93/161

FINAL REPORT

OF

THE MARKETING AND TRANSPORTING OF LIVE SCALLOPS

PROJECT NUMBER : 93/161

TASMANIAN SCALLOPS PTY LTD

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NON-TECHNICAL SUMMARY

The demand for live scallop is quite strong. The main customer of live scallop is restaurants. Restaurants require the freshness to attract their customer. Live scallop is good to impress the freshness. The freshness is the key word to add value to scallop product.

The freshness of live scallop is indicated by the mortality. The company examined the effect of air exposure on mortality that arises from transporting. The company developed the means of maintaining live scallop condition through the result of examination. The company introduced sea water cooling system for on-shore storage.

Cultured scallop is attached by oyster, mussel, sea squirt and other marine life. It needs cleaning. The company used to do this by hand. The company introduced the shell cleaning machine. Economical advantage was tested by comparison between hand cleaning and machine cleaning.

When transporting live scallop, insulation and keeping cool are important factor. The best combination of packing material is verified by examination.

Scallop live market is still embryonic. The company requested the University of Tasmania to study overseas and domestic live scallop market. The company framed a marketing strategy through that study.

BACKGROUND

PROGRESS IN SCALLOP AQUACULTURE

In 1967, D.C.Wolfe and J.F.Grant deployed spat collectors in Promise Bay on Tasmania's east coast. Although this work continued until 1973, no attempt was made to increase the scale of the work.

From 1982-1986, spat collectors were deployed at various sites in Great Oyster Bay and at Darlington on Maria Island and Birches Bay in the D'Entrecasteaux Channel.

A F.I.R.T.A. funded research project from 1984-1987 sought to produce large batches of scallop spat in commercial oyster hatcheries, to compare intermediate culture methods and to establish large scale beds of hatchery produced juvenile scallops. Some 2,000 scallop juveniles were reseeded in the first experiments in Promise Bay in the north-east of Great Oyster Bay. Survival within a fenced area was 20% at 28 months. This study indicated that reseeding was a possibility in Great Oyster Bay.

In 1987, the Overseas Fishery Cooperation Foundation of Japan and the Tasmanian Department of Sea Fisheries began a three year project, the Scallop Enhancement Research Project. In 1990 the project name was altered to the Scallop Enhancement Project to indicate that the project had entered the pilot commercial phase.

In 1991/92 the project collected 30 million spat, reseeded 11 million juveniles and hanged 7.2 million scallops.

Tasmanian Scallops Pty Ltd was established in 1989 for the purpose of commercialising the Scallop Enhancement Project. Tasmanian Scallops Pty Ltd inherited all technical knowledge from the project. The company still require more knowledge, especially marketing and processing.

PRESENT MARKETING SITUATION

The wild fishery has not returned in Tasmania despite optimism among managers and fishermen. However in Bass Strait, a large bed of commercial scallop of 60-70 meats per kilo is causing Tasmanian Scallop Pty Ltd difficulty in marketing reseeded scallops as fresh meat at a profitable sale price through the traditional distribution channels. The company does not wish to compete in the same market as the wild fishery.

In so far as Tasmanian consumers are concerned, a 1992 survey carried out by students at the University of Tasmania showed that thirty per cent of the survey participants purchased scallop for their latest seafood meal. This indicates the importance of scallop in the local seafood preference.

It is possible to look at numerous "value adding" approaches to scallop marketing, the underlying criteria is the key price factor. The key price factor is that which is a combination of the desire to purchase on the part of the consumer and the fishing industry supply price competitiveness. To achieve a value added product, large fish production, superior packing presentation, marketing etc have to be taken to account. Given the key price factor, to recover such additional costs is difficult to contemplate in these economic times.

The company offered live scallops to a number of potential customers and it was quickly found that there was a substantial market potential and that the selling proceeds were in keeping with "value added" returns.

It is seen that a substantial value added market for live scallops can be developed in Australia and the Asian area. This will reduce competition with existing wild scallop fisheries. The company will need to do its own research in Asian countries to ensure that it best fulfils local requirement and uses the best channel of distribution systems.

If the company can achieve the right technologies of handling, cleaning, packaging so it has the desired product, then further markets can be developed both domestically and internationally.

OBJECTIVES

The objectives of the project are briefly described as:

(1) To develop the means of maintaining live scallop condition.

(2) To develop mechanical shell cleaning system for live scallops.

(3) To develop a packaging and temperature maintenance system that will ensure the best condition and live viability of scallops during the freight and distribution stage.

(4) To prepare a comprehensive marketing plan to cover both domestic and export market. From this marketing plan, develop a business strategy for servicing new markets and the ongoing service of current embryonic market.

INTRODUCTORY TECHNICAL INFORMATION

MAINTAINING LIVE SCALLOP CONDITION

It is apparent that when consumers purchase live fish, at a premium, they expect to attain maximum longevity of the fish and the retention of condition. It has been found that customers vary greatly in the methods in which they handle the live fish on receipt. Obviously the supplier cannot be responsible for ill treatment of product, however, a specification for the conditions for the storage of live fish is a necessity. The company must first ensure that overall condition of the fish at the time of packing and dispatch must always be of a constant standard and research and development is required to achieve this objective. As well the company should advise suppliers of the best methods of storage and handling to ensure the final consumer receives the best possible product.

MECHANICAL SHELL CLEANING SYSTEM

Where reseeded scallops are grown in a natural habitat on the sea bed, the shell condition is clean, as pertaining to natural scallops. Where scallops are grown in a hanging culture long line mode, shells are encrusted with substantial, but varying, marine growths. It is very apparent that when live scallops are supplied to the market and presented to consumers, cooked in the shell, the shell condition takes on greater importance. The shells of hanging cultured scallops need to be cleaned before shipment as live scallop.

PACKAGING AND TEMPERATURE MAINTENANCE SYSTEM

To date, the company has dispatched live scallops to Australian east coast capital cities with reasonable fish survival rates. However, more efficient and cost effective methods of packaging and presentation are required to ensure they always arrive in good condition.

MARKETING

Live scallop market have been tentatively developed in Tasmania, Melbourne, Sydney, Queensland and trial shipments have been undertaken to Singapore, Indonesia and in particular, Hong Kong and Taiwan. This is an important market as it does not put the company into direct competition with wild scallop fishermen. The company considers that the sales achieved to date are simply a mean indicator of a substantial, but exacting local market requirement. Better research and an understanding of the needs and perceptions of sub-groups in the domestic market would assist the company solve many of the initial problems it has encountered in building this market to date. Even greater difficulties have been encountered in consideration of the export market. There is very ample evidence of a substantial export market, with Asian importers visiting the company to study the supply potential. The company will need to do its own research in these countries.

THE RESEARCH METHODOLOGY

MAINTAINING LIVE SCALLOP CONDITION

The live scallop's mortality is very important for customers. Live scallops are exposed to the air in boxes during transport. The company should know the effect of air exposure on mortality. In general, chilling is effective for keep freshness. Chilling also could affect the mortality of live scallop. The company experimented the survival of scallops exposed to the air. The data obtained from the experiment on the survival of scallops is used to determine the most suitable means of transporting live scallops. The method of experiment is as below.

Harvest a sufficient number of live scallops, which will be kept fresh and alive in sea water and collect the normal shaped scallops as samples for the experiments. Half of sample are chilled. Chilled and un-chilled scallops were packed in polystyrene boxes. Certain number of scallops were picked up after various hours and moved into normal sea water. The scallops were checked to see if they were alive or dead several hours after moving.

MECHANICAL SHELL CLEANING SYSTEM

Shell cleaning operation is essential before shipment of hanging cultured scallop. Hand cleaning required a lot of labour. Mechanisation would reduce labour cost. The company introduced shell cleaning machine from Japan. It was checked that the Japanese machine was able to used for commercial scallop. The speed of machine cleaning was compared with hand cleaning. The breakage rate was also checked. We examined the mortality after cleaning. The data obtained is used to recognise the advantage of mechanisation.

PACKAGING AND TEMPERATURE MAINTENANCE SYSTEM

The company introduced sea water cooling system and packaging condition monitoring equipment to control water temperature in preconditioning tanks. This equipment gave effect to use on the result of this research.

Packing materials already exist. The best combination of packing material should be found. The company examined survival for each combination of packing material. The data from these experiments is used to evaluate the efficiency of existing packing materials. This establishes a standard of packing necessary for each market. The experiment carried out as below.

Harvest a sufficient number of live scallops, which was kept fresh and alive in sea water filled containers and collect the necessary number of normal shaped scallops as samples for the experiments. Samples was chilled down to predetermined temperatures in chilled sea water. Samples then packed with different combination of materials. The samples moved into normal sea water at regular intervals. The samples were checked to see if they were alive or dead at regular intervals.

MARKETING

A study undertaken by the University of Tasmania marketing team, that will cover retail and food service customers in key potential markets for live scallops. The study would undertake a program of investigation in each of the key specific markets, conducting in depth interviews with key operators including buyers, chefs, retailers, distributors, etc.

The company's own personnel and, where needed, an expert in regional markets visited potential Asia importers; report of these visits was analysed by the University team and an overseas marketing plan formulated.

From the results obtained and the company's own research, the University of Tasmania team prepared an analytical report and market plan and strategies.

The University team evaluated the company's performance and modify marketing strategy plan as required.

RESULTS

MAINTAINING SCALLOP LIVE CONDITION

The technical report of experiments into the survival of scallops exposed to the air was issued on 31 November 1994. The details of material, method for each experiment is described in the technical report.

Experiment 1 (change of temperature in the polystyrene box)

Date	Time	Inside Temp. (°C)	Outside Temp. (°C)	Water Temp. (°C)	Date	Time	Inside Temp. (°C)	Outside Temp. (°C)	Water Temp. (°C)
1994					1994				
26 Oct.	11:30	Chill & Pack			27 Oct.	00:30	13.7		
	12;00		18.5	15.5		01:30	13.6		
	14:30	16.7	20.3	15.8		02:30	13.5		
	15:30	17				03:30	13.4		
	16:30	17.1				04:30	13.1		
	9 17:30	16.6	17.5	16		05:30	13	12.5	15.8
	18:30	15.9				06:30	12.6		
	19:30	15				07:30	12.3		
	20:30	14.5	13.2	16		08:30	13.1	14	15.9
	21:30	14.3				09:30	13.8		
	22:30	14.1				10:30	15		
	23:30	13.9	13.4	16		11:20	15.3		
						11:30		17	16.5

Experiment 2 (no exposed to the air)

Date Time	Chilled				Un-chilled				Water Temp. °C	Air Temp °C
	Live		Dead		Live		Dead			
	Number	%	Number	%	Number	%	Number	%		
26 Oct.1994										
11:30	Chill &Pack				Pack					
12:00	Remove into sea water				Remove into sea water				15.5	18.5
14:30	25	100	0	0	25	100	0	0	15.8	20.3
17:30	25	100	0	0	25	100	0	0	16	17.5
20:30	25	100	0	0	25	100	0	0	16	13.2
23:30	25	100	0	0	25	100	0	0	16	13.4
27 Oct.1994										
05:30	25	100	0	0	25	100	0	0	15.8	12.5
08:30	25	100	0	0	25	100	0	0	15.9	14
11:30	25	100	0	0	25	100	0	0	16.5	17
14:30	25	100	0	0	24	96	1	4	17.1	20.7
17:30	25	100	0	0	24	96	1	4	17.8	16.3
20:30	25	100	0	0	24	96	1	4	17	12.2
23:30	25	100	0	0	24	96	1	4	16.7	11.9
28 Oct.1994										
02:30	25	100	0	0	24	96	1	4	16.5	11.9
05:30	25	100	0	0	24	96	1	4	16.3	11.2
08:30	25	100	0	0	24	96	1	4	16.5	10.7
11:30	25	100	0	0	24	96	1	4	16.2	18.2
14:30	25	100	0	0	24	96	1	4	16.3	16.8
15:50	25	100	0	0	24	96	1	4	16.4	13.2

Experiment 3 (6 hours exposed to the air)

Date Time	Chilled				Un-chilled				Water Temp. °C	Air Temp °C
	Live		Dead		Live		Dead			
	Number	%	Number	%	Number	%	Number	%		
26 Oct.1994										
11:30	Chill & Pack				Pack					
12:00									15.5	18.5
14:30									15.8	20.3
17:30	Remove into sea water				Remove into sea water				16	17.5
20:30	25	100	0	0	25	100	0	0	16	13.2
23:30	25	100	0	0	24	100	1	4	16	13.4
27 Oct.1994										
05:30	25	100	0	0	24	100	1	4	15.8	12.5
08:30	25	100	0	0	24	100	1	4	15.9	14
11:30	25	100	0	0	24	100	1	4	16.5	17
14:30	24	96	1	4	24	96	1	4	17.1	20.7
17:30	24	96	1	4	24	96	1	4	17.8	16.3
20:30	23	92	2	8	24	96	1	4	17	12.2
23:30	23	92	2	8	24	96	1	4	16.7	11.9
28 Oct.1994										
02:30	23	92	2	8	24	96	1	4	16.5	11.9
05:30	23	92	2	8	23	92	2	8	16.3	11.2
08:30	23	92	2	8	23	92	2	8	16.5	10.7
11:30	23	92	2	8	23	92	2	8	16.2	18.2
14:30	23	92	2	8	23	92	2	8	16.3	16.8
15:50	23	92	2	8	23	92	2	8	16.4	13.2

Experiment 4 (12 hours exposed to the air)

Date Time	Chilled				Un-chilled				Water Temp. °C	Air Temp °C
	Live		Dead		Live		Dead			
	Number	%	Number	%	Number	%	Number	%		
26 Oct.1994										
11:30	Chill & Pack				Pack					
12:00									15.5	18.5
14:30									15.8	20.3
17:30									16	17.5
20:30									16	13.2
23:30	Remove into sea water				Remove into sea water				16	13.4
27 Oct.1994										
05:30	24	96	1	4	24	96	1	4	15.8	12.5
08:30	24	96	1	4	24	96	1	4	15.9	14
11:30	24	96	1	4	24	96	1	4	16.5	17
14:30	24	96	1	4	24	96	1	4	17.1	20.7
17:30	24	96	1	4	24	96	1	4	17.8	16.3
20:30	24	96	1	4	24	96	1	4	17	12.2
23:30	24	96	1	4	23	92	2	8	16.7	11.9
28 Oct.1994										
02:30	23	92	2	8	23	92	2	8	16.5	11.9
05:30	23	92	2	8	22	88	3	12	16.3	11.2
08:30	23	92	2	8	21	84	4	16	16.5	10.7
11:30	23	92	2	8	20	80	5	20	16.2	18.2
14:30	23	92	2	8	20	80	5	20	16.3	16.8
15:50	23	92	2	8	20	80	5	20	16.4	13.2

Experiment 5 (18 hours exposed in the air)

Date Time	Chilled				Un-chilled				Water Temp. °C	Air Temp.° C
	Live		Dead		Live		Dead			
	Number	%	Number	%	Number	%	Number	%		
26 Oct.1994										
11:30	Chill & Pack				Pack					
12:00									15.5	18.5
14:30									15.8	20.3
17:30									16	17.5
20:30									16	13.2
23:30									16	13.4
27 Oct.1994										
05:30	Remove into sea water				Remove into sea water				15.8	12.5
08:30	25	96	0	4	25	96	0	0	15.9	14
11:30	25	96	0	4	24	96	1	4	16.5	17
14:30	24	96	1	4	24	96	1	4	17.1	20.7
17:30	24	96	1	4	23	92	2	8	17.8	16.3
20:30	24	96	1	4	22	88	3	12	17	12.2
23:30	23	96	2	4	20	80	5	20	16.7	11.9
28 Oct.1994										
02:30	23	92	2	8	19	76	6	24	16.5	11.9
05:30	23	92	2	8	18	72	7	28	16.3	11.2
08:30	22	88	3	12	16	64	9	36	16.5	10.7
11:30	20	80	5	20	15	60	10	40	16.2	18.2
14:30	19	76	6	24	13	52	12	48	16.3	16.8
15:50	18	72	7	28	13	52	12	48	16.4	13.2

Experiment 6 (24 hours exposed to the air)

Date Time	Chilled				Un-chilled				Water Temp. °C	Air Temp °C
	Live		Dead		Live		Dead			
	Number	%	Number	%	Number	%	Number	%		
26 Oct.1994										
11:30	Chill & Pack				Pack					
12:00									15.5	18.5
14:30									15.8	20.3
17:30									16	17.5
20:30									16	13.2
23:30									16	13.4
27 Oct.										
05:30									15.8	12.5
08:30									15.9	14
11:30	Remove into sea water				Remove into sea water				16.5	17
14:30	25	100	0	0	23	92	2	8	17.1	20.7
17:30	22	88	3	12	22	88	3	12	17.8	16.3
20:30	21	84	4	16	19	76	9	36	17	12.2
23:30	20	80	5	20	15	60	10	40	16.7	11.9
28 Oct.										
02:30	19	76	6	24	12	48	13	52	16.5	11.9
05:30	17	68	8	32	9	36	16	64	16.3	11.2
08:30	15	60	10	40	6	24	19	76	16.5	10.7
11:30	14	56	11	44	4	16	21	84	16.2	18.2
14:30	12	48	13	52	3	12	22	88	16.3	16.8
15:50	11	44	14	56	3	12	22	88	16.4	13.2

MECHANICAL SHELL CLEANING SYSTEM

Purchasing of shell cleaning machine completed on 19 September 1994. The technical report of experiments in development shell cleaning machine for live scallops was issued on 31 March 1995. The details of material, method for each experiment is described in the technical report.

Experiment 1 (machine cleaning)

	Time	Weight	Number of scallop	Weight per scallop
Start	13:36	37.5 kg	500	75g
End	14:03	27.5 kg	422	65g

Speed 27 minutes/500scallops=3.24 seconds per scallop
Breakage rate 78 broken scallop / 500 scallops = 15.6 %
Cleaning cost $10.79*(27minutes/60 minutes)/422 scallops = $0.0115 per cleaned scallop

Experiment 2 (hand cleaning)

	Time	Weight	Number of scallop	Weight per scallop
Start	14:30	37.2 kg	500	74g
End	15:15	29.0 kg	480	60g

Speed 45 minutes/500scallops=5.40 seconds per scallop
Breakage rate 20 broken scallop / 500 scallops = 4 %
Cleaning cost $10.79*(45minutes/60 minutes)/480 scallop = $0.0169 per cleaned scallop

Experiment 3 (survival of cleaned scallop)

Date Time	Cleaned				Un-cleaned				Water Temp. °C	Air Temp °C
	Live		Dead		Live		Dead			
	Number	%	Number	%	Number	%	Number	%		
29 Mar.1995										
08:00	Clean & pack				Pack				14.2	13.6
14:00	Move into sea water				Move into sea water					
14:00	50	100	0	0	50	100	0	0	14	13
19:50	41	82	9	18	46	92	4	8	13.3	11.4
30 Mar.1995										
01:45	31	62	19	38	39	78	11	22	12.6	10
07:55	27	54	23	46	37	74	13	26	14.3	9

PACKAGING AND TEMPERATURE MAINTENANCE SYSTEM

Purchasing of preconditioning tanks and salt water cooling system completed on 31 March 1995. Purchasing packaging condition monitoring equipment completed on 15 November 1994. The technical report of experiments into developing methods of packaging for transport of live scallops was issued on 31 March 1995. The details of date, material and method were stated in the technical report.

Experiment 1 (compare insulation between polystyrene and aluminium coated cardboard)

Date Time	Inside Temperature(°C) Polystyrene	Aluminium	Air Temp. (°C)	Date Time	Inside Temperature(°C) Polystyrene	Aluminium	Air Temp. (°C)
29 July 1994				17:00	4	10.4	20.5
09:57	Put 7 kg ice in box			17:35	4.1	10.4	20.5
10:00	4.5	11.6	20.5	30 July 1994			
10:30	4	9	20	09:30	5.5	11	20
11:00	4	9	20.1	11:00	6	11.4	20.5
11:30	3.5	9.5	20.1	12:00	6	11.5	21
12:00	3.6	9.5	20.2	13:00	6	11.5	21
12:30	3.6	9.5	20.2	14:00	6.3	11.7	21
13:00	3.7	0.5	20.2	15:00	6.3	11.7	21
14:00	3.9	9.9	20.2	16:00	6.5	11.7	21
15:00	4	101	20.5	17:00	6.5	12.2	21
16:00	4	10.4	20.5	Ice weight	3,555 g	79 g	

Experiment 2 (one plastic bag in polystyrene box)

Date Time	Lot 1 (16 hours exposed) Number Live	Dead	Mortality %	Lot 2 (21 hours exposed) Number Live	Dead	Mortality %	Lot 3 (25 hours exposed) Number Live	Dead	Mortality %	Inside Temp °C	Air Temp °C
19 Nov 1994											
16:12	Chill			Chill			Chill				
16:14	Pack			Pack			Pack				16.1
20 Nov 1994											
08:05	Move to sea water									13.7	15.9
13:38				Move to sea water						15	16.7
17:22							Move to sea water			16.9	16.9
21 Nov 1994											
18:15	14	11	44%	3	22	88%	2	87	98%		
22 Nov 1994											
17:55	11	14	56%	0	25	100%	0	89	100%		

Experiment 3 (one plastic bag and four sponge sheets in polystyrene box)

Date Time (1994)	Lot 1 (15hours exposed)			Lot 2 (21 hours exposed)			Lot 3 (25.5 hours exposed)			Inside Temp °C	Air Temp °C
	Number		Mortality	Number		Mortality	Number		Mortality		
	Live	Dead	%	Live	Dead	%	Live	Dead	%		
19 Nov 1994											
16:51	Chill			Chill			Chill				
16:55	Pack			Pack			Pack				17.2
20 Nov 1994											
08:16	Move to sea water									12.3	15.4
13:45				Move to sea water						13.8	16.8
17:31							Move to sea water			15.7	17.2
21 Nov 1994											
18:55	21	4	16%	17	8	32%	34	52	60%		
22 Nov 1994											
17:55	19	6	24%	11	14	56%	15	71	83%		

Experiment 4 (one plastic bag, one sponge sheet, one cooling gel pack in polystyrene box)

Date Time (1994)	Lot 1 (15.5hours exposed)			Lot 2 (21 hours exposed)			Lot 3 (24.5 hours exposed)			Inside Temp °C	Air Temp °C
	Number		Mortality	Number		Mortality	Number		Mortality		
	Live	Dead	%	Live	Dead	%	Live	Dead	%		
19 Nov 1994											
17:06	Chill			Chill			Chill				
17:08	Pack			Pack			Pack				17.2
20 Nov 1994											
08:26	Move to sea water									7.7	15.6
13:53				Move to sea water						9.9	18.2
17:39							Move to sea water			13.7	17.5
21 Nov 1994											
19:10	18	7	28%	15	10	40%	46	38	45%		
22 Nov 1994											
18:10	17	8	32%	14	11	44%	28	56	67%		

Experiment 5 (one plastic bag, four sponge sheets, one cooling pack in polystyrene box)

Date Time (1994)	Lot 1 (15hours exposed)			Lot 2 (21 hours exposed)			Lot 3 (24.5 hours exposed)			Inside Temp °C	Air Temp °C
	Number		Mortality %	Number		Mortality %	Number		Mortality %		
	Live	Dead		Live	Dead		Live	Dead			
19 Nov 1994											
17:20	Chill			Chill			Chill				
17:22	Pack			Pack			Pack				17.4
20 Nov 1994											
08:36	Move to sea water									7.6	15.2
14:02				Move to sea water						9.6	18.1
17:48							Move to sea water			12.2	17.7
21 Nov 1994											
19:20	19	5	21%	15	10	40%	44	43	49%		
22 Nov 1994											
18:10	19	5	21%	13	12	48%	36	51	59%		

Experiment 6 (one plastic bag, eight sponge sheets, 1.5 kg ice in polystyrene box)

Date Time (1994)	Upper layer in box			Lower layer in box			Air Temp °C
	Number		Mortality %	Number		Mortality %	
	Live	Dead		Live	Dead		
23 Nov 1994							
06:33	Chill			Chill			
06:35	Pack			Pack			6.5
24 Nov 1994							
07:26	Move to sea water			Move to sea water			
25 Nov 1994							
07:35	81	38	32%	55	26	32%	
26 Nov 1994							
07:35	49	70	59%	28	53	65%	

MARKETING

The marketing strategy plan was issued on 31 March 1995. Details of objectives, method were described in the marketing strategy plan. The analysis of target customers are as below.

(1) Tasmania

Tasmania were traditional scallop eaters until the recent depletion of the wild fishery stock. There remain considerable interest in scallops and the community in general has shown considerable support to the company in setting up a scallop husbandry fishery. This market is seen as a traditional roe on meat market, with little interest in live in the shell scallops. Some interest has been shown from the better restaurants and international hotels in the state, with a growing sub market in catering to international visitors. Tour groups from Singapore are becoming more popular and a major attraction to these visitors is the fresh local seafood. Tasmania hopes to attract additional direct flight and participate more directly in packaged Asian tour growth.

The market research report "An Analysis of Scallop Market in the Southern Tasmania region" clearly showed strong differences in perceptions between Tasmanians and mainland Australia with regard to scallops. The report also clearly shows, that scallops are price elastic, with both total revenue and marginal revenue increasing as the price was lowered. Caution must be taken in reading these results as when the report was undertaken scallops were very scarce and husbanded scallops were a novelty commanding a premium. Parallel with the experience of the salmon industry may be drawn and any marketing must take into account the effects of production increases.

(2) Melbourne

Victoria is the closest state to Tasmania in proximity and the major traditional market for the state's primary products. Victorian tastes in seafood are very similar to Tasmania as they share common fishing grounds. Victoria still has a 'wild' scallops fishery in Bass Strait centred on Lakes Entrance and occasional fishery in Port Philip Bay.

In Melbourne the two main distributors for the company, have good salt water tank set up for handling live product, mainly lobster and abalone. Product delivered into Melbourne live by Tasmania scallops though, is rarely kept in their tanks, but delivered direct to customers. Orders received from these distributors therefore reflects actual ordering requirements of their clients. The handling processes of these clients were examined in the 1994 report "Report on Qualitative Market Research for Live Scallops into Australian and Overseas Markets".

Both these clients deal mainly live scallops, with some interest in half shell. The chief outlets for both are Chinatown and Chinese restaurants, while some interest has been received from the four and five star hotels and some of the seafood restaurants, especially for half shell, very low penetration has been achieved in these markets to date.

The company has dealt with a variety of other distributors in Melbourne, but it feels it is best to concentrate on supplying two main distributors. Considerable problems arose in the

past, with distributors having overlapping constituencies resulting in price cutting and a cheapened image for the company.

The two current distributors expressed general satisfaction with the company, but do have problems with constant supply and quality. Both feel the market has considerable potential and will grow at a steady rate if the company can guarantee these two factors.

The supply and quality problems the company faces in this and other markets can be attributed to the varying methods of cultivation used by the company, current stock size and levels among the different methods and the weather conditions prevailing on and given day. The distributors are aware of some of these problems and are prepared to give the company some leeway in the matter.

Handling and distribution procedure through the Melbourne Fish Market was investigated. As the company plan calls for a considerable increase in production over the next five years, it is important to be familiar with the existing distribution chain for seafood. The generic nature of fish auctions and handling procedures through the market do not lend themselves to creating a quality image. If the company wishes to have any profile in this market, the packing and image of the company must be clearly established first. If this is not done scallops will be seen as generic and the company will have little control over the prices they receive. There was little knowledge of the company among the dealers in this market.

Distribution through the supermarket has also been considered by the company. This has been found to be very price sensitive. In an experiment in a Safeway supermarket clean split scallops were placed side by side with scallops from the company containing 20% added water and offered at a 20% discount price. The scallops were clearly labelled and the "wet" scallops outsold the "dry" scallops nine to one. The practise of soaking scallops and including water based preservatives has been common practise in the generic scallop market for some time and will not be easily overcome. Victorian supermarket, however, are now operating chilled display areas of packaged seafood. A well packaged and branded product would probably find a position in this section. Other select supermarket and food outlets are following the Daimaru examples and providing a live shellfish section, this will provide an opportunity for the company's live in the shell product.

Victorian is a roe on a market, there was little discussion of roeless scallops and there appeared to be a low penetration of the roeless West Australia and Queensland Saucer scallops. Most people in the industry knew of "Coffin Bay" half shell scallops, which has a special market niche and "Streaky Bay" scallops considered on a par or not as desirable as Tasmanian Scallops product. These scallops were from S.A.. but the dive was currently closed, so there was no product on offer, this dive is experiencing a dino flagellate problem. There were some offering of the local Lakes Entrance scallops, these scallops do not appear to differ much in appearance from Tasmanian scallops and the split meat product was selling for a comparable price. This appears to be the first year fisherman have successfully controlled their catch and been able to maintain prices. There was no mention of any Port Philip Bay scallops and the fishery remain closed. What information exists on the fishery points to the scallops being too small to maintain a commercial opening this year.

Victorian 'wild' dredged scallops. that are purged in tanks may be seen as an alternative to the company's live in the shell husbanded scallop, but the practise was not observed.

(3) Sydney

Sydney is the country's largest seafood market, with a high per head seafood consumption and has well developed seafood infrastructure and distribution system. The fish market and auction system is extensive and handles more than twice the volume of the Melbourne market.

The bulk of the company's product in this market is handled by agents operating out of the fish markets in contrast to Melbourne, where agents are geographically dispersed. The agents in Sydney have extensive links through most states and many operate in another city as well as Sydney.

The company has several agents operating in Sydney and while some overlap does occur there is more specialisation and segmentation in this market. The main segments of interest to the company at present, are the live scallop market which is concentrated on Chinatown and the half shell market for restaurant and the retail trade. Live shipment have not increased at the pace expected, but the market for half shell showed strong growth.

From interviews and the response to surveys the agents handling live product were happy with the quality of the company product and feel the market will grown in time, with the gradual acceptance of live scallops and the availability of supply. They all see the market for live scallops remaining concentrated on ethnic Asian restaurants, in particular Chinese, with limited potential outside this area. Their main concerns are reliable deliveries, consistent size and quality, a guaranteed supply and a stable price. They appeared happy with current packaging and consignment arrangements and this result was supported in the survey. Some concern was expressed about mortality, but they were aware the Company was currently working on this problem and expect to see some improvements.

None of the current agents have tanks where they can stock live product and shipments are broken into client orders at the airport and delivered directly or the packs are taken back to the market and broken into job lots and then delivered. One agents regularly orders more than current client orders and keeps live scallops in cool store in order to meet more spontaneous demand.

There is currently a good supply of cheaply priced saucer scallops on the market, but these are not considered a good substitute for the live market. There were some local Jarvis Bay live scallops in the market caught from the wild fishery and purged, some of the market operators were featuring salt water tanks with these scallops purging. The supply of these scallops is erratic and not expected to be a major supply.

The half shell market is showing strong growth and interest. Restaurants are willing to include scallops on their menus if they can be guaranteed a regular supply, consistent size and quality and the price fixed for a certain period. This market is more competitive, with the current market members competing amongst one another for the same customer base. Price is likely to be more important in this market, but there is a greater demand for product.

Queensland saucer scallops were plentiful and cheap, presentation and quality varied considerably and all were roe off. There were also some Streaky Bay scallops from South Australia, these were poorly presented and visually unattractive. They were probably frozen

and thawed. The Jarvis Bay scallops on display were well presented and the quality matched the company's product, it was similarly priced.

There is a large demand for split scallop meat in the Sydney area and there was considerable interest in the Company's potential to supply. This market primarily requires a roe off product, though there was some interest in roe on. As was stated in the McKinna report the market is very generic with Tasmanian scallops being a generic name for all split scallops, there has been some improvement in labelling since then with Victoria and New Zealand scallops being marketed under their source name.

Frozen Japanese and Asian scallops were not observed to be plentiful but there was no mention of any shortage of supply and block frozen and TQF supplies for the local fish shop trade appeared to be adequate.

(4) Brisbane and the Gold coast

This market remains currently undeveloped. While it has a large growing population and tourist base, it is outside the traditional seafood distribution network for Tasmanian seafood. Local sea food tastes are different and concentrate more on the offering from local waters. saucer scallops dominate this market and there is a higher penetration of imported scallops. The company has established tentative links with this market through local distributors and Sydney customers with contacts in the region.

East Asian tourism is seen by the company as a major consuming market for live in the shell and the Gold Coast region has become a major destination for Asia tourism. There is also a large expatriate population from the Southern states. This market should therefore have considerable potential growth for the company and as more product becomes available further effort in this market could be rewarding.

(5) Hong Kong

The Chinese have a traditional banqueting season between the Moon Festival in September and the Chinese New Year in February. This is the time for family reunions and marriages. There is a traditional banqueting menu, of eight courses of which scallops is a component of one course. This results in a high demand for scallop products during this period, approx 85% of the demand for scallops would occur in this period.

The Chinese have a strong preference for roe off meat product for these banquets with the next preference being for dried whole and shredded scallops, again without roe. There was considerable interest in the Company's product in Hong Kong at the time of the visit, but this was strongly concentrated on the roe off scallop meat. Australian product would be preferred to local product, due to pollution concerns about local and mainland Chinese product. The prices being quoted were acceptable and quantities ordered would be by the container. However, the prices were for roe on scallop meat and demand was for roe off only, unfortunately the company does not currently have sufficient supplies, to follow through on these enquires at present.

The live scallop market, is different from the meat market and does not have such a strong seasonal demand. By Hong Kong standards, there is only a small number of restaurants dealing exclusively with live sea food, approx one third of these would handle

live scallops at some stage. There remains an aversion to the roe, and it was reported that even though Chinese enjoy eating scallops prepared in these restaurants, they often will not eat the roe. The Chinese have a traditional preference for only two types of roe, crab and mullet. From personal observation of Chinese eating live scallops steamed, there was no discrimination against any part of the scallop, with the one exception of a group of young Chinese women, who only ate the abductor.

(6) Singapore

Singapore has experienced strong growth and is now a prosperous and sophisticated market. The country is a major world communications and distribution centre, with regular daily flights from major Australian airport. These attributes led to the country being targeted early by the company. In the company's first year of commercial operations, they participated in a trade fair and received positive feedback about the company products.

The company has tried to maintain these links and has successfully shipped half shell and live in shell scallops to this market. Major problems for the company have arisen through poor choice a distributor initially inconsistent and occasionally high mortality rates. The company is also facing a credibility problem, by not being able to ship sufficient quantities of high quality scallops regularly.

When visiting this market in March, there were a number of distributors very keen to handle to product. The company's new promotional material was well received and widely distributed. Preference for shell size was varied but most seemed prepared to try what the company could supply. All had some previous experience with Australian seafood, some important live and processing holding tanks. They stressed two main points, they are willing to handle the company products but it is important that supply be guaranteed and the quality being supplied be consistent. As the market for live scallops is not well supplied, it would be up to the company to set quality standards, but these must be maintained. They are also keen to see the company brand and provide promotional material.

Tasmanian seafood is surprisingly well known and received. Many of the Singaporean restaurants had knowledge of Tasmanian and good image of the products being supplied. They also stated there was a shortage of quality products on the market and they were looking for new sources of supply.

DISCUSSION

MAINTAINING SCALLOP LIVE CONDITION

Mortality rate of chilled scallops (Experiment 2 - Experiment 6)

Hours after remove into sea water	Moratlity rate				
	Exposure period in air				
	0.5 hours	6 hours	12 hours	18 hours	24 hours
3 hours	0 %	0 %		0 %	0 %
6 hours	0 %	0 %	4 %	0 %	12 %
9 hours	0 %	0 %	4 %	4 %	16 %
12 hours	0 %	0 %	4 %	4 %	20 %
15 hours	0 %	0 %	4 %	4 %	24 %
18 hours	0 %	0 %	4 %	8 %	28 %
21 hours	0 %	4 %	4 %	8 %	40 %
24 hours	0 %	4 %	4 %	8 %	44 %
27 hours	0 %	8 %	8 %	12 %	52 %

Mortality rate of un-chilled scallops(Experiment 2 - Experiment 6)

Hours after remove into sea water	Moratlity rate				
	Exposure period in air				
	0.5 hours	6 hours	12 hours	18 hours	24 hours
3 hours	0 %	0 %		0 %	8 %
6 hours	0 %	4 %	4 %	4 %	12 %
9 hours	0 %	4 %	4 %	4 %	24 %
12 hours	0 %	4 %	4 %	8 %	40 %
15 hours	0 %	4 %	4 %	12 %	52 %
18 hours	0 %	4 %	4 %	20 %	64 %
21 hours	0 %	4 %	4 %	24 %	76 %
24 hours	0 %	4 %	8 %	28 %	84 %
27 hours	4 %	4 %	8 %	36 %	88 %

From above tables, It is clear that mortality of un-chilled scallop is twice as high as mortality of chilled scallop. The best mean of maintaining live scallop condition is 'CHILLING'. Without chilling, 12 hours is the maximum exposure period for selling live scallop. Eighteen hours is the maximum exposure period for selling scallops as live with chilled packing.

MECHANICAL SHELL CLEANING SYSTEM

Japanese shell cleaning machine is able to clean commercial scallop's shell with a little adjustment. Point of discussion is economical advantage. The machine cleaning cost

was $0.0115 per cleaned scallop. The hand cleaning cost was $0.0169 per cleaned scallop. Cleaning machine saves the cost of 0.54 cents per scallop based on current wage rate ($10.79 per hour). Purchasing cost of cleaning machine ($11,500) will be recovered by the cleaning 2,000,000 scallops.

The breakage rate of machine cleaning is higher than hand cleaning. Machine breaks small scallops. Before using machine, sorting operation is essential.

18 hours after moving into water, mortality rate of cleaned scallops was 46 % and mortality rate of cleaned scallop was 26 %. Cleaning operation affected the mortality of live scallop by physical shock. Air exposure should be minimised to reduce mortality.

PACKAGING AND TEMPERATURE MAINTENANCE SYSTEM

Mortality rate for each combination of packing material (50 hours after packing)

Packing material	Mortality		
	15 hours air exposure	20.5 hours air exposure	25 hours air exposure
1 plastic bag	44%	88%	98%
1 plastic bag 4 sponge sheet	16%	32%	60%
1 plastic bag 1 sponge sheet 1 cooling gel pack	28%	40%	45%
1 plastic bag 4 sponge sheets 1 cooling gel pack	21%	40%	49%
1 plastic bag 8 sponge sheets 1.5 kg ice			32%

Mortality rate for each combination of packing material (73 hours after packing)

Packing material	Mortality		
	15 hours air exposure	20.5 hours air exposure	25 hours air exposure
1 plastic bag	56%	100%	100%
1 plastic bag 4 sponge sheet	24%	56%	83%
1 plastic bag 1 sponge sheet 1 cooling gel pack	32%	44%	67%
1 plastic bag 4 sponge sheets 1 cooling gel pack	21%	48%	59%
1 plastic bag 8 sponge sheets 1.5 kg ice			62%

Sponge sheet showed good results even without cooling gel pack. Cooling gel pack or ice affected the mortality of longer air exposure lot and keeping longer in tank.

Insulation is important for ensure the best condition and live viability of scallops during the freight and distribution stage. Sponge sheet is good material as insulation. Longer freight needs cooling gel pack or ice.

The sender should recommend the customer as:
If the customer expects less than 25% mortality, scallops should be placed back in water within 15 hours after packing. If the customer expects less than 40% mortality, scallops should be placed back in water within 20.5 hours after packing. If more than 25 hours is required for transporting, cooling gel pack or ice should be used in box. Even with these used the mortality will be over 45%. Scallops should be cooked before 50 hours after packing.

MARKETING

The company as the first commercial scallop farm in Australia and new kid on the block having no affiliation with existing player, is starting with a fairly clean slate as regards marketing strategies. From this marketing research, the current available strategies are as:

(1) The company proceed alone to develop its own place in the market and control all aspects of marketing. There are some obvious problems with this strategy due to finance and resource constraints. The company currently leases processing facilitates and has no clear branding. Both these issues are currently being addressed.

(2) Appointment of sole agents. The company has been approached to give sole rights to a wholesaler who will undertake all marketing. This would leave the company free to concentrate on the technical aspects of scallop culture, but would leave the company vulnerable to the requirements of the agent.

(3) Tassea Pty Ltd ; this new marketing arm for Tasmania oysters has shown considerable interest in broadening their product base and offered the company a place within their organisation. There is some evidence to support the practically of this as mixed shipments of sea food especially for overseas markets may be the only way of servicing some markets sufficiently.

(4) Tied alliance ; this may be particularly valid for Japan or Taiwan, where the company has a equity or contractual partnership and works in close liaison with a distribution channel in a major consuming market.

(5) Tasmanian Seafood marketing group. The need to minimise freight costs to ensure market competitiveness, requires the maximum utilisation of standard shipping containers. Individual firms often do not have sufficient demand to fully utilise all space so co-operation by Tasmanian supplies would make the more cost effective. As well many purchasers of Tasmania seafood buy a range of product and mixed containers would suit their purposes. This strategy would require a degree of trust, co operation and co ordination, that could only be achieved by some formal grouping. The good offices of the Tasmanian Development and Resources could possibly arrange such a grouping.

(6) Coat tail marketing ; Tassal and Aquatas have established good marketing channels for their product, a possible strategy for the company is to come to some arrangement to use these existing channels. Some caution would be required here in the light of recent events and Tassal statement it would like to take over the company.

IMPLICATIONS AND RECOMMENDATION

MAINTAINING LIVE SCALLOP CONDITION

The company sold 70 tons live scallop in 1993/94. The value was $360,000. The market size of live scallop would become $1,000,000 in Australia. Overseas live scallop market is twice or three times as much as domestic market.

Chilling is essential for transporting live scallop. The cost of chilling facilities is $9,000. From 1993/94 result, the chilling cost is ($9,000/70,000kilo=$0.13). Present beach price of live scallop is $6. This additional cost is 2 % of beach price. The investment in chilling facilities is profitable.

Chilling extend the maximum air exposure period from 12 hours to 18 hours. It open up the possibilities of exporting live scallop. It is worth $2,000,000-$3,000,000.

The sender should establish harvesting system which minimise air exposure. And also the sender should prepare scallop live tanks for maintaining live scallop condition.

MECHANICAL SHELL CLEANING SYSTEM

Japanese shell cleaning machine is useful for cleaning Commercial scallop. Especially it is successful in cleaning hanging scallop. Hanging scallop is stuck by many things. Before send hanging scallop as live, each scallop must be cleaned one by one. If do this by hand, the cost will be expensive. In this research, cleaning machine saves the cost of 0.54 cents per scallop. Purchasing cost of cleaning machine will be recovered by the cleaning of 2,000,000 scallops. In 1993/94 the company sold 3,700,000 hanging scallop. If shell cleaning machine cleans 3,700,000 scallops, it will save $19,980 instead of hand cleaning. The cleaning machine will last 10 years. The company will sell 5,000,000 scallops per year. Finally the company will save $300,000 in 10 years.

If someone is going to do scallop culture, the cleaning machine is essential. Many other place has potentialities for scallop culture. This research of cleaning machine will be applied in many other place.

PACKAGING AND TEMPERATURE MAINTENANCE SYSTEM

Suitable packaging system would avoid waste unnecessary packing material. From this research, sponge sheet is effective for keep cool in box. Expensive cooling gel pack is not necessary for short transport. If the company prepares thicker polystyrene box, sponge sheet will not be necessary.

Suitable packaging system extends transporting period. Exporting of live scallop will become easy by good packaging system. Overseas live scallop market is $2,000,000 -

$3,000,000. Chilling and good packing must be combined to open overseas live scallop market.

Sender should choose good and cheaper packing material using this research's results. It is necessary to ask customer's requirement how much mortality, how to cook.

MARKETING

The company feels that to date effective promotion of their products has been done while on the road selling, many new customers have been found for the company this way. The company also considers any market research done while selling to current customers as very effective in identifying new niche markets and defining their existing markets in greater detail.

This identification of niche market is perceived as being vital to the company's future. By finding segments in the scallop market that are currently unfilled and suited to the strength of the company so it can dominate the market, the company will be able to command a premium for their quality products. For each of these niches it is necessary to know the customers exact needs, so the company can provide exact requirement. For the company to achieve a dominant and profitable position in these markets it is important to enhance and emphasise the company's reputation for excellent customer service and product.

TECHNICAL SUMMARY

MAINTAINING LIVE SCALLOP CONDITION

(1) Mortality of un-chilled scallops is twice as high as mortality of chilled scallop.
(2) 18 hours is the maximum exposure period for selling scallop as live with chilled packing.
(3) 12 hours is the maximum exposure period for selling scallop as live without chilled packing.

MECHANICAL SHELL CLEANING SYSTEM

(1) Japanese cleaning machine is able to use for Tasmanian scallop.
(2) Cleaning machine saves the cost of 0.54 cents per scallop based on current wage rate ($10.79 per hour).
(3) Purchasing cost of cleaning machine ($11,500) will be recovered by the cleaning of 2,000,000 scallops.
(4) Before using machine, sorting operation is essential because the cleaning machine breaks small scallops.
(5) Cleaning operation gives physical shock to scallops and increases the mortality. Air exposure should be minimized to reduce mortality.

PACKAGING AND TEMPERATURE MAINTENANCE SYSTEM

(1) Sponge sheet showed good results even without cooling gel pack.
(2) Cooling gel pack or ice affected the mortality of longer air exposure lot and keeping longer in tank.

(3) If the customer expects less than 25% mortality, scallop should be placed back in water within 15 hours after packing. Sender should cover scallops with sponge sheets.
(4) If the customer expects less than 40% mortality, scallop should be placed back in water within 20.5 hours after packing. Sender should cover scallops with sponge sheets.
(5) If more than 25 hours is required for transporting, cooling gel pack or ice should be used in box. Even with these used the mortality will be over 45%. Scallops should be cooked before 50 hours after packing.

MARKETING

(1) Tasmanian market is seen as a traditional roe on meat market, with little interest in live in the shell scallops.
(2) Victorian tastes in seafood are very similar to Tasmanian as they share common fishing grounds. But Chinatown and Chinese restaurants deal with live scallop, while some interest has been received from the four and five star hotels and some of the seafood restaurants, especially for half shell, very low penetration has been achieved in these markets to date.
(3) Sydney market is very generic with Tasmanian scallops being a generic name for all scallops. The market of live scallop concentrated on ethnic Asian restaurants, in particular Chinese.
(4) Saucer scallops dominate Queensland market and there is a higher penetration of imported scallop. East Asian tourism is seen by Tasmanian scallops as a major consuming market for live in the shell.
(5) In Hong Kong the Chinese have a strong preference for roe off meat product with the next preference being for dried whole and shredded scallops. There is a small number of restaurants dealing exclusively with live sea food, approx one third of these would handle live scallops at some stage.
(6) Many of the Singaporean restaurants had knowledge of Tasmania and good image of the products being supplied. They are willing to handle live scallops but it is important that supply be guaranteed and the quality being supplied be consistent.

MARKETING STRATEGY PLAN

FOR

LIVE SCALLOPS

INTO

AUSTRALIAN AND OVERSEAS

MARKETS

MARCH 1995

TASMANIAN SCALLOPS PTY LTD

PREPARED BY

NORTON GREY
DEPARTMENT OF ECONOMICS
UNIVERSITY OF TASMANIA

FOREWORD

The Fisheries Research and Development Commission following receipt of a submission , has provided a grant to Tasmanian Scallops Pty Ltd to assist in fostering the development of the marketing of live scallops . Staff and students at the University of Tasmania have had a relationship with the company for the past five years . In 1990 a Preliminary Market Survey was undertaken sponsored by N.I.E.S. and in 1992 a Market Research report " An Analysis of Scallop Markets in the Southern Tasmanian Region " prepared by Market Research students for the company . In 1994 Market Research students completed the " Report on Qualitative Market Research for Live Scallops into Australian and Overseas Markets " . Unitas consulting is the official consulting and contracting arm of the University of Tasmania .

INTRODUCTION

This Company Marketing Strategy Plan for Tasmanian Scallops Pty. Ltd. has been prepared by Mr Norton Grey lecturer in Economics and Tom Hallam research assistant.

RESEARCH OBJECTIVES

The Company , Tasmanian Scallops Pty. Ltd., has identified a sub-market, within the Australian seafood industry, which they believe to be currently under serviced. This scallop market has not been one targeted by "wild" scallop fishermen due to the seasonal nature of the scallop harvest and the ethnic centre of demand being outside normal distribution channels. The Company, being the only established scallop husbandry farm in the country, believes it is in a unique position to satisfy this market by being able to offer a continuous range of scallop products, year round.

The aim of this report is to prepare a marketing plan for the sale of scallop products, in particular live in shell, based on the company's production objectives and information on markets obtained from previous market research.

(1) To predict marketing achievements by assessing marketing objectives, projecting market profitability and market share and setting business expansion goals.

(2) Establish marketing management strategies by identification of target markets, positioning of products and planned penetration strategy.

(3) Establish marketing mix tactics including planning for market research, product development, product line, pricing, distribution, sales, advertising, promotion and public relations.

(4) Implement the marketing plan by scheduling marketing mix activities and media placement.

(5) Determine the marketing budget by activity and overall.

(6) Establish marketing control through monitoring techniques.

METHODOLOGY

1) Discussion with the company to determine their marketing objectives, production and product mix, product profitability and expansion goals.

2) Analysis of previous market research and company marketing data, to identify key market areas.

3) Discussion of positioning scallops with particular emphasis on live scallops in these key markets and suggested market entry strategies.

4) Preparation of Marketing Plan.

BRIEFING AND FAMILIARISATION

Total world production has established since 1988 at between 800,000 and 900,000 mt (shell weight) of this some 500.000 mt is landed from the large aquaculture industries of Japan (350,000 mt) and China (150,000 mt). The variance in the overall figures is due to the unreliability of the wild fishery. The Japanese have

saturated demand in their own domestic market so export large amounts of scallops mainly to France, USA, Hong Kong and Taiwan, however, it is expected that the Japanese are at the limits of their production possibilities. Almost all available waters suitable to scallop husbandry are being fully exploited. China's production is regarded as a low quality commodity scallop and therefore isn't in competition with the company's product. Both these countries export scallops to Australia but this is almost entirely satisfying demand for frozen meat at the low end of the market, again not in competition with the company's product. The company could not achieve a positive cash flow attempting to compete directly with these huge suppliers of commodity scallops and their low prices.

The domestic market consumes approximately 1850 mt (meat weight). The company expects to produce 29 mt (meat weight) in 1994/95. This is less than 2% of domestic consumption, but is more than 10% of the targeted premium end of the market. Therefore, the company is already a major player in this segment. By 2000/01 the company plans to be producing 230 mt (meat weight) and have the dominant position as the market leader in the premium sector of the market. With any excess supply the company will be looking to export rather than compete in the domestic generic market. The generic market is dominated by cheap imports as buyers at the lower end of the market, fish and chip outlets, have little concern for size or quality and the market is completely price driven. By targeting the premium live export market the company can maintain higher prices for its product.

It is apparent from this information, that there is scope for exploitation of high quality, high return niche markets throughout both the domestic and international markets.

TARGET CUSTOMERS DOMESTIC

1) TASMANIAN

Tasmanians were traditional scallop eater until recent depletion of the wild fishery stock. There remains considerable interest in scallops in the community in general has shown considerable support to the company in setting up a scallop husbandry fishery. This market is seen as a traditional roe on meat market, with little interest in live in the shell scallops. Some interest has been shown from the better restaurants and international hotels in the state, with a growing sub market in catering to international visitors. Tour groups from Singapore are becoming more popular and

a major attraction to these visitors is the fresh local seafood. Tasmania hopes to attract additional direct flights and participate more directly in packaged Asian tour growth.

The market research report "An Analysis of Scallop Markets in the Southern Tasmanian Region "clearly showed strong differences in perceptions between Tasmanians and mainland Australia with regard to scallops. The report also clearly shows, that scallops are price elastic, with both total revenue and marginal revenue increasing as the price was lowered. Caution must be taken in reading these results as when the report was undertaken scallops were very scarce and husbanded scallops were a novelty commanding a premium. Parallel with the experience of the salmon industry may be drawn and any marketing must take into account the effects of production increases.

The company is currently marketing scallops through the following channels ;

(a) Tasmanian Scallops Pty Ltd. acts as their own wholesaler to the local retail market supplying hotels, and individual customers from their office in Triabunna with daily deliveries to Hobart and the North.

(b) The company supplies local wholesalers who on sell mainly to supermarkets and add water to the product to lower the price.

(c) The company supplies all the fish mongers and punts in Hobart and the majority in the North.

The company has established a local profile and is known in the local seafood industry. The company believes it is important to be able to offer a full range of products in their local state, but sees the market for live in the shell scallops limited to a small number of seafood establishments catering to mainly interstate and international visitors.

The Australian market is no longer homogenous in their tastes. Multiculturalism and the wide range of cuisine it supports provides the company with a window of opportunity to supply seafood products that are not traditionally provided from the wild fishery. In particular a growing number of outlets that cater to the culinary tastes of an increasing resident Asian segment of the population and the new attractiveness of Australia to east Asian tourists. This desire for live or very fresh food, has created a demand for large quantities of live seafood. The Australian infrastructure has been growing with this demand and the Sydney Fish Market is second to Tokyo in offering the widest variety of seafood. The company believes it is in a unique position to satisfy this demand with regard to scallops.

The Mc.Kinna Preliminary Marketing report of November 1991 was mainly concerned with the meat market, while the Market research report of 1994 concentrated on live scallops in the shell and the Asian segment of the market.

2) MELBOURNE

Victoria is the closest state to Tasmania in proximity and the major traditional market for the states' primary products. Victorian tastes in seafood are very similar to Tasmanian as they share common fishing grounds. Victoria still has a 'wild' scallop fishery in Bass Strait centred on Lakes Entrance and occasional fishery in Port Philip Bay.

In Melbourne the two main distributors for the company, have good salt water tank setups for handling live product, mainly lobster and abalone. Product delivered into Melbourne live by Tasmanian scallops though, is rarely kept in their tanks, but delivered direct to customers. Orders received from these distributors therefore reflects actual ordering requirements of their clients. The handling processes of these clients were examined in the 1994 report "Report on Qualitative Market Research for Live Scallops into Australian and Overseas Markets".

Both these clients deal mainly in live scallops, with some interest in half shell. The chief outlets for both are Chinatown and Chinese restaurants, while some interest has been received from the four and five star hotels and some of the seafood restaurants, especially for half shell, very low penetration has been achieved in these markets to date.

The company has dealt with a variety of other distributors in Melbourne, but feels it is best to concentrate on supplying two main distributors. Considerable problems arose in the past, with distributors having overlapping constituencies resulting in price cutting and a cheapened image for the company.

The two current distributors expressed general satisfaction with the company, but do have problems with consistent supply and quality. Both feel the market has considerable potential and will grow at a steady rate if the company can guarantee these two factors.

The supply and quality problems the company faces in this and other markets can be attributed to the varying methods of cultivation used by the company, current

stock size and levels among the different methods and the weather conditions prevailing on any given day. The distributors are aware of some of these problems and are prepared to give the company some leeway in the matter.

Handling and distribution procedures through the Melbourne Fish Market was investigated. As the company plan calls for a considerable increase in production over the next five years, it is important to be familiar with the existing distribution chain for seafood. The generic nature of fish auctions and handling procedures through the market do not lend themselves to creating a quality image. If the company wishes to have any profile in this market, the packaging and image of the company must be clearly established first. If this is not done scallops will be seen as generic and the company will have little control over the prices they receive. There was little knowledge of the company among the dealers in this market.

Distribution through the supermarket system has also been considered by the company. This has been found to be very price sensitive. In an experiment in a Safeway supermarket clean split scallops were placed side by side with scallops from the company containing 20% added water and offered at a 20% discount price. The scallops were clearly labelled and the "wet" scallops outsold the "dry" scallops nine to one. The practise of soaking scallops and including water based preservatives has been common practise in the generic scallop market for some time and will not be easily overcome. Victorian supermarkets, however, are now operating chilled display areas of packaged seafood. A well packaged and branded product would probably find a position in this section. Other select supermarkets and food outlets are following the Diamaru example and providing a live shellfish section, this will provide an opportunity for the company's live in the shell product.

Victoria is a roe on market, there was little discussion of a roeless scallops and there appeared to be a low penetration of the roeless West Australian and Queensland Saucer scallops. Most people in the industry knew of "Coffin Bay" half shell scallops, which has a special market niche and "Streaky Bay" scallops considered on a par or not as desirable as Tasmanian Scallops product. These scallops were from S.A. but the dive was currently closed, so there was no product on offer, this dive is experiencing a dino flagellate problem. There were some offering of the local Lakes Entrance scallops, these scallops do not appear to differ much in appearance from Tasmanian scallops and the split meat product was selling for a comparable price. This appears to be the first year fisherman have successfully controlled their catch and been able to maintain prices. There was no mention of any Port Philip Bay scallops and the fishery remains closed. What information

exists on the fishery points to the scallops being too small a commercial opening this year.

Victorian 'wild' dredged scallops, that are purged in tanks may be seen as an alternative to the company's live in the shell husbanded scallop, but the practise was not observed.

there was little discussion of imported scallops, though one Chinese importer had recently received a large shipment of Japanese IQF and there appeared to be no shortage of frozen product on the market.

(3) SYDNEY

Sydney is the country's largest seafood market, with a high per head seafood consumption and has well developed seafood infrastructure and distribution system. The fish market and auction system is extensive and handles more than twice the volume of the Melbourne market.

The bulk of the company's product in this market is handled by agents operating out of the fish markets in contrast to Melbourne, where agents are geographically dispersed. The agents in Sydney have extensive links through most states and many operate in another city as well as Sydney.

The company has several agents operating in Sydney and while some overlap does occur there is more specialisation and segmentation in this market. The main segments of interest to the company at present, are the live scallop market which is concentrated on Chinatown and the half shell market for restaurants and the retail trade. Live shipments have not increased at the pace expected, but the market for half shell showed strong growth.

From interviews and the response to surveys the agents handling live product were happy with the quality of the company product and feel the market will grow in time' with the gradual acceptance of live scallops and the availability of supply. They all see the market for live scallops remaining concentrated on ethnic Asian restaurants, in particular Chinese, with limited potential outside this area. Their main concerns are reliable deliveries, consistent size and quality, a guaranteed supply and a stable price. They appeared happy with current packaging and consignment arrangements and this result was supported in the survey. Some

concern was expressed about mortality, but they were aware the Company was currently working on this problem and expect to see some improvements.

None of the current agents have tanks where they can stock live product and shipments are broken into client orders at the airport and delivered directly or the packs are taken back to the market and broken into job lots and then delivered. One agent regularly orders more than current client orders and keeps live scallops in cool store in order to meet more spontaneous demand.

There is currently a good supply of cheaply priced saucer scallops on the market, but these are not considered a good substitute for the live market. There were some local Jarvis Bay live scallops in the market caught from the wild fishery and purged, some of the market operators were featuring salt water tanks with these scallops purging. The supply of these scallops is erratic and not expected to be a major supply.

The half shell market is showing strong growth and interest. Restaurants are willing to include scallops on their menus if they can guarantee a regular supply, consistent size and quality and price fixed for a certain period. This market is core competitive, with the current market members competing amongst one another for the same customer base. Price is likely to be more important in this market, but there is a greater demand for product.

Queensland saucer scallops were plentiful and cheap, presentation and quality varied considerably and all were roe off. There were also some Streaky Bay scallops from South Australia, these were poorly presented and visually unattractive. They were probably frozen and thawed. The Jarvis Bay scallops on display were well presented and the quality matched the company's product, it was similarly priced.

There is a large demand for split scallop meat in the Sydney area and there was considerable interest in the company's potential to supply. This market primarily requires a roe off product, though there was some interest in roe on. As was stated in the McKinna report the market is very generic with Tasmanian Scallops being a generic name for all split scallops, there has been some improvement in labelling since then with Victoria and New Zealand scallops being marketed under their source name.

Frozen Japanese and Asian scallops were not observed to be plentiful but there was no mention of any shortage of supply and block frozen and IQF supplies for the local fish shop trade appeared to be adequate.

4) BRISBANE AND THE GOLD COAST

This market remains currently undeveloped. While it has a large growing population and tourist base, it is outside the traditional seafood distribution network for Tasmanian seafood. Local seafood tastes are different and concentrate more on the offerings from local waters. Saucer scallops dominate this market and there is a higher penetration of imported scallops. The company has established tentative links with this market through local distributors and Sydney customers with contacts in the region.

East Asian tourism is seen by the company as a major destination for Asian tourism. There is also a large expatriate population from the Southern states. This market should therefore have considerable potential growth for the company and as more product becomes available further effort in this market could be rewarding.

SUMMARY OF MAINLAND MARKET FINDINGS

The company's current marketing strategies for mainland markets reflects the early stages of development. Establishing contact with these markets and acceptance of the company and their products are the prime considerations.

The company is currently using the following distribution methods;

(a) The company targets wholesalers on the mainland to facilitate shipping, local knowledge and customer relations.

(b) The company will supply to a special sub market of top ranked hotels and restaurants who want a special quality product.

The company has tried to limit their supplies to agents who have performed the best especially in the live scallop market, as competition between agents all offering the company product competitively, will cause discounting and price competition. While a wide as possible distribution is required by the company, image and rapport with customers is just as important to maintain a dominant position in specialist niches.

The current customers main concerns with the company are that the company maintains regular supply. They need to put a great deal of effort and personal expense into having live scallops accepted and placed on the menu of hotels and restaurants, their credibility as well as the company's is at stake if the company can not maintain regular supplies. Another concern is consistency in appearance and size, while there is some variation as to what the optimal size should be amongst the various customers and distributors. They all have definite ideas about what they would like. The company needs to address this or re educate them to what the company is able to supply. Finally they all believe the company has a future within the live shellfish and half shell markets and these markets have considerable growth potential, but believe strongly the company must restrict their distribution outlets.

EXPORT MARKETS

The prosperous Chinese states of South East Asia (Singapore, Hong Kong and Taiwan) are seen as the primary export target. The company envisages being able to supply scallops live whole for the specialty live seafood niche market. Interest has been expressed in Hong Kong and Singapore for half shell for the hotel trade and considerable interest has been expressed by Hong Kong and Taiwan for frozen roeless meat particularly for the months October through to February when scallops form a traditional dish in Chinese celebration banquets.

There has been interest expressed by both Indonesian and Malaysian importers but, based on current research and production constraints, the company feels these two countries are too price sensitive for the company's foreseeable production.

France is seen as a major potential customer as it is the major importing country for scallops and scallops have an established place in French cuisine, the French have the highest per capita consumption of scallops in the world. It has been the traditional market for surplus Tasmanian scallops in the past and the Tasmanian product is still well considered in this market and capable of obtaining a premium. French and EU trade policies and health and environment factors eg (the dino flagellate scare in Northern Japan), could provide a stable export market and prime entry point into the European Union.

While this market has been traditionally seen as a roe on IQF and block frozen market with shipment by sea container, some interest has also been expressed by

some importers in half shell fresh and frozen and live in shell fresh and frozen air freighted. The products could possibly obtain a niche in this sophisticated market.

The company has also received enquires from Austria, Germany and Belgium, these relate primarily to live in shell (may be frozen) and half shell scallops for a particular regional seafood restaurant niche.

Other possible but low priority markets include Hawaii and the western seaboard of the North American mainland.

As export markets are less forgiving than domestic ones, the company must time their entry carefully and not rush, in an effort to export as quickly as possible. Size quantity and appearance must be consistent and the company must be assured it can ship the product so it arrives at the customer in top condition. It is difficult to re establish relationships if these conditions are not met.

1) HONG KONG

The Chinese have a traditional banqueting season between the Moon Festival in September and the Chinese New Year in February. This is the time for family reunions and marriages. There is a traditional banqueting menu, of eight courses of which scallops is a component of one course. This results in a high demand for scallop products during this period, approximately 85% of the demand for scallops would occur in this period.

The Chinese have a strong preference for roe off meat product for these banquets with the next preference being for dried whole and shredded scallops, again without roe. There was considerable interest in the company's product in Hong Kong at the time of the visit, but this was strongly concentrated on the roe off scallop meat. Australian product would be preferred to local products, due to pollution concerns about local and mainland Chinese product. The prices being quoted were acceptable and quantities ordered would be by the container. However, the prices were for roe on scallop meat and demand was for roe off only, unfortunately the company does not currently have sufficient supplies, to follow through on these enquires at present.

The live scallop market, is different from the meat market and does not have such a strong seasonal demand. By Hong Kong standards, there is only a small number of restaurants dealing exclusively with live sea food, approximately one third of these

would handle live scallops at some stage. There remains an aversion to the roe, and it was reported that even though Chinese enjoy eating scallops prepared in these restaurants, they often will not eat the roe. The Chinese have a traditional preference for only two types of roe, crab and mullet. From personal observation of Chinese eating live scallops steamed, there was no discrimination against any part of the scallop, with the one exception of a group of young Chinese women, who only ate the abductor.

2) SINGAPORE

Singapore has experienced strong growth and is now a prosperous and sophisticated market. The country is a major world communications and distribution center, with regular daily flights from major Australian airports. These attributes led to the country being targeted early by the company. In the company's first year of commercial operations, they participated in a trade fair and received positive feedback about the company products.

The company has tried to maintain these links and has successfully shipped half shell and live in shell scallops to this market. Major problems for the company have arisen through poor choice a distributor initially inconsistent and occasionally high mortality rates. The company is also facing a credibility problem, by not being able to ship sufficient quantities of high quality scallops regularly.

When visiting this market in March, there were a number of distributors very keen to handle the company products and restaurants and distribution centres also seemed keen to handle product. The company's new promotional material was well received and widely distributed. Preference for shell size was varied but most seemed prepared to try what the company could supply. All had some previous experience with Australian seafood, some importing live and possessing holding tanks. They stressed two main points, they are willing to handle the company products but it is important that supply be guaranteed and the quality being supplied be consistent. As the market for live scallops is not well supplied, it would be up to the company to set quality standards, but these must be maintained. They are also keen to see the company brand and provide promotional material.

Tasmanian seafood is surprisingly well known and received. Many of the Singaporean restaurants had knowledge of Tasmania and good image of the products being supplied. They also stated there was a shortage of quality products on the market and they were looking for new sources of supply.

MARKETING STRATEGIES AND PLANS

An analysis of current and potential market strategies. The company as the first commercial scallop farm in Australia and the new kid on the block having no affiliation with existing players, is starting with a fairly clean slate as regards marketing strategies. Most of the company's energies to date have been focused on the production side and sales have occurred mostly as a result of customer demand. While the company does not have monthly budget projections and maintains close liaison with existing customers, marketing is still a scatter gun approach, with now being an opportune time to focus on alternatives and prepare a blueprint for a marketing strategy for the next five years.

CURRENT SITUATION

The company is currently producing 300 tonne of scallops shell weight, this is expected to rise to 2,000 tonnes by the year 2000. The main focus of the company has been on production, scallop husbandry is a recent innovation in aquaculture in Australia and many teething problems have been experienced. A model based on the most successful scallop husbandry industry of Hokkaido and Northern Honshu, was initially planned, but the local pecten fumatus appears to have different habits to the scallop specie of Northern Japan and mixed results from scallop husbandry have been obtained. These mixed results, resulted in the increased emphasis on cage culture, and earhanging of scallops to ensure a more reliable supply of scallops.

Cage culture and earhanging are expensive operations, but greater control and reliability of supply can be achieved, whether this supply can be marketed profitably by traditional sources depends on the current supplies from "wild" fisheries. The landed price of scallops has in the past been volatile and in recent times large catches of wild scallops in Bass Strait and Western Australia has resulted in split scallop prices lower that the company's production costs.

To overcome this problem the company has been forced to develop a market segmentation policy. They have identified three fairly distinct segments.

(1) An expanding ethnic market in Chinese and Japanese food in the major cities of Australia, partly based on increased migration and partly on increased tourism

from the East Asian region. Shell fish has quite an important position in the diet of these people, Sushi and Sashimi are popular in Japanese cuisine, live scallops ensure that scallops included in these dishes are always fresh. As well Japanese steam scallops live in the shell. Chinese cuisine has a large tradition of steaming and scallops are well received for this purpose, but considered a close substitute for oysters. Caged culture and earhung scallops are preferred for steaming as they have no sand or grit that bottom dwellers accumulate.

(2) Half shell scallops, suitable for presentation dishes in European cuisine, Yum Cha and a satisfactory substitute for steaming. The market here was sharply defined into a roe on and roe off. West Australian and Queensland saucer scallops have an established position at the lower end of this market and visually striking scallops and shells especially those from Coffin Bay in South Australia had an established market position at the top end. Tasmanian scallops tried to position their product midway.

(3) Split or shucked scallop, this market is generic clearly defined into roe on and roe off markets. All southern pecten species including New Zealand scallops are often marketed as Tasmanian. Little differentiation appears to exist between frozen and fresh, for the catering trade frozen is often preferred for its ease of handling. Evidence would suggest that price is the determinant, with customers, having no regard for quality or additives. A series of supermarket trials were conducted at Melbourne supermarkets, where scallops with 25% added water were sold for $20.00 and scallops with no additional water were sold for $25.00. The"wet" scallop outsold "dry" 20 to 1 despite being clearly labelled. As scallops freeze and thaw well there also appears to be no market perception of a differentiation between fresh and thawed scallops.

STRENGTH'S AND WEAKNESS OF CURRENT STRATEGIES

Prices obtained for live and half shell are substantially above the generic split market.

The company has established itself as a known player, this result is supported by the finding of the survey.

The mortality rates on the shipment of live scallops have declined, this will enable the company to serve markets requiring a longer delivery time.

Handling and packaging procedures have improved, costs have been declining over the past three years. Definite evidence of the benefits of a learning curve can be seen.

The company has been selling scallops of less than optimal size: the results of the survey indicate that the market would prefer a scallop shell of 120 mm with the exception of one major wholesaler. Much of the company's offering has been smaller due to a combination of the need to supply the market regularly and the company's continuing need for cash flow in the start up stage.

The company originally promoted the taste and quality of cage hung scallops, but has recently used bottom seeded and purged scallops on the market. The cultured scallops were perceived as having a better taste and were free of grit, they have a larger meat to shell ratio and the shell has evidence of parasite growth. The bottom seeded scallop have a larger shell and smaller meat but generally the shell is clean.

The company supplies either twice weekly or depending on availability of supply at the time. This mix is causing confusion in the market.

Wild fisheries are purging some of their catch and supplying the live market, providing some competition in what the company perceived as a niche market.

Price remains a significant factor in the market, from both the company experience in the generic market and the results of the 1992 and 1994 survey support this.

The company suffers from an identification problem, both from a perception of the company by the market and in differentiating Tasmanian scallops from scallops of other areas. New South Wales in particular uses the generic name "Tasmanian". The company believes sufficient latent demand exists for their products such that extensive marketing push will not be needed for 5 years. Production and area constraints aside they hope to be satisfying 50% of scallop demand in Australia by then.

CURRENT AVAILABLE STRATEGIES

1. The company proceed alone to develop its own place in the market and control all aspects of marketing. There are some obvious problems with this strategy due to finance and resource constraints. The company currently leases processing facilities and has no clear branding. Both these issues are currently being addressed.

2. Appointment of sole agents. The company has been approached to give sole rights to a wholesaler who will undertake all marketing. This would leave the company free to concentrate on the technical aspects of scallops culture, but would leave the company vulnerable to the requirements of the agent.

3. Tassea: this new marketing arm for Tasmanian oysters has shown considerable interest in broadening their product base and offered the company a place within their organisation. Thee is some evidence to support the practicality of this as mixed shipments of seafood especially for overseas markets may be the only way of servicing some markets efficiently.

4. Tied alliance: this maybe particularly valid for Japan or Taiwan, where the company has a equity or contractual partnership and works in close liaison with a distribution channel in a major consuming market.

5. Tasmanian seafood marketing group. The need to minimise freight costs to ensure market competitiveness, requires the maximum utilisation of standard shipping containers. Individual firms often do not have sufficient demand to fully utilise all space so co-operation by Tasmanian suppliers would make the more cost effective. As well many purchasers of Tasmanian seafood buy a range of product and mixed containers would suit their purposes. This strategy would require a degree of trust, co operation and co ordination, that could only be achieved by some formal grouping. The good offices of the T.D.R. could possibly arrange such a grouping.

6. Coat tail marketing: Tassal and Aquatas have established good marketing channels for their products, a possible strategy for the company is to come to some arrangement to use these existing channels. Some caution would be required here in the light of recent events and Tassal statement it would like to take over the company.

Note that the Japanese co-ops handle their marketing mix differently depending on the market. Individual co-ops will control their local promotion and sales. The co-op association handles all export sales, international customer relations and promotion as well as regulation and supply of fishing equipment.

MARKET RESEARCH

Date NIES Report

July 1991 Scallops Market Survey and Strategy Plan, David McKinna et al Pty Ltd.

A document was prepared including both a market research survey and a marketing strategy plan. It involved proposals for methodology and costing of a market research project for scallops and an assessment of the overall marketing situation. This was used for formulating a marketing strategy plan.

November 1991 Preliminary Marketing Report, David McKinna et al PtyLtd

A report of findings to date which had been reached from a limited program of market assessment with wholesalers, distributors, importers, retailers and restaurateurs in Brisbane, Sydney and Adelaide.

November 1992 An Analysis of Scallop Markets in the Southern Tasmanian Region.

A telephone survey was conducted in the 002 telephone area. The survey was designed to identify consumer preferences, perceptions and purchasing patterns with regard to scallops, in order to assess the viability of a market for scallops in the Hobart area. The survey was conducted in a four week period from the 5-9-1992 to the 4-10-1992 to 491 respondents.

November 1994 Report on Qualitative Market Research for Live Scallops into Australian and Overseas Markets.

A questionnaire was prepared from the customer lists of Tasmanian Scallops and was administered by telephone to all known current users of live scallops and

former users. The questionnaire was designed to test perceived attributes in terms of availability, convenience, visual acceptability, price and Tasmanianess for live scallops. The questionnaire was administered 17-9-1994 to the 31-11-1994 to approximately 40 respondents. It was appreciated that many of the respondents did not have English as their first language, the interviews were all from Asian countries and spoke a range of languages.

The company feels that to date effective promotion of their products has been done while on the road selling, many new customers have been found for the company this way. The company also considers any market research done while selling to current customers as very effective in identifying new niche markets and defining their existing markets in greater detail.

This identification of niche markets is perceived as being vital to the company's future. By finding segment in the scallop market that are currently unfilled and suited to the strengths of the company so it can dominate the market, the company will be able to command a premium for their quality products. For each of these niches it is necessary to know the customers exact needs, so the company can provide exact requirements. For the company to achieve a dominant and profitable position in these markets it is important to enhance and emphasise the company's reputation for excellent customer service and product.

PRODUCTION

PRODUCT RANGE

The company at present is dealing only in basic product lines, the company would like to move into some value added products in the future. The company is at present renting processing facilities and any expansion of product lines will depend on processing space and scallop stocks becoming available.

Live in Shell:
sold by the kilogram
14 - 16 scallops per kilo
90mm - 110mm shell length

Half shell:
sold by the dozen

FRESH (UNFROZEN)
80mm - 100mm shell length

Frozen (IQF)
80mm - 100mm shell length

Split "dry" scallops:
sold by the kilogram

Fresh
Frozen in the block form
The target is to maintain a count of 90 - 100 split scallops per kilogram. This is obtained by mixing scallops from various cultivation methods.
IQF (the company does not presently have facilities at the current processing works to undertake this commercially but could access another processor).

When expanding into the South-East Asian market it will be beneficial to offer a wider range of products more suited to the traditional Asian palate. These products include boiled scallops and various forms of prepared mantle. Being able to offer a wide ranging selection of products gives the company another marketing edge and allows selling to be tailored for a particular niche market. This aspect of production has been identified as very attractive to customers and greatly aids the sales team. Customers will even differentiate between scallops from different husbandry techniques, for instance, the Chinese prefer scallops from black cages or reseeded beds because the shell is bigger while other customers prefer ear hung scallops because they have more meat on them despite the smaller shell.

The existing license the company is operating under allows the company to engage in the farming and processing of other shellfish. Currently the company is engaged in protracted negotiations with the state fisheries department over a new licensing agreement. Pressure is being exerted to insert clauses that preclude the farming of other shellfish species. This pressure is being vigorously resisted and if successful the company would like to expand the range of shellfish it offers for sale to include mussels and oysters.

PRODUCT MIX

In the short term, because there is limited stock, the company will focus on producing for the live and half shell markets where profit margins are greatest.

Therefore meat production has been falling and is forecast to continue to fall until 1996/97.

The half shell product demands skilled splitterea as it requires more preparation than the live product. There is a shortage of skilled splitters which limits half shell production to less than 1000 dozen per day. Again production of half shell has been falling in the short term but is forecast to expand rapidly if the skilled labour constraint can be overcome.

BRANDS AND LOGO'S

These are currently under discussion and review with a T.D.R. sponsored consultant.

The most important outcome of this development is that it will enable the company to push its quality image as hard as possible. As mentioned previously, in the Sydney market Tasmanian scallops is a generic term for all split scallops and can be sourced from as far away as New Zealand. Marketing products under the quality brand name Spring Bay allows previous confusion with the marketing term Tasmanian Scallops to be avoided.

The importance of the brand being quality based is paramount to the desired company's image. It will allow the company to start educating customers and the general public on differences between wet and dry scallops, cultured and wild etc.

There are no plans to expand the number of brands, however, if the company decides togo down market it is advisable a new brand name is used to market those products.

PACKAGING

1) LIVE

Live scallops are packed curved side down to retain moisture. Fifteen kilogram polystyrene boxes are used and the scallops are packed in 3 five kilo layers. Each layer is surrounded with sponge sheet of chilled sea water. Two sheets are used for domestic deliveries, six are used for exports.

2) HALF SHELL

Fifteen kilogram polystyrene boxes are used and the scallops are packed in individual layers, curved face down. There are 3 five dozen layers in each box in a separate plastic bag and each of these layers is surrounded with a sponge sheet of chilled sea water. This method facilitates the agent in breaking the shipment into smaller orders.

3) MEAT

Normal shipment package is 20 kilo of ice water washed scallops per polystyrene box. The company also packs in 500 gm flat rectangular plastic containers for the local market and special requests.

Frozen scallops are packed in 10 kg cardboard boxes containing four frozen plates each weighing 2.5 kilograms.

Currently the company is very happy with the quality of the plastic liner used to package the scallops, however the thickness of both the polystyrene boxes and the sponge sheets will have to be increased or the quality improved, as tests are showing that they provide insufficient insulation for the chilled product.

POLICIES AND CUSTOMER SERVICE

1) Domestic
Normal business terms 7 days payment on invoice.
New wholesalers and customers need to complete a credit application, which is checked through Tas Collection Service Pty Ltd.

The company will refund in full any substandard product returned to it or to their wholesaler. A company representative will also make every effort to view the product to ascertain the precise problems. Most problems have been associated with freight handling by Ansett. These have since been corrected and the freight service is now considered very good. It is estimated that complaints are made on less than 2% of sales.

Domestic target of 10% or less mortality in live scallop shipments, while company prefers customers to split and use dead scallops as fresh meat, a refund will be given on any returns.

2) Export

Importing agents must establish a letter of credit. This remains the companies policy at present, but if a satisfactory long term business arrangement can be established the company would sight draft facilities.

Live shipments are made at importer risk and should be insured. The company is, however, prepared to negotiate on any claim of bad product or high mortality. Importers are currently putting all the live scallop shipment directly in salt water tanks on arrival and expecting full recovery of the scallops. The company feels this is adding to the mortality and trying to change policies where part of the shipment would be tanked for display and the remainder kept chilled before cooking and presentation.

PRICING

1)Live

The companies current policy is to set a factory door price and add freight and packaging costs. The current factory door price is $6.00.

2) Half Shell

Factory door price currently $7.00 per dozen.

3) Split meat

Factory door price $21.00 per kilo.

These remain the current base prices, but competition in some markets makes negotiation necessary. At present frozen Japanese scallops are being quoted $15.00 F.O.B. Yokohama, add $1.00 for freight. This price make it necessary for the

company to negotiate discount rate in some markets, especially for split meat products.

Product	Activity	Objectives	Pricing Formula	Expected Results
Live in shell	No change	Improve sales	$6 plus freight and packaging	Increased sales
Half shell	No change	Improve sales	$7 per dozen plus freight and packaging	Increased sales
Split meat	Modify	Maintain solid sales	$21, will have to negotiate in some markets where competition is strong	Increased sales
Overall		Improve sales and profits	Set door price then add freight and packaging costs, will negotiate on price	Increase sales

Prices will change depending on cost reduction and the volume of stock on hand. All surveys to date have shown scallops to be price elastic.
The company tries to keep the price of products stable in both the short and long term. This advantages for both the company and the customer. The preferred method of doing this is through a contract, the company tries to contract as many customers as possible but this tends to be possible only for large clients who take regular deliveries. The larger the volume the more stable price will become. Fluctuations in the short term in various states occur as wild scallop fisheries are exploited for short periods of time. This affect should be diminished in the long term as the company becomes the major supplier of live scallops in the domestic market. As the stock is small at this time, the company prefers not to compete with the wild scallop supplies if their price is lower than the factory door price. However as volumes increase this policy may be changed. During the Christmas and Easter holidays the company offers specials, this results in a much higher demand and has tended to attract new custom, therefore this practise will be continued. The company also provides samples at a greatly discounted price to any potential customer. At the top end of the market price competition is rare the main

determining factor being quality. Marketing research therefore needs to focus more on identifying potential new customers, most customers will use the company's product once aware that it exists because of its superior quality rather than a lower price.

DISTRIBUTION

Scallops are supplied twice weekly currently on Mondays and Thursdays. For a big order from a regular customer the company is prepared to supply on another day. It is hoped that in the future, when more stock becomes available and after the purchase of a proper harvesting boat, supplies will be daily.

1) LOCAL

Tasmanian scallops distribute scallops by local carriers to their own customers and two local wholesalers. The local wholesalers then use their own delivery system to supply their clients especially the local supermarket chain. The local southern carrier also takes the company's product to the airport cool room for dispatch to the mainland and export.

2) AUSTRALIAN MARKET

Product leaves the company in late afternoon for the airlines cool room and despatched on the early morning flights. Mainland agents collect direct from the airport and deliver direct to their clients that morning their most preferred delivery time. Scallops for smaller orders are taken to their storerooms broken into order lots and delivered in the afternoon. It is possible to deliver into Melbourne late in the afternoon for evening deliveries.

3) EXPORT

All export deliveries have been arranged through local export agents or through importing agents. The shipment is packaged to their specifications and they are responsible for delivery at the destination.

Product	Delivery Channel	Expected Results	Origin Purchase	Distribute Plan	Expected Results

Local	Sell to wholesaler and direct	Steady sales	Local restaurant hotels etc	Same	No change
Australian market	Sell to w/salers	Increasing sales	Whole-sales	Same, also will supply top hotels	Faster more reliable service
Export	Sell through local export agents or foreign agents	Increasing sales	W/salers Hong Kong Singapore Taiwan	Expand to other markets	Faster more reliable service
Overall	Combine channels	Increasing sales	Various	Some expansion	Faster more reliable service

A time delay model will be very useful for live scallop exports as experience shows that after 20 hours mortality of live scallops during transport rises dramatically. The Hong Kong and Taiwan markets are right on the outer limits of this 20 hour boundary. The poor distribution on the ground in Malaysia and Indonesia means that although they are closer in terms of air freight it is unlikely scallops would reach the restaurant table until well after 24 hours. This precludes those two markets from live exports at the present time.

Note that the Japanese co-ops can use special transportation tanks filled with seawater that can keep a live scallop shipment alive for 3-4 days. These are very expensive and the company cannot justify the capital expenditure required in the short term or medium term.

SALES MANAGEMENT

At the moment the company tracks sales using a monthly sales figures report and variance analysis. In addition to this a weekly review is carried out on sales in factory. Extensive feedback is gathered from the customers with great assistance

from the wholesalers. This is used to keep track of quality and customer opinions on smell, shell size, colour etc.

Staffing

Sales Manager	full time
Assistant sales manager	part time

As sales volume increases over the next 5 years it is anticipated that the increasing workload will be handled by the existing staff. The assistant sales manager position will become full time when the need arises. No incentive scheme for the sales force is in place and none is planned in the future.

ADVERTISING

Hopes to eventually advertise on both radio and television however this will be years away before this sort of marketing budget can be justified.

PROMOTION, OBJECTIVES AND METHODS

It is the company's objective to make clear the difference between Tasmanian Scallops product and other scallop products on the domestic market. In making this difference clear, the company will emphasis the freshness and high quality of the Tasmanian supply. The company aims to be involved in state promotions that highlight the quality and cleanliness of the Tasmanian environment and the primary products being produced here.

The company advertises and promotes their product, through the local press and in association with customers, is involved in local food fairs, and has trialed seafood and wine tasting at local vineyards. Participation in large food festivals has been found to be very effective resulting in increased sales. Wide campaigns using company literature have also gained excellent results. Small promotions have had little success.

Overseas the company relies on promotion through agents and co-operative efforts with Austrade. The company has joined the Tasmanian Development Authority promotion at international food fairs in the past and would be keen to join similar

promotions in target markets in the future. Eventually, as the company embarks on large volume live scallop exports, some promotion will be handled by the company itself. This has been found to be most effective after links have been established with a large customer, they can be immensely helpful in passing on promotional material to smaller current and potential customers. It won't be until 1997 that production will reach levels where intensive promotion will be necessary.

Product	Activity	Objectives
Local	local food fairs and tastings	Increase awareness of product
Australian market	Widespread target literature campaign	Increase awareness of product
Export market	International food fairs and Austrade promotions	Increase awareness of product

The company has had discussions with the executive chefs of the two leading hotels in Hobart and they are both willing to participate in promoting scallops, in food journals and magazine articles. The cost of such an operation has precluded the company from taking up this offer at present. The company is also supplying product to local Chinese restaurants for special international tour groups especially from Singapore.

The development of the brand, which should be ready by the March quarter of this year, will help enormously. At this point another wide distribution of promotional material is planned bearing the company' new logo and brand name. Before this is done the company feels they need more information on potential customers so they can target the campaign at them.

PUBLIC RELATIONS

The company regularly issues press releases to show milestones in development. The company participates in the Great Oyster Bay Festival and Summer Festival in Hobart. The company also maintained a display at the Royal Hobart Show.

The company undertakes to provide on the job training to students from the School of Aquaculture at the University of Tasmania and other interested departments of the university. Company personnel have been available to give an address at meetings and functions showing the firms operations.
The company will provide tours of operations on request to school groups, visitors and overseas tour groups.
The company has a designated media spokesperson.
The company plans to continue all the above public relations exercises. In particular the employment of students will continue, as a good relationship with the school of Aquaculture is seen as strategically vital.

Market	Activity	Cost	% of sales	Objectives	results
Local	Issue press releases, food festivals, train students, tours	1000	1%	maintain good relations with media, public university	enhance public image of product
Australia	Run tours			relation with customers	
Export	Run tours			relations with customers	
Overall	Compliment promotions when opportunity rises	1000	1%		enhance image

MARKET PROFITABILITY AND PENETRATION STRATEGIES

Primary objective is to establish reliable supply. Most supplies know what they like but there is considerable scope for the company to establish its own product range and set industry standards.

PENETRATION STRATEGIES

At present scatter gun approach and no real collated plan of action. Limited supply has seen the company fighting to keep a toehold in both Melbourne and Sydney

markets for live scallops, but the company has not been able to live up to their market strategy of reliable quality year round supply. Current strategy of concentrating supply on two main distributors in Melbourne and Sydney has merit, but their expectations of what the company can deliver are not being met, leading to some disolusiment and the positive results of the survey of distributors has not been maintained. The company strategy of national coverage and international market development is ad hoe and should be reassessed in the light of current realities and what the company can achieve. In the company's current circumstances this should be concentrated on the most profitable markets at present.

International shipments whilst prestigious from the company point of view and a substantial market exists for scallop products would not be in the best interest of the company at present. Current trial shipments to Singapore is a useful learning experience, but should only be considered as this. When the company has ascertained the best quality and distribution system for supplying the more forgiving Australian market, then strategies for entry to export markets need to be reexamined and formulated. A track record of international supply even if only a small quantity will help establish company credentials when the time is right for concerted export action.

CURRENT PROFITABILITY OF SINGAPORE

Shipment to Hong Kong, Taiwan and Japan would not be in the best interest of the company at present, as supply is not sufficient to satisfy requirements of these market, quality varies and their is uncertainty as to condition. The basic system should be sorted out locally before reattempting to establish in these markets. The experience with Taiwan should be a good lesson. A strong market and currently unsatisfied does exist but regular supplies of an assured quality is a must to stay in this market. Strategies should be realised in three years time and the use of one carefully chosen agent in each market should be considered as the better strategy at present. This is due to the need for a direct mutual confident relationship. Agents need certain encouragement to make a commitment to a new product. The company product must not be seen as a generic replacement, but all the inherent positive attributes of Tasmanian waters and the Australian Health service are fully exploited. Currency fluctuations could have a disastrous impact on a generic product but has less on a well branded and identified national product.

The prime objective of the company at present should be to daw up an achievable plan. Too much at present is based on future projections and the high expectations

for the company by both it's members and states instrumentalities. This has lead to market dominate in certain niche markets which the company has not been able to live up to.

The priority now is to look at what can be achieved and the best options for current productions levels. A realistic plan needs to draw up so strategies can be matched. The last two years production forecasts have not been approached. While this is due largely to unforeseen large stock losses in the water, it has led to the company promoting itself in manner to which it is unable to live up to. The current company strategy of promoting itself as a reliable year round supplier of uniform quality has not been achieved and is unlikely to be achieved in the next 12 months. Periods of supply see a concerned marketing push to shift product followed by periods of no or limited supply. Production driven strategies dominate current marketing, contrary to the company promoted view. Whilst much of this is due to the financial needs of the company it is contrary to the long term profit and market development needs of the company. The company needs to determine realistic output ranges in advance and the type of product that can be obtained from these. The live scallop component of the productions should be the highest priority and the chief determinant of harvesting. This harvesting plan should be determined in consultation with current distributors as to when the best prices can be obtained on a seasonal market. The Australian and Tasmanian market both exhibit strong demand and price peak over the year and the company at present does not take advantage of these. While scallop conditions is an important consideration marketing and profitability considerations need to be weighed more heavily. The company approach at present needs careful appraisal.

TECHNICAL REPORT

OF

EXPERIMENTS INTO THE SURVIVAL OF SCALLOPS EXPOSED TO AIR

NOVEMBER 1994

TASMANIAN SCALLOPS PTY LTD

THE SURVIVAL OF SCALLOPS EXPOSED TO AIR

EXPERIMENT 1

1. AIM
To obtain data for a change of temperature in the polystyrene box after packing chilled scallops.

2. DATE
26/10/1994 11.30 Chilling and packing
26/10/1994 14.30 - 27/10/1994 11.20 Checking temperature

3. MATERIAL
Reseeding scallops 3 t years old, a polystyrene box (internal L 54cm, W 35cm, H 22cm, Thickness 2cm).

4. METHOD
After the scallops were chilled for five minutes in sea water at a temperature of 1.5 °c, 25 scallops were packed into a polystyrene box with a plastic bag and sponge sheets. Set a wire probe of temperature recorder (HANNA HI-9184) in a box and record the temperature every 1 hour. Sea water temperature and air temperature were recorded by mercury thermometers every 3 hours.

5. RESULTS

DATE	TIME	AIR TEMP IN BOX (°c)	WATER TEMP (°c)	AIR TEMP (°c)
26/10/94	11.30	packed		
	12.00		15.5	18.5
	14.30	16.7	15.8	20.3
	15.30	17.0		
	16.30	17.1		
	17.30	16.6	16.0	17.5
	18.30	15.9		
	19.30	15.0		
	20.30	14.5	16.0	13.2
	21.30	14.3		
	22.30	14.1		
	23.30	13.9	16.0	13.4
27.10.94	00.30	13.7		
	01.30	13.6		
	02.30	13.5		
	03.30	13.4		
	04.30	13.1		
	05.30	13.0	15.8	12.5
	06.30	12.6		
	07.30	12.3		

08.30	13.1	15.9	14.0
09.30	13.8		
10.30	15.0		
11.20	15.3		
11.30		16.5	17.0

6. CONCLUSION

25 chilled scallops are not enough to keep cool inside of the box. In the first 8 hours the chilled scallops lowered the temperature. Chilling worked to reduce both temperature and body activity.

EXPERIMENT 2 (NO EXPOSURE)

1. AIM
To obtain data for a comparison of mortality between chilled and un-chilled scallops after 30 minutes exposed to air in a polystyrene box.

2. DATE
26/10/1994 11.30 Chilling and packing
12.30 Removing scallops into normal sea water
26/10/1994 14.30 - 28/10/1994 15.50 Checking mortality

3. MATERIAL
Reseeding scallops 3 t years old.

4. METHOD
After the scallops were chilled for five minutes in sea water at a temperature of 1.5 °c, 25 scallops were packed in to a polystyrene box (internal 1.54cm, W 35cm, H 22cm, thickness 2cm) with a plastic bag and sponge sheets. 25 un-chilled scallops were packed into another polystyrene box with a plastic bag and sponge sheets. Both lots of scallops were removed 30 minutes later from the boxes and put into normal sea water. The number of live and dead scallops were checked every three hours after removing. The sea water temperature and air temperature were measured by mercury thermometer.

5. RESULTS

DATE	CHILLED		UN-CHILLED		WATER TEMP	AIR TEMP
Time	live	dead %	live	dead %	(°c)	(°c)
26/10/1994						
11.30	packed		packed			
12.00	removed		removed		15.5	18.5
14.30	25	0	25	0	15.8	20.3
17.30	25	0	25	0	16.0	17.5
20.30	25	0	25	0	16.0	13.2
23.30	25	0	25	0	16.0	13.4
27/10/1994						
05.30	25	0	25	0	15.8	12.5
08.30	25	0	25	0	15.9	14.0
11.30	25	0	25	0	16.5	17.0
14.30	25	0	24	1	17.1	20.7
17.30	25	0	24	1	17.8	16.3
20.30	25	0	24	1	17.0	12.2
23.30	25	0	24	1	16.7	11.9
28/10/1994						
02.30	25	0	24	1	16.5	11.9
05.30	25	0	24	1	16.3	11.2

08.30	25	0	24	1	16.5	10.7
11.30	25	0	24	1	16.2	18.2
14.30	25	0	24	1	16.3	16.8
15.50	25	0	24	1	16.4	13.2

6. CONCLUSION

There were no significant differences between the chilled and the un-chilled scallops. Air temperature (10.7 - 20 °c) more varied than water temperature (15.5 - 17.8 °c).

EXPERIMENT 3 (6 HOURS EXPOSURE)

1. AIM
To obtain data for a comparison of changes of mortality between chilled and un-chilled scallops after 6 hours exposure to air in a polystyrene box.

2. DATE
26/10/1994 11.30 Chilling and packing
17.30 Removing scallops into normal sea water
26/10/1994 20.30 - 28/10/1994 15.50 Checking mortality

3. MATERIAL
Reseeding scallops 3 t years old.

4. METHOD
After the scallops were chilled for five minutes in sea water at a temperature of 1.5 °c, 25 scallops were packed into a polystyrene box (internal L54 cm, W35 cm, H22 cm, thickness 2cm) with a plastic bag and sponge sheets. Both lots of scallops were removed from the boxes and put into normal sea water 6 hours later. The number of live and dead scallops were checked every three hours after removing. The sea water temperature and air temperature were measured by mercury thermometer.

5.RESULTS

DATE	CHILLED		UN-CHILLED		WATER TEMP	AIR TEMP
Time	live	dead%	live	dead%	(°c)	(°c)
26/10/94						
11.30	packed		packed			
17.30	removed		removed		16.0	17.5
20.30	25	0	25	0	16.0	13.2
23.30	25	0	24	1	16.0	13.4
27/10/1994						
05.30	25	0	24	1	15.8	12.5
08.30	25	0	24	1	15.9	14.0
11.30	25	0	24	1	16.5	17.0
14.30	24	1	24	1	17.1	20.7
17.30	24	1	24	1	17.8	16.3
20.30	23	2	24	1	17.0	12.2
23.30	23	2	24	1	16.7	11.9
28/10/1994						
02.30	23	2	24	1	16.5	11.9
05.30	23	2	23	2	16.3	11.2
08.30	23	2	23	2	16.5	10.7
11.30	23	2	23	2	16.2	18.2
14.30	23	2	23	2	16.3	16.8

15.50	23	2	23	2	16.4	13.2

6. CONCLUSION

There were no significant differences between the chilled and the un-chilled scallop. The mortality is a bit higher than Experiment 1 (30 minutes exposure).

EXPERIMENT 4 (12 HOURS EXPOSURE)

1. AIM

To obtain data for a comparison of changes of mortality between chilled and un-chilled scallops after 12 hours exposure to air in a polystyrene box.

2. DATE

26/10/1994 11.30 Chilling and packing
23.30 Removing scallops into normal sea water
27/10/1994 05.30 - 28/10/1994 15.50 Checking mortality

3. MATERIAL

Reseeding scallops 3 t years old.

4. METHOD

After the scallops were chilled for five minutes in sea water at a temperature of 1.5 °c, 25 scallops were packed into a polystyrene box (internal L54 cm, W35 cm, H22 cm, thickness 2cm) with a plastic bag and sponge sheets. Both lots of scallops were removed from the boxes and put into normal sea water 12 hours later. The number of live and dead scallops were checked every three hours after removing. The sea water temperature and air temperature were measured by mercury thermometer.

5. RESULTS

DATE	CHILLED		UN-CHILLED		WATER TEMP	AIR TEMP
Time	live	dead%	live	dead%	(°c)	(°c)
26/10/1994						
11.30	packed		packed			
23.30	removed		removed		16.0	13.4
27/10/1994						
05.30	24	1	24	1	15.8	12.5
08.30	24	1	24	1	15.9	14.0
11.30	24	1	24	1	16.5	17.0
14.30	24	1	24	1	17.1	20.7
17.30	24	1	24	1	17.8	16.3
20.30	24	1	24	1	17.0	12.2
23.30	24	1	23	2	16.7	11.9
28/10/1994						
02.30	23	2	23	2	16.5	11.9
05.30	23	2	22	3	16.3	11.2
08.30	23	2	21	4	16.5	10.7
11.30	23	2	20	5	16.2	18.2
14.30	23	2	20	5	16.3	16.8
15.40	23	2	20	5	16.4	13.2

6. CONCLUSION

There was significant differences between the chilled and the un-chilled scallop. The mortality of the un-chilled was 2.5 times the chilled. The mortality of the un-chilled increased 30 hours after removing, 42 hours after packing.

EXPERIMENT 5 (18 HOURS EXPOSURE)

1. AIM

To obtain data for a comparison of changes of mortality between chilled and un-chilled scallops after 18 hours exposure to air in a polystyrene box.

2. DATE

26/10/1994 11.30 Chilling and packing
27/10/1994 05.30 Removing scallops into normal sea water
27/10/1994 08.30 - 28/10/1994 15.50 Checking mortality

3. MATERIAL

Reseeding scallops 3 t years old.

4. METHOD

After the scallops were chilled for five minutes in sea water at a temperature of 1.5 °c, 25 scallops were packed into a polystyrene box (internal L54 cm, W35 cm, H22 cm, thickness 2cm) with a plastic bag and sponge sheets. 25 un-chilled scallops were packed in to other polystyrene box with a plastic bag and sponge sheets. Both lots of scallops were removed from the boxes and put into normal sea water 18 hours later. The number of live and dead scallops were checked every three hours after removing. The sea water temperature and air temperature were measured by mercury thermometer.

5. RESULTS

DATE	CHILLED		UN-CHILLED		WATER TEMP	AIR TEMP
Time	live	dead%	live	dead%	(°c)	(°c)
26/10/1994						
11.30	packed		packed			
27/10/1994						
05.30	removed		removed		15.8	12.5
08.30	25	0	25	0	15.9	14.0
11.30	25	0	24	1	16.5	17.0
14.30	24	1	24	1	17.1	20.7
17.30	24	1	23	2	17.8	16.3
20.30	24	1	22	3	17.0	12.2
23.30	23	2	20	5	16.7	11.9
28/10/1994						
02.30	23	2	19	6	16.5	11.9
05.30	23	2	18	7	16.3	11.2
08.30	22	3	16	9	16.5	10.7
11.30	20	5	15	10	16.2	18.2
14.30	19	6	13	12	16.3	16.8
15.50	18	8	13	12	16.4	13.2

6. CONCLUSION

There was a significant difference between the chilled and un-chilled scallop. The mortality of the chilled was also high. The mortality of chilled increased 21 hours after removing, 39 hours after packing. The mortality of un-chilled increased 15 hours after removing, 33 hours after packing. The mortality is 3 times greater than Experiment 3.

EXPERIMENT 6 (24 HOURS EXPOSURE)

1. AIM
To obtain data for a comparison of changes of mortality between chilled and un-chilled scallops after 24 hours exposure to air in a polystyrene box.

2. DATE
26/10/1994 11.30 Chilling and packing
27/10/1994 11.30 Removing scallops into normal sea water
27/10/1994 14.30 - 28/10/1994 15.50 Checking mortality

3. MATERIAL
Reseeding scallops 3 t years old.

4. METHOD
After the scallops were chilled for five minutes in sea water at a temperature of 1.5 °c, 25 scallops were packed into a polystyrene box (internal L54 cm, W35 cm, H22 cm, thickness 2cm) with a plastic bag and sponge sheets. 25 un-chilled scallops were packed into another polystyrene box with a plastic bag and sponge sheets. Both lots of scallops were removed from the boxes and put into normal sea water 24 hours later. The number of live and dead scallops were checked every three hours after removing. The sea water temperature and air temperature were measured by mercury thermometer.

5. RESULT

DATE	CHILLED		UN-CHILLED		WATER TEMP	AIR TEMP
Time	live	dead%	live	dead%	(°c)	(°c)
26/10/1994						
11.30	packed		packed			
27/10/1994						
11.30	removed		removed		16.5	17.0
14.30	25	0	23	2	17.1	20.7
17.30	22	3	22	3	17.8	16.3
20.30	21	4	19	6	17.0	12.2
23.30	20	5	15	10	16.7	11.9
28/10/1994						
02.30	19	6	12	13	16.5	11.9
05.30	17	7	9	16	16.3	11.2
08.30	15	10	6	19	16.5	10.7
11.30	14	11	4	21	16.2	18.2
14.30	12	13	3	22	16.3	16.8
15.50	11	14	3	22	16.4	13.2

6. CONCLUSION
The mortality of both conditions are very high. 88 % of the un-chilled scallop died 27 hours after removing.

GENERAL CONCLUSION

Fig 1 and Fig 2 show the summary of survival rate for each experiment. From these figures the general conclusions below were reached:

1) Mortality of un-chilled scallop is twice as high as mortality of chilled scallop
2) 18 hours is the maximum exposure period for selling scallop as live with chilled packing.
3) 12 hours is the maximum exposure period for selling scallop as live without chilled packing.

Fig. 1 SURVIVAL RATE OF CHILLED SCALLOPS

FOR EACH EXPOSURE PERIOD IN AIR

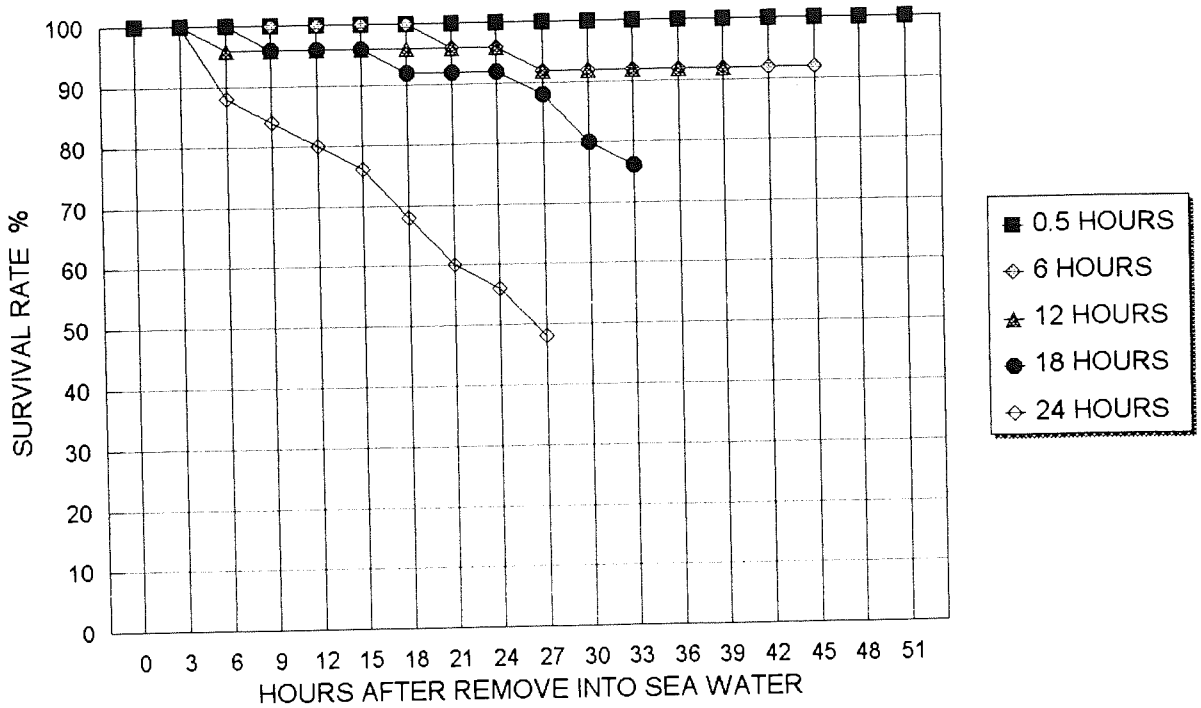
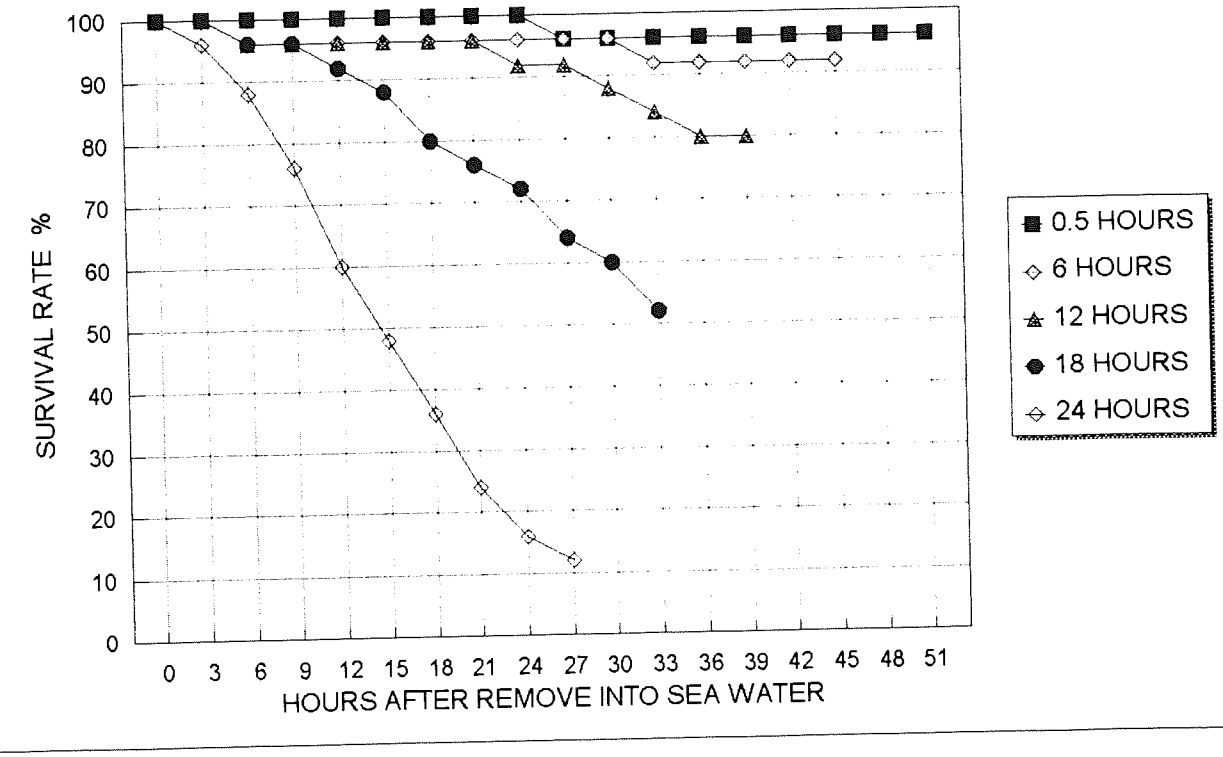


Fig. 2 SURVIVAL RATE OF UN-CHILLED SCALLOPS

FOR EACH EXPOSURE PERIOD IN AIR



93/161

TECHNICAL REPORT

OF

EXPERIMENTS IN DEVELOPMENT SHELL CLEANING MACHINE

FOR LIVE SCALLOPS

MARCH 1995

TASMANIAN SCALLOPS PTY LTD

DEVELOPMENT SHELL CLEANING MACHINE

EXPERIMENT 1 (CALCULATE THE CLEANING COST OF USING THE CLEANING MACHINE)

1. AIM

To compare the cleaning cost between using the cleaning machine and hand cleaning.

2. DATE

4th January 1995

3. MATERIAL

500 Cage culture scallop 2 + years old
A cleaning machine ("KUMATANI CUTTER", made in Japan)

4. METHOD

Before cleaning, weighed 500 scallops. Recorded the starting time and the finishing time. After cleaning, weighed and counted the number of scallop.

5. RESULTS

1. Start
   Time 13.36 Weight 37.5kg (500 scallops)
2. End
   Time 14.03 Weight 27.5kg (422 scallops)

6. CONCLUSION

1) The speed of cleaning machine was 3.24 second per scallop
2) The breakage rate was 15.6%
3) The cleaning cost was as below:
   Wage $10.79 x 0.45 hour / 422 scallops = $0.0115 per cleaned scallop

EXPERIMENT 2 (CALCULATE THE HAND CLEANING COST)

1. AIM

To compare the cleaning cost between using the cleaning machine and hand cleaning.

2. DATE

4th January 1995

3. MATERIAL

500 Cage culture scallop 2 + years old

4. METHOD

Cleaning was done manually. Before cleaning, weighed 500 scallops. Recorded the starting time and the finishing time. After cleaning, weighted and counted the number of scallops.

5. RESULTS

1) Start
   Time 14.30 Weight 37.2kg (500 scallops)
2) End
   Time 15.15 Weight 29.0kg (480 scallops)

6. CONCLUSION

1) The speed of hand cleaning was 5.40 second per scallop
2) The breakage rate was 4.0%
3) The cleaning cost was as below:
   Wage $10.79 x 0.75 hour / 480 scallops = $0.0169 per cleaned scallop

DEVELOPMENT SHELL CLEANING MACHINE

EXPERIMENT 3 (MORTALITY OF CLEANED AND UNCLEANED LIVE SCALLOP)

1. AIM

To obtain data for comparing the mortality between cleaned scallop and uncleaned scallop

2. DATE

28 March 1995 15.00 Bring scallop and move into tanks
29 March 1995 07.30 - 08.00 Cleaning shell by machine
08.00 - 14.00 Exposed in air
14.00 Move into water
19.50 Check mortality
30 March 1995 01.45 Check mortality
07.55 Check mortality

3. MATERIAL

100 cage culture scallops 2 + years old
A cleaning machine ("KUMATANI CUTTER", made in Japan)

4. METHOD

100 scallops were kept in tanks overnight. 50 scallops were cleaned by machine, 50 scallops were not cleaned. After 6 hours exposure in air, all scallops were moved to water. After every 4 hours in the water, scallops were observed for life or death. At the same time, the air temperature and water temperature was measured.

5. RESULTS

Date	Time	Number of scallop				Temperature (°C)	
		Cleaned		Uncleaned			
		Dead	Live	Dead	Live	Water	Air
29 Mar 1995	08.00	0	50	0	50	14.2	13.6
		Exposed in air					
	14.00	0	50	0	50	14.0	13.0
	19.50	9	41	4	46	13.3	11.4
30 Mar 1995	01.45	18	31	11	39	12.6	10.0
	07.55	23	27	13	37	14.3	9.0

6. CONCLUSION

1) 18 hours after moving into water, mortality rate of cleaned scallops was 46% and mortality rate of uncleaned scallop was 26%

2) This high mortality was caused by keeping overnight in tanks without running water.

3) Cleaning operation affected the mortality of live scallop by physical shock.

4) To minimize mortality, air exposure should be as short as possible.

GENERAL CONCLUSION

1) Cleaning machine saves the cost of 0.54 cents per scallop based on current wage rate ($10.79 per hour).

2) Purchasing cost of cleaning machine ($11 500) will be recovered by the cleaning of 2 000 000 scallops.

3) Before using machine, sorting operation is essential because the cleaning machine breaks small scallops.

4) Cleaning operation gives physical shock to scallops and increases the mortality. Air exposure should be minimized to reduce mortality.

93/161

TECHNICAL REPORT

OF

EXPERIMENTS INTO DEVELOPING METHODS OF PACKAGING

FOR TRANSPORT OF LIVE SCALLOPS

MARCH 1995

TASMANIAN SCALLOPS PTY LTD

EXPERIMENT 1 (COMPARE BETWEEN POLYSTYRENE AND CARDBOARD)

1. AIM -
To obtain data for a temperature change dependant on different types of boxes.

2. DATE
29 - 30 July 1994

3. MATERIAL
A. Polystyrene Box (L 535 mm , W 340 mm, H 170 mm, 30.9 litre)
B. Aluminium coated cardboard box (L 480 mm, W 300 mm, H 260 mm, 37.4 litre)

4. METHOD
After 7 kg of ice was packed in each box, the inside temperature was recorded on a frequent basis. A thermometer was placed 5 cm through lid and set to measure the inside temperature. The heated room air temperature was also measured. At the end of the temperature measurement the remaining ice was weighed.

5. RESULTS
1) Temperature (°C)

Date - Time	Polystyrene Box	Aluminium Coated Box	Air
29 July 1994			
10.00	4.5	11.6	20.5
10.30	4.0	9.0	20.0
11.00	4.0	9.0	20.1
11.30	3.5	9.5	20.1
12.00	3.6	9.5	20.2
12.30	3.6	9.5	20.2
13.00	3.7	9.5	20.2
14.00	3.9	9.9	20.2
15.00	4.0	10.1	20.5
16.00	4.0	10.4	20.5
17.00	4.0	10.4	20.5
17.35	4.1	10.4	20.5
30 July 1994			
09.30	5.5	11.0	20.0
11.00	6.0	11.4	20.5
12.00	6.0	11.5	21.0
13.00	6.0	11.5	21.0
14.00	6.3	11.7	21.0
15.00	6.3	11.7	21.0
16.00	6.5	11.7	21.0
17.00	6.5	12.2	21.0

2) Remaining ice weight at 17.00, January 17th 1995
Polystyrene box 3.55 kg
Aluminium Coated Cardboard box 0.08 kg

6. CONCLUSION

1) Polystyrene box had better insulating ability than Aluminium Coated Cardboard box.
2) Polystyrene box requires 1.1 kg ice per litre of volume for keeping the temperature less than 6.5 °c within 31 hours of packaging.

EXPERIMENT 2 (1 PLASTIC BAG IN POLYSTYRENE BOX)

1. AIM -
To obtain data for recovery rate dependant on different packing materials.

2. DATE
19 November 1994 - Chilling and Packing
20 November 1994 - Measuring and removing scallops into sea water after chilling (15 hours, 20.5 hours, 25 hours)
21 November 1994 - Checking recovery rate (50 hours after chilling)
22 November 1994 - Checking recovery rate (73 hours after chilling)

3. MATERIAL
Ear hanging culture scallops 2 + years old
A polystyrene box (L 535 mm, W 340 mm, H 170 mm, 30.9 litres, 20 mm thick)
A plastic bag (L 1000 mm, W 650 mm, 100 micron thick)

4. METHOD
The scallops were packed using a plastic bag and polystyrene box. 25 scallops were picked up after 16 hours, 21 hours, 25 hours and were moved into normal sea water. At the same time, the temperature of the normal sea water, inside the box and the air was measured. The scallops were checked to see if they were alive or dead 50 hours and 73 hours after chilling.

5. RESULTS
1) Chilling (19 November 1994)

	Chilling start	Chilling finish	Packing
Time	16.07	16.12	16.14
Water Temp (°c)	2.8	4.9	
Salinity (Per mil)	35.20	34.98	
Air Temp (°c)			16.1

2) Removing (20 November 1994)

	1st (16 hours)	2nd (21 hours)	3rd (25 hours)
Time	08.05	13.38	17.22
Temp in box (°c)	13.7	15.0	16.9
Air temp (°c)	15.9	16.7	16.9

3) Recovery (18.15 21 November 1994, 50 hours after packing)

	Removing Lot		
	1st (16 hours)	2nd (21 hours)	3rd (25 hours)
Number of live	14	3	2
Number of dead	11	22	87
Mortality	44%	88%	98%

4) Recovery (17.55 22 November 1994, 73 hours after packing)

	Removing Lot		
	1st (16 hours)	2nd (21 hours)	3rd (25 hours)
Number of live	11	0	0
Number of dead	14	25	89
Mortality	56%	100%	100%

6. CONCLUSION

1) There was a big difference of mortality between 15 hours of removing and 20.5 hours removing.

2) The inside temperature of the polystyrene box was the same as the outside temperature within 25 hours after packing.

EXPERIMENT 3 (1 PLASTIC BAG AND 4 SPONGE SHEETS IN POLYSTYRENE BOX)

1. AIM

To obtain data for the recovery rate dependant on different packing materials.

2. DATE

19 November 1994 Chilling and packing
20 November 1994 Measuring and removing scallops into sea water after chilling (15 hours, 20.5 hours, 25 hours)
21 November 1994 Checking recovery rate (50 hours after chilling)
22 November 1994 Checking recovery rate (73 hours after chilling)

3. MATERIAL

Ear hanging culture scallops 2 + years old
A polystyrene box (L 535 mm, W 340 mm, H 170 mm, 30.9 litre, 20 mm thick)
A plastic bag (L 1000 mm, W 650 mm, 100 micron thick)
Sponge sheets (L 560 mm, W 330 mm, 5 mm thick)

4. METHOD

The scallops were packed using 4 sponge sheets, plastic bag and a polystyrene box. Four sponge sheets covered all of the scallops. 25 scallops were picked up after 15 hours, 20.5 hours, 25 hours and they were moved into normal sea water. At the same time, the temperature of the normal sea water inside the box and the air was measured. The scallops were checked at 50 hours and 73 hours after chilling to see if they were alive or dead.

5. RESULTS

1) Chilling (19 November 1994)

	Chilling start	Chilling finish	Packing
Time	16.46	16.51	16.55
Water temp (°c)	3.1	4.7	
Salinity (Per mil)	35.23	35.23	
Air Temp (°c)		17.2	

2) Removing (20 November 1994)

	1st (15 hours)	2nd (21 hours)	3rd (25.5 hours)
Time	08.16	13.45	17.31
Temp in box (°c)	12.3	13.8	15.7
Air temp (°c)	15.4	16.8	17.2

3) Recovery (18.55 21 November 1994, 50 hours after packing)

	Removing lot		
	1st (15 hours)	2nd (21 hours)	3rd (25.5 hours)
Number of live	21	17	34
Number of dead	4	8	52
Mortality	16%	32%	60%

4) Recovery (17.55 22 November 1994, 73 hours after packing)

	Removing lot		
	1st (15 hours)	2nd (21 hours)	3rd (25.5 hours)
Number of live	19	11	15
Number of dead	6	14	71
Mortality	24%	56%	83%

6. CONCLUSION

1) The mortality of this experiment was remarkably low. It was half of Experiment 2.

2) The difference of mortality between 20.5 hours removing and 25 hours removing was bigger than Experiment 2. Sponge sheets affected the mortality, especially on 20.5 hours removing lot.

3) The inside temperature of polystyrene box was lower than Experiment 2. The reason for this being for improved mortality was to keep cool longer.

EXPERIMENT 4 (1 PLASTIC BAG, 1 SPONGE SHEET , 1 COOLING GEL PACK IN A POLYSTYRENE BOX)

1. AIM

To obtain data for the recovery rate dependant of a difference of packing materials.

2. DATE

19 November 1994 Chilling and packing
20 November 1994 Measuring and removing scallops into sea water after chilling (15 hours, 20.5 hours, 25 hours)
21 November 1994 Checking recovery rate (50 hours after chilling)
22 November 1994 Checking recovery rate (73 hours after chilling)

3. MATERIAL

Ear hanging culture scallops 2 + years old
A polystyrene box (L 535 mm, W 340 mm, H 170 mm, 30.9 litres, 20 mm thick)
A plastic bag (L 1000 mm, W 650 mm, 100 micron thick)
A sponge sheet (L 560 mm, W 330 mm, 5 mm thick)
A cooling gel pack (L 390 mm, W 280 mm, 860g)

4. METHOD

The scallops were packed using a polystyrene box, plastic bag, 1 sponge sheet and 1 cooling gel pack. A sponge sheet was put over the scallops and a cooling gel pack put on top of the sponge sheet. 25 scallops were picked up after 15 hours, 20.5 hours, 25 hours and they were moved into normal sea water. At the same time, the temperature of the normal sea water inside the box and the air was measured. They were checked at 50 hours and 73 hours after chilling to see if they were alive or dead.

5. RESULTS

1) Chilling (19 November 1994)

	Chilling start	Chilling finish	Packing
Time	17.01	17.06	17.08
Water temp (°c)	2.6	4.1	
Salinity (Per mil)	35.05	35.05	
Air temp (°c)			17.2

2) Removing (20 November 1994)

	1st (15.5 hours)	2nd (21 hours)	3rd (24.5 hours)
Time	08.26	13.53	17.39
Temp in box (°c)	7.7	9.9	13.7
Air temp (°c)	15.6	18.2	17.5

3) Recovery (19.10 21 November 1994, 50 hours after packing)

	Removing lot		
	1st (15.5 hours)	2nd (21 hours)	3rd (24.5 hours)
Number of live	18	15	46
Number of dead	7	10	38
Mortality	28%	40%	45%

4) Recovery (18.10 22 November 1994, 73 hours after packing)

	Removing lot		
	1st (15.5 hours)	2nd (21 hours)	3rd (24.5 hours)
Number of live	17	14	28
Number of dead	8	11	56
Mortality	32%	44%	67%

6. CONCLUSION

1) The mortality of 25 hours removing lot was remarkably low. The 15 hours lot and 20.5 hours lot had almost the same result as Experiment 3.

2) The difference of mortality between 20.5 hours removing and 25 hours removing was smaller than Experiment 3. A cooling gel affected the mortality, especially on 25 hours removing lot.

3) The inside temperature of polystyrene box was remarkably low. The scallops were kept cool in the box for a long time. This did not improve the mortality of 15 hours removing lot and 20.5 hours removing lot in comparison with Experiment 3.

EXPERIMENT 5 (1 PLASTIC BAG, 4 SPONGE SHEETS , 1 COOLING GEL PACK IN A POLYSTYRENE BOX)

1. AIM

To obtain data for the recovery rate dependant of a difference of packing materials.

2. DATE

19 November 1994 Chilling and packing
20 November 1994 Measuring and removing scallops into sea water after chilling (15 hours, 20.5 hours, 25 hours)
21 November 1994 Checking recovery rate (50 hours after chilling)
22 November 1994 Checking recovery rate (73 hours after chilling)

3. MATERIAL

Ear hanging culture scallops 2 + years old
A polystyrene box (L 535 mm, W 340 mm, H 170 mm, 30.9 litres, 20 mm thick)
A plastic bag (L 1000 mm, W 650 mm, 100 micron thick)
4 sponge sheets (L 560 mm, W 330 mm, 5 mm thick)
A cooling gel pack (L 390 mm, W 280 mm, 860g)

4. METHOD

The scallops were packed using a polystyrene box, a plastic bag, 1 sponge sheet and a cooling gel pack. 4 sponge sheets covered all scallops and a cooling gel pack put on top of sponge sheet. 25 scallops were picked up after 15 hours, 20.5 hours, 25 hours and they were moved into normal sea water. At the same time, the temperature of the normal sea water inside the box and the air was measured. They were checked to see if they were alive or dead at 50 hours and 73 hours after chilling.

5. RESULTS

1) Chilling (19 November 1994)

	Chilling start	Chilling finish	Packing
Time	17.15	17.20	17.22
Water temp (°c)	2.7	4.2	
Salinity (Per mil)	35.02	35.02	
Air temp (°c)			17.4

2) Removing (20 November 1994)

	1st (15 hours)	2nd (21 hours)	3rd (24.5 hours)
Time	08.36	14.02	17.48
Temp in box (°c)	7.6	9.6	12.2
Air temp (°c)	15.2	18.1	17.7

3) Recovery (19.20 21 November 1994, 50 hours after packing)

	Removing lot		
	1st (15 hours)	2nd (21 hours)	3rd (24.5 hours)
Number of live	19	15	44
Number of dead	5	10	43
Mortality	21%	40%	49%

4) Recovery (18.10 22 November 1994, 73 hours after packing)

	Removing lot		
	1st (15 hours)	2nd (21 hours)	3rd (24.5 hours)
Number of live	19	13	36
Number of dead	5	12	51
Mortality	21%	48%	59%

6. CONCLUSION

1) The mortality was almost the same as Experiment 4. More sponge sheets did not affect the mortality using cooling gel pack.

2) The difference of mortality between 20.5 hours removing and 25 hours removing was smaller than Experiment 3. This result was the same as Experiment 4.

3) The inside temperature of polystyrene box was a bit lower than Experiment 4. Sponge sheets proved to be effective for keeping cool by the result of Experiment 3 and 5.

EXPERIMENT 6 (1 PLASTIC BAG, 8 SPONGE SHEETS, 1.5 KG ICE IN A POLYSTYRENE BOX)

1. AIM
To obtain data for the recovery rate dependant on different packing materials.

2. DATE
23 November 1994 Chilling and packing
24 November 1994 Moving scallops into normal sea water, 25 hours after packing.
25 November 1994 Checking recovery rate (49 hours after packing)
26 November 1994 Checking recovery rate (73 hours after packing)

3. MATERIAL
Ear hanging culture scallops 2 + years old
A polystyrene box (L 535 mm, W 340 mm, H 170 mm, 30.9 litres, 20 mm thick)
A plastic bag (L 1000 mm, W 650 mm, 100 micron thick)
8 sponge sheets (L 560 mm, W 330 mm, 5 mm thick)
1.5 kg ice

4. METHOD
Scallops for this experiment were chilled to 5.6 °c in cold sea water for 3 minutes and then chilled by 0.5 °c in chilled sea water for 2 minutes. Chilled scallops were then packed. 4 sponge sheets were put on the sides, a sponge sheet put on the bottom, a sponge sheet put in the middle of scallops, 2 sponge sheets on the top. 1.5 kg ice was put on top of sponge sheet. Packed scallops were moved into normal sea water 25 hours later and they were then checked to see if they were alive or dead at intervals of 49 hours and 73 hours.

5. RESULTS
1) Chilling (23 November 1994)

	Chilling start	Chilling finish	Packing
Time	06.30	06.33	06.35
Water Temp (°c)	5.6	0.5	
Air temp (°c)			6.5

2) Opening box and remove scallops into normal sea water.
(7.10 - 7.26, 24 November 1994. 25 hours after packing)
* Condition of test lot *
Ice was not thawed completely. A proportion of the scallops, up the middle sponge sheet, were opened and the mantle was stepped back. Generally most of the scallops were of closed shell. Sea water was about 5 mm in the bottom of the pack container.

3) Recovery (7.35 25 November 1994, 49 hours after packing)

	Upper layer	Lower layer	Total
Number of live	81	55	136
Number of dead	38	26	64
Mortality	32%	32%	32%

4) Recovery (7.35 26 November 1994, 73 hours after packing)

	Upper layer	Lower layer	Total
Number of live	49	28	77
Number of dead	70	53	123
Mortality	59%	65%	62%

6. CONCLUSION

1) The mortality after 50 hours of packing was lower than previous Experiments, but 73 hours after packing it was not lower. The ice had better cooling capacities than the cooling gel, but it couldn't recover scallop condition.

2) There were no differences between upper layer and lower layer. Sponge sheet did not intercept cool air circulation in the box.

GENERAL CONCLUSION

1. Summary of mortality (50 hours after packing)

Packing material	Air exposure period 15 hours	20.5 hours	25 hours
1 plastic bag	44%	88%	98%
1 plastic bag 4 sponge sheets	16%	32%	60%
1 plastic bag 1 sponge sheet 1 cooling gel pack	28%	40%	45%
1 plastic bag 4 sponge sheets 1 cooling gel pack	21%	40%	49%
1 plastic bag 8 sponge sheets 1.5 kg ice			32%

2. Summary of mortality (73 hours after packing)

Packing material	Air exposure period 15 hours	20.5 hours	25 hours
1 plastic bag	56%	100%	100%
1 plastic bag 4 sponge sheets	24%	56%	83%
1 plastic bag 1 sponge sheet 1 cooling gel pack	32%	44%	67%
1 plastic bag 4 sponge sheets 1 cooling gel pack	21%	48%	59%
1 plastic bag 8 sponge sheets 1.5 kg ice			62%

3. Sponge sheet showed good results even without cooling gel pack.

4. Cooling gel pack or ice affected the mortality of longer air exposure lot and keeping longer in tank.

5. If the customer expects less than 25% mortality, scallops should be placed back in water within 15 hours after packing. Sender should cover scallops with sponge sheets.

6. If the customer expects less than 40% mortality, scallops should be placed back in water within 20.5 hours after packing. Sender should cover scallops with sponge sheets.

7. If more than 25 hours is required for transporting, cooling gel pack or ice should be used in box. Even with these used the mortality will be over 45%. Scallops should be cooked before 50 hours after packing.