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**FINAL REPORT TO THE
FISHERIES RESEARCH AND DEVELOPMENT
CORPORATION**

**FEASIBILITY STUDY FOR THE
ESTABLISHMENT OF A KELP
PROCESSING INDUSTRY ON THE
WEST COAST OF TASMANIA**

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FRDC Grant 94/113



FISHERIES
RESEARCH &
DEVELOPMENT
CORPORATION

**Department of
Primary Industry and Fisheries**
TASMANIA



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NON-TECHNICAL SUMMARY

An assessment of the cast bull kelp resource was conducted between Granville Harbour and Four Mile Beach on the west coast of Tasmania to determine the feasibility for the establishment of a kelp processing industry.

An intensive sampling program involving the collection of cast kelp from the tidal pools and rock platforms around areas of accessible coastline formed the basis for estimations of instantaneous standing crop of cast bull kelp and projected annual tonnage of cast kelp deposited within the total potential kelp harvesting area.

An initial reconnaissance survey identified nine experimental harvesting sites between Granville Harbour and Four Mile Beach. The nine experimental harvesting sites were sampled fortnightly for twelve months and information recorded on the numbers and wet weight of kelp plants within each site. Estimates of the mean density of cast kelp within each collection area, and an estimate of the total survey area relevant to this study was used to obtain the instantaneous standing crop for each sampling event.

Estimates of instantaneous standing crop for this study ranged from 0 - 34.2 tonnes. Substantial quantities of cast kelp were only deposited during winter and autumn as opposed to the generally poor quantities of cast kelp deposited in spring and summer. The variation in deposition of cast kelp between Granville Harbour and Four Mile Beach may in part be explained by the prevailing environmental conditions. The seasonal nature of kelp deposition on the west coast may restrict any commercial kelp harvesting operations to autumn and winter months.

An estimate of the annual tonnage of cast kelp deposited between Granville Harbour and Four Mile Beach was calculated from the instantaneous standing crop estimates and assumes that the standing crop of cast kelp at any one time is representative of all kelp that has been deposited onto the shores in the previous three days.

Projected annual tonnage (including the upper and lower 95% confidence limits) of cast kelp deposited between Granville Harbour and Four Mile Beach for the period July 1994 - July 1995:

Estimated tonnage = 1102.9 tonnes (wet weight)

95% Upper Bound = 2220.8 tonnes (wet weight)

95% Lower Bound = 150.7 tonnes (wet weight)

The findings of this study provide an indication of resource availability to interested parties investigating the feasibility for the establishment of a cast kelp processing industry on the west coast of Tasmania, and should be considered in the development of a strategic plan for the establishment of such an industry.

BACKGROUND

Along the exposed rocky coasts of the temperate to sub-antarctic regions of the southern hemisphere, the genus *Durvillaea* (Bory 1826) is a dominant and visually impressive member of the intertidal to shallow sub-tidal marine flora (Cheshire and Hallam, 1988a and 1988b). Plants within this genus occur in areas typified by high wave energy environments over rocky substrata and are highly adapted to withstand the physical forces of vigorous wave action (Cheshire and Hallam, 1988a and 1988b). Moreover, the morphological features of *Durvillaea* exhibit physical characteristics consistent with the hydrodynamic regime encountered within the preferred habitat (Khailov 1978, Cheshire and Hallam, 1989).

Durvillaea potatorum (commonly referred to as bull kelp) is endemic to south-eastern Australia and generally occurs on rough water coasts as a fringe zone to the sub-littoral. The distribution of this species extends from Cape Jaffa in South Australia to Bermagui in New South Wales, the Bass Strait islands and coastal areas of western, southern and eastern Tasmania where wave action is considerable (Rolley, 1980). Three additional species of *Durvillaea* have been recorded and identified within circumpolar regions of the southern hemisphere (Hay, 1979).

The first recorded use of seaweed in Tasmania was noted by Labillardiere in the early 1790's (Sanderson, 1994). A marine algae, possibly *Durvillaea potatorum*, was used by indigenous inhabitants as a foodstuff and also as a water carrier. Historical evidence suggests that harvesting of endemic seaweeds for various uses has been widespread. However, it was not until 1964 that the first commercial seaweed harvesting operation commenced on the east coast of Tasmania. Alginates (Aust.) Co. harvested *Macrocystis pyrifera* as a source of alginates and as the seaweed stocks were depleted over time, divers were encouraged to harvest *D. potatorum* as an additional alginate source to supplement the shortfall in *M. pyrifera*. Technical and processing difficulties forced Alginates (Aust.) Co. to cease operations in 1973 (Sanderson, 1994).

Seaweed Industries Pty. Ltd. was the first commercial operation to utilise the *Durvillaea* resource exclusively in Tasmania and commenced harvesting drift *D. potatorum* in the 1960's. Currently, Kelp Industries Pty. Ltd. is the

only established commercial harvester of drift bull kelp in Tasmania and operates from King Island, located off north west Tasmania in Bass Strait. In 1993 Kelp Industries Pty. Ltd. harvested between 18-20,000 tonnes (wet weight) of bull kelp and expects this amount to increase due to increased market demand for kelp products. The company processes kelp to the dried and milled stage and exports this product for value added processing overseas to supply the international alginate industry.

Predominantly westerly weather on the west coast of Tasmania and King Island throws enormous amounts of bull kelp onto the shore each year. A tonne of dried and milled bull kelp can potentially fetch between \$ 600 and \$ 1, 500 on the international market. As there are only five major kelp harvesting areas worldwide (Australia, South Africa, America, Norway and Scotland), there is significant potential for, and interest in, the development of a second processing facility on the west coast of Tasmania.

There are currently five multinational companies producing biopolymers from alginates obtained on the international kelp market. The appeal generated by alginates lies in the diverse nature of applications that biopolymers provide to medical, pharmaceutical, food manufacturing, cosmetic and biotechnological industries. Biopolymers extracted from kelp are soluble in water at low temperatures and form gels that are heat resistant. They are often the preferred agents for thickening and stabilising, and for coating and film forming.

In November 1993, the Tasmanian based company Western Red Mining Pty. Ltd. (WRM) approached the Department of Primary Industry and Fisheries (DPIF) having identified the drift kelp resource on the west coast of Tasmania as a potential business opportunity for the production of raw material for the international alginate industry. WRM saw this potential industry as a means of generating employment on the west coast after the downturn in the mining industry.

In view of the concentrated international kelp market and the control exerted by the five multinational alginate producers, WRM were advised that entry to this market could prove extremely difficult without a joint venture or contractual arrangement with one of these companies.

Pronova, a Norwegian multinational company involved in alginate production, explored the potential for a joint venture with WRM and indicated that any contractual arrangement would require WRM to supply Pronova with approximately 1,000 tonnes dry weight drift kelp per annum (approximately 5,000 tonnes wet weight) processed to the first stage raw material. A preliminary evaluation of potential kelp harvesting and processing sites on the west coast was undertaken by DPIF in June 1994 to consider the extent of coastline accessible to harvesting operations, the amount of drift kelp available for harvesting and the proximity of siting arrangements for drying and processing facilities. Concerns on the environmental impact of kelp harvesting along the foreshore reserve were also considered with the Department of Environment and Land Management.

In recognising that the siting and development of a kelp industry on the west coast would depend on the amount of kelp available, the cost of building and running a large drying facility and locating accessible markets for the raw (dried and chipped) product, DPIF proposed to undertake a 12 month FR&DC funded feasibility study for the establishment of a kelp processing facility on the west coast of Tasmania in association with WRM.

NEED

The establishment of a new Tasmanian kelp harvesting and processing facility on the west coast is dependant on the tonnage of cast bull kelp available each year. The present study attempted to determine an annual tonnage of cast kelp along a selected area of accessible coastline on the west coast, prior to any significant investment by WRM in financing preliminary harvesting and processing operations.

Little is known of the characteristics of the international kelp market regarding supply and demand issues worldwide. A concern for WRM was in maintaining a supply of raw materials on the large scale required by the potential joint venture partner. This report will assist WRM in their negotiations with Pronova, or any other processing and marketing companies, as quantitative information on the potential annual tonnage of cast bull kelp is essential before any investment can be considered.

Currently, all bull kelp harvested in Australia is exported as raw material for the international alginate industry for additional processing to the alginate and biopolymer stage. Consequently, all alginates used in Australia by food manufacturing and other specialised industries are imported. The King Island company does not intend at this stage to build a downstream processing facility in Australia. Therefore, the establishment of a new kelp drying and chipping plant may be the catalyst for the development of a value adding industry for the production of alginate products in Australia, should a threshold harvest level be achieved on the west coast of Tasmania.

The majority of towns situated on the west coast of Tasmania were established in the first half of this century as mining centres. Recent financial losses by mining companies operating on the west coast has seen a significant increase in unemployment as well as relocation of local residents to the major cities for employment. The establishment of a kelp harvesting and processing facility on the west coast may provide an opportunity for employment for WRM and other local residents.

OBJECTIVES

1. Assess the potential annual tonnage of cast bull kelp (*Durvillaea potatorum*) available on the accessible shores of the west coast
2. Provide recommendations on the management of kelp resources for the establishment of such an industry.

METHODS

Study Area

An assessment of the bull kelp resource was conducted between Granville Harbour and Four Mile Beach, approximately 6.5 kilometres of coastline, on the west coast of Tasmania. Along this section of coastline, there were a number of suitable gravel or rocky shores from which cast kelp may be harvested (Figure 1). As any commercial harvesting operations would only be targeting cast bull kelp, there was no need to conduct dive surveys to

assess the percentage cover or biomass of attached bull kelp plants. Methods used in the present study attempted to estimate the amount of cast kelp distributed along the shore between Granville Harbour and Four Mile Beach at any one time. An intensive sampling program involving the collection of cast kelp from the tidal pools and rock platforms around areas of accessible coastline formed the basis for this estimation of "standing crop" of cast bull kelp.

Site Selection

A reconnaissance survey was conducted between Granville Harbour and Four Mile Beach to rapidly evaluate coverage of kelp along the shore and to identify suitable sites for more detailed sampling. With the assistance of WRM personnel, nine sites were chosen along the intertidal shore as experimental harvesting sites (Figure 2). Selection of these sites was based on kelp availability and the nature of the substrata, access to four wheel drive vehicles throughout the year and the environmental impact of this assessment on the foreshore. Consideration was also given to areas that would be regularly targeted during a commercial kelp harvesting operation. Sandy areas were not chosen because sand impregnation of kelp significantly reduces the commercial value of the raw product.

Each of the nine sites was identified by the setting of an eight foot star picket (Figure 3). Collection areas for sites 1-6 were defined by all kelp within five metres radius of the star pickets. Sites 7-9 were surveyed and marked for natural topographic features and measurements taken to calculate the collection areas. These methods were employed to reduce the likelihood of the sampling sites being disturbed over the twelve month period.

Experimental Design

The main objective of the detailed sampling regime was to establish the potential recovery of drift kelp by wet weight from areas between Granville Harbour and Four Mile Beach. Therefore, estimates (with confidence limits) of the mean density of cast kelp within each collection area, and an estimate of the total survey area relevant to this study was used to give estimates of the instantaneous standing crop of cast kelp at fortnightly intervals

throughout the year. An estimate of the projected annual tonnage of bull kelp cast along the shore between Granville Harbour and Four Mile Beach was extrapolated from the data.

The nine experimental harvesting sites were sampled fortnightly for twelve months (26 data sets) and information recorded on:-

- (a) the number of kelp plants within each collection area;
- (b) total weight of kelp plants within each collection area, including particular weights of the plant body (laminae + stipes) and holdfast; and,
- (c) general weather conditions - wind, tides and wave exposure.

At each site, kelp within the collection area ($\geq 50\%$ of plant body within the designated collection site) was gathered with the assistance of a petrol powered capstan winch; holdfasts were detached and separated from the rest of the plant body. Bull kelp from within the collection areas was conveyed to the foreshore, shaken dry and wet weighted.

Standing crop of cast kelp at each of the nine sampling areas was scaled up by the proportion of total sample area to the total potential harvesting area to give an estimate of the instantaneous standing crop between Granville Harbour and Four Mile Beach.

- (a) Standing Crop Estimation

The instantaneous standing crop (X_s) for the total potential harvesting area (A_t) between Granville Harbour and Four Mile Beach was calculated as:

$$X_s = \bar{\rho}_s \cdot A_t$$

The mean lamina density $\bar{\rho}_s$ (kg/m²) is equal to:
$$\bar{\rho}_s = \frac{\sum_s \frac{W_s}{a_s}}{n_s}$$

where w_s is the lamina weight (kg), a_s is the sampling site area (m²) and n_s is the number of experimental sites sampled during each fortnightly sampling event s .

Confidence limits for the mean lamina density determinations were calculated from the table for critical values for the t-distribution (small sample distribution).

The critical value $t_{\alpha(n-1)}$ for the required confidence limit was obtained from the two-tailed t-table where $1-\alpha$ is the proportion expressing confidence and $n-1$ are the degrees of freedom. Hence, the critical value $t_{0.05(8)}=2.306$ was used to calculate the upper and lower 95% confidence limits for mean lamina density determinations.

$$\text{The Lower 95\% Confidence Limit} = \bar{\rho}_s - t_{0.05(n-1)} \cdot \frac{s_s}{\sqrt{n_s}}$$

where s_s is the sample standard deviation of the lamina density determinations for the nine experimental sites (n_s) sampled during sampling event s .

$$\text{Similarly, the Upper 95\% Confidence Limit} = \bar{\rho}_s + t_{0.05(n-1)} \cdot \frac{s_s}{\sqrt{n_s}}$$

(b) Projected Annual Tonnage Estimated From the Study Sites

Assumptions used to obtain estimates of annual cast kelp production:

- (a) That cast kelp deposited for periods in excess of 3 days was not collected from the study sites. It was assumed that after this period, cast kelp began to exhibit signs of deterioration due to decomposition and desiccation and was of no commercial value.
- (b) That cast kelp was deposited randomly within the total potential kelp harvesting area and that the nine experimental sites

selected for this study were representative of this random deposition process.

(c) Correlation of Mean Lamina Density with Environmental Parameters

The effect of certain environmental variables on the mean lamina density and the instantaneous standing crop of cast kelp was investigated. Data from three days immediately prior to each sampling date (based on assumption of harvestable cast kelp remaining "fresh" for approximately three days) was obtained for maximum wave height, mean wave height, maximum wind speed, mean wind speed, mean maximum tide height and mean minimum tide height. Means and maximums for each of these parameters was calculated and correlated with mean lamina density determinations. All environmental data was obtained from both the Bureau of Meteorology and the C.S.I.R.O. Division of Oceanography, Hobart. Wave height and tide height information was model derived, whereas wind speed information was compiled from real measurements.

DETAILED RESULTS

(a) Summarised Site Information

A total of 1464 kelp plants were removed from the nine sampling sites and wet weighted during the twelve month cast kelp assessment study. The total lamina weight collected (23, 928 kg) represents 91.7% of the total kelp weight removed from the sites. Table 1 summarises the total number of plants and total weight of cast kelp collected at each sampling site for the experimental period July 1994 - July 1995 ($N = 26$ fortnightly samples).

(b) Standing Crop Estimates

Estimates of instantaneous standing crop of cast kelp at each sampling date (including the upper and lower 95% confidence limits) are shown in Table 2.

The total potential cast kelp harvesting area between Granville Harbour and Four Mile Beach (A_t) was determined from surface area measurements recorded for additional kelp deposition sites and includes the areas encompassed by the experimental sites. Estimates of instantaneous standing crop for this study ranged from 0 - 34.2 tonnes (upper bound 95% confidence limit = 52.2 tonnes, lower bound limit = 16.3 tonnes) and it is significant that the largest values of standing crop were obtained in autumn and winter (Figure 4.).

A clear indication of the seasonal nature of cast kelp deposition is shown in Figure 5. Substantial quantities of cast kelp were only deposited during winter and autumn as opposed to the generally poor quantities deposited in spring and summer. Further evidence of this seasonal pattern is demonstrated by the absence of any cast kelp within the experimental sites during summer and on four out of six occasions during summer, all experimental sites were totally devoid of cast kelp. The mean estimated standing crop calculated from data grouped by season ranged from 19.6 tonnes in winter to 0.6 tonnes in summer.

The variation in deposition of cast kelp between Granville Harbour and Four Mile Beach may in part be explained by the prevailing environmental conditions. During this study, prevailing wind and sea conditions were considerably harsher in autumn and winter (Figure 6) than those conditions experienced in spring and summer. Winds from the north and east were far more frequent in spring and summer compared to predominantly southerly and westerly winds during autumn and winter.

(b) Projected Annual Tonnage Estimated From the Study Site

Collection of cast kelp within the experimental sites during this study targeted cast kelp that would be suitable for further processing; decomposed kelp was rejected during sampling (Figure 7). A critical assumption in the estimation of the annual tonnage of cast kelp deposited between Granville Harbour and Four Mile Beach is that cast kelp deposited in excess of three days began to show signs of deterioration, and hence was not collected. This assumption was based on observations from DPIF staff, WRM representatives and commercial operations on King Island.

Furthermore, it was assumed that movement of cast kelp along the coastline as a result of tidal flows and currents was limited. There was little evidence of kelp deposition and subsequent re-deposition to other sites. Fluorescent streamer tags attached to kelp plants were not recaptured any more than 15 metres away from the original tagging position.

Therefore, an estimate of the annual tonnage of cast kelp deposited within this area of study (including the upper and lower 95% confidence limits) was calculated from the instantaneous standing crop estimates shown in Figure 4, and assumes that the standing crop of cast kelp at any one time is representative of all kelp that has been deposited onto the shores in the previous three days. As fourteen days separates the sampling events, the estimates of the weight of kelp deposited for this period assumes that the standing crop has been "turned over" on 4.67 occasions.

Projected annual tonnage of cast kelp deposited between Granville Harbour and Four Mile Beach for the period July 1994 - July 1995:

Estimated tonnage = 1102.9 tonnes (wet weight)

95% Upper Bound = 2220.8 tonnes (wet weight)

95% Lower Bound = 150.7 tonnes (wet weight)

As the wet weight : dry weight relationship for bull kelp approximates 5 : 1 (Kelp Industries Pty. Ltd.), it can be assumed that the estimated annual tonnage of cast kelp deposited within the study area could be dried to provide 220.6 tonnes of raw product (95% upper bound estimate = 444.2 tonnes, 95% lower bound estimate = 30.1 tonnes).

(c) Correlation of Mean Lamina Density with Environmental Parameters

Stepwise regression analyses of the mean lamina density determinations and the environmental variables indicated relationships between mean lamina density at each sampling event and two of the environmental variables recorded for the three days prior to each sampling event. These are:

- (i) mean maximum tide height; and,
- (ii) mean wave height.

Multiple regression analysis of the logarithmic relationship between the dependant variable (mean lamina density) and the independent variables (mean maximum tide height and the mean wave height) provides an indication of the influence of the selected independent variables on mean lamina density, where the relationship between mean lamina density, mean maximum tide height and the mean wave height is derived as;

$$\ln (\text{lamina density} + 0.063) = -1.495 + 0.605 \ln (\text{mean maximum wave height}) + 1.92 \ln (\text{mean maximum tide height}),$$

and $R^2 = 0.392$

Therefore, 39.2% of the variation in the mean lamina density at each sampling event over the course of this study can be explained by variations in the combination of mean maximum tide height and mean wave height. The remaining environmental variables contributed little to explain the relationships with mean lamina density.

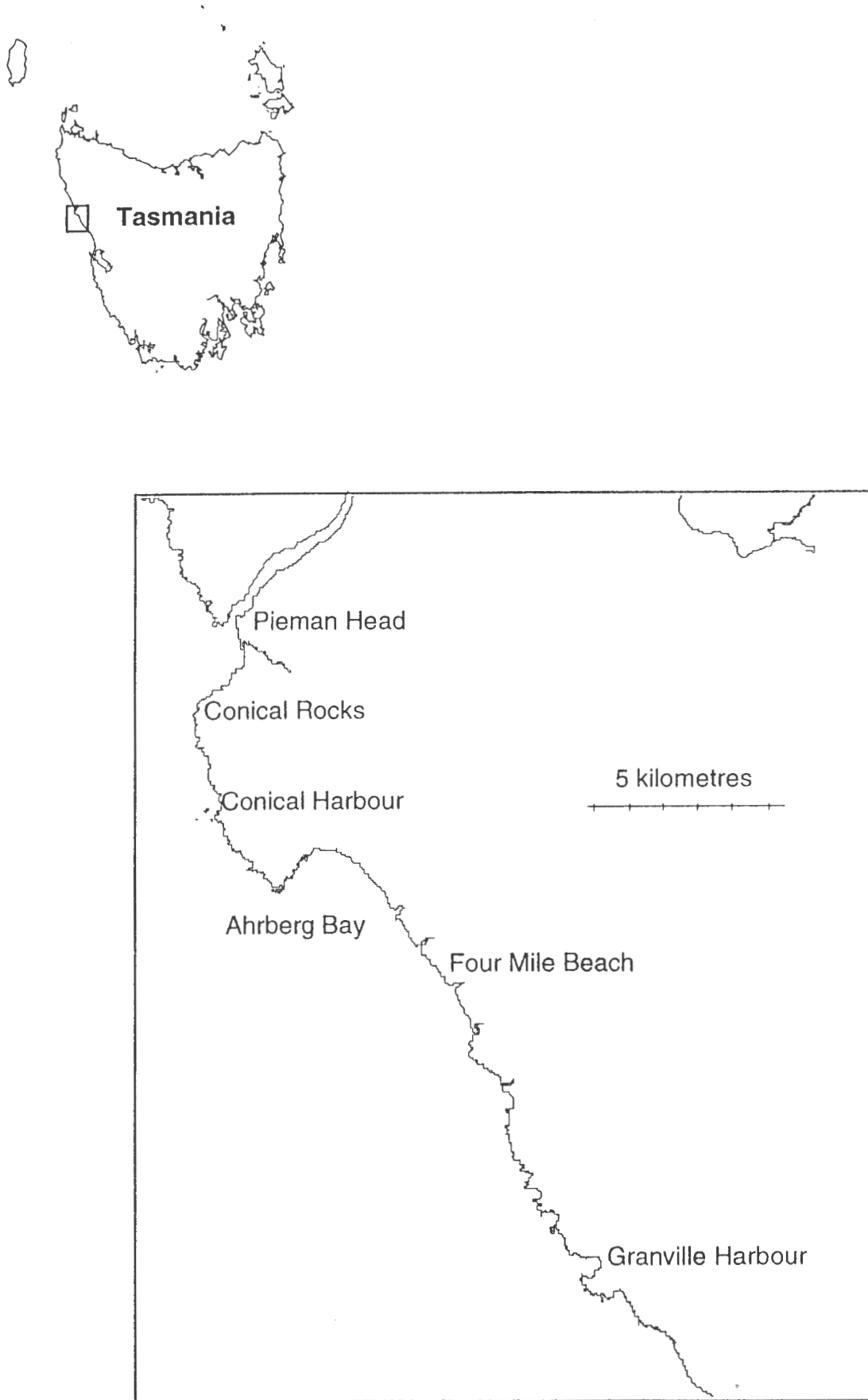


Figure 1. Map showing the location of Granville Harbour on the west coast of Tasmania.

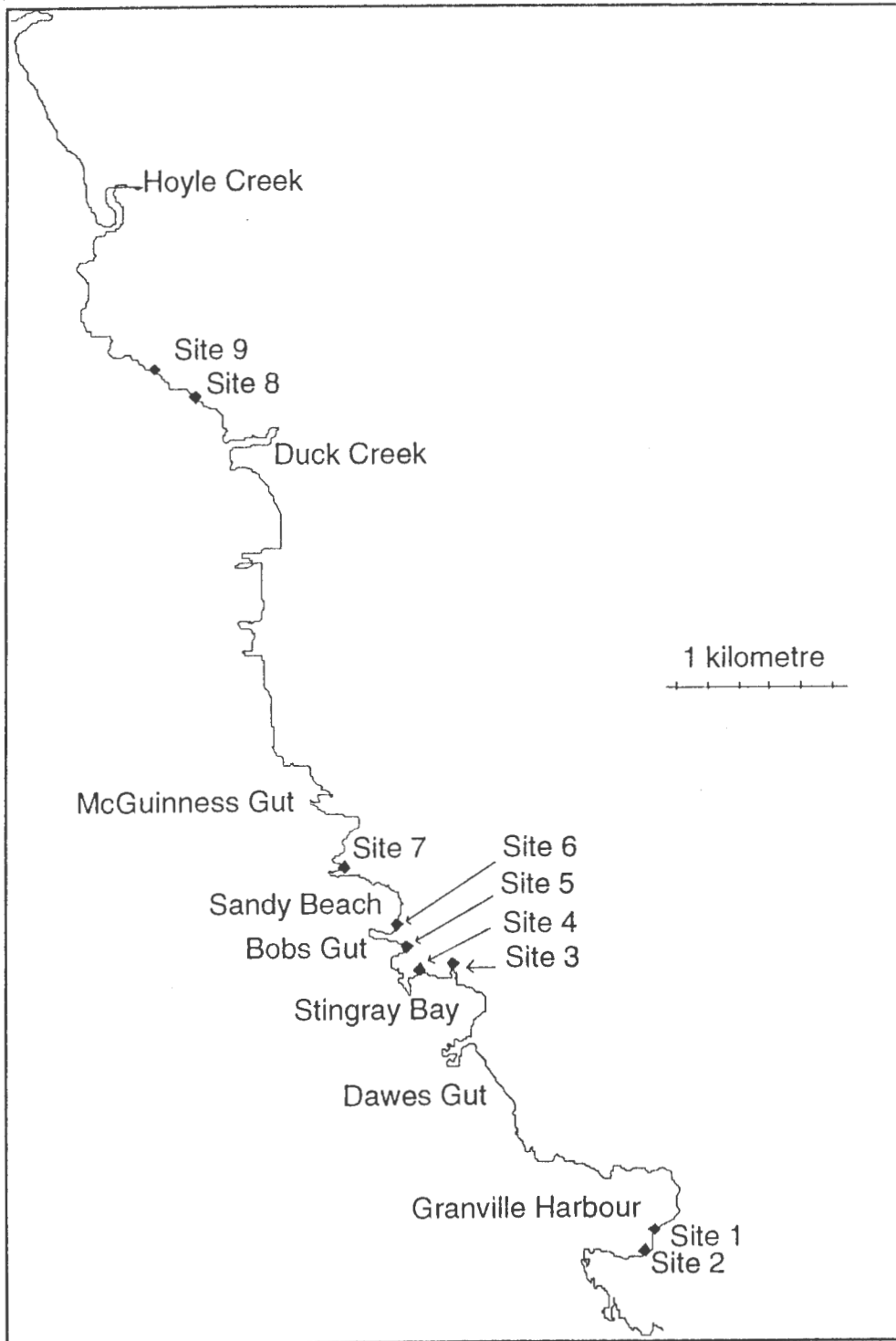


Figure 2. Map showing location of study sites in relation to Granville Harbour.



Figure 3. Kelp sampling site used during this study. Cast kelp within five metres of the star picket was gathered and wet weighted at each sampling event.

Table 1. Summarised site information for the numbers and weights of cast kelp plants collected during the twelve month kelp assessment study. Sites were sampled fortnightly during this period ($N=26$).

Site No.	Site Area (m ²)	No. of Plants Collected	Total Weight of Cast Kelp (kg)	Lamina/Stipe Weight (kg)	Holdfast Weight (kg)
1	78.5	133	2238.5	2040.5	198
2	78.5	112	2177.5	1991.5	186
3	78.5	39	1043	960	83
4	78.5	84	2063.5	1887	176.5
5	78.5	98	1999.5	1778	221.5
6	78.5	113	1958.5	1806	152.5
7	63.5	417	7435.5	6832.5	603
8	51.6	79	1131	1018	113
9	121.5	383	6042	5615	427
Total	707.6	1464	26088.5	23928.0	1983.5

Table 2. Estimates of instantaneous standing crop (including upper and lower 95% confidence limits) derived from the mean lamina density of cast kelp collected from the nine experimental sites on each sampling event. Total potential harvesting area(A_t) = 7808.6 m².

Sample Date	Mean Lamina Density (kg/m ²)	Lower Bound (kg)	Estimated Standing Crop (kg)	Upper Bound (kg)	Coef. Var. (%)
28.7.94	4.39	16312.17	34240.71	52169.26	68.11
9.8.94	2.80	2889.18	21856.27	40823.36	112.87
23.8.94	2.40	0.00	18701.60	39003.96	141.17
6.9.94	1.25	0.00	9760.75	22652.75	171.7
20.9.94	1.16	0.00	9065.78	18904.62	141.13
4.10.94	0.00	0.00	0.00	0.00	-
18.10.94	0.35	0.00	2725.20	8074.09	255.58
1.11.94	0.57	0.00	4411.86	12720.21	244.80
14.11.94	1.10	0.00	8589.46	20122.76	174.53
28.11.94	0.00	0.00	0.00	0.00	-
12.12.94	0.00	0.00	0.00	0.00	-
3.1.95	0.19	0.00	1483.63	4895.99	300.00
16.1.95	0.00	0.00	0.00	0.00	-
30.1.95	0.00	0.00	0.00	0.00	-
13.2.95	0.26	0.00	2022.43	6684.16	300.00
27.2.95	0.00	0.00	0.00	0.00	-
14.3.95	0.94	0.00	7355.70	19029.56	206.54
28.3.95	1.57	0.00	12220.46	30601.90	195.72
10.4.95	1.49	0.00	11611.39	26681.99	168.77
25.4.95	3.97	12735.83	30984.52	49225.41	76.60
9.5.95	0.00	0.00	0.00	0.00	-
23.5.95	1.54	0.00	12056.48	25120.27	140.95
6.6.95	0.22	0.00	1702.27	4232.26	192.94
20.6.95	2.14	1436.78	16718.21	31999.64	118.89
4.7.95	2.68	921.41	20895.81	40878.02	124.36
18.7.95	2.98	2202.03	23285.25	44368.47	117.79

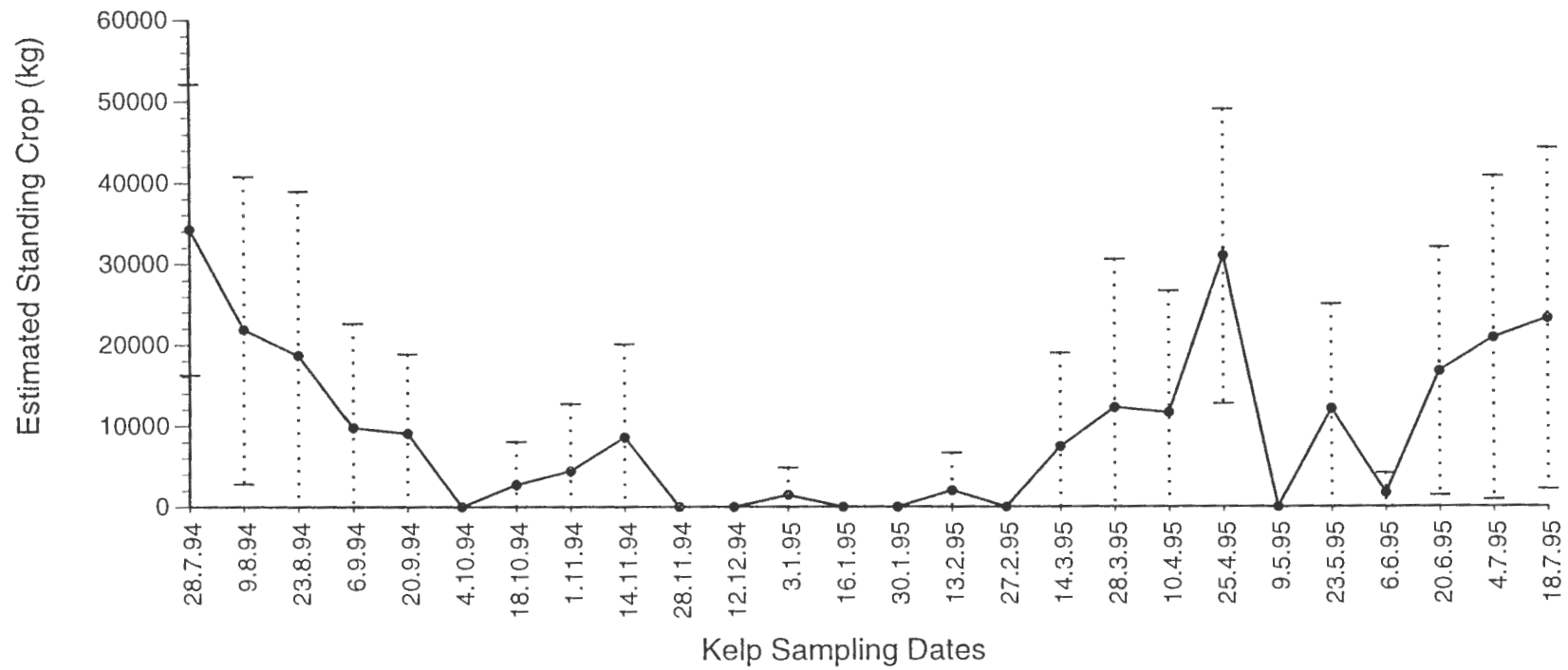


Figure 4. Estimated instantaneous standing crop (kg), including upper and lower 95% confidence limits of cast kelp between Granville Harbour and Four Mile Beach for each sampling event.

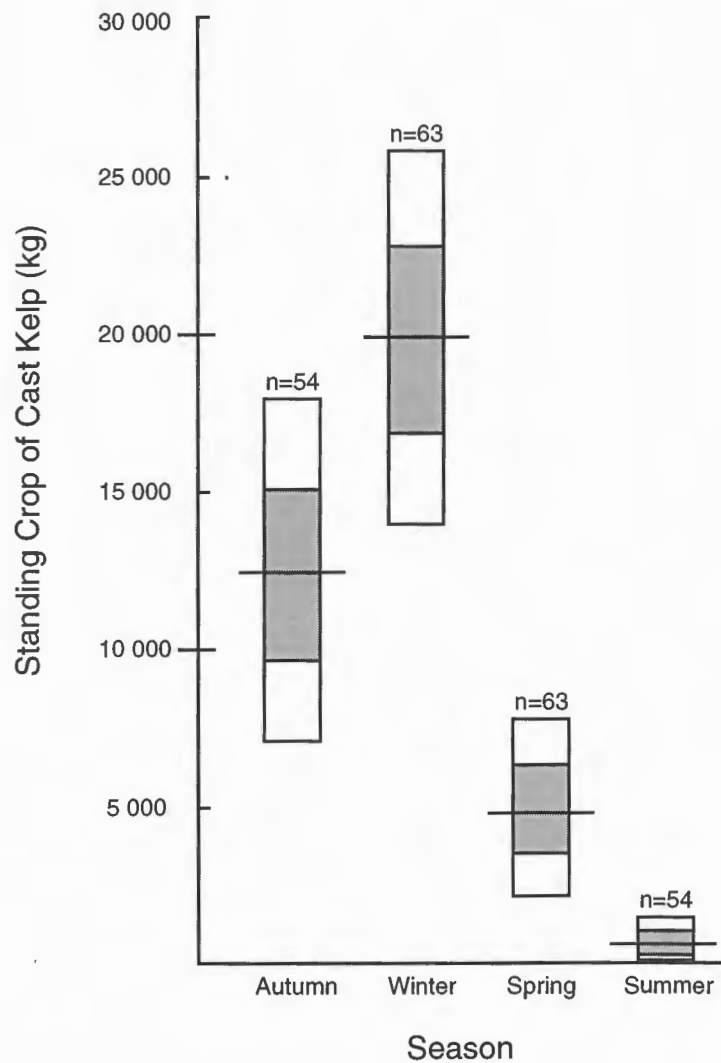


Figure 5. Estimates of standing crop of cast kelp (based on lamina density determinations for the nine study sites) by season. Shown is the mean standing crop \pm standard error (shaded) and the upper and lower 95% confidence limits (open) for each season.



Figure 6. An example of the harsh wind and sea conditions experienced in autumn and winter on the west coast of Tasmania.



Figure 7. Decomposing kelp rejected during sampling between Granville Harbour and Four Mile Beach.

BENEFITS

Originally, it was proposed that the direct benefit of conducting this study would be the establishment of a kelp processing facility on the west coast of Tasmania. This would be the fourth such facility in the world. Bull kelp is a low cost resource that is labour intensive to collect and it was envisaged that the establishment of a kelp processing facility would lead to employment for a number of the local unemployed residents on the west coast as well as WRM members. However, the results of this study indicate that there are insufficient quantities of kelp deposited annually between Granville Harbour and Four Mile Beach for this benefit to be completely realised.

In the event that a kelp processing plant was established on the west coast of Tasmania, the expected financial returns (before costs deducted) generated by the sale of the dried and chipped kelp product at various international market prices can be calculated as:

Market Price (\$/tonne)	Returns Generated by Lower Bound Estimate (\$, 000)	Returns Generated by Estimated Annual Tonnage (\$, 000)	Returns Generated by Upper Bound Estimate (\$, 000)
600	18.06	132.36	266.52
700	21.07	154.42	310.94
800	24.08	176.48	355.36
900	27.09	198.54	399.78
1, 000	30.10	220.60	444.20
1, 100	33.11	242.66	488.62
1, 200	36.12	264.72	533.04

It has been suggested by Pronova that a regular supply of kelp in quantities ranging from 500 - 1, 000 dry tonnes annually would be required for a joint venture with WRM to be considered. The projected annual tonnage of kelp deposited between Granville Harbour and Four Mile Beach determined from this study of 220.6 dry tonnes only represents 44.1% of the minimum quantity required for the establishment of a kelp processing facility.

There may, however, be an opportunity for negotiations between WRM and Kelp Industries Pty. Ltd. (King Island) to establish a joint venture arrangement for the collection of kelp between Granville Harbour and Four Mile Beach when cast kelp is readily available. The initial drying process could be carried out in the vicinity of the collection sites with further processing to the dried and milled stage taking place at the Kelp Industries Pty. Ltd. plant on King Island. This would only result in increasing the supply of raw bull kelp available for processing into alginate in Australia.

INTELLECTUAL PROPERTY

There is no intellectual property arising from the conduct of this project. Details of the resource assessment of cast kelp between Granville Harbour and Four Mile Beach will be made available to all interested parties and the general public.

FURTHER DEVELOPMENT

In light of the findings of this study, there is definitely scope for development in the processing and value adding of the cast kelp resource and the establishment of an additional supply of alginate in Australia, with long term benefits to the food manufacturing and biomedical industries a likely outcome. Furthermore, it would be advisable for interested parties to prepare a strategic development plan for the establishment of a kelp industry on the west coast of Tasmania, taking into account factors such as the amount of kelp available for harvesting, the costs associated with the initial processing and access to secure markets for the raw (dried and chipped) product.

Any proposal for the establishment of a kelp harvesting and processing facility on the west coast of Tasmania would need to consider the seasonal nature of kelp deposition and it is quite conceivable that harvesting of commercially viable quantities of cast kelp may be restricted to autumn and winter months.

Cast kelp harvesting on any scale would also need to consider environmental impact issues and would involve extensive liaison between

DPIF and the Department of Environment and Land Management (DELM) to establish a non-obstructive code of practice and licence conditions for harvesting as well as monitoring access arrangements during harvesting operations.

STAFF

A.	Mr David Andrews BSc (Hons) Technical Officer Department of Primary Industry and Fisheries	100% of time
B.	Mr Will Zacharin BSc (Hons) MSc Acting Manager - Wild Fisheries Management Department of Primary Industry and Fisheries	10% of time
C.	Mr Ralph Stuart M.A.I.S. A.V.L.E. (Val) Manager - Research and Development Unit Department of Primary Industry and Fisheries	2% of time
D.	Mr Sean Riley BSc (Hons) Acting Principal Management Officer - Fisheries Development Department of Primary Industry and Fisheries	20% of time
E.	Mr Robert Green Senior Technical Officer Department of Primary Industry and Fisheries	10% of time
F.	Mr Graeme Bryan Director Western Red Mining Pty. Ltd. Zeehan	10% of time
G.	Mr Graham Appleby Director Western Red Mining Pty. Ltd. Zeehan	10% of time

H. Mr Barry Groombridge 10% of time
Director
Western Red Mining Pty. Ltd.
Zeehan

FINAL COST

	1993-94	1994-95	1995-96	TOTAL
Contribution by FRDC				
Salaries and On-costs	\$ -	\$ 20,000	\$ -	\$ -
Travel	\$ -	\$ -	\$ -	\$ -
Operating	\$ -	\$ -	\$ -	\$ -
Capital	\$ -	\$ -	\$ -	\$ -
Total	\$ -	\$ 20,000	\$ -	\$ 20,000

Contribution by Applicant				
Salaries and On-costs	\$ -	\$ 19,154	\$ -	\$ 19,154
Travel	\$ -	\$ 11,448	\$ -	\$ 11,448
Operating	\$ -	\$ 1,000	\$ -	\$ 1,000
Capital	\$ -	\$ -	\$ -	\$ -
Total	\$ -	\$ 30,502	\$ -	\$ 30,502

Contribution by Other Sources				
Cash	\$ -	\$ -	\$ -	\$ -
Other (include 'in-kind')	\$ -	\$ 5,000	\$ -	\$ 5,000
Total	\$ -	\$ 5,000	\$ -	\$ 5,000

TOTAL BUDGET	\$ -	\$ 55,502	\$ -	\$ 55,502
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FISHERIES RESEARCH AND DEVELOPMENT CORPORATION
STATEMENT OF RECEIPTS & EXPENDITURE
(For the Year Ending 30 June 1995)

Form B

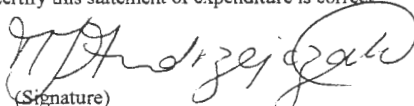
		Grant:	\$
Grantee:	Department of Primary Industry and Fisheries	Salaries:	20000.00
Project Number:	94/113	Travel:	0.00
		Operating:	0.00
Title of Project:	Feasibility study for the establishment of a kelp processing industry on the West Coast of Tasmania.	Capital:	0.00
		Total Grant:	20000.00

	EXPENDITURE				
	Salaries	Travel	Operating	Capital	Total
	\$	\$	\$	\$	\$
a) Unspent and Uncommitted (c/f 1 July)	0.00	0.00	0.00	0.00	0.00
b) Refunds to/ Payments by FRDC	0.00	0.00	0.00	0.00	0.00
c) Outstanding Commitments (c/f 1 July)	0.00	0.00	0.00	0.00	0.00
d) Cash Received from FRDC	10,000.00	0.00	0.00	0.00	10,000.00
e) Approved Transfers	0.00	0.00	0.00	0.00	0.00
f) Cash Available (A-B+C+D+ E)	10,000.00	0.00	0.00	0.00	10,000.00
g) Expenditure	16,162.28	0.00	0.00	0.00	16,162.28
h) Commitments (30 June)	0.00	0.00	0.00	0.00	0.00
i) Total Funds Committed (G+H)	16,162.28	0.00	0.00	0.00	16,162.28
j) Unspent and Uncommitted (30 June) (F-I)	-6,162.28	0.00	0.00	0.00	-6,162.28
k) Other Income/ Expenditure					

Note: Row B should be the same as Row H from the previous year and Row A the same as Row J from the previous year.

Certificate of Accounting Officer

I hereby certify this statement of expenditure is correct

 (Signature)	Maria Andrzejczak (Printed Name)	Accountant (Designation)	(002) 33 3137 (Phone No)	8/9/1995 (Date)
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**FISHERIES RESEARCH AND DEVELOPMENT CORPORATION
STATEMENT OF RECEIPTS & EXPENDITURE**

(For the period 1 July 1995 to 31 October 1995)

Form B

		Grant:	\$
Grantee:	Department of Primary Industry and Fisheries	Salaries:	20000.00
Project Number:	94/113	Travel:	0.00
		Operating:	0.00
Title of Project:	Feasibility study for the establishment of a kelp processing industry on the West Coast of Tasmania.	Capital:	0.00
		Total Grant:	20000.00

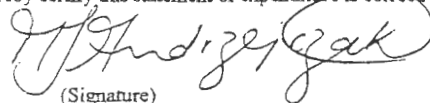
	EXPENDITURE				
	Salaries	Travel	Operating	Capital	Total
	\$	\$	\$	\$	\$
a) Unspent and Uncommitted (c/f 1 July)	-6,162.28	0.00	0.00	0.00	-6,162.28
b) Refunds to/ Payments by FRDC	0.00	0.00	0.00	0.00	0.00
c) Outstanding Commitments (c/f 1 July)	0.00	0.00	0.00	0.00	0.00
d) Cash Received from FRDC	0.00	0.00	0.00	0.00	0.00
e) Approved Transfers	0.00	0.00	0.00	0.00	0.00
f) Cash Available (A-B+C+D+ E)	-6,162.28	0.00	0.00	0.00	-6,162.28
g) Expenditure	3,837.72	0.00	0.00	0.00	3,837.72
h) Commitments (30 June)	0.00	0.00	0.00	0.00	0.00
i) Total Funds Committed (G+H)	3,837.72	0.00	0.00	0.00	3,837.72
j) Unspent and Uncommitted (30 June) (F-I)	-10,000.00	0.00	0.00	0.00	-10,000.00 *
k) Other Income/ Expenditure					

Note: Row B should be the same as Row H from the previous year and Row A the same as Row J from the previous year.

* 2nd instalment not received.

Certificate of Accounting Officer

I hereby certify this statement of expenditure is correct.

	Maria Andrzejczak	Accountant	(002) 33 3137	02/11/1995
(Signature)	(Printed Name)	(Designation)	(Phone No)	(Date)

03250014

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