Processing of the

Southern King Crab
(pseudocarcirus gigas)

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FISHERIES
RESEARCH &
DEVELOPMENT
CORPORATION

FAC Enterprises Pty Ltd

Project NSC 92/125.16

Executive Summary

The Southern King Crab , once a by-catch of the Southern Rock Lobster fishery, has developed into a reasonably strong fishery in its own right. The crabs are found in similar locations as the lobster, along the southern coast of Australia (although primarily restricted to the sea between west Victoria and north Tasmania).

The crabs are found in sizes ranging from 1.5 to 12kg and live in mostly deep water. A market for the crabs has developed in the live export trade to Asia. This has caused some concern as the market prefers the smaller crabs (up to 5 kg) and will pay almost nothing for the larger ones. This situation has led to an imbalance in the catch specifications and there are fears that the long term effect on the fishery will be detrimental.

FAC Enterprises has identified a market for the larger crabs by processing the meat and packaging it in canned or snap frozen containers. The end product would then be sold into the premium crab market in Japan.

To achieve this objective, a suitable method for the commercial cooking and processing of the crab needed to be identified. That is the purpose of these trials. On the successful completion of the trials the project would achieve firm orders from interested organisations in Tokyo. There were two factors critical to the success of the project:

- The processing must be economically viable and strong enough to withstand the fluctuations of the international seafood demand cycle.
- The processing must produce a premium product with 100% consistency to satisfy the high expectations of the market.

These two factors are obviously linked and are dependant on the other for determining the degree of success of the project.

Within the parameters of the objectives it was found that the crabs were best cooked by steaming them and that a picking-line procedure could be established to separate the meat from the body. Yield on the crab was averaged at 18-19% (less than the objective of 20%), and the packaging proved to be reliable and effective.

The only problem encountered during the trial process was the quality of the finished product. It proved to be beyond the expertise and resources of the project team to consistently supply a finished product that did not have fragments of shell or cartilage in it or had suffered a loss of quality in some other way.

Approximately 70% of the resources for the trial was given to this issue without achieving greater than a 95% quality success.

For this reason the trials were completed without achieving the initial objectives and failed in two areas to provide a commercially viable procedure for the processing of the crabs.

Recommendations

The following recommendations are made:

- The information detailed as a result of these trials be made available to as broad an audience as possible in order to promote the opportunity to develop the existing knowledge into a viable process.
- The studies on the biology and breeding of the crabs be given a high priority to establish the value in continuing research on a fishery that does not have a certain future.
- The premium crab market in Japan be further investigated from a marketing point of view to ascertain the value of this product in the region.
- Research into the separation of the crab-meat from the body be taken further to explore other avenues , such as flotation or air blowing. These options were not available to these trials.
- Studies of the biology of the crab be broadened to provide more precise information on of gender, season, temperature and size and the effect this has on yields.

Section 1

Background

From 1983 there was a surge in the market demand for the Southern Rock Lobster, fished out of ports along the southern coast of Australia. This demand was largely met from fisheries operating in the triangle formed by Adelaide, Melbourne and northern Tasmania. The fishery has developed into a strong supplier of live product into the Asian export markets and, although subject to market fluctuations, it has proven to be a stable platform for fishermen in the long term. Because of the variety of the locations that the lobsters could be found, it was noted that in some areas there was a high percentage of the large king crabs being recovered with the pots. In some cases this proved to be a nuisance as the crabs could (and did) destroy the lighter pots and/or eat the lobsters along with the bait. Gradually, a market opportunity was found for these large crabs and they were upgraded from the status of "by-catch" to become a new fishery.

Today this fishery produces in the vicinity of 450 tonnes of crab per year. There are seasonal restrictions placed on the fishermen and these are controlled at the state level in much the same manner as the regulations for the lobster industry. Over 90% of these crabs are caught in the same area as the rock lobster and many lobster boats have diversified into the crab market.

The crab fishery has not flourished as the lobster market did. There are a number of possible reasons for this:

- The crabs are not as prolific as the lobsters (at least in the areas accessed by the lobster boats).
- The crabs are difficult to locate in fishable quantities.
- The mortality rate for the live export market can be up to 30%
- The crabs vary in size from 1.5 - 12kg (for adult crabs)
- Little is known about the age and breeding cycle of the crabs, creating questions regarding the sustainability and viability of the fishery.

The variation in weight and the high potential mortality on export proved to cause a problem for fishermen who where faced with strong demand for the smaller crabs and very little interest in any thing over 5kg. This often resulted in large quantities of the over-5kg crabs being tossed over the side of the boat to make room for the more valuable smaller crabs.

This situation has been exasperated by suspicion that the larger crabs are quite old (up to twenty years) and the smaller crabs are responsible for most of the breeding (being younger and / or female - females are up to two thirds the size of the males). Trials are being conducted to investigate this with a view to determining the size and sustainability of the fishery.

With this in mind it was determined that a balanced approach to the fishery was needed. One solution put forward was to find a market for the larger crabs and to even-out the distribution of weight across the total amount fished. This, combined with regulatory steps to control the fishery, would

provide reasonable stability for the mid-term until a greater understanding of the crab could be reached.

FAC Enterprises Pty Ltd had been operating in the wholesaling of the crabs (and lobster) within the Perth area and had developed some interest from the local Asian community. This interest developed when a Japanese business contact suggested that the meat from the crab was extraordinary and would do well in the premium crab market in Japan. This market had been relying on the Northern King Crab (found off Japan and Alaska) and required the meat from the crab to be processed in some manner and packaged.

Initial enquiries and preliminary samples sent to Tokyo were well received and several companies expressed interest in seeing more samples along with details of production. This was a major hurdle as at this stage the crabs had not been processed in large numbers and there was no data on the crab to suggest how (or if) this could be achieved. The additional hurdle was that FAC Enterprises was a small Western Australian based company and nearly 90% of the crabs were found off the Victorian coast.

At this stage it was decided to move the company to Victoria and, with the assistance of a grant from the Fisheries Research and Development Corporation, conduct research into the viability of commercial processing techniques. The objectives for the research were to be very specific and were designed to either produce a commercially viable system to come up with an acceptable product, or to determine if possible obstacles to such a system could be predicted and overcome with time and other resources. The specific objectives are detailed in the next section.

Section 2

Objectives

The objectives for the research were modelled around a number of key contributing factors:

- The processing capacity would have to handle up to 5 tonnes of crabs over a weekly cycle.
- The process would require the separation of the meat from the body in a manner that would not damage the quality and texture of the meat.
- The cooking process needed to take into account the packaging of the product using canning and/or quick-frozen techniques.
- The resources available would be restricted to those at Safcol in Footscray, Victoria (due to time constraints and lack of suitable alternatives).
- The budget for the trialing process allowed for a finite number of trials to be conducted to achieve the information required.

The objectives for the project were:

1. Determine the most efficient and effective cooking method (ie. boil/steam/pressure).
2. Determine the optimum cook-time and cook-temperature requirements to maximise meat yield and quality.
3. Develop and implement cutting and picking process line to extract meat whilst maintaining texture.
4. Achieve a minimum yield on picking of 20%.

Section 3

Methodologies

Cooking

The cooking trials were covered in three distinct phases:

- Phase 1 - killing the crabs
- Phase 2 - sorting the crabs
- Phase 3 - cooking the crabs

Phase 1 - killing the crabs.
Three methods were trialed in the killing phase:

- drowning
- spiking, and
- gassing with carbon dioxide

Drowning proved to be effective but was quickly discounted as a viable method. On average it took between three and four hours for the crabs to drown in a fresh water solution. During drowning the crabs became waterlogged, this had an adverse effect on the quality of the meat after cooking and caused high variations in the yield results making accurate calculations impossible.

Anecdotal evidence from fishermen had suggested that spiking with a long-bladed knife between the eyes would provide an instant kill. Many attempts at this, using a variety of blades and techniques failed to kill a single crab. There is also a question over whether this would be more time-consuming than other methods. This method was discounted on the grounds of uncertainty and requires further investigation.

The most effective and efficient method of killing the crabs was with CO_2 gas. This resulted in a consistent 100% result in between 30 - 45 minutes. To achieve this result the following process was used:

1. Place approx. 40 kg of crab in 100 litre drums
2. Add 750g (a double handful) of dry ice
3. Cover the drum to ensure maximum effect

After 45 minutes it was found that the crabs were dead and had not suffered any damage as a result of the process. To provide a consistency of results this method was used for all the trials detailed in section 6 of this report.

Phase 2 - sorting the crabs.
There are two considerations in the sorting of the crabs:

- the crabs varied from 5kg to 10kg in size
- the crabs must be processed "on their backs"

Firstly the crabs were graded into three groups by size; these sizes were,

- 5 - 6.5kg

- 6.5 - 8kg
- 8 - 8++kg

This grading was done to approximate levels based on a "rough" gauge of comparative sizing. Actually weighing individual crabs was trialed but added no perceptible difference to the results.

From this point on the crabs must spend the rest of the preparation and processing on their backs. This is done for two reasons:

- The crabs store their waste products in the "top" part of the shell. Care must therefore be taken to ensure that this does not flow down into the "bottom" sections where the meat is.
- The shell on the underside is thinner (by up to 60 %) and therefore easier for heat penetration and accessibility during the cooking and processing phases.

Phase 3 - cooking the crabs.

As mentioned previously, pressure cooking was not trialed for this report. The two cooking methods used were boiling and steaming.

Boiling

The crabs were boiled in a 3% saline solution for between 15 to 25 minutes at 95 - 100^{0}C. After a number of trials on different sizes and cook-times, boiling was discounted as a viable method for the following reasons:

- The "violence" of the boiling water caused the crabs to shed their legs and claws. This allowed both water into the meat cavities and meat to escape the body, causing significant variations in quality and yield.
- The boiling caused the meat in the legs and claws (in some cases) to over cook and turn to a yellowish jelly. This is a result of either direct contact with the boiling water and/or variations in the distribution of heat throughout the crab (due to different shell thickness and meat texture).

Steaming

The steaming of the crabs was carried out in large industrial size steamers. The crabs were placed (on their backs) on shelves in a mobile racking platform and were cooked according to graded size. Results of these trials are detailed in section 6 of this report. Steaming proved to be the favoured cooking option for the following reasons:

- The preparation was easier and required less set-up time.
- The steaming allowed for quicker, accurate controls over temperature.
- Steaming provided an even cook through the different components of the crab.
- Steaming caused virtually no damage to the crab during cooking.
- Steaming the crab produced consistent yield results.

Once the cooked crabs left the steamers, they were cooled in a 3% saline ice slurry for 4 - 5 minutes.

Overall steaming provided consistent results in a measured environment and proved to be efficient and effective within the parameters of the trial

objectives.

Cook-time trials

Trials to establish the optimum cooking time and temperature were conducted alongside the trials on the cooking process. The detailed results of these are included in the next section (section 6). These trials were designed to test and isolate a number of key variables:

- the effect of crab weight on cook-time and temperature
- any variations caused by shell thickness
- the optimum combination of the above to provide consistent yields
- the effect of preparation and cooking methods on quality of the cooked crab

In summary they were to provide a clear and measured performance indicator on the optimum combination of factors that best achieved the trial objectives. This data was then to be collated in a form that could be duplicated on a larger scale allowing for production modelling and commercial development.

Trial and error was used to determine the best combination of factors which would present the most workable solution. To provide the baseline data for future analysis the following collection methods were used:

- temperature probes inserted into the different components of the crab
- body temperatures and cook-time rated against weight and shell thickness
- variations in the speed of heating and cooling the crabs
- variations in cooking the crabs "live" *

To determine the definition of "cooked", it was necessary to trial several variations of the above factors before an acceptable level of whiteness and texture was reached. The cooked meat has a stringy texture and maintains a succulence while retaining a white colour. If the meat is over-cooked it will be a yellowish tint and will tend towards dryness. An under-cooked batch will appear grey or translucent and will not separate easily from the shell casing.

Processing the cooked product.

The cooked crabs were treated to a series of production trials to ascertain the most acceptable method of removing the meat within the confines of the objectives. These trials accepted knowledge from previous experience which had ascertained that the nature of the crab and the location of the meat in the sections of the body did not lend itself to mechanical separation. It was also assumed that chemical separation or flotation mechanisms would damage the fragile qualities of the processed meat or at best would alter these qualities to effect the saleability into a premium market.

For these reasons the objectives concentrated solely on assessing a manual process and determining the stages required to guarantee end-product quality and achieve the desired yield of 20%.

* Note: When live crabs were cooked, they virtually all shed their legs and claws during the cooking process. This happened during boiling and steaming and is not a recommended practise for reasons discussed above.

The Process that was selected developed through trial and error and input from a number of sources such as:

- senior process workers
- quality engineers
- fishermen
- restaurant chefs

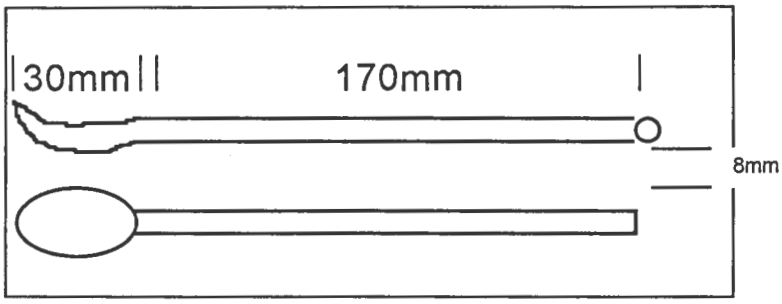
The final process for the removal of the meat from the cooked crab is included as **appendix A** to this report. The appendix provides a flow chart of the stages in the process as well as a detailed description of the techniques to be used.

There are however a number of key points to note regarding the separation stages:

- Timing is critical. If the freshly cooked meat is exposed to air for longer than 45-50 minutes the meat will start to develop black spots as rapid oxidation occurs.
- This problem is delayed somewhat by dipping the extracted meat in a solution of sodium metabisulphite (0.5 %) for 15 seconds then dipping in water for the same time.

Note:
Appendix A refers to a "shucking" tool used to extract the meat from the components of the crab. This tool was purpose designed and built for the job and is described below:

Fig. 5-1 Shucking Tool - stainless steel



Summary of Methodologies

The methods used for each of the trials reflected the nature of the equipment at hand and information known from previous experience with the crabs. In addition, the objectives were deliberately limiting to direct the trials towards information that would become useful during the eventual commercialising of the production process. As this product was developed specifically for the premium crab market in Japan and Taiwan, the major driver in the research was a guarantee of product quality. If this could not be reached with 100% consistency then the product would not meet the criteria for commercial production.

Section 4

Results

Cook-time and temperature

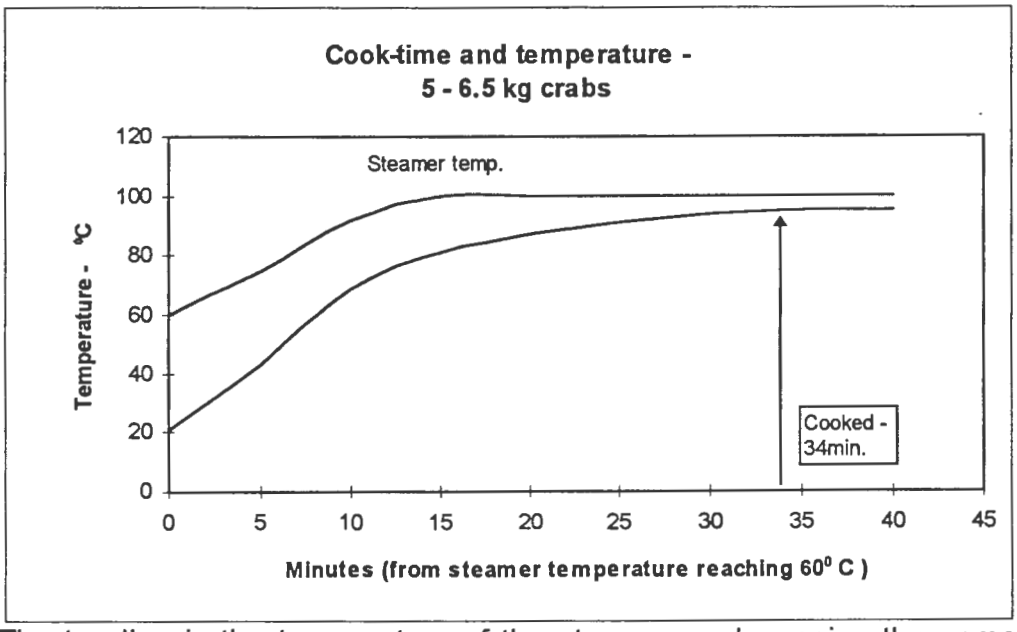
Steaming Results
The difficulty with establishing accurate cook-times and temperature for these crabs lay in the fact that they differ greatly in size and shell thickness (<1mm - 2.5mm). To achieve a consistent result it was first necessary to determine the accurate cooking rate for the meat (inside the crab). This information was then used as the basis for all other tests. The methodology for this trial was a result of a combination of prior experience, common sense and guesswork. These combined to develop a series of tests to approximate the point at which a given quantity of meat would reach optimum cooking. The formula below was developed out of this work and was used in the remaining trials:

> X min = 3 min. per kilogram of crab cooked at 70^0 C (plus)
> (where X is the cook-time after the internal body temperature has reached 70^0C and continues to rise.)

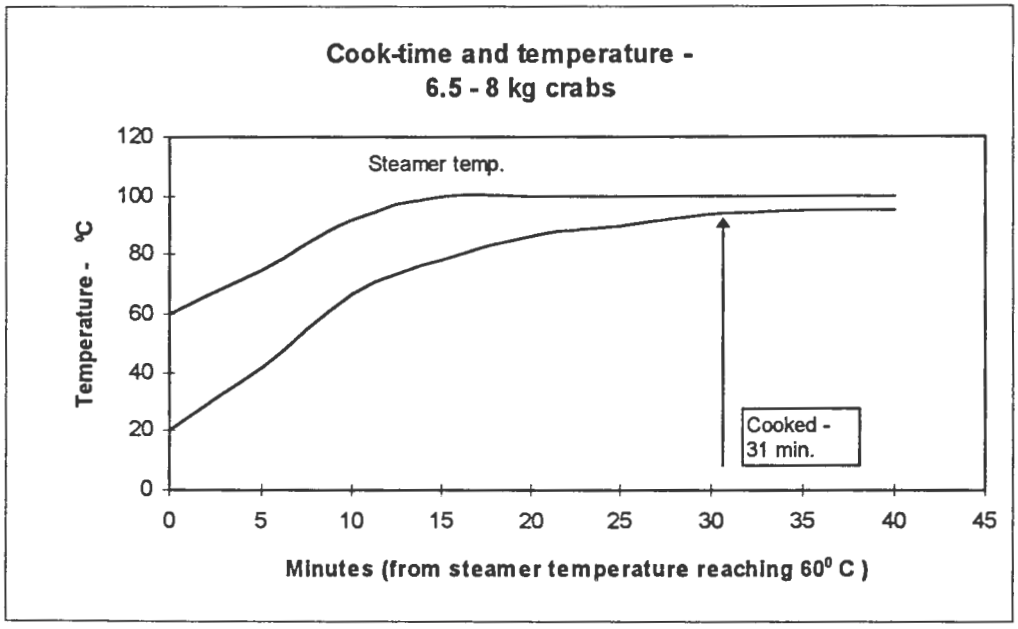
In the development of this formula the results where erratic for the boiling trials and consistent for the steaming. This reinforces the selection of steaming as the optimum cooking method. To illustrate the application of this information the example below outlines the cook-time for a selection of crabs from the smaller grading:

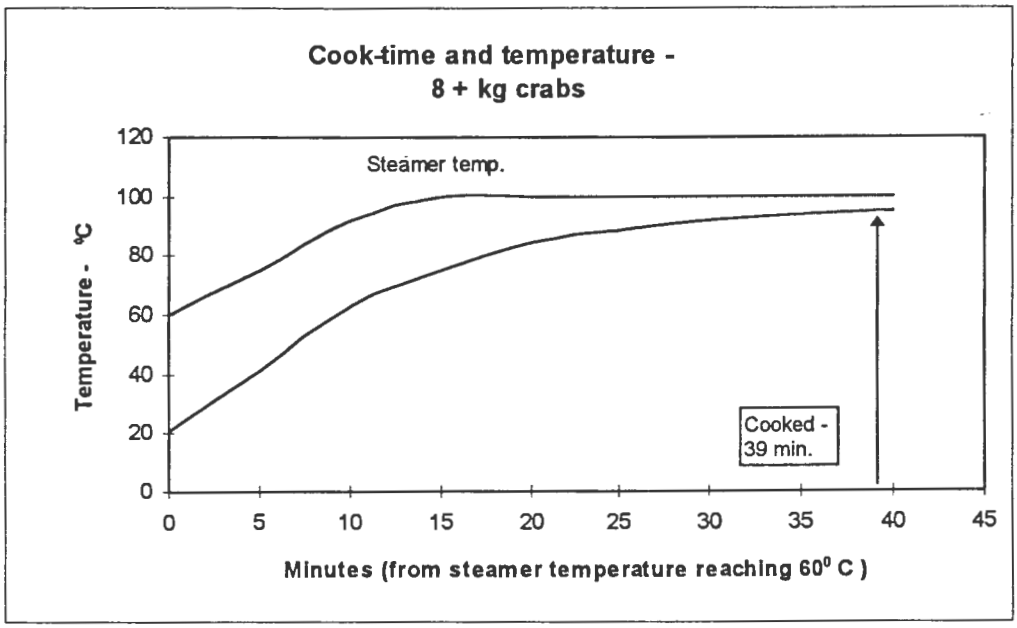
> weight - 5kg - 6.5kg
> cooktime @ 3min per kg = 6.5 x 3 = 20.5 min (max)
> note: this time starts when the internal temp. of the crab has reached 70^0C

This information is best displayed graphically as the results of the test below show. This chart gives the results from the cook-time / temperature trials for the graded crabs in the 5 - 6.5kg range.



The top line is the temperature of the steamer and remains the same for all the trials using this method. Below are the results from the trials for the other weight grades developed using the same methodology.





This data is contained in table form below:

	Time in brackets of 5 minutes (temps. in °C)								
Weight	0	5	10	15	20	25	30	35	40
5 - 6.5kg	21	43	69	81	87	91	94	95	
6.5 - 8kg	20	42	67	78	86	90	94	95	
8+ kg	21	41	63	75	84	88	92	94	95
Steamer°C	60	75	92	100	100	100	100	100	100

Section 5

Benefits

The original research was to validate a process enabling the crabs to be commercially fished and exported as a premium product. This value-adding process has proven to be beyond the reach of the resources of the trials and the results are reflected in the list of potential beneficiaries of the research. Having said that, it is important to note that we now know a lot more about the crabs than we did before, and we have a good idea of where our research should concentrate for further trials and tests.

The main beneficiaries from this project will be:

- The crab fishermen who desire a stable and balanced fishery.
- The exporters of processed seafood who may seek to diversify.
- Food processing companies who may offer a solution to the processing dilemma and develop a capable process.
- Future prospects who have the resources to extend the project to achieve a commercial solution.
- The research bodies currently compiling data on the crabs for scientific studies.

While the benefits to these parties are yet to be verified, it is anticipated that the problem with the over-size crabs will not go away. Any suggestion that these crabs may be used commercially, at a fair and competitive price, will be well received and should generate further speculation on how best to capitalise on the current imbalance.

Section 6

Miscellaneous

Intellectual Property

There is no intellectual property associated with this research that can be identified as worth protecting. In view of the time lapse since the commencement of research on the crabs it would seem to be expedient to disseminate the information in this report to as many interested parties as possible in the hope of generating a response to take on the recommendations and develop the process one step further.

In this case FAC Enterprises passes responsibility for any perceived intellectual property to the FRDC to decide and administer. This reflects the status of the company and it's lack of involvement in the seafood industry.

Further Development

The project could be advanced along the lines of a joint venture between the fishing fraternity and the relevant authoritative bodies. This would achieve the purpose of developing the market for the crabs overall and providing a balance to the catch specifications of the fishermen.

Research for this project could be funded through private companies with an interest in the processing of the crabs. This research would follow on from the trials documented in this report and should focus on the development of a consistent method of extracting the meat to provide a high level of quality at a viable cost.

There will always be the need to protect and monitor this fishery. This will only be achieved if the catch is viable as a whole and the market is reasonably stable. All parties who share involvement with the crabs should be presented with the opportunity to increase the knowledge on the crab and the commercial applications of the catch.

Staff List

The staff that have be involved in this project are:

FAC Enterprises	Mark Turkington Treasure Jennings
Food Consultant	Phillip Walsh
Food Scientist	SAFCOL Foods Ltd - R & D team led by Dr Piatek

Conclusion

The project was completed without achieving 100% consistency in a viable process for the crabs. While this is disappointing, it ignores the fact that the research was 90% successful in the remainder of the trials. The resulting body of information adds to the very little that is understood about this crab and whether it should be exploited or protected.

The findings of this report point to a fluctuating market with high prices and costs to the primary producers, little stability in the demand prices and no capacity to value-add at a commercially acceptable rate.

Further studies into the crabs will provide much needed information on the nature of the fishery and whether it will sustain itself to an acceptable degree.

att: **Appendix A** - Process flow chart and description

Processing the Southern King Crab - Report
Appendix A

Version 2
Status Under Review
Created 21/8/96 Modified 14/9/96 Approved
Process Owner Mark Turkington

1. PROCESS DETAIL

1.0 Start process

START

The next figure is 1.1 Sort the crabs

1.1 Sort the crabs

TASK

1.1.1 DESCRIPTION
Crabs are to be graded according to size (weight). This is best done to approximate levels using a rough guide.

1.1.2 TECHNIQUES
Actually weighing the crabs is very time consuming. Obtain a crab of each size grade - ie. 5 kg, 6.5 kg, 8 kg - locate these crabs at the sorting tables to be used as a guide. As the crabs are passed through they are compared against the control samples and placed accordingly.

The next figure is 1.2 Kill the crabs

1.2 Kill the crabs

TASK

1.2.1 DESCRIPTION
Crabs are killed using CO_2 gas.

1.2.2 TECHNIQUES
1 Place approximately 40 kg of crabs in 100 litre drums
2 Add 750 g (two handfuls) of dry ice
3 Ensure a lid is fitted
4 Let sit for 45 - 50 minutes

Note: The crabs should be placed on their backs at the start of this stage and should remain this way for the duration of the cooking process.

The next figure is 1.3 Cook the crabs

1.3 Cook the crabs

TASK

1.3.1 DESCRIPTION
Cook the crabs in steam for the time as per appropriate for the size grade (see section 6 of the main report for details on recommended cook-time and temperatures).

1.3.2 TECHNIQUES
The dead crabs are placed on trays (on their backs) and positioned inside an industrial size steamer. The steam is turned on and the crabs cook according to the details in section 6.

The next figure is 1.4 Separate the crabs into sections

1.4 Separate the crabs into sections

TASK

1.4.1 DESCRIPTION
Dismantle the crab into three component sections:
- Body
- Claws
- Legs

1.4.2 TECHNIQUES
The crab claw and leg joints are easily broken by pulling and twisting against the normal direction of movement of the appendage.

The next figure is 1.5 Remove body shell

1.5 Remove body shell

TASK

1.5.1 DESCRIPTION
Removing the outer shell of the crab body.

1.5.2 TECHNIQUES

Hold crab upside down and facing away from operator. Insert shucking tool at base of crab between outer shell and body component. Prise body away from shell.

The next figure is 1.6 Clear body component

1.6 Clear body component

TASK

1.6.1 DESCRIPTION
Removing the gills and waste products from around the body component.

1.6.2 TECHNIQUES
Clean the body component by removing the extraneous gills, flaps and mouth sections from the crab. This is done by hand.

The next figure is 1.7 Clean body component

1.7 Clean body component

TASK

1.7.1 DESCRIPTION
Remove dirt and waste product from inside the body cavities.

1.7.2 TECHNIQUES
Rinse the body component in a 3% saline solution, ensuring that the internal cavities are thoroughly cleaned of any waste or fragments of shell.

The next figure is 1.8 Dissect the body

1.8 Dissect the body

TASK

1.8.1 DESCRIPTION
Dissect the body component.

1.8.2 TECHNIQUES
Using either a band saw or shears, cut the crab longitudinally to produce two hemispheres with the meat cavities exposed.

The next figure is 1.9 Remove joints from the body

1.9 Remove joints from the body

TASK

1.9.1 DESCRIPTION
Removing the joint sections of the claw and leg joints.

1.9.2 TECHNIQUES
These joints may already have been removed during the separation stage. If not, then take extra care not to lose any of the meat from the body when these joints are cracked off.

The next figure is 1.10 Legs Claws

1.10 Legs Claws

SPLITTER

1.10.1 DESCRIPTION
Separate legs and claws

The next figure for "A" is 1.11 Separate legs into three segments
The next figure for "B" is 1.12 Remove claw shell

1.11 Separate legs into three segments

TASK

1.11.1 DESCRIPTION
Separate the legs into three sections.

1.11.2 TECHNIQUES
Using shears, cut the leg sections before each of the joints. This will produce three sections - an upper leg, lower leg and toe section.
The toe section will rarely contain any meat and can be set to one side. The other sections can be relied on to produce reasonable quantities of meat of a good quality.

Note: Instead of using shears, an alternative is to break the joints against the direction of movement. This can often result in the meat coming straight out still attached to the cartilage (it is wise to practise this before adopting as a viable technique).

The next figure is 1.13 Extract meat

1.12 Remove claw shell

TASK

1.12.1 DESCRIPTION
Cut the shell of the claws.

1.12.2 TECHNIQUES
Use a band-saw to cut the shell of the claws. There is no recommended method of doing this as it varied from operator to operator. The common requirement was the need for care as the claw meat can be damaged easily by the blade or by dust from the shell being cut.

The next figure is 1.13 Extract meat

1.13 Extract meat

TASK

1.13.1 DESCRIPTION
Extracting the meat.

1.13.2 TECHNIQUES
Leg Meat:
Insert the curved end of the shucking tool (as described in section 5 of the report) . Use this to "spoon" and scrape the meat from the sections.

Claw Meat:
Once the shell has been removed, use a fine blade knife to remove the internal cartilage from the larger sections of meat. This requires a high degree of skill and should be given to a worker with experience in this area.

Body Meat:
Use the shucking tool to spoon and push the meat from the cavities. There will be a requirement to use shears to cut some sections of the cartilage walls to get to the meat inside. This should be done with great care as the cartilage fragments easily and will enter the meat if not handled correctly.

The next figure is 1.14 Rinse meat

1.14 Rinse meat

TASK

1.14.1 DESCRIPTION
Due to the onset of oxidation, the meat should be rinsed in a solution of sodium metabisulphate (0.5%) for 15 seconds and then dipped in fresh (clean) water for 15 seconds. This slows the development of black spots and serves to clean the meat . It also adds moisture to the meat, providing for a succulent finished product.

1.14.2 TECHNIQUES

Note: the meat should be weighed before this process to assess the yield ratios. Obviously the presence of the excess water will add to the weight of the meat and would falsely increase the yield readings.

The next figure is 1.15 Grade meat

1.15 Grade meat

TASK

1.15.1 DESCRIPTION
Grade the meat according to:
- type (leg, body, claw)
- quality

1.15.2 TECHNIQUES
This stage is also used to assess the quality and remove shell fragments and cartilage that escaped the attention of the processors. This becomes a major control point for quality prior to canning the meat.

The next figure is 1.16 Pack the meat

1.16 Pack the meat

TASK

1.16.1 DESCRIPTION
Pack the meat according to requirements - frozen or canned.

1.16.2 TECHNIQUES
The packaging of the product was outside the objectives of the research for this report.

The next figure is 1.17 Add brine solution

1.17 Add brine solution

TASK

1.17.1 DESCRIPTION
A brine solution is added to the tinned product to keep the meat white, succulent and "fresh".

1.17.2 TECHNIQUES
The solution is formulated as follows (per 1000 ml water):
- Sodium Tri Poly Phosphate 15g
- Citric Acid 3g

- Salt 10g
- Calcium Disodium EDTA 2g

The next figure is 1.18 Close tins

1.18 Close tins

TASK

1.18.1 DESCRIPTION
Close the tins as per normal canning procedures.

The next figure is 1.19 Retort tins

1.19 Retort tins

TASK

1.19.1 DESCRIPTION
The tins are retorted at 115^0C for 25 minutes. Previous trials had established this as producing a F_0 value of ≥ 3.0 .

1.19.2 TECHNIQUES
These tests were conducted at Safcol premises in Victoria using heat penetration techniques.

The next figure is 1.20 Finish

1.20 Finish

FINISH

Appendix A

Process
1.0 Start process
1.1 Sort the crabs
1.2 Kill the crabs
1.3 Cook the crabs
1.4 Separate the crabs into sections
1.5 Remove body shell
1.6 Clear body component
1.7 Clean body component
1.8 Dissect the body
1.9 Remove joints from the body
1.11 Separate legs into three segments
1.12 Remove claw shell

1.13 Extract meat
1.14 Rinse meat
1.15 Grade meat
1.16 Pack the meat
1.17 Add brine solution
1.18 Close tins
1.19 Retort tins
1.20 Finish