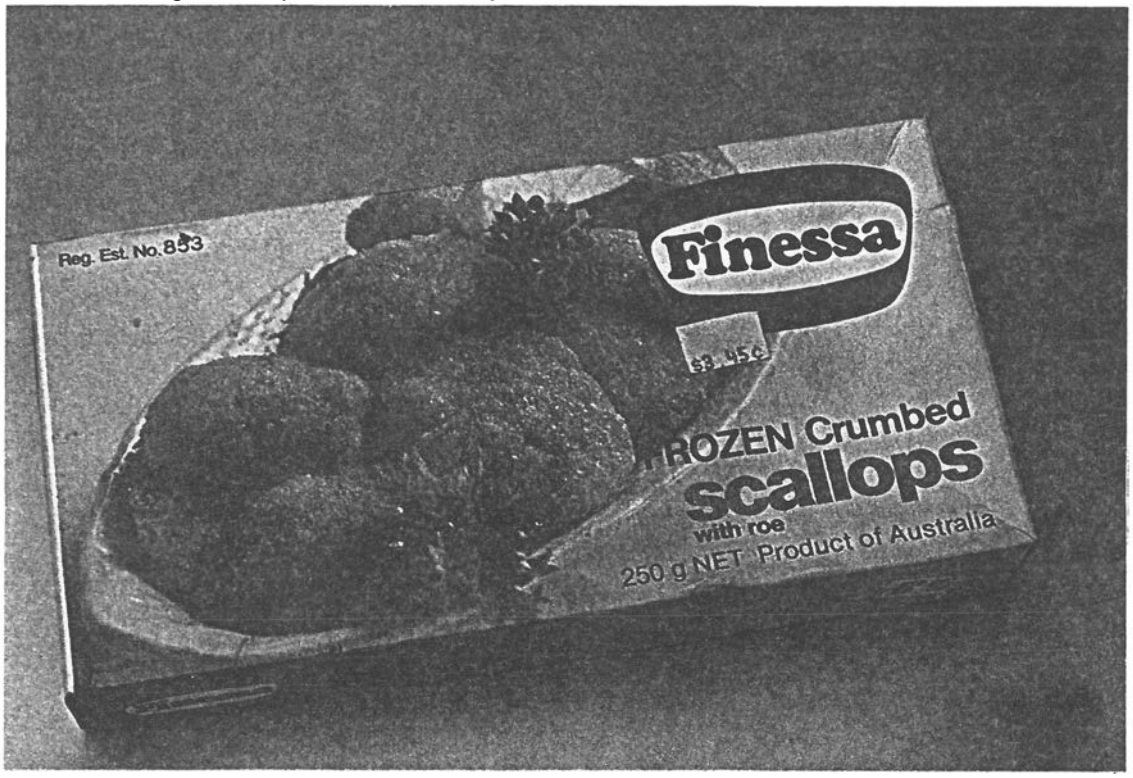



Plate 1. Finessa brand crumbed scallops.

An assessment of the likelihood of successfully competing against imported products (see Appendix 1 for details of cost structures) indicated that local products might be competitive only against imported pate from New Zealand.

Radical price rises for scallops, however, have ensured that scallop processing in Victoria cannot now compete against imported products.

Some 23 mussel and mussel-based products were located in supermarket surveys carried out in Melbourne.

Enquiries from importers revealed that more than 106t were imported in various forms, around 50% as mussels or mussel meat from New Zealand and the remainder as mainly smoked mussels in cans or packs.

Some major forms of imported mussels are illustrated in Plates 2- 7.

An analysis of cost structures of imported mussels and mussel meat from New Zealand indicated that the local product was considerably more expensive and that Victorian importers would continue to favour the New Zealand product, both for price and for continuity of supply.

A full analysis is presented in Appendix 2.

As well, competition for the large smoked mussel market indicated that locally-cultivated mussels were far too expensive as a raw material for this product.

It was concluded that the local mussel industry might achieve penetration of the processed, value-added market only by concentrating on "up-market" products which would be utilised within the food service sector.

Thus, a series of mussel-based products suitable for the restaurant and the bulk-catering trade, was mooted.

Plate 2. Imported mussel meat from New Zealand.

Plate 3. Frozen, half-shell mussels from New Zealand.

Plate 4. Frozen green-lippied mussels from New Zealand.

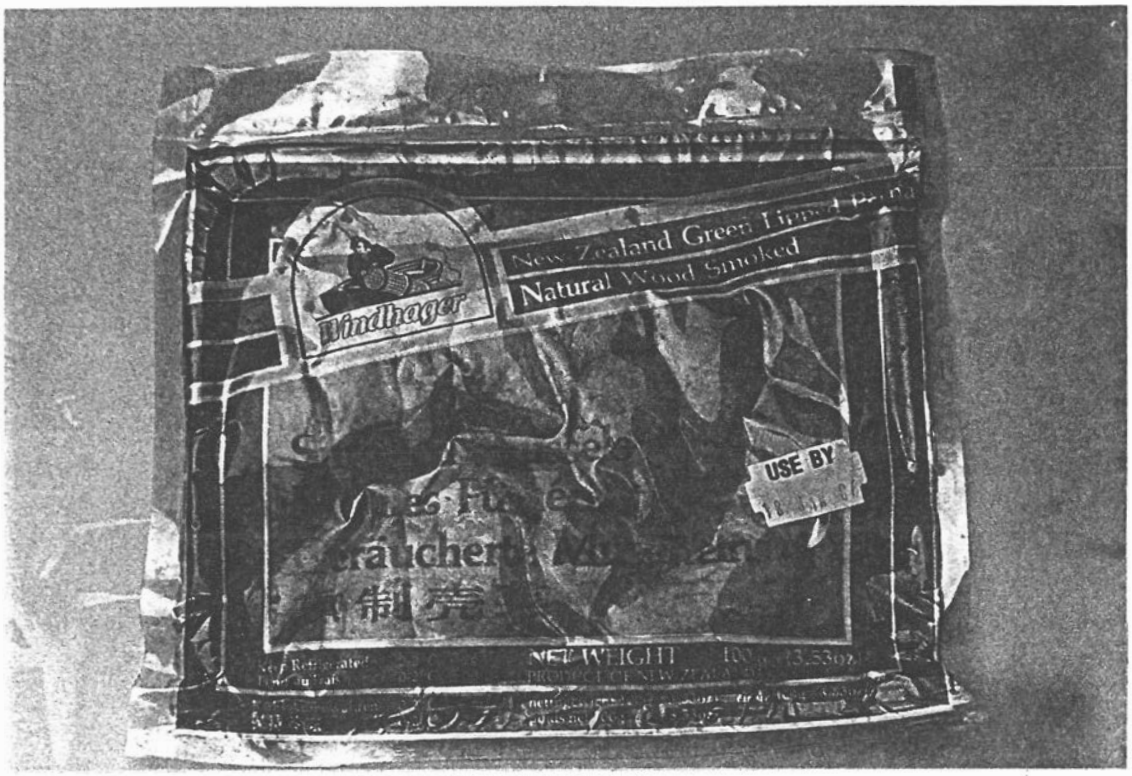



Plate 5. Smoked green-lipped mussels from New Zealand


Plate 6. Mussel imports from Spain and Scandinavia.

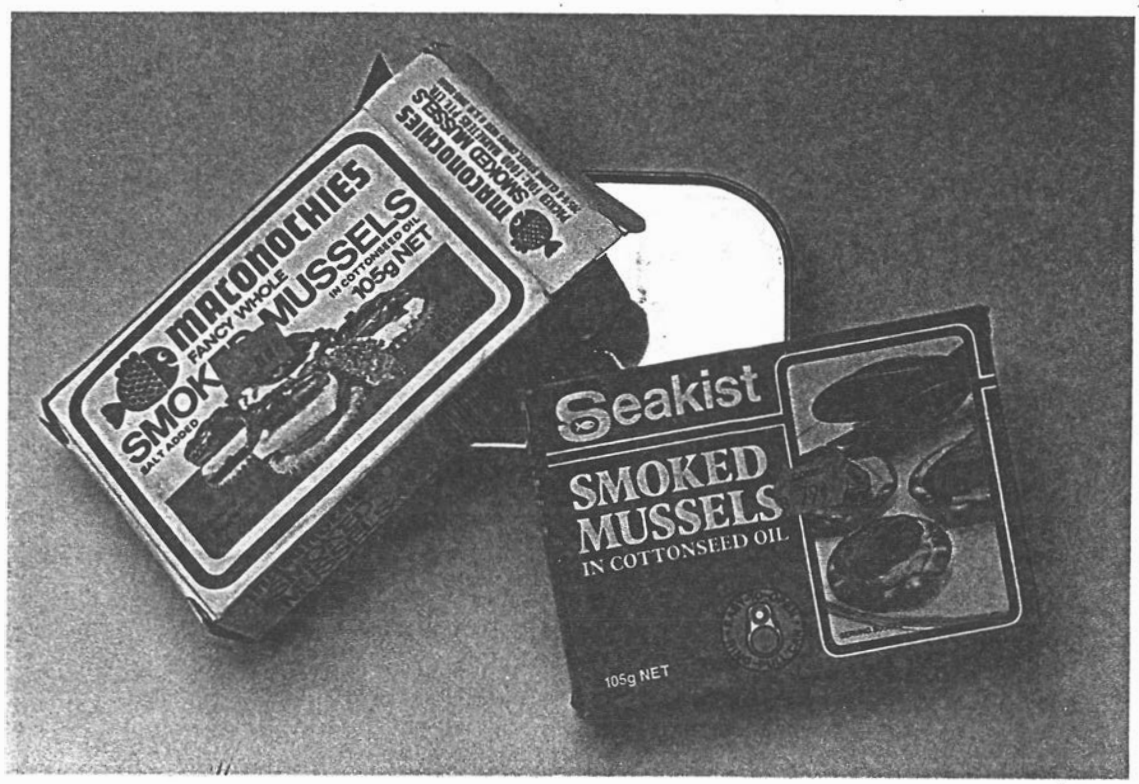



PLate 7. Imported smoked mussels.

## PHASE 2. New Product Development.

### (i) Scallops.

Some seven scallop-based products were developed:

* Scallop pate
* Crumbed scallops
* Battered scallops
* Scallop bisque
* Scallop fritters
* Scallop mornay

Formulations and costings are presented for all except scallop fritters.

One product, pickled scallops achieved commercial reality through Chatara Pty Ltd, packed in trays with a clear top web. Unfortunately, this company ceased trading during 1986 as an effect of the downturn in availability of scallops.

PICKLED SCALLOPS

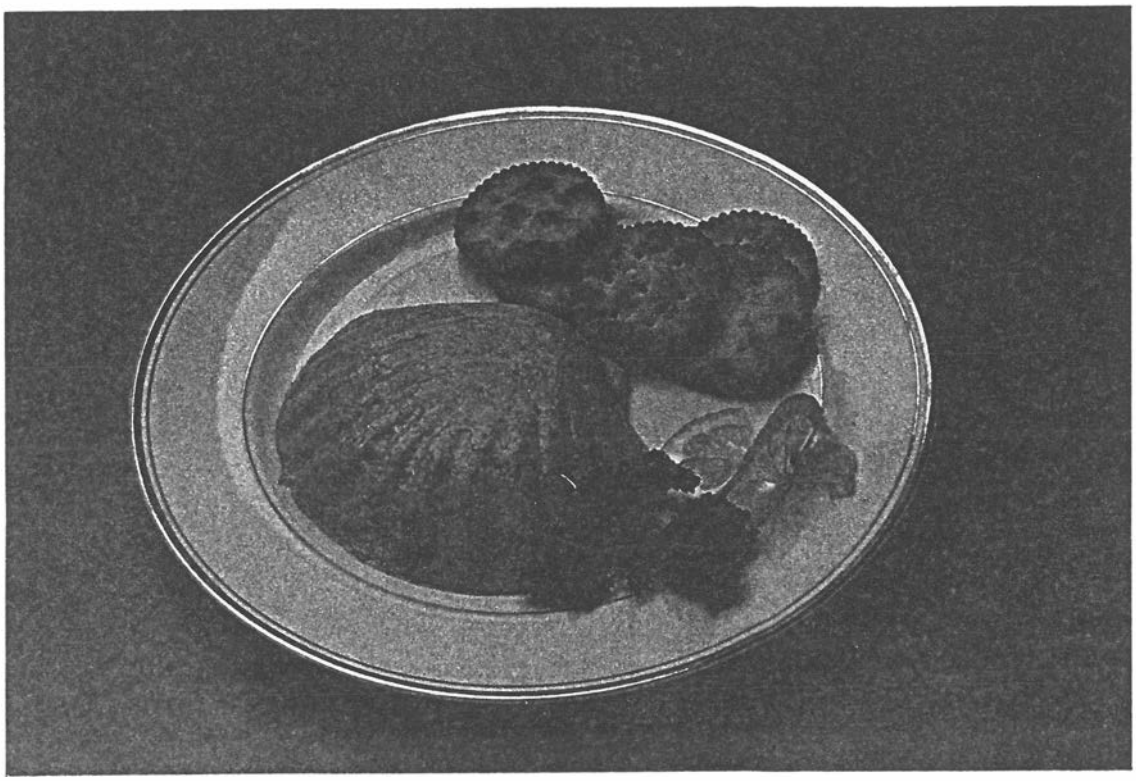
(a) Formulation:

| Ingredient | % by weight |
|---|---|
| Scallops | 40 |
| Vinegar | 30 |
| Water | 29 |
| Acetic acid | 0.5 |
| Pimento | 0.2 |
| Salt | 0.1 |
| Garlic - minced | 0.1 |
| Garlic - powdered | 0.1 |
| | 100% |

(b) Costing:- Retail product, 230g glass jar.

| | |
|---|---|
| Raw materials - scallops | $0.82 |
| - pickling vinegar | $0.09 |
| Packaging materials | $0.15 |
| | $1.06 |
| Processing costs | $0.45 |
| EX FACTORY COST | $1.51 |
| Manufacturer's selling price | $1.96 |
| RETAIL PRICE | $2.80/230g |

# Scallop pate.



(a) Formulation:

| Ingredient | % by weight |
|---|---|
| Scallops | 40 |
| Smoked cod | 30 |
| Fat | 9 |
| Skim milk powder | 6 |
| Egg yolk | 6 |
| Starch | 5 |
| Vinegar | 3 |
| Emulsifier | 0.4 |
| Salt | 0.3 |
| Pepper | 0.2 |
| Garlic powder | 0.08 |
| Oyster powder | 0.03 |
| | 100% |

(b) Costing: Retail product, 200g can.

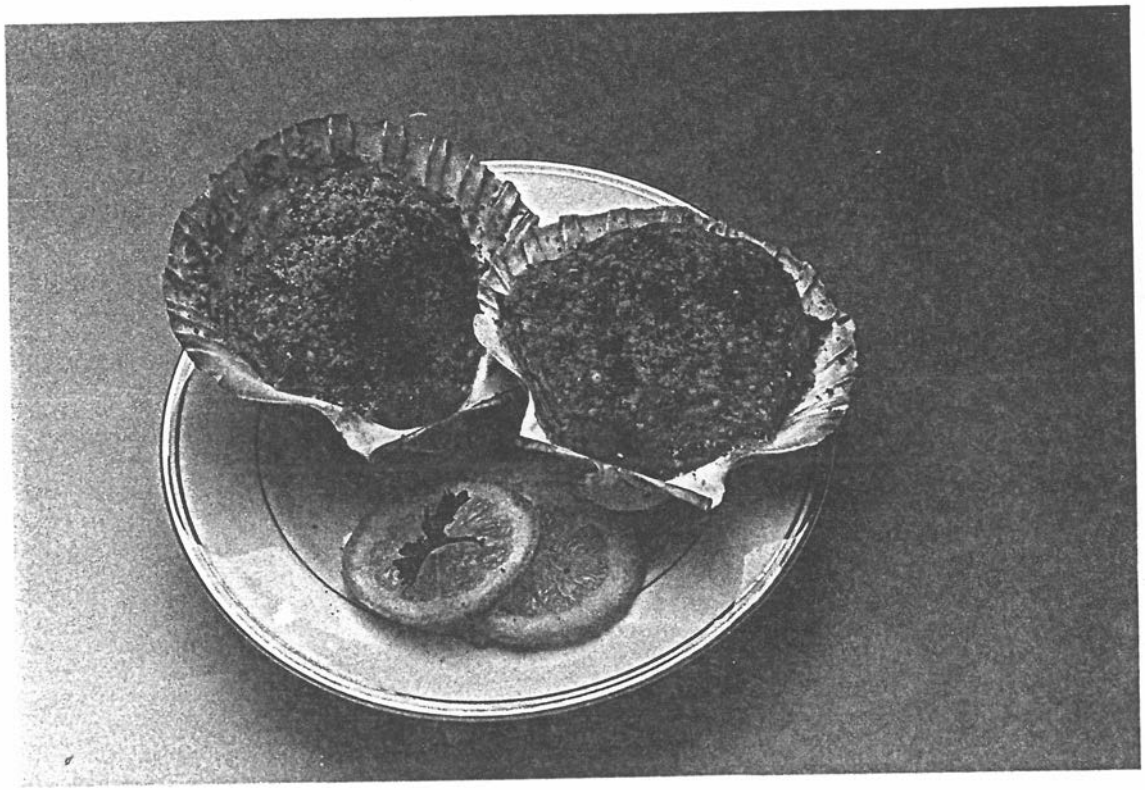
| | | |
|---|---|---|
| Raw materials | - scallops | $0.72 |
| | - other ingredients | $0.32 |
| Packaging materials | | $0.10 |
| | | $1.14 |
| Processing costs | | $0.48 |
| EX FACTORY COST | | $1.62 |
| Manufacturer's selling price | | $2.10 |
| RETAIL PRICE | | $3.00/200g |

(c) Competition:

Scallop pate (Lochland brand)
Processed by Donaghys' Industries Ltd.,Dunedin, New Zealand.

$2.19/60g can or $3.65/100g.

# Scallop mornay.



(a) Formulation:

| Ingredient | % by weight |
|---|---|
| Water | 64.10 |
| Butter | 11 |
| Cheese powder | 9 |
| Plain flour | 8 |
| Skim milk powder | 6 |
| White pepper | 0.20 |
| Parsley flakes | 0.15 |
| Sweet paprika | 0.15 |
| Minced garlic | 1.20 |
| Salt | 0.12 |
| Hot paprika | 0.08 |
| | 100% |

(b) Costing: Catering pack, 1 dozen shells.

| | | |
|---|---|---|
| Raw materials | - scallop meat | $3.78 |
| | - sauce | $0.52 |
| Packaging materials | | $0.15 |
| | | $4.45 |
| Processing costs | | $1.90 |
| EX FACTORY COST | | $6.35 |
| Manufacturer's selling price | | $8.25/dozen |

(c) Competition:

Scallop mornay marketed by Select Seafoods, Melbourne retails at $3.95 per unit.

# Scallop Bisque

## (a) Formulation

| Ingredients | % by weight |
|---|---|
| Scallops | 25 |
| Mushrooms | 7 |
| Butter | 5.3 |
| Dry mustard | 0.2 |
| Salt | 0.2 |
| Pepper | 0.1 |
| Flour | 2.2 |
| Milk | 60 |
| | 100% |

## (b) Costing Catering pack 2kg

| | | |
|---|---|---|
| Raw Materials | - scallops | $4.25 |
| | others | 2.79 |
| | | $7.04 |
| Packaging | | 0.5 |
| Processing costs | | 3.23 |
| EX FACTORY COST | | $10.77 |
| Manufacturer's margin | | $ 3.23 |
| Retail Price | | $14.00/2 kg |

## Crumbed scallops

(a) Formulation:

| Ingredients | % by weight |
|---|---|
| Scallops | 70 |
| Powdered batter mix | 10 |
| Water | 10 |
| Breadcrumbs | 10 |
| | 100% |

(b) Costing: Catering pack, 2Kg.

| | | |
|---|---|---|
| Raw materials | - scallops | $14.00 |
| | - batter | $ 0.28 |
| | - crumbs | $ 0.10 |
| Packaging materials | | $ 0.50 |
| | | $14.88 |
| Processing costs | | $6.37 |
| EX FACTORY COST | | $21.25 |
| Manufacturer's selling price | | $27.62/2Kg pack |
| | | or $13.80/Kg. |

(c) Competition:

Frionor frozen crumbed scallops - 250g retail pack.
$2.49/250g (or approximately $10.00/Kg)

(ii) Mussels.

Some nine mussel-based products were developed:

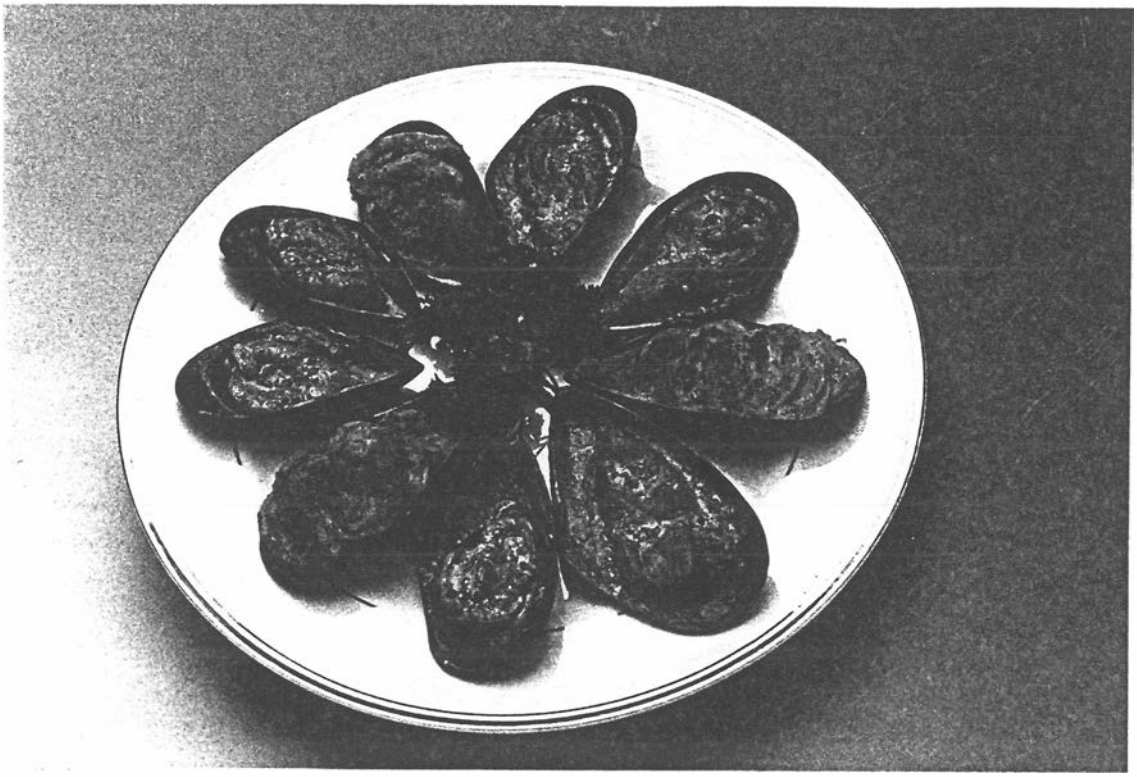
* Mussel chowder
* Mussel salad
* Smoked mussels
* Mussel mornay
* Seafood mix
* Mussel marinara
* Mussels in white sauce
* Mussels in garlic butter
* Kebabs

Formulations and costings, together with (where applicable) market competitors, are presented (Plates 10-18).

Two products achieved commercial reality: Pickled mussels and smoked mussels were marketed by Chatara Pty Ltd until the demise of this company in 1986.

A third product, crumbed mussels was developed in association with Seafoods of Melbourne Pty Ltd and was scheduled for commercial launch early in 1987.

# Half-shell mussels with garlic butter.



## 1/2 SHELL MUSSELS WITH GARLIC BUTTER

(a) Formulation:

| Ingredient | % by weight |
|---|---|
| Butter | 97.15 |
| Parsley flakes | 0.30 |
| Minced garlic | 1.30 |
| Black pepper | 0.25 |
| Citric acid | 0.23 |
| Sugar | 0.08 |
| Water | 0.69 |
| | 100% |

(c) Costing: Catering pack, 1 dozen 1/2 shells.

| | | |
|---|---|---|
| Raw materials | - 1/2 shell mussels | $0.85 |
| | - butter | $0.12 |
| Packaging materials | | $0.15 |
| | | $1.12 |
| Processing costs | | $0.48 |
| EX FACTORY COST | | $1.60 |
| Manufacturer's selling price | | $2.08\|dozen |

## Battered and crumbed mussels

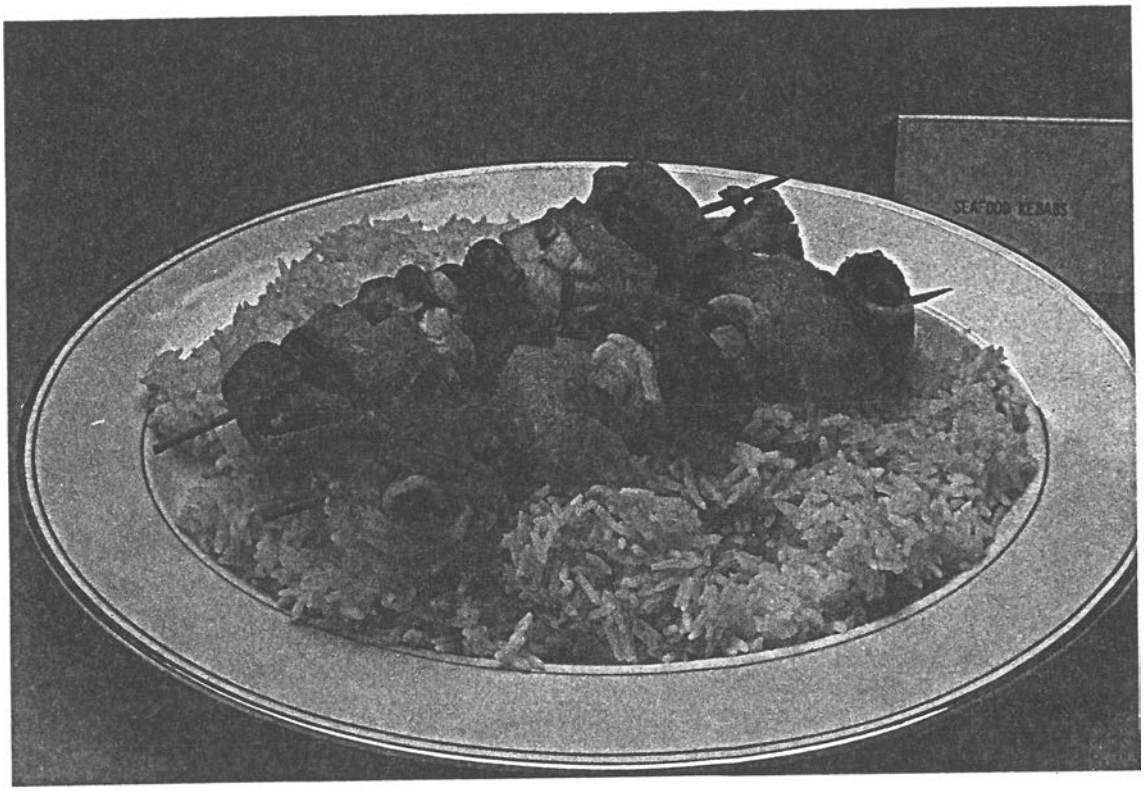
(a) Formulation:

| Ingredients | % by weight |
|---|---|
| Mussels | 65 |
| Powdered batter mix | 16 |
| Water | 19 |
| | 100% |

(b) Costing: Catering pack, 2Kg.

| | |
|---|---|
| Raw materials - mussels | $7.34 |
| - batter | $0.04 |
| Packaging materials | $0.50 |
| | $7.88 |
| Processing costs | $3.37 |
| EX FACTORY COST | $11.25 |
| Manufacturer's selling price | $14.63/2 Kg. |

## Seafood kebabs




(a) Formulation:

| Ingredient | % by weight |
|---|---|
| Mussels | 34 |
| Scallops | 27 |
| Bacon | 12 |
| Pineapple | 27 |
| | 100% |

(b) Costing: Retail product, 2 kebabs (250g)

| | | |
|---|---|---|
| Raw materials | - mussels | $0.60 |
| | - scallops | $0.78 |
| | - others | $0.44 |
| Packaging materials | | $0.30 |
| | | $2.12 |
| Processing costs | | $0.90 |
| EX FACTORY COST | | $3.02 |
| Manufacturer's selling price | | $3.92 |
| RETAIL PRICE | | $5.60 |

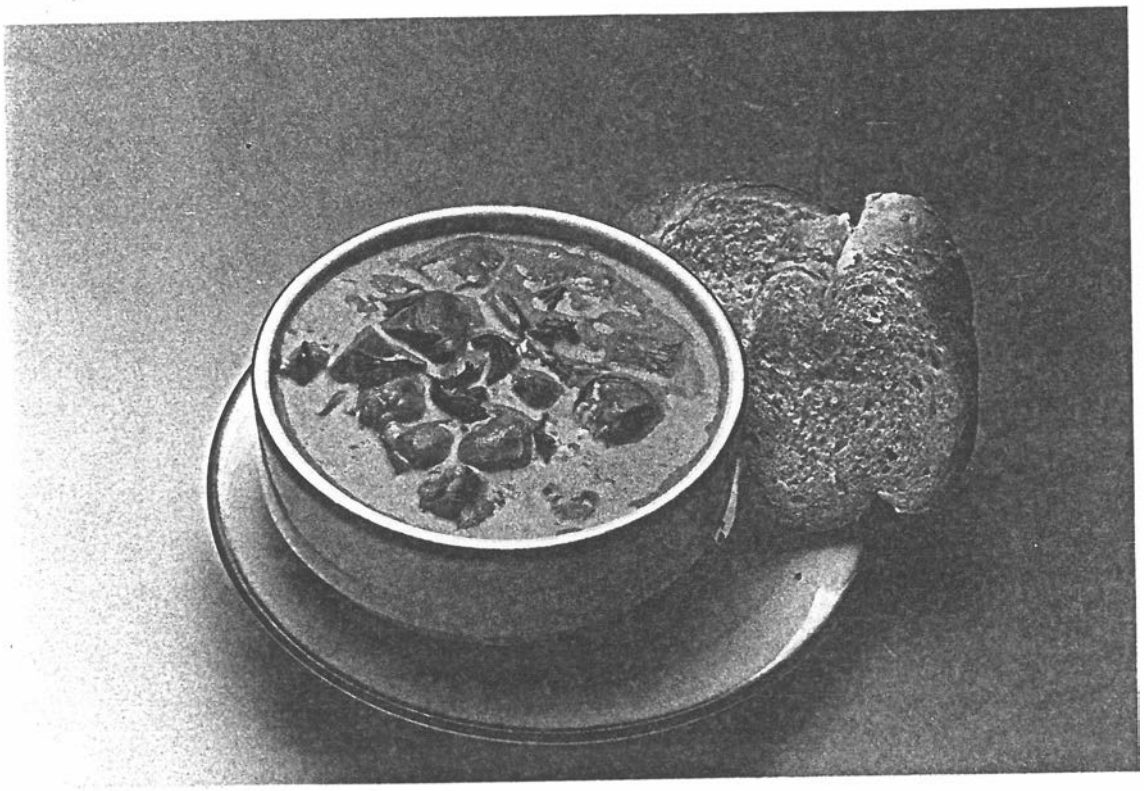
(c) Competition:

Seafood Kebabs - packed for Frionor Australia Pty Ltd., Thailand.

$2.49/250g pack of 2 kebabs.

( These kebabs contain fish chunks and fewer scallops per skewer, hence a direct comparison with the product above is not valid.)

# Mussel chowder



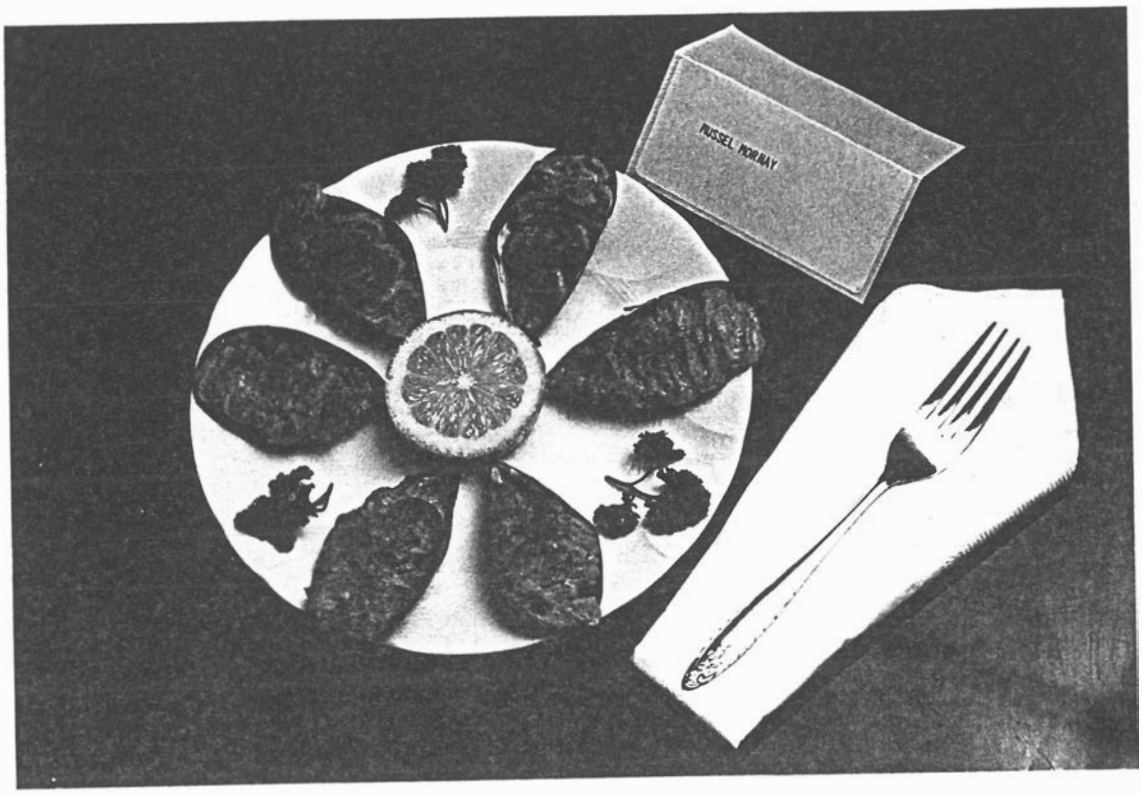
(a) Formulation:

| Ingredients | % by weight |
|---|---|
| Water | 56 |
| Mussels | 20 |
| Potato | 9 |
| Carrot | 3 |
| Corn | 3 |
| White wine | 4 |
| Whole milk powder | 2.5 |
| Butter | 0.6 |
| Starch | 0.6 |
| Onion flakes | 0.6 |
| Garlic powder | 0.25 |
| Bacon | 0.4 |
| Parsley | 0.08 |
| Oregano | 0.02 |
| Bay leaf | 0.01 |
| White pepper | 0.02 |
| | 100% |

(b) Costing: Catering pack, 2Kg.

| | |
|---|---|
| Raw materials - mussels | $2.25 |
| " - others | $0.87 |
| Packaging materials | $0.50 |
| | $3.62 |
| Processing costs | $1.55 |
| EX FACTORY COST | $5.17 |
| Manufacturer's selling price | $6.72 |

# Mussel mornay



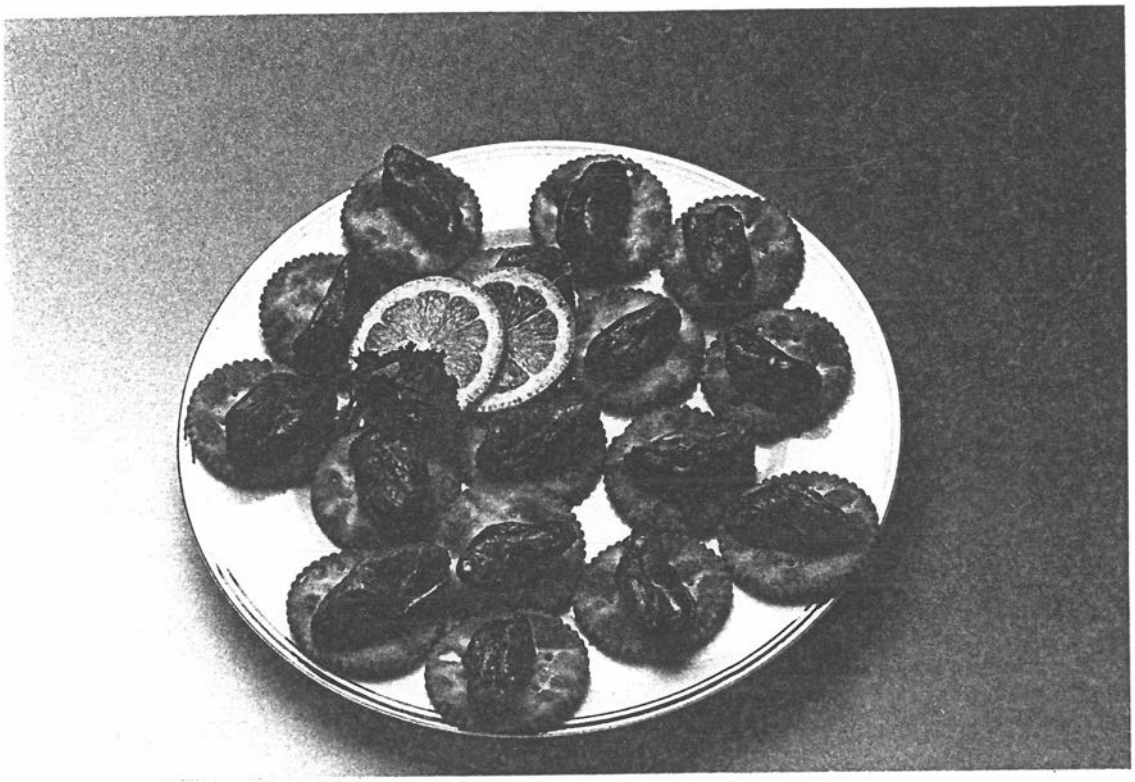

(a) Formulation:

| Ingredient | % by weight |
|---|---|
| Water | 64.10 |
| Butter | 11 |
| Cheese powder | 9 |
| Plain flour | 8 |
| Skim milk powder | 6 |
| White pepper | 0.20 |
| Parsley flakes | 0.15 |
| Sweet paprika | 0.15 |
| Minced garlic | 1.20 |
| Salt | 0.12 |
| Hot paprika | 0.08 |
| | 100% |

(b) Costing: Catering pack, 1 dozen 1/2 shells.

| | | |
|---|---|---|
| Raw materials | - 1/2 shell mussels | $0.85 |
| | - sauce | $0.22 |
| Packaging materials | | $0.15 |
| | | $1.22 |
| Processing costs | | $0.52 |
| EX FACTORY COST | | $1.74 |
| Manufacturer's selling price | | $2.26 /dozen |

# Smoked mussels



(a) Formulation:

| Ingredient | % by weight |
|---|---|
| Mussels | 77 |
| Oil | 20 |
| Salt | 3 |
| | 100% |

(b) Costing: Retail product, 100g can.

| | | |
|---|---|---|
| Raw materials | - mussels | $0.43 |
| | - oil/salt | $0.03 |
| Packaging materials | | $0.11 |
| | | $0.57 |
| Processing costs | | $0.24 |
| EX FACTORY COST | | $0.81 |
| Manufacturer's selling price | | $1.05 |
| RETAIL PRICE | | $1.50/100g |

(c) Competition:

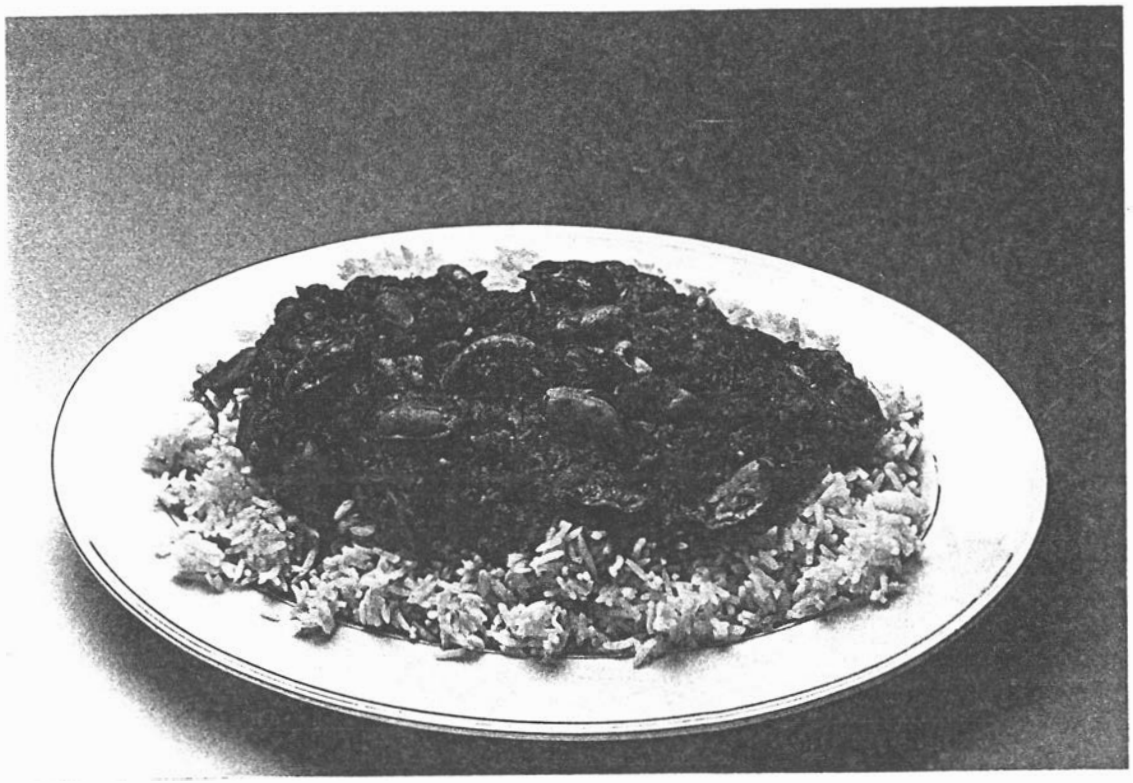
N.Z. Smoked Mussels - chilled, Thomas Richard Co. Ltd., Auckland. $1.30/100g wholesale.

Seakist Smoked Mussels - canned, product of Korea. $0.79/105g.

Admiral Smoked Mussels - canned, product of Korea. $0.70/105g.

John West Smoked Mussels - canned, product of Korea. $1.05/100g.

# Mussel marinara



(a) Formulation:

| Ingredients | % by weight |
|---|---|
| Whole peeled tomatoes | 67 |
| Mussels | 20 |
| Onions | 8 |
| Olive oil | 3 |
| Butter | 1 |
| Garlic | 0.9 |
| Basil | 0.01 |
| Oregano | 0.01 |
| Salt | 0.06 |
| Black pepper | 0.04 |
| | 100% |

(b) Costing: Catering pack, 2Kg.

| | |
|---|---|
| Raw materials - mussels | $2.26 |
| - others | $2.16 |
| Packaging materials | $0.50 |
| | $4.92 |
| Processing costs | $2.10 |
| EX FACTORY COST | $7.02 |
| Manufacturer's selling price | $9.13/2Kg |

# Mussel salad

(a) Formulation:

| Ingredients | % by weight |
|---|---|
| Mussel meat | 65.10 |
| Vinegar | 26.00 |
| Olive oil | 5.24 |
| Parsley flakes | 0.13 |
| Onion flakes | 0.52 |
| Dried chives | 0.13 |
| Dried peppers | 0.26 |
| Paprika | 0.13 |
| Garlic powder | 0.18 |
| Black pepper | 0.13 |
| Monosodium glutamate | 0.08 |
| Salt | 2.10 |
| | 100% |

(b) Costing: Catering pack, 2kg.

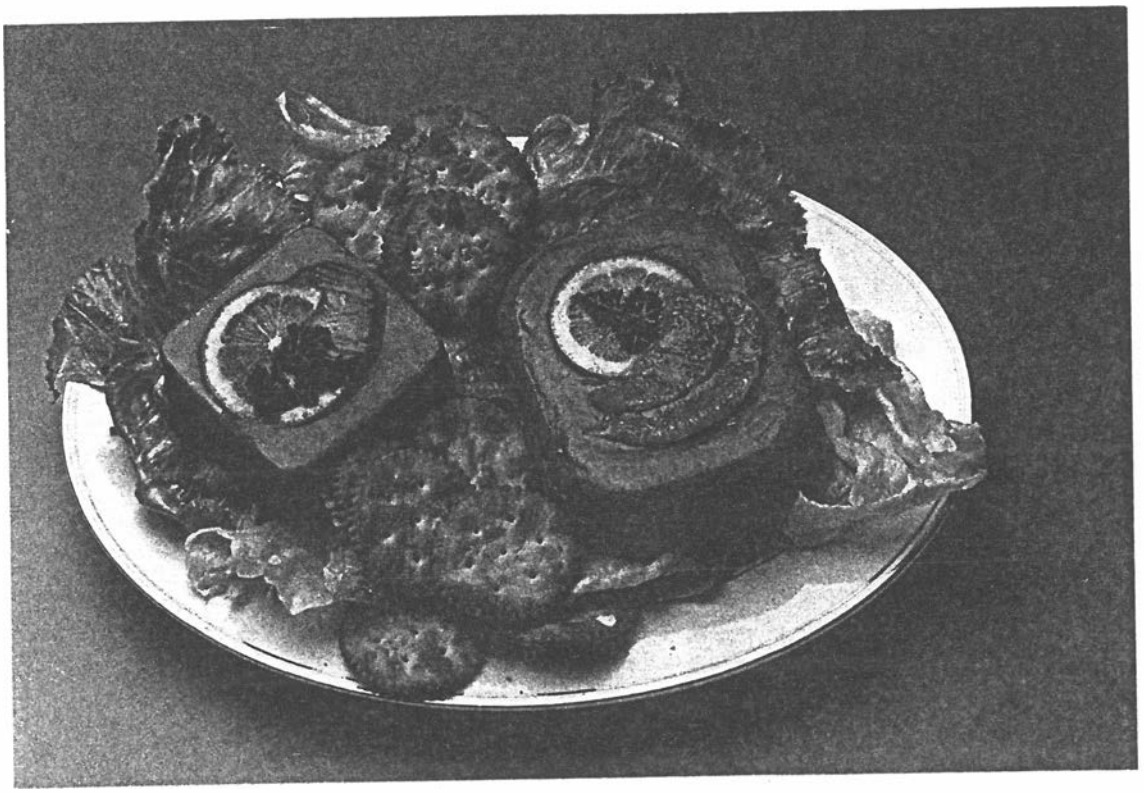
| | | |
|---|---|---|
| Raw materials | - mussel meat | $11.26 |
| | - others | $ 1.56 |
| Packaging materials | | $ 0.50 |
| | | $13.32 |
| Processing costs | | $ 5.70 |
| EX FACTORY COST | | $19.02 |
| Manufacturer's selling price | | $24.72/2 KG or $12.36/Kg |

(c) Competition:

Mussel Salad Mix, Marina Danish brand imported from Denmark.

$1.56/330g (or $4.12/Kg)

# Mussel pate



(a) Formulation:

| Ingredients | % by weight |
|---|---|
| Mussels | 52 |
| Smoked cod | 6 |
| Cream | 22 |
| Gelatine | 2 |
| Lemon juice | 1 |
| Onion flakes | 0.95 |
| Ginger powder | 0.03 |
| Garlic powder | 0.10 |
| Oyster flavour | 0.04 |
| Pepper | 0.05 |
| Salt | 0.24 |
| Water | 15.59 |
| | 100% |

(b) Costing: Retail product, 250g tub, chilled.

| | | |
|---|---|---|
| Raw materials | - mussels | $0.71 |
| | - others | $0.28 |
| Packaging materials | | $0.15 |
| | | $1.14 |
| Processing costs | | $0.48 |
| EX FACTORY COST | | $1.62 |
| Manufacturer's selling price | | $2.10/250g. |

(c) Competition:

Seafood pate marketed by Select Seafoods, Lygon St, Carlton retails for $2.95/150g or $20.00/Kg.

PHASE 3. Consumer evaluation.

(i) Scallop-based products.

Six scallop-based products were evaluated by consumers at the RMIT. The results (Table 1) indicate that all products were rated "Good" by the majority of consumers.

Several of the products were considered suitable for progression to a market evaluation by food service outlets (see Phase 4).

Table 1. Consumer evaluation of scallop-based products.

| Product | No. responses | Product rating | | | | |
|---|---|---|---|---|---|---|
| | | Excellent | Good | OK | Poor | Revolting |
| Scallop pate | 37 | 7 | 21 | 8 | 1 | - |
| Crumbed scallops | 30 | 4 | 20 | - 5 | 1 | - |
| Battered scallops | 48 | 14 | 20 | 12 | 2 | - |
| Scallop bisque | 39 | 7 | 24 | 9 | - | - |
| Scallop fritters | 37 | 8 | 19 | 10 | - | - |
| Scallop mornay | 34 | 14 | 13 | 6 | 2 | - |

(ii) Mussel-based products.

A comparison between New Zealand and local mussels.

Throughout the early phases of this investigation a common statement by trade personnel was that NZ mussels were "better" than locally-cultivated mussels. No quality criteria were applied to qualify this statement so that it was considered vital to monitor the comparative performance of both species of cultured mussel.

Accordingly, the RMIT Bistro was used to provide lunches for consumers. Each consumer was provided with two small lunches in which the sole variation was that either NZ mussels, or locally-cultivated mussels, were used.

Consumers were asked to rate each meal and to describe the flavour and texture of the mussel components .

Around 107 consumers evaluated three meals:

* Battered, deep-fried mussels, with french fries (Plate 19).
* Mussel marinara with rice(Plate 20).
* Mussel vol au vents (Plate 21).

The results (Table 2) indicate a high acceptance for locally-produced mussels, Consumers considered battered mussels from Victorian cultured mussels superior to NZ (59% versus 41%: non significant); Marinara (67% versus 33% $P < 0.05$), and vol au vents (74% versus 26%: $P < 0.01$).

Consumers citing Victorian mussels as their preference liked the soft, tender texture and mild, sweet flavour.

Consumers preferring NZ mussels cited firm, meaty texture and strong, seafood flavour as positive attributes.

Table 2. Comparison of New Zealand and Victorian mussels.

| Dish | % preferring Victorian mussels | % preferring NZ mussels |
|---|---|---|
| Deep-fried, battered mussels with french fries | 59% | 41% |
| Mussel marinara | 67% | 33% |
| Mussel vol au vents in white sauce | 74% | 26% |

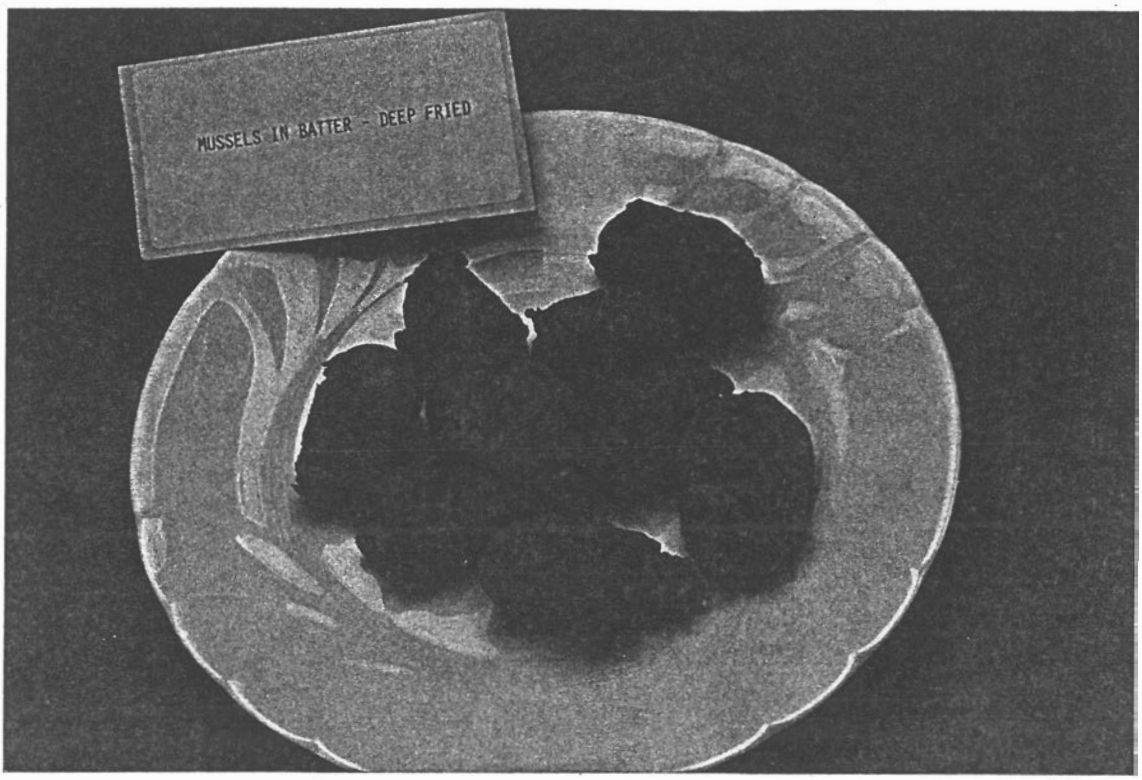



Plate 19. Battered, deep-fried mussels.

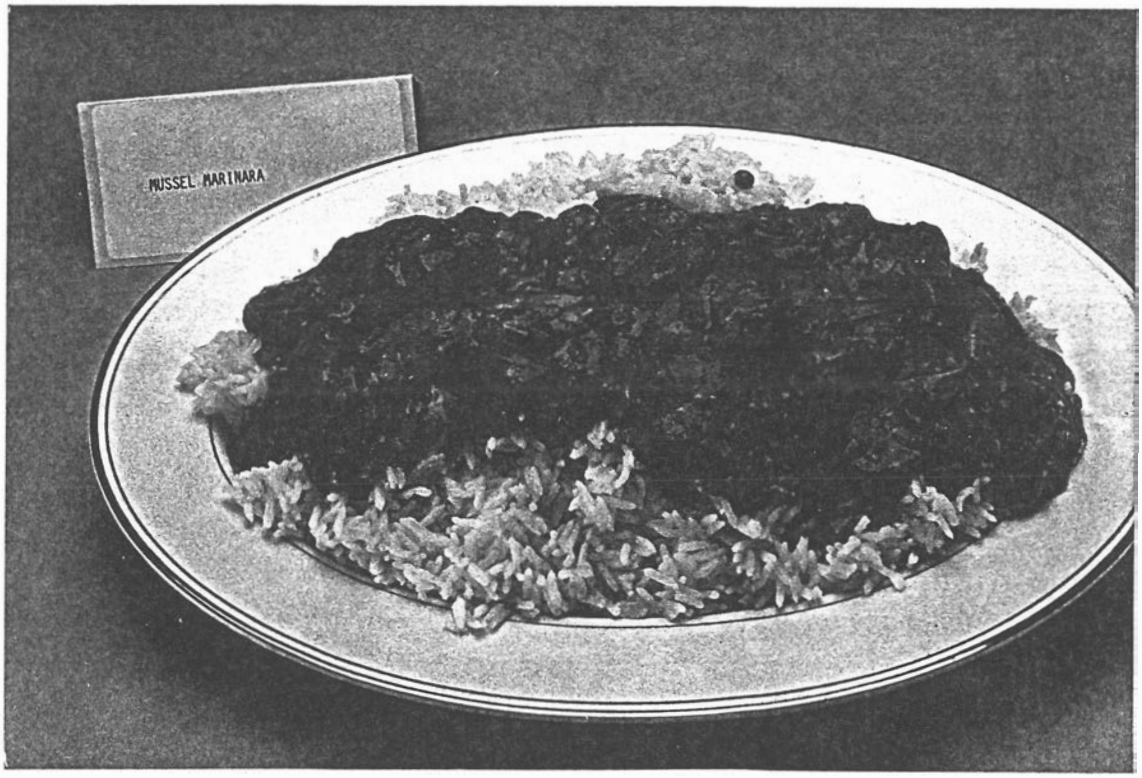



Plate 20. Mussel marinara.

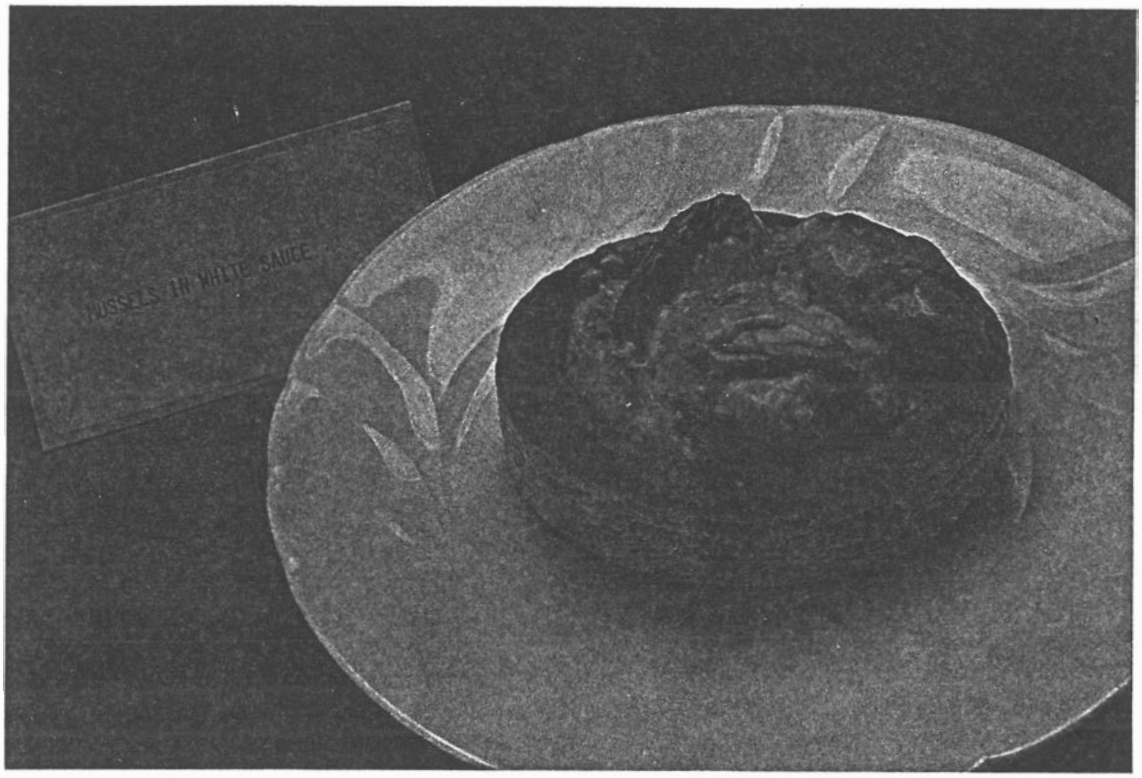



Plate 21. Mussel vol au vents.

PHASE 4. Market evaluation of scallop and mussel-based products.

The food service industry in Victoria is a major user of mussels, both local and imported and it was considered important to canvass the industry to evaluate the likelihood of value-added mussel-based based products being acceptable.

Accordingly, a range of nine products was prepared, in both chilled and frozen form for testing in a range of restaurants and food service outlets.

Each outlet received an insulated chest containing a sample quantity of each product, together with a questionnaire (Plate 22).

A list of food service outlets is presented in Table 3, from which it can be adduced that the survey covered a sample of the more than 3,000 restaurants and food premises in the Melbourne City area, alone, and also covered some of the larger users of food products e.g. O'Brien and Dennis catering.

After allowing one week for evaluation of products each outlet received a follow-up visit when the questionnaire was returned.

The response varied from poor (marinara and seafood mix) to acceptable (mussels in garlic butter, chowder) to good (mornay, smoked mussels) (Table 4).

A number of outlets indicated an interest in purchasing certain products were they to become available. The range of interest is presented in Table 5.

The result of this market evaluation was that certain products, both scallop and mussel-based, seemed capable of market and consumer acceptance.

The evaluation served to narrow the range of products which had been developed down to those with a high likelihood of acceptance.

Accordingly, this narrower range was produced in pilot quantities for presentation to an Industry Day when members of all sectors of the seafood industry would be participants in further market trials.

Table 3. Listing of food service outlets involved in market evaluation of mussel-based products.

| | | |
|---|---|---|
| (i) Caterers | Nationwide Food Services | |
| | Dennis Catering - Flemmington Racecourse | |
| | - Exhibition buildings | |
| | Epicure Catering | |
| | O'Briens | |
| | TAA Catering Centre | |
| (ii) Restaurants | The Swagman | Large restaurants |
| | Rembrants | |
| | L'aragosta D'oro | |
| | Trotters | |
| | Totos | |
| | Copperwood | |
| | Chalkeys | Small restaurants |
| | Cafe Paradiso | Lygon St., Carlton |
| | Ilios | - - |
| | The Lemon Tree | |
| | La Cacciatora | |
| | Cafe Sport | |
| | Avanti restaurant | |
| | Marostica Bistro | |
| (iii) Retail Outlets | Select Seafoods | |
| | Bottom of the Harbour | |

Table 4. Market responses for mussel-based product evaluation.



| Product | No. Responses | Product rating | | | | |
|---|---|---|---|---|---|---|
| | | Excellent | Good | OK | Poor | Revolting |
| Chowder | 14 | 2 | 3 | 7 | 2 | - |
| Salad | 16 | 2 | 6 | 6 | 2 | - |
| Mornay | 15 | 7 | 7 | 1 | - | - |
| Garlic butter | 16 | 6 | 5 | 2 | 3 | - |
| Smoked mussels | 17 | 5 | 10 | 2 | - | - |
| White sauce | 16 | 1 | 2 | 8 | 5 | - |
| Seafood Mix | 14 | 2 | 3 | 3 | 3 | 3 |
| Kebabs | 15 | 3 | 6 | 5 | 1 | - |
| Marinara | 16 | 2 | 1 | 7 | 4 | 2 |

Table 5. Indication of propensity for purchase of mussel-based products.



| Outlet | Product | Quantity/week |
|---|---|---|
| The Swagman | Mussel in garlic butter | 50 dozen |
| Rembrants | " | 30 " |
| | Mussels mornay | 30 " |
| | Mussel Salad | 10kg |
| Trotters Cafe | Smoked mussels | 10kg |
| Ilios | Mussel salad | 4kg |
| | Mussels in garlic | 5 doz |
| | Mussel mornay | 5 " |
| | Kebabs | 3 doz |
| L'aragosta D'oro | Smoked mussels | 6 kg |
| | Kebabs | 2 doz |
| | Mussel mornay | 10 " |
| Avanti | Mussels in garlic | 10 doz |
| | Mussel mornay | 10 " |
| Marostica Bistro | Mussels in garlic | 15 doz |
| | Seafood Mix | 1kg |
| | Smoked mussels | 0.5kg |

Plate 22. Mussel evaluation kit and questionnaire.

PHASE 5. Industry day to review products and packaging formats for scallop and mussel-based products.

On March 18, 1986 an industry day was held at RMIT in which some 60 participants from the seafood production, processing and packaging industry met with R&D staff from RMIT and the Marine Sciences Laboratories, Queenscliff, and with members of the Victorian Departments of Conservation, Forests and Lands, and of Agriculture. Representatives of the media were also present.
A list of those attending is presented in Table 6.

The day was opened by the Right Honourable Minister for Agriculture, Mr. Evan Walker (Plate 23).

Partcicipants received short presentations from RMIT staff involved with the R&D programme:

"Import Competition, and Opportunities with local Raw Materials"
by Catharine Prattley and John Sumner

" Processing and Packaging Opportunities"
by Darian Warne (see Appendix 3)

Participants were required to evaluate a range of products on a 10-point hedonic scale where 0="revolting", 7= "good" and 10="excellent".

Meals were served by final year students in Food Science and Technology at RMIT (Plate 24) to the more than 60 representatives of industry, the regulatory and the media (Plate 25).

As well, packaging formats and products were available for comparison with competitive products (Plate 26).

The results (Table 7) indicate that, on the average, participants considered most products either"acceptable" or "good".

As well, in order to gain an insight into how rigorous participants were in evaluating products comparison testing was carried out between products produced at RMIT in the present investigation and commercial products.

Mussel pate produced at RMIT compared favourably with the Lochland product imported from NZ, while local smoked mussels compared well with imported Korean smoked mussels on the JohnWest label (Table 8).

The industry day generated a great deal of media attention in Melbourne and also encouraged the Mussel Growers Association to seek aid from the Victorian Department of Industry, Technology and Resources and other local government bodies.

Table 6. Attendees at the industry day.

Tony Kosky, Bentleigh Gourmet Seafoods
Murray Elmer, Safeway
Fred Theis, Heritage Enterprises.
John Wilder Chartara Pty.Ltd.
Sid Ostrow "
Alan Ward "
Brian Linnacre W.R. Grace.
Ted Kempner "
Tony Garwood Garwood Packaging
R.T. Slabak "
Kevin Street, Sally O'Connor, Conservation
Geoff Cox, Dept Industry, Technology and Resources
Neil Hickman, Bev Sause, Greg Parry, Marine Science Labs, Queenscliff
Dennis Mirabella, National Training committee
Neil NcKenzie, Victorian Fishing Industry Training Committee
Scott Larson, ASP Seafoods
Peter Rankin, Cheetham's
Jillian Fox, Tony Castro, Alvamira
Colin Sumner Tasmanian Sea Fisheries
Ingrid Piper, ABC Country Hour.
Hetty Pruis, Hospitality Magazine
Jeff Brooks, Sun newspaper
? , Australian newspaper
Murray Mitchell, Professional Fisherman, magazine
Gordon Ross, Morlock Mussels
Bruce Speirs, Michael Smith, Mayfair Foods
Jock Forbes, Louise Learmonth, AJ Forbes P/L
Catharina Pihl, Vicfish
Fiona Grant, Home Economics, RMIT
Ian Anderson, Wrightcell, Packaging.
Graeme Rodda Packaging News.
Greg Danholm, Robert Bates Lindgren Vic Pty.Ltd.
Brian Smith, Ian Baker, Fred James, Derek Kew, Frank Difford, RMIT
John Sumner, Catharine Prattley, Darian Warne, Liz Gorczyca, RMIT
Thelma Kirkbride , RMIT
Duncan McLean, Rick James, Kevin Miles, Ms Miles, Peter Knietelaitis,
Geoff Searle, Ron McCowan, Pierre Cances, Paul Jensen, Stuart Raines,Bill Reid
(All mussel farmers).
Peter Armstrong Food Processor.

Table 7. Responses of participants at the industry day to products tested.

| Product | No. Responses | Mean Score | Grading |
|---|---|---|---|
| Mussel marinara | 44 | 6.0 | OK - Good |
| Mussel chowder | 31 | 7.1 | Good |
| Mussel mornay | 34 | 7.7 | Good |
| Mussel pate | 9 | 7.4 | Good |
| Smoked mussels | 46 | 6.4 | OK - Good |
| Battered mussels | 40 | 6.4 | OK - Good |
| Breaded mussels | 27 | 5.7 | OK - Good |
| Mussels in garlic butter | 25 | 6.2 | OK - Good |
| Scallop mornay | 37 | 6.6 | OK - Good |
| Battered scallops | 34 | 7.2 | Good |
| Pickled | 8 | 7.6 | Good |

Table 8. Comparison of locally-produced and imported mussel products.

| Product | Number of responses | Mean score | Grading |
|---|---|---|---|
| Scallop pate | | | |
| Local product | 42 | 6.0 | Acceptable - Good |
| Lochland brand (NZ) | 42 | 6.1 | Acceptable - Good |
| Smoked mussels | | | |
| Local product | 46 | 6.4 | Acceptable - Good |
| Korean (JohnWest) | 46 | 6.2 | Acceptable - Good |

Plate 23. The Right Honourable Mr. Evan Walker, Minister of Agriculture.

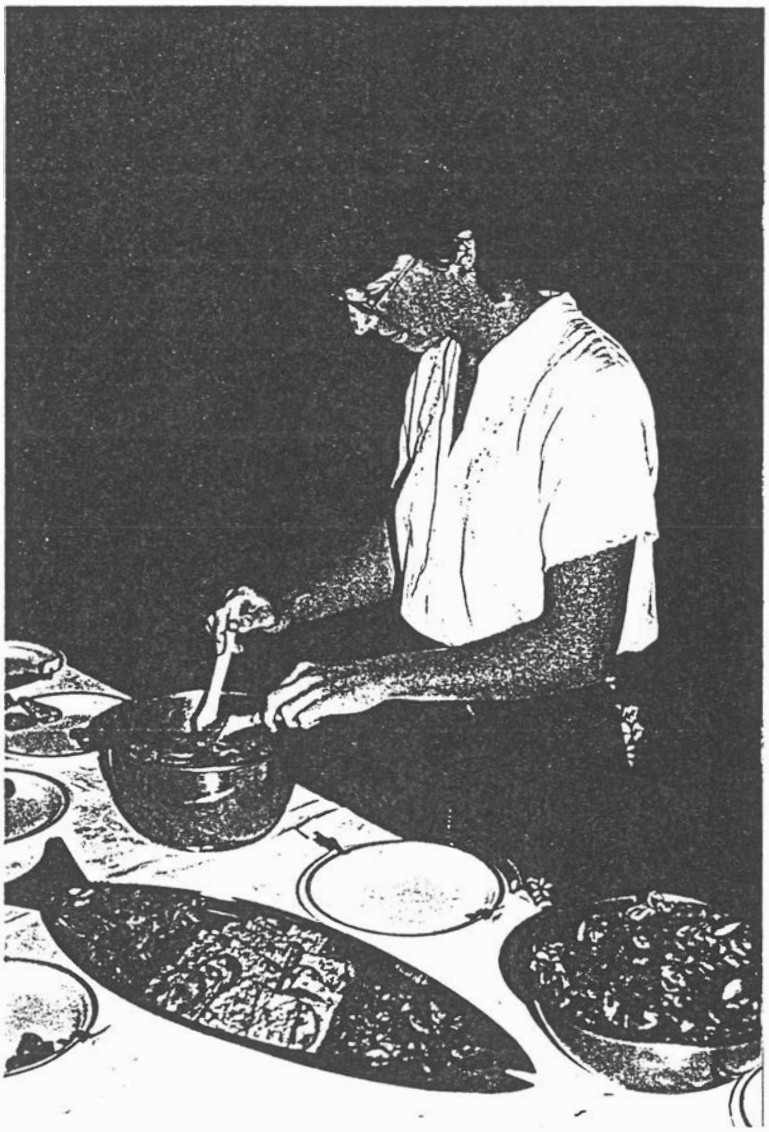


Plate 24.
Serving and preparation on Industry Day.

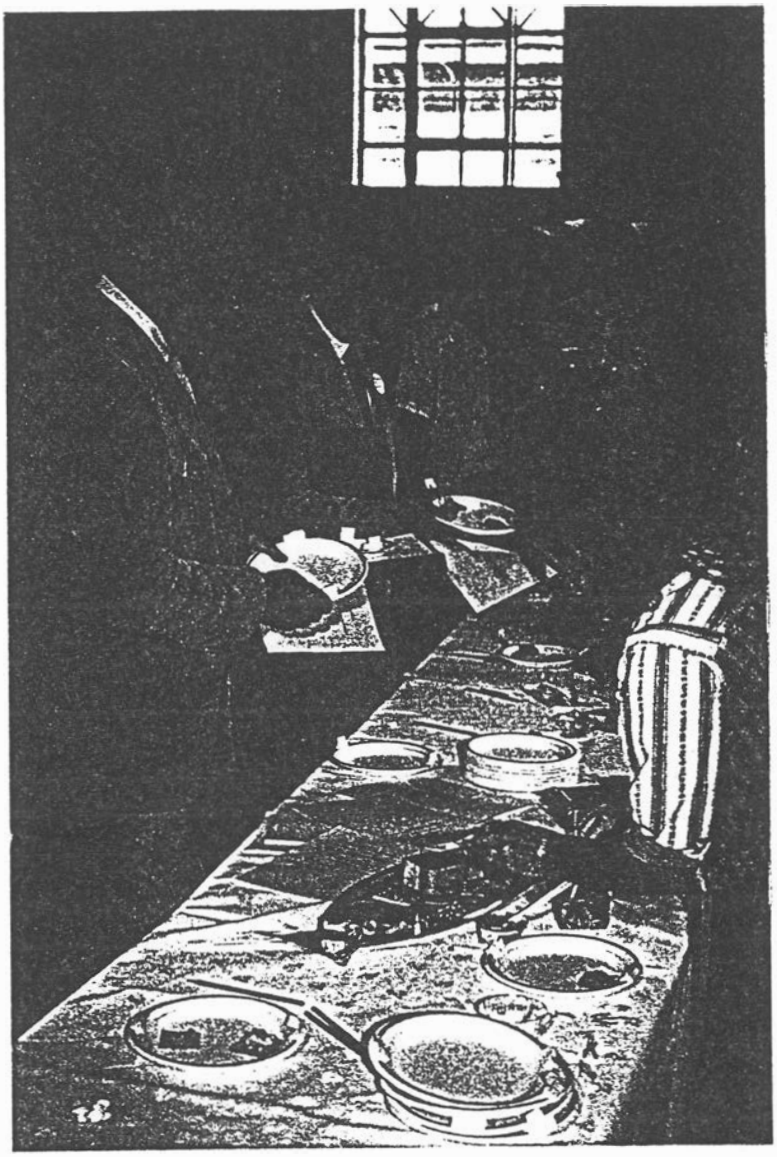


Plate 25. Participants at Industry Day.

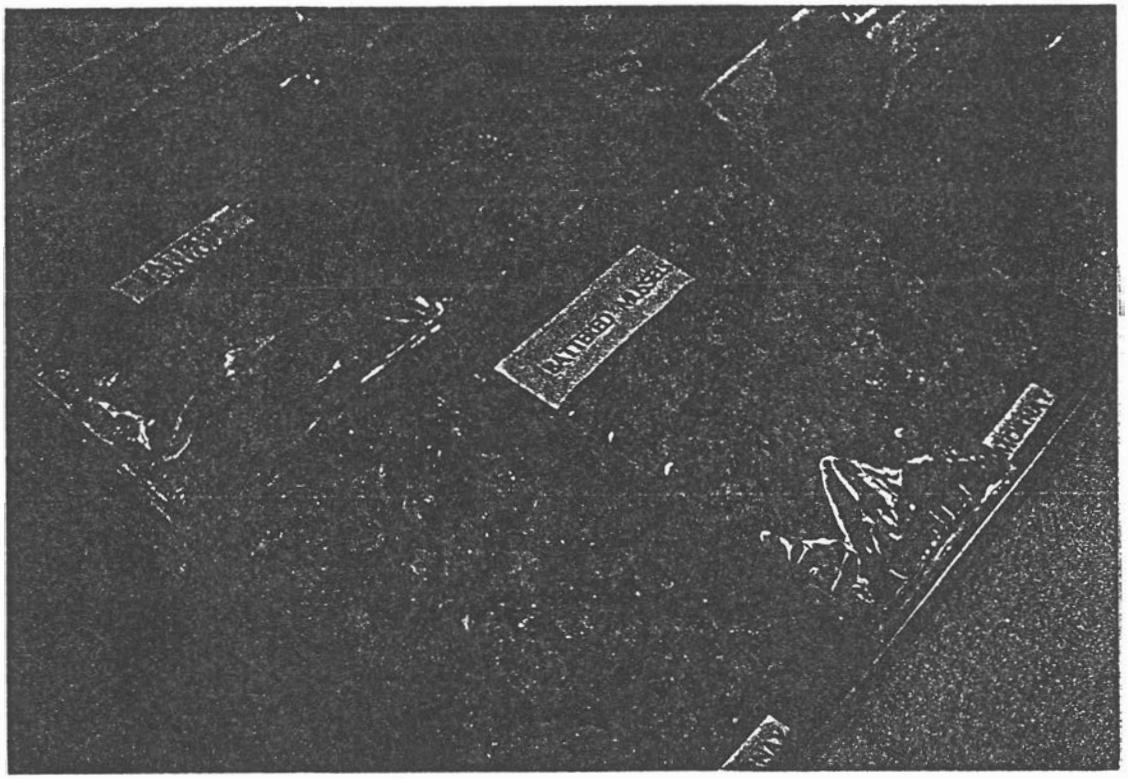


Plate 26. Some packaging formats developed in the present study.

PHASE 6. Research and Development work carried out with industry.

During the tenure of this investigation two companies received R&D assistance in processing of mussels.

Russell Crayfish Pty Ltd required information on steaming under pressure for opening of mussels. This work was carried out at the RMIT Food Laboratories. The company wishes to retain this knowledge and it will not be reported here.

A.J. Forbes Pty Ltd emerged as the major processor of mussels in Victoria. R&D advice was given in two areas:

(i) Construction of a continuous steamer for opening of mussels. The company wishes to retain knowledge of this work phase.

(ii) Frozen storage of mussels.
Storage trials were set up at -18°C in which mussels were stored in whole shell, half-shell or as meat.

This trial established that whole mussels do not respond well to freezing and frozen storage.

Half-shell mussels and mussel meat had an acceptable shelf-life at -18°C of 3-4 months.

The impact of this trial is the knowledge that mussel growers can freeze part of a harvest as half-shell and as meat for at least some of the off-season period.

PHASE 7. Work with local industry towards commercialisation of locally-produced scallops and mussels.

Several products designed within the current R&D programme became commercial within a few months of development.

Work was carried out with two companies in order to facilitate production: Chatara Pty Ltd, a scallop-processing company which branched into advanced packaging formats.

Seafoods of Melbourne Pty Ltd, a processor and packager of seafoods for the retail trade.

Chatara Pty Ltd produced smoked mussels, soused mussels and soused scallops to formulations developed in the present investigation. These products were packed in modern packs which could have the facility for controlled gaseous atmospheres (though this was not the case in the present context).

Unfortunately the company was wound up when supplies of scallops into Melbourne effectively ceased during 1986.

Seafoods of Melbourne became interested in breaded mussel products following a tasting of the products developed in the present programme.

The company developed four pilot products using their own pre-dusting flavours and crumb formulations. These products were taste paneled at RMIT during August, 1986.

Around 80 consumers rated the four products on a hedonic scale from 0-10 The results (Table 9) showed that two products (a J-crumb product, and agarlic batter product) were more acceptable than products with plain batter or plain breadcrumb.
Consumers also indicated an encouraging intention to buy (Table 10) these products.

As a result the company, Seafoods of Melbourne Pty Ltd, and the major outlet for cultivated mussels (A.J. Forbes Pty Ltd) reached an agreement on a price structure acceptable both to mussel growers and to processor.

Table 9. Consumer rating of breaded and battered mussel products.

| Rating* | Sample | | | |
|---|---|---|---|---|
| | A | B | C | D |
| 10 | 10 # | 5 | 1 | 21 |
| 8 | 44 | 33 | 24 | 34 |
| 6 | 34 | 41 | 31 | 21 |
| 4 | 10 | 15 | 30 | 16 |
| 2 | 2 | 2 | 14 | 5 |
| 0 | 0 | 4 | 2 | 2 |
| Average (n = 80) | 6.98 | 6.22 | 5.37 | 6.85 |

* Rating 10 = fantastic
Rating 0 = horrible
\# % of respondents giving each rating

A=J crumb; B=plain breadcrumb; C=plain batter; D=garlic batter

Table 10. Intention to buy battered and crumbed mussel products.

| Buying intention | Sample | | | |
|---|---|---|---|---|
| | A | B | C | D |
| Definitely | 15(21)* | 9(13) | 3( 4) | 21(29) |
| Probably | 20(28) | 19(27) | 14(20) | 21(29) |
| Might | 29(41) | 22(31) | 20(28) | 16(23) |
| Would not | 7(10) | 21(29) | 34(48) | 13(19) |

* Figures in parentheses indicate proportion(%) of responses for each product type.

# APPENDIX 1

Scallop products imported into Victoria, and the likelihood of local products successfully competing.

## SUMMARY - SCALLOPS.

| PRODUCT | LOCAL PRICE | IMPORTED PRICE |
|---|---|---|
| Scallop pate | $1.50/100g * | $3.65/100g |
| Crumbed frozen scallops | $3.82/250g | $2.49/250g |
| Scallop Kebabs | $4.00/230g | $2.49/250g |

---

* Price current in early-1985

## SCALLOPS - VOLUME OF IMPORTS.

| PRODUCT | IMPORTER | QUANTITY |
|---|---|---|
| Scallop Pate Lochland, N.Z. | Arthur Brunt International Foods Pty. Ltd., Melbourne. | 3600 Kg/year |
| Crumbed scallops Frozen, Finessa Brand. | Frionor Australia Pty Ltd., Melbourne. | 56 tonnes/year. |
| Seafood Kebabs Frozen, Frionor Brand. | " | 18 tonnes/year |
| Frozen scallops. | " | 10 tonnes/year |

## ESTIMATED COSTS FOR LOCALLY PROCESSED SCALLOP PRODUCTS

1. Product which might replace imports.

   Frozen crumbed scallops

   Scallop Kebabs

   Scallop pate.

2. Raw material costs.

| | | |
|---|---|---|
| "Beached scallops" | - $7.50/Kg | |
| Shucked scallops | - $10.50/Kg dry | wholesale |
| | - $8.50/Kg wet | wholesale |
| | - $9.00/Kg wet | Victoria market |
| | - $13.50/Kg wet | Myers, Coles. |

1. Scallop pate.

(a) Formulation:-

| Ingredients | % by weight |
|---|---|
| Scallops | 40 |
| Cod | 30 |
| Fat | 15 |
| Water | 6 |
| Starch | 5 |
| Vinegar | 3 |
| Flavours | 0.6 |
| Emulsifier | 0.4 |
| | 100% |

(b) Costing:-

| | | COST/200g can |
|---|---|---|
| Scallops | 80g @ $8.50/Kg | $0.68 |
| Cod | 60g @ $3.00/Kg | $0.18 |
| Fat | 30g @ $1.40/Kg | $0.04 |
| Vinegar | 6ml @ $0.50/L | $0.003 |
| Starch | 10g @ $1.24/Kg | $0.01 |
| Emulsifier | 0.8g @ $6.00/Kg | $0.004 |
| Flavours | 0.4g @ $20.00/Kg | $0.002 |
| | | $0.92 |
| Packaging | | $0.10 |
| Manufacturing Costs | | $0.44 |
| EX FACTORY COST | | $1.46 |
| Manufacturer's selling price | | $2.09 |
| Retail price | | $2.99/200g |

COMPARISON WITH IMPORTED PRODUCT

Scallop pate (Lochland Brand from N.Z.) - $3.65/100g

Locally processed - $1.50/100g

2. Crumbed Frozen Scallops.

(a) Formulation:-

| Ingredients | % by weight |
|---|---|
| Scallops | 61 |
| Batter mix | 12 |
| Water | 12 |
| Breading | 15 |
| | 100% |

(b) Costing:-

| | COST/250g box. |
|---|---|
| Scallops 152g @ $7.50/Kg | $1.14 |
| Batter 30g @ $1.40/Kg | $0.04 |
| Bread crumbs 38g @ $0.54/Kg | $0.02 |
| | $1.20 |
| Packaging | $0.12 |
| Manufacturing Costs[1] | $0.56 |
| EX FACTORY COST | $1.88 |
| Manufacturer's selling price | $2.68 |
| Retail price | $3.82 |

1. Taken at 30% of total product cost.

Frionor advise that Safeway make 35% profit on their product.- it sells for $2.49/250g box, hence Safeway are adding 87cents to the wholesale price of $1.62. Frionor claim to have a manufacturing profit of only 11% on this product - therefore they must be producing it for $1.45. Either they purchase scallops more cheaply than $7.50/Kg or their processing costs are less than the estimated 30% of total product cost.

COMPARISON WITH IMPORTED PRODUCT.

Frionor Frozen Crumbed Scallops - $2.49/250g retail

Locally processed product - $3.82/250g retail

3. Scallop Kebabs.

(a) Formulation:-

| Ingredients | % by weight |
|---|---|
| Scallops | 53 |
| Pineapple | 30 |
| Bacon | 17 |
| | 100% |

(b) Costing:-

| | | | COST/2 Kebabs in a box |
|---|---|---|---|
| Scallops | 120g | @ $7.50/Kg | $0.90 |
| Pineapple | 70g | @ $1.53/Kg | $0.10 |
| Bacon | 40g | @ $2.00/Kg | $0.08 |
| | | | $1.08 |
| Packaging | Skewers, bag & box. | | $0.30 |
| Manufacturing Costs | | | $0.59 |
| EX FACTORY COST | | | $1.97 |
| Manufacturer's selling price | | | $2.81 |
| Retail price | | | $4.01 |

COMPARISON WITH IMPORTED PRODUCT.

Frionor Seafood Kebabs (Thailand) - $2.49/250g or per 2 Kebabs.

Locally processed product - $4.01/230g or per 2 Kebabs.

Note The Frionor Kebabs contain fish chunks in addition to scallops. There are only 2-3 scallops/kebab in contrast to the 4-5 allowed for the locally processed product.

# APPENDIX 2

Imports of mussels and of mussel-based products into Victoria, and the likelihood of locally-processed products successfully competing.

## MUSSEL PRODUCT IMPORTS TO VICTORIA.

| PRODUCT | ORIGIN | MANUFACTURER | PRICE |
|---|---|---|---|
| Chilled mussel meat | N.Z. | JAT Processors Ltd, Havelock, N.Z. | $5.00/Kg wholesale<br>$9.99/Kg retail |
| Frozen mussel meat (I.Q.F.) | N.Z. | " | $4.50/Kg wholesale |
| 1/2 shell mussels Chilled | N.Z. | McFarlane Fisheries Ltd, Auckland, N.Z. | $2.50/dozen wholesale |
| 1/2 shell mussels Frozen | N.Z. | " | $2.20/dozen wholesale |
| Whole shell mussels Chill/Kill | N.Z. | JAT Processors Ltd, Havelock, N.Z. | $2.80/Kg wholesale |
| Whole mussels Frozen | N.Z. | " | $2.50/Kg wholesale |
| Smoked mussels Chilled | N.Z. | Thomas Richard Co. Ltd, Auckland, N.z. | $1.30/100g pack wholesale |
| Smoked mussels Canned | Korea | Packed for SEAKIST, | $0.79/105g retail |
| Smoked mussels Canned | Korea | Packed for ADMIRAL, Riviana Australia Ltd, Melbourne. | $0.70/105g retail |
| Smoked mussels Canned | | Packed for JOHN WEST | $1.05/100g retail |
| Crusader mussels in vinegar. | England | Sefton Meadowsea Ltd, England. | $1.49/140g glass jar. Retail. |
| Pickled mussels | Denmark | Glyngore | $1.05/190g jar wholesale<br>retail |
| " | " | " | $2.00/830g jar wholesale |
| " | " | " | $16.00/3.5Kg bucket wholesale |

MUSSEL IMPORTS - continued.

| PRODUCT | ORIGIN | MANUFACTURER | PRICE |
|---|---|---|---|
| Pickled mussels | - | Alvania | $2.99/375g retail |
| Mussels in red pickle sauce. Canned | Spain | Jose R. Curbera,SA Vigo, Spain. | $1.68/115g retail |
| " | " | " | $2.65/200g retail |
| Mussels in brine Canned | China | China National Cereals, Oils & Foodstuffs, Import & Export Corporation, Tsingtao. | $1.00/100g retail |
| Mussels in water Bottled | Sweden | Falkeshog, Delikefarran. | $2.15/150g bottle retail |
| Mussels in Shell Canned | Holland | The Fishing Dutchman, Schevening, Holland. | $3.49/900g can retail |
| Mussel salad mix A La Catalane Bottled. | Denmark | Marina Danish Seafood. | $2.10/340g retail |
| Mussel Salad Bottle | Denmark | Glyngore, Denmark. | $1.56/330g wholesale |
| Mussel hor d'ouveres. Bottled. | Denmark | Marina Danish Seafood. | $2.10/350g retail |

## MUSSELS - VOLUME OF IMPORTS.

| PRODUCT | IMPORTER | QUANTITY |
|---|---|---|
| Chilled meat (NZ) | J.Jurie Fish Merchants Pty Ltd. Footscray. | 32 tonnes/year |
| Frozen meat (NZ) | " | 8 tonnes/year |
| Chilled 1/2 shell (NZ) | " | 4 tonnes/year |
| Frozen 1/2 shell (NZ) | " | 1 tonne/year |
| Chilled whole shell (NZ) | " | 4 tonnes/year |
| Frozen whole shell (NZ) | " | 1 tonne/year |
| Smoked mussels (NZ) | " | 50 Kg/year |
| Smoked mussels Canned - John West. | John West Crows Nest, NSW. | 24 tonnes/year |
| Smoked mussels Canned - Seakist. | Seakist Foods Sydney, NSW. | 20 tonnes/year |
| Smoked mussels Canned - Admiral | Riviana Australia Melbourne. | 400 Kg/year |
| Pickled mussels Glygore | Socomin International Fine Foods, Melbourne. | 2 tonnes/year |
| Pickled mussels Canned in red sauce Spain. | Viking Imports Melbourne. | 30Kg/year |
| Mussels - Marina Danish Brands. | Exclusive Food Houses, Melbourne. | 10 tonnes/year. |
| | TOTAL IMPORTS: | 106,480 Kg/year. |

## MUSSEL PRODUCTS - LOCAL.

| PRODUCT | MANUFACTURER | PRICE |
|---|---|---|
| Pickled mussels<br>Plastic bottle. | Alvamira Seafoods | $2.40/375g retail |
| Mussels<br>Glass bottle | Fatourous Food processors<br>Edmonds Rd, Prahran. | $3.24/375g retail. |
| Smoked mussels<br>(Vic. Blue lip) | Lord Trout<br>North Melbourne | $0.70/mussel retail |
| Chilled mussels -cultured<br>Whole shell | | $1.70/Kg wholesale<br>$5.00/Kg retail |
| Chilled - dredged<br>Whole shell | | $0.60/Kg wholesale<br>$3.50/Kg retail. |

## ESTIMATED COSTS FOR LOCALLY PROCESSED MUSSEL PRODUCTS.

1. Products which might replace imports.

   Frozen & chilled mussel meat.

   Frozen & chilled 1/2 shell mussels.

   Frozen & chilled whole shell mussels.

   Smoked mussels - canned & flexible pouch.

   Pickled mussels.

   Mussel marinara/salad products.

2. Raw material costs.

   (a) Dredged mussels @ $0.50/Kg.
   Assume a meat yield of approx. 15% - $3.30/Kg mussel meat.

   (b) Cultured mussels @ $1.70/Kg. (or as much as $2.25/Kg)
   Assume a meat yield of 30% - $5.65/Kg mussel meat.

### SUMMARY - MUSSELS.

| PRODUCT | LOCAL PRICE | IMPORTED PRICE |
|---|---|---|
| Mussel meat -chilled | $7.71/Kg dredged<br>$11.67/Kg cultured | $5.50/Kg |
| -frozen | $9.01/Kg dredged<br>$12.74/Kg cultured | $4.50/Kg |
| 1/2 shell mussels -chilled | $8.97/Kg cultured | $6.94/Kg |
| -frozen | $10.51/Kg cultured | |
| Whole shell -chilled | $1.23/Kg dredged | $2.80/Kg |
| -frozen | $3.67/Kg cultured | |
| Smoked mussels | $1.16/100g dredged<br>$1.67/Kg cultured | $0.67 - $1.30/100g |
| Pickled mussels | $0.66/100g dredged<br>$0.94/100g cultured | $0.55 - $1.46/100g |
| Mussel marinara/salad | $0.69/100g dredged<br>$0.97/100g cultured | $0.47 - $0.61/100g |

1. Chilled mussel meat.

| | COST/Kg. | |
|---|---|---|
| | Dredged | Cultured |
| Mussels | $3.30 | $5.65 |
| Direct Labour[1] | $1.20 | $1.20 |
| Packaging | $0.10 | $0.10 |
| Manufacturing Costs[2] & Overheads. | $0.81 | $1.22 |
| EX FACTORY COST | $5.40 | $8.17 |
| Manufacturer's selling[3] price. | $7.71 | $11.67 |
| Retail price[4] | $11.01/Kg | $16.67/Kg |

1. Based on current Industry rate for shucking mussels $1.20/Kg
2. Includes processing, factory overheads, admin etc - usually about 30% of ex factory cost or sometimes costed as 70% of direct labour costs.
3. Most food processors aim to achieve a 30% profit margin on products.
4. Supermarkets markup gourmet products such that a 28-36% profit margin is acheived - their margin on everyday lines is approx. 20% and on frozen foods 28-30%.

COMPARISON WITH IMPORTED PRODUCT.

| | | |
|---|---|---|
| N.Z. chilled mussel meat | - $5.50/Kg wholesale | $9.99/Kg retail |
| Local replacement | - $7.71/Kg " (dredged) | $11.10/Kg retail |
| | - $11.67/Kg wholesale (cultured) | $16.67/Kg retail |

2. Frozen mussel meat.

| | COST /KG | |
|---|---|---|
| | Dredged | Cultured |
| Mussels | $3.30 | $5.65 |
| Packaging | $0.20 | $0.20 |
| Direct Labour | $2.00 | $2.00 |
| Freezing (IQF)[1] | $0.18 | $0.18 |
| Manufacturing Costs[2] | $0.63 | $0.89 |
| EX FACTORY COST | $6.31 | $8.92 |
| Manufacturer's selling price | $9.01 | $12.74 |
| Retail price | $12.87/Kg | $18.20/Kg |

1.Estimate from Ocean Delight - IQF $0.18/Kg; blast $0.06/Kg
2. Overheads taken at 10% total product cost since cost of labour & freezing included separately.

All other margins as for chilled mussel meat.

COMPARISON WITH IMPORTED PRODUCT.

Frozen meat N.Z. - $4.50/kg wholesale

Local replacement - $9.01/Kg dreged or $12.74 cultured.

3. Chilled 1/2 shell mussels.

Assume yield of 40% for cultured or reef mussels.

This gives a retail price of $4.25/Kg 1/2 shell mussels.

| | COST/Kg cultured mussels |
|---|---|
| Mussels | $4.25 |
| Packaging | $0.15 |
| Manufacturing Costs | $1.88 |
| EX FACTORY COST | $6.28 |
| Manufacturer's selling price | $8.97 |
| Retail price | $12.81 |

COMPARISON WITH IMPORTED PRODUCT.

1/2 shell mussels from N.Z. - $2.50/doz or $2.50/360g = $6.94/Kg

Locally processed product - $8.97/Kg

4. Frozen 1/2 shell mussels.

| | COST/Kg cultured mussels |
|---|---|
| Mussels | $4.25 |
| Packaging | $0.20 |
| Direct Labour | $2.00 |
| Freezing (IQF) | $0.18 |
| Manufacturing costs[1] | $0.73 |
| EX FACTORY COST | $7.36 |
| Manufacturer's selling price. | $10.51 |
| Retail price | $15.00 |

1. Taken at 10% of total product cost since labour and freezing costs included separately.

COMPARISON WITH IMPORTED PRODUCT.

1/2 shell mussels from N.Z. - $2.20/doz or $2.20/360g = $6.11/Kg

Locally processed product $10.51/Kg 1/2 shell

5. Frozen mussels - whole shell.

| | COST /Kg | |
|---|---|---|
| | Dredged | Cultured |
| Mussels | $0.50 | $1.70 |
| Packaging | $0.20 | $0.20 |
| Freezing | $0.18 | $0.18 |
| Manufacturing Costs[1] | $0.22 | $0.52 |
| EX FACTORY COST | $1.10 | $2.60 |
| Manufacturer's selling price | $1.57 | $3.71 |
| Retail price | $2.24 | $5.31 |

1. Manufacturing costs taken at 20% of total product cost since freezing costs (but not labour) have been included separately.

COMPARISON WITH IMPORTED PROBUCT.

N.Z. whole shell IQF frozen mussels - $2.50/Kg wholesale
Locally processed mussels - $1.57/Kg dredged
- $3.71/Kg cultured

6. Chilled mussels - whole shell (Chill/Kill)

| | COST /Kg | |
|---|---|---|
| | Dredged | Cultured |
| Mussels | $0.50 | $1.70 |
| Packaging | $0.10 | $0.10 |
| Manufacturing Costs | $0.26 | $0.77 |
| EX FACTORY COST | $0.86 | $2.57 |
| Manufacturer's selling price | $1.23 | $3.67 |
| Retail price | $1.75 | $5.24 |

COMPARISON WITH IMPORTED PRODUCT.

Chilled mussels from N.Z. - $2.80/Kg wholesale
Locally processed - $1.23/Kg dredged
- $3.67/Kg cultured

7. Smoked mussels - canned or flexible pouch*

(a) Formulation:-

| Ingredient | % by weight |
|---|---|
| Mussels | 80 |
| Cottonseed Oil | 20 |
| | 100% |

(b) Costing:-

| | | COST/100g | |
|---|---|---|---|
| | | Dredged | Cultured |
| Mussels | 80g | $0.26 | $0.44 |
| Oil | 20g @ $1.25/L | $0.03 | $0.03 |
| | | $0.29 | $0.47 |
| Packaging | | $0.11 | $0.11 |
| Manufacturing Costs[1] | | $0.17 | $0.25 |
| EX FACTORY COST | | $0.57 | $0.82 |
| Manufacturer's selling price. | | $0.81 | $1.17 |
| Retail price | | $1.16 | $1.67 |

1. Manufacturing costs taken at 30% of total product cost.

* Packaging costs will differ only slightly.

COMPARISON WITH IMPORTED PRODUCT.

N.Z. smoked mussels - $1.30/100g

Seakist - $0.75/100g

John West - $1.05/100g

Admiral - $0.67/100g

Locally processed - $1.16/100g dredged
- $1.67/100g cultured

## SCALLOP PRODUCTS - IMPORTS TO VICTORIA.

| PRODUCT | ORIGIN | MANUFACTURER | PRICE |
|---|---|---|---|
| Frozen crumbed scallops. Finessa Brand | Perth, Australia. | Australian Seafood Processors, Perth. | $2.49/250g retail |
| Scallop Pate Lochland Brand | N.Z. | Donaghys' Industries Ltd., Dunedin, N.Z. | $2.19/60g can retail |
| Whole bay scallops Canned. | Iceland | Iceland Waters Corp. Reykjavik, Iceland. | $3.85/113g can retail |
| Seafood Kebabs | Thailand | Packed for Frionor Australia Pty Ltd. | $2.49/250g retail |
| Frozen scallops Block frozen. | Thailand | " | |

# APPENDIX 3

Papers presented to participants at the Industry Day to evaluate mussel and scallop-based products.

# AUSTRALIAN FISHERIES IMPORTS: A PROFILE

Bureau of Agricultural Economics "Situation and Outlook, 1985: Fish Products"

During 1983-84 Australia imported almost 80,000t (A$258m) of edible fish products.

| | quantity (t) | Value (A$m) |
|---|---|---|
| Fillets: chilled, fresh, frozen | 27,000 | 64 |
| Whole fish: chilled, fresh, frozen | 7,000 | 12 |
| Fish blocks and sticks | 8,000 | 20 |
| Smoked fish | 3,700 | 9 |
| Canned fish | 16,000 | 56 |
| Crustacea: chilled or frozen | 11,000 | 83 |
| Crustacea: Canned | 2,500 | 11 |

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New Zealand exports 1984-85.

| | | |
|---|---|---|
| Mussels - greenlipped | 1,481 | 7.2 |
| - blue | 22 | 0.08 |
| - meat | 309 | 1.5 |
| - mince | 1 | - |
| - powder | 6 | 0.5 |
| - powder/capsule | - | 0.5 |
| - other | 81 | 0.5 |
| Fish fingers | 1,869 | 5.0 |
| Prepared dinners | 862 | 4.1 |
| Fish blocks | 3,569 | 7.3 |

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# PROCESSING AND PACKAGING OPPORTUNITIES

by

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BACKGROUND.

The techniques used to process, package and promote Australian seafood are conservative by comparison with those employed by local competitive industries. As a result of this, perishable commodities such as red meat, pork and poultry frequently exhibit a higher quality image at catering and retail outlets than do seafood products. Disparity also exists between the level of sophistication evident in the processing and packaging methods used by the local and international seafood processing industries; in general, the technology practised in Australia lags behind that applied overseas. Thus it is that marketers of Australian seafoods not only face strong competition from the red meat and poultry sectors, in which imaginative and convenient to use presentations are commonplace; but also, there is a dearth of evidence that Australian seafood processors are capitalising on the recent advances in processing and packaging technology, as for instance are overseas manufacturers, some of whom supply the Australian market.

It was in response to the perceived need for greater product development and promotion of seafoods in general, and because of the increasing availability of cultured mussels from Port Phillip Bay in particular, that a new product development exercise at RMIT was initiated with a Fishing Industry Research Trust Account (FIRTA) grant. This paper summarises some of the work completed under the grant since July 1985.

PRESERVATION TECHNIQUES AND PROCESSING OPTIONS.

With emphasis being placed on product development of mussels and scallops, the objectives of the exercise were as follows,

- to extend the shelf life of the perishable products,
- to create a range of value-added new products incorporating recent advances in packaging technology, and
- to provide end-use convenience for caterers and retailers.

Neither the processing nor the packaging methods adopted were untried, for as can be seen in Table 1, all of the systems chosen had been used extensively for preserving a wide range of foods in Australia and overseas.

Table 1. Preservation methods used for development of value-added mussel and scallop products and examples of similar applications with other commodities.

| Preservation method | Value-added product | Examples of use with other commodities |
|---|---|---|
| Refrigeration | Mussel pate & smoked mussels | Meat, fish, dairy |
| Freezing | Mussel marinara & chowder, dressed 1/2 shell mussels & scallops, battered and/or breaded mussels & scallops | Fish, vegetables |
| Heat | Mussel marinara & chowder | Canned foods, sauces |
| Smoking | Mussels | Oysters, fish, meats |
| Pickling | ——— | Soused scallops, vegetables |
| MA* storage | Dressed 1/2 shell mussels & scallops, battered and/or breaded mussels & scallops | Fish, meats, pizza, fruits, vegetables |

* MA = modified atmosphere, in which air in the sealed package is replaced with various combinations of $O_2$, $CO_2$, CO and $N_2$.

NEW PRODUCT DEVELOPMENT.

After pilot production trials and taste panel evaluation by segments of the food service industry, product formulations and processing techniques were modified so that a range of value added-mussel and scallop items was available for presentation to growers, processors, packaging companies, caterers and retailers. The key stages of processing and packaging, the recommended storage conditions and methods of preparation for serving, for a selection of the new products are summarised in Tables 2, 3, and 4.

Table 2. Production sequence for battered and/or breaded mussels and scallops

| |
|---|
| Raw material shucked, and washed |
| Portions battered and/or breaded |
| Par deep - fried |
| Cryogenic freezing (-60 °C/10 min) |
| Vacuum or MA packaged |
| Frozen storage ( -30 °C/6 months) |
| *Preparation for serving:* |
| Deep fry ( 1 min) |

Table 3. Production sequence for 1/2 shell mussels and scallops dressed with garlic butter or mornay sauce

| |
|---|
| Raw material shucked, and washed |
| 1/2 shell units dressed with butter or sauce |
| Cryogenic freezing (-60 °C/10 min) |
| Vacuum or MA packed |
| Frozen storage ( -30 °C/6 months) |
| *Preparation for serving:* |
| Grill |

Table 4. Production sequence for mussel marinara and chowder

| |
|---|
| Raw material shucked, and washed |
| Ingredients blended |
| Product par-cooked and pasteurised (indirect heating at 85-90 °C/15min) |
| Hot fill into plastic bag, seal and hold (5 min at >85 °C) |
| Rapid cooling to less than 10 °C |
| Frozen storage ( -30 °C/6 months) |
| *Preparation for serving:* |
| Thaw and heat sealed bag in hot water |

PACKAGING OPPORTUNITIES

Two essential features of commercially successful packaging systems are funtional adequacy and end-use convenience. This means that the package must protect its contents from physical, chemical and microbiological deterioration for the duration of the product shelf life while under "normal" storage conditions. These performance criteria place stringent demands on the package, nevertheless there is ample evidence that because of recent developments in packaging technology, the diversity of suitable systems is growing - albeit that they are rarely used for marketing of seafood products in Australia.

To utilise some of the range of packaging opportunities that is available, each of the new mussel or scallop products developed was presented in a "non-traditional" pack, many of which have proved successful with other commodities in Australia and/or with seafood products manufactured overseas. The benefits of these systems and some the products with which they can be used are summarised in Tables 5, 7 and 8.

## MODIFIED ATMOSPHERE PACKAGING

Table 5. Modified atmosphere (MA) packaging for value-added mussel and scallop products

| | | |
|---|---|---|
| Products | : | battered and/or breaded mussels and scallops; 1/2 shell mussels dressed with garlic butter or mornay sauce; smoked mussels; soused scallops; fresh fish; smoked fish. |
| Benefits | : | controls spoilage mechanisms and prolongs refrigerated shelf life; system reduces the need for severe treatment thus yielding improved flavour and texture; suitable for catering and retail packs. |

Modified atmosphere storage of retail packs of refrigerated fresh fish has proved successful in the United Kingdom, and to a small extent in Australia where it lags behind MA storage for fresh beef, lamb, pork and poultry in a rapidly growing market sector. The benefits of the system derive from the manipulation of the atmosphere in the pack so that the environment becomes unfavourable for the normal spoilage mechanisms to occur. MA storage is widely used for the storage and transport of fresh fruit and vegetables in bulk and in retail packs. Shown in Table 6 is a summary of the typical conditions used for the MA storage of selected commodities.

Table 6. Typical modified atmospheres for various commodities (from Wolf 1980)

| Commodity | Relative concentration of MA components# | | |
|---|---|---|---|
| | $O_2$ | $CO_2$ | CO |
| Meats, fish, poultry | High | High | - |
| Tomatoes, lettuce | Low | - | -* |
| Cauliflower, mushroom | Medium | Low | -* |
| Cantaloupe | Low | Medium | -* |
| Citrus (most) | Low | Medium | -* |
| Navel oranges | Medium | Low | -* |
| Strawberries | Medium | Medium | - |

\# Low = 0 - 10%
Medium = 10 - 20%
High = > 20%
Balance as $N_2$

* 5 - 10% recommended as beneficial

An interesting adaption of the MA system is used by one Australian seafood processor who uses a two part package. Fish portions are vacuum packed in an inner film of low gas and vapour permeability, and this package is placed in an outer thermoformed tray which is then heat sealed with an impermeable top web. Although this application is not stictly MA storage, imaginative use of vacuum packaging, thermoforming and heat sealing technology means that when stored frozen, the occurrence of freezer burn is prevented, while thaw drip is contained.

BOIL IN THE BAG SYSTEMS.

Table 7. Boil in the bag packaging systems for value-added mussel and scallop products

| | | |
|---|---|---|
| Products | : | mussel marinara and chowder. |
| Benefits | : | provides extended frozen shelf life of prepared ready to use product for caterers; convenient to use - can be reheated in boiling water while in package, or portions can be removed and heated as required. |

Boil in the bag systems are being used for meat casseroles and roasts which are partially cooked, filled hot, sealed and then cooled rapidly (to prevent microbial action by heat resistant spore forming bacteria which will survive the pasteurisation process) and stored refrigerated or frozen. After sealing the product contracts and draws a vacuum inside the pack, thus limiting the deleterious effects of oxygen. Extended shelf life is dependent upon strict control of storage temperature. Successful commercial applications are found in which refrigerated storage is suitable; however, the mussel marinara and chowder developed in this exercise are intended for frozen storage. In cases where the preliminary heating is controlled so that the product is only partially cooked, reheating prior to use completes the process. This means that foods using the boil in the bag system avoid the all too common fault found with institutional dishes, that is of being overcooked when served.

VACUUM PACKAGING WITH HEAT SHRINKABLE BAGS

Table 8. Vacuum packaged shrink bag systems for value-added mussel and scallop products

| | | |
|---|---|---|
| Products | : | battered and/or breaded mussels and scallops. |
| Benefits | : | provides extended frozen shelf life without dehydration; attractive package with good display characteristics; suitable for catering and retail outlets; convenient to use. |

The benefits of this system arise from the combination of vacuum packaging in a film of low moisture and gas permeability and frozen storage. Cryogenically frozen par-fried mussels and scallops were vacuum sealed in the bags which were then dipped in hot water (approx 90 °C) to toughen the film. Large and small catering outlets will find the system attractive as it is a simple matter to select bag capacity to suit individual requirements.

From a brief study of these applications, it is reasonable to expect that the benefits of modern packaging techniques which are extensively enjoyed by food processors, caterers and retailers around the world could likewise prove beneficial to Australian seafood processors and consumers.

# IMPORT COMPETITION, AND OPPORTUNITIES WITH LOCAL RAW MATERIALS.

by

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Traditionally, in common with other agriculture-based industries, the Australian Fishing Industry has been production, rather than consumer, oriented. In recent times, however, diminishing markets for meat, fruit and vegetables have served as catalysts for change in these industries, changes embracing the conversion of primary produce into value-added, further processed forms. Value-adding, as well as providing employment opportunities, is a source of added revenue for the processor, and fills the increasing consumer wants of greater variety and convenience.

The Australian Fishing Industry, by contrast, has barely embraced the concept of further-processing, particularly for domestic consumption. For example, while Australia has the expertise to export virtually its entire crop of abalone in canned form , an industry worth A$20+m, we also import, for domestic consumption more than A$ 50 m of canned fish. Processors will talk of lack of resource while fishermen will wax lyrical on the thousands of tonnes of pilchards in Port Phillip Bay which they would catch if only someone would buy at a stable price.

That a market for processed fish products exists in Australia is chillingly obvious; Australian Bureau of Statistics data for 1984-85 highlight the A$70m of "Prepared and Processed Fish" imported into this country, from caviar to fish balls to canned salmon. Another ABS category lists imported molluscs at almost A$7m.

It was against this background that the Food Technology Unit, RMIT sought Federal funding via the Fishing Industry Research Trust Account (FIRTA) to undertake research and development (R&D) into two Victorian products, scallops and mussels. Paradoxically, the scallop processors of Victoria have their own quaint way of value-adding, by simply soaking scallops so that the sell-weight is grossly inflated. As consumers know, the cook-weight is rapidly reduced as the scallops drop their added water during cooking. It is possible that soaking of scallops, except for sousing (pickling) will fall foul of Weights and Measures and we may, once more, be able to buy a succulent "dry" scallop.

A work programme since July, 1985 has been carried out along the following lines:

(i) An assessment of the current market for scallops and mussels in Victoria, both domestically-produced, and imported.

(ii) The development of a range of products likely to be utilised by the local Food Service Industry.

(iii) The "targeting" of imports most vulnerable to replacement by local processing.

(iv) The monitoring of quality of locally-produced and of imported products by consumer "shoot-outs".

The underlying long-term strategy was that more local produce could be processed in Victoria, and that mussel farmers could be able to utilise the proven proclivity of the Bay to enhance and develop their leases.

The current market for mussels (Table 1) has proved difficult to accurately assess, specifically because of the range of processed mussel products imported.

Table 1. The Victorian market for mussels.

| Format | Quantity (tonnes) |
|---|---|
| Dredged mussels | 900 |
| Cultured mussels | 250 |
| Tasmanian mussels | 15 |
| Imported processed mussels | 400* |

Thus, in the 1985 harvest of cultured mussels from the Bay, some 250t were marketed. The Bay also yielded some 900t of dredged mussels.

Data for imported mussels are scarce and the quantity of 400t has been converted from a weight of imported mussel meat of around 80t ( scale-up of 5:1 whole mussels:meat has been used). The range of imported products involves at least 27 product lines priced from $0.70 (Korean canned mussels) to $3.5(Canned mussels in the shell, from Holland).

In Table 2 an attempt has been made to evaluate the value of processed mussel imports.

Table 2. Imports of processed mussels into Victoria.

| Format | quantity (t) | total value ($) |
|---|---|---|
| Chilled meat (NZ) | 32 | 320,000 |
| Frozen meat (NZ) | 8 | 80,000 |
| Chilled halfshell (NZ) | 4 | 28,000 |
| Frozen halfshell (NZ) | 1 | 7,000 |
| Whole chilled (NZ) | 4 | 12,000 |
| Whole frozen (NZ) | 1 | 3,000 |
| Smoked canned (JW brand) | 24 | 250,000 |
| Smoked canned (Seakist) | 20 | 150,000 |
| Smoked canned (Admiral) | 0.4 | 4,000 |
| Soused | 2 | 11,000 |
| Bottled (Denmark) | 10 | 60,000 |
| | | $920,000 |

It must be emphasised that the data in Table 2 are probably gross underestimations of the range and scale of importation. The data were gained by telephone enquiries from importers several of whom were, understandably, loth to part with information regarding their livelihood.

Of obvious importance, however, is the impact made by NZ mussel meat in a variety of forms. Barely 10 years old, the NZ mussel industry based mainly in the Marlborough Sounds of the the South Island has grown to an export size of 1910 t ( A$ 10.5 ) by the end of 1984 with exports to Australia of 348t (A$1.4m).

In the early stages of the current R&D work a common statement was that "NZ mussels are better quality than Victorian" (a statement applied equally to both dredged and cultured mussels). Clearly, if this statement had any factual basis, then the local industry would be at a devastating disadvantage. A series of taste panels were therefore set-up in which 50 consumers were invited to lunches in which mussels were the menu. Panelists sat down to three lunches in the RMIT bistro, each lunch comprising two plates of basically the same meal, except one plate had NZ mussels and the other local mussels, For each meal both NZ greenlips and local blue mussels were "disguised" so that no visual identification were possible. Thus, mussel marinara, battered mussels and mussel vol au vent were on the menu and consumers were asked to state a preference.

In all cases (Table 3) consumers expressed a solid preference for local mussels. Positive attributes for local mussels were "delicate flavour", "tender texture". NZ mussels, by difference, were assessed as "tougher, more rubbery" than local. It should be emphasised that, to be absolutely fair to the NZ greenlip chilled local meat was aged in the refrigerator so that it was the same age as the import. Naturally, local mussels have a great freshness advantage over the imported competitor.

Table 3. Consumer preferences for local and NZ mussels.

| Mussel dish | % preference | |
|---|---|---|
| | Victorian | NZ |
| Battered, deepfried | 59 | 41 |
| Mussel marinara | 67 | 33 |
| Vol au vent in white sauce | 74 | 26 |

In another taste panel"shoot out" canned smoked mussels from Korea (Admiral brand marketed by Riviana Australia Pty Ltd) were compared with samples processed locally. Of 37 consumers 24 (65%) were able to correctly pick a difference, but preferences were equally divided between import and local product.

Thus, product "shoot-outs" unambiguously monitor consumer preferences and negate industry comment about imports having "higher quality" than local material. In reality, such comments often reflect quality to the importer, which invariably means factors such as consistency, continuity of supply and a stable (not necessarily cheap) price.

The results of the present work provide great encouragement for local mussel growers - they have a product considered superior by consumers.

Targeting of imports vulnerable to local competition revealed two categories of imports:

Category 1: Standard wholesale and retail lines produced for the bottom end (low price/high volume) market e.g. John West smoked mussels, Admiral smoked mussels, Seakist smoked mussels, Frionor seafood kebabs and crumbed frozen scallops.

Category 2: Up-market gourmet products which are highly (if not over-) priced, and are distributed typically through specialty outlets. These products are aimed at the more discerning consumer with a greater disposable income e.g. mussel hors d'ouveres, mussel salade a la catalane (Marina Danish Seafood Co. Denmark).

A total of 5 scallop imports and 27 mussel imports comprise the above categories; can any be targeted for replacement?
A series of cost analyses involving raw material and ingredient costs, processing costs, manufacturing and retail margin costs has been carried out. It is improbable, given present import prices, that the local industry could compete with Category 1 imports. For example, local mussels would retail at approximately $1.67/100g can compared with Korean mussels (Admiral brand) retailing at $0.67. The Korean import has radically lower processing costs, and, even if local mussels were supplied gratis it is unlikely that the empty can could reach the supermarket shelves at much cheaper than $0.67!

For Category 2 products, however, the outlook is much brighter. For example, a scallop pate manufactured locally could retail at $1.50/100g compared with the NZ Lochland brand which retails at $3.65/100g.

An alternative to the "me-too" marketing approach is that of "gap analysis". This involves scanning the market for areas which are not presently serviced and targeting product development accordingly. In Australia, in general, and Victoria in particular, there is a continuing trend towards meals consumed away from home. As a result the Food Service Industry (Mr. Keating notwithstanding!) is an expanding one, and should be viewed as a large and lucrative market for pre-prepared/processed seafoods.

During 1985 the Food Technology Unit, RMIT developed a range of mussel and scallop products targeted at the Food Service sector:-

Mussel marinara
Mussel chowder
Mussel salade - marinade
Mussel mornay
Mussels in garlic butter
Mussel pate
Mussels smoked
Mussels soused (pickled)

Scallop bisque
Scallop pate
Scallops battered and breaded
Scallops pickled
Scallop and mussel kebabs

A "test-kit" in which the full range of products packaged for Food Service use was distributed to more than 20 operations, from restaurants serving the middle and upper-middle market segment, to large-scale caterers e.g. Dennis Catering.

Based on their responses a nucleus of products was selected for further development. These products, in a range of packaging formats, will be presented for your evaluation today. Preliminary costings indicate that all products could provide suitable margins both for processors and Food Service proprietors.

It must be emphasised, however, that costs of locally-produced mussel meat are high; chilled mussel meat from NZ can be purchased for A$5.0/kg compared with prices for local product of close to A$10.0/kg. So far, the local industry has serviced the restaurant trade, and the price has been a reflection of what that trade can afford. In order to compete with imports the local culture industry will be required:

(i) To radically increase the volume of production.

(ii) To rationalise the pricing structure of mussels so that a component of the harvest is sold at a "processing price", such a price differential is commonplace in other farming industries e.g. liquid milk.

In summary, the local market for mussels is considerable, as is the interstate market. At present, both markets have a sizeable import component. The keys to development of the local mussel culture industry are:

(i) The replacement of imports with locally-processed products.

(ii) The use of product development to broach the retail and food service trades.