

ALLOCATION OF AREAS FOR MARINE FARMING IN TASMANIA

by

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## Abstract

This thesis evaluates the procedures used by the Tasmanian Government to dedicate parts of the marine environment for marine farming purposes, and shows that the process potentially favours the formation of marine farms at the expense of the other users of the marine environment. Furthermore, the Tasmanian Department of Sea Fisheries, which grants marine farming leases and permits and adjudicates over appeals, is also responsible for the promotion and development of marine farming in Tasmania. Due to the rapid expansion of marine farming in the State, it is argued that the Department will be increasingly less able to resist pressure to allocate areas of the sea that are better suited for public rather than private use.

The thesis identifies the vesting of parts of the sea as special marine farming areas by the Lands Department in the Department of Sea Fisheries as the point where Crown Land is designated for exclusive private use. A case study of eight marine farming areas in southern Tasmania supports the view that inadequate consideration was given to the public amenity. The thesis argues that the State Government has abrogated its responsibilities, and must develop a mechanism for safeguarding the public interest. The best prospects for a just system rest with the Lands Department before areas are designated for marine farming.

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## Preface

This thesis was completed on a part-time basis from 1984 to early 1987. Most of the data were collected in Tasmania in 1984, but the thesis has been kept abreast of the changes in the management of the marine farming industry even though the author has been living outside Tasmania. The major development to occur during this period was the dissolution of the Tasmanian Fisheries Development Authority and the formation of the Department of Sea Fisheries. It is argued in the thesis that this did not change the style or emphasis of marine farming management, and that the basic argument of the thesis is as valid today as it was in 1984.

## Chapter 1

### INTRODUCTION

#### 1.1 Global Context of Marine Farming in Tasmania

The levels of production from aquaculture are rapidly increasing around the world. From 1966 to 1975, the annual harvest had increased from 1 million tonnes to 6 million tonnes and it was predicted that the next decade would see a 50% increase in production levels (Ackefors and Rosen 1979). The impetus for this increase can be attributed to increasing human population numbers, decreasing levels of arable land, increased difficulty in supplying fish from wild populations and increasing marginal costs (especially for fuel) of harvesting wild populations. The level of husbandry in aquaculture is usually very low and is analogous to pre-industrial agriculture, but aquaculture is becoming more intensive and technological in the more developed nations. In Tasmania, marine farming consists of relatively complex capital intensive schemes involving high cost, high value species destined for the upper end of the sea food market (Shepherd 1974). The animals cultured or in the development stages in Tasmania are abalone, mussels, scallops, oysters, Atlantic Salmon and sea trout, all of which are high value species.

Against this background of the changing use of the world's fishery resources, there has also been a growing

awareness of the need to plan for the allocation of the limited resources available to us in a rational way before the resources are utilized. Often there is inflexibility in public administration and government to the detriment of the conservation of limited resources. It should be possible in Australia to integrate marine farming into the marine environment with low impacts. This thesis addresses key problems arising from the conflicting demands on the marine environment associated with aquaculture in Tasmania.

## 1.2 Aim and Scope of Thesis

In the thesis, it will be shown that conflict in Tasmania between marine farming and the other users of the marine environment has not been satisfactorily addressed by the Government. It will also be shown that the present legislation and its administration does not protect the legitimate interests of the other users of the marine environment. Increasingly frequent reports in the Tasmanian news media of sometimes bitter conflicts over the location of marine farms during the last three years and still continuing, suggests support for the thesis contention that the situation will worsen as the industry grows.

Marine farming is an expanding industry in Tasmania and will result in increasing competition for space with other marine users. It is expanding partly because it is being encouraged by government policy. It has been stated, for

example, that "... all forms of shellfish farming ... should be encouraged and fostered by the government." (Tasmania, Parliament, Legislative Council Select Committee 1976, p.8). Geographically Tasmania favours a large marine farming industry. In proportion to its size, Tasmania has a long coastline, which is greatly invaginated and as such is highly suitable for marine farming.

A restriction on the scope of the thesis is the range of farmed species specifically dealt with in the text. Only oysters and mussel species are considered in the thesis. One reason for this is that oyster and mussel species are the most commonly farmed marine animals in Australia. This is true for Tasmania where the Pacific Rock Oyster, Crassostrea gigas, and the Common Blue Mussel, Mytilus edulis, are the animals most commonly cultured. Atlantic Salmon and sea trout are also being cultured in the sea on a trial basis in Tasmania, but have yet to reach commercial production. The thesis was also restricted to oyster and mussel farming to avoid complicating the theme by taking into account unusual culturing techniques for new farmed species. However, the reasoning presented within the thesis is applicable to all types of marine farming that compete for space with other uses of the marine environment.

The history and development of the farming of oysters and mussels in Tasmania is dealt with in Chapter 2. Read in conjunction with the Appendix on the biology of these

species, it provides a useful background to the issues. Chapter 2 demonstrates that marine farming is an expanding industry and that the Tasmanian Government has been closely involved with that development.

The third chapter is dedicated to analysing the legal position of the Tasmanian Government in relation to marine farming. It will be argued that legally the State Government's control over the coastal zone to the 3 nautical mile limit is not clear but, notwithstanding, the managerial role belongs to the State Government at the present time. Furthermore, the State Government has responsibilities to users of the marine environment other than marine farmers. How the State Government has structured its legislation and administration to fulfill this role will be analysed. It will be argued that the allocation of areas for marine farming is a process whereby the seabed ceases to be a common and that the public can only belatedly and ineffectually object to this change.

The aim of Chapter 4 is to assess, in practice, the effectiveness of the Tasmanian procedures for choosing marine farming areas with respect to resolving conflicts with other users of the marine environment. A case study was made of the D'Entrecasteaux Channel region, near Hobart, to evaluate how well the allocation of marine farming areas takes into account the use of the marine environment by the general public.

The final chapter brings together the pertinent points from the previous chapters. It will show that the present administration has not resolved the conflict between users of the coastal environment. A prediction of further problems soon to arise is made, and a more effective role for the pertinent State authorities, namely, the Lands Department and the Department of Sea Fisheries, is discussed.

## Chapter 2

### DEVELOPMENT OF MARINE FARMING IN TASMANIA

#### 2.1 Linking the History of Marine Farming to the Present Day

In this chapter, the history of marine farming since the middle of the last century is used to outline the importance of government involvement in marine farming and the formation of the present day industry. To complete this overview, it is argued that marine farming, in particular the oyster industry, will continue to expand in Tasmania and increase the pressure on the Government to allocate more of the seabed for the exclusive use of the industry.

#### 2.2 Historical Perspectives

##### 2.2.1 Utilization of Mussels and Oysters during the 19th Century

During the previous century, there was practically no documentation on the Common Blue Mussel, Mytilus edulis. The documentation that does exist is mainly biological and some reference has been made to the possibility that the animal was introduced by Captain Cook in 1770. The fact that the shells had not been found in Aboriginal middens had supported this notion; however, it was dispelled when



several 8000 year old shells were found in an Aboriginal midden at a later date (MacIntyre 1980). Notwithstanding the disputed origins of the Common Blue Mussel in Australia, there is no documented history of its commercial use until more recent times (ca 1950). The impact of the more recent mussel farming industry on the Tasmanian legislation is discussed in Chapter 4.

There is much more documentation on the utilization of oysters. The principal oyster harvested in Tasmania during the 19th century was the Mud Oyster, Ostrea angasi, as at that time the Pacific Rock Oyster, Crassostrea gigas, had not been introduced into Australia.

The native oyster, unlike Crassostrea gigas and Crassostrea commercialis (the Sydney Rock Oyster) is usually found growing on gravel, mud, or hard sand. This type of substrate allows dredges to be used to harvest the animals, unlike the rock oysters which need to be knocked off the rocks. In the early period of Tasmanian settlement, there was a thriving industry dredging for the native oyster (Sumner 1972). The meat was both eaten locally and sold at the markets, while the shells were often burned to make lime (Olsen 1965; Coleman 1976). The lime was used to make mortar and, for many years, oysters were the sole source of lime in Tasmania.

### 2.2.2 History of Mud Oyster Farming

The history of marine farming in Tasmania is not well documented. A major problem is that during the previous century, the distinction between marine farming and harvesting of wild populations was unclear. The colonial government had a policy of granting leases of natural oyster beds to private people (see Acts in Table 2.1). Private oyster fisheries were made conditional on the consent of the owner of the land bordering the bed and specifically stated that the licence would not give any exclusive right or title except for the purpose of oyster farming. No means of controlling the taking of oysters by the lessee from the bed was mentioned in the various Acts, although it was stated that the leases could be used for propagating oyster. It is difficult to determine whether these leases were, in fact, used for marine farming or merely exploited for their wild populations.

It was under the application of the above Acts that the industry collapsed reportedly from overfishing. This was described in 1882 by the Royal Commission on the Fisheries in Tasmania. The report made general (and critical) observations on the fisheries of the colony and included the Mud or Native Oyster and the Common Blue Mussel (which, at that time, was known as Mytilus latus). Indeed, the two species were judged by the Commissioners as being "...worthy of special notice..." (Tasmania, Royal Commission on

the Fisheries of Tasmania 1883, p.9).

Table 2.1

Colonial Tasmanian Acts relating to the leasing of  
oyster beds for the purpose of oyster dredging and farming

Title of Act

1. An Act for the Improvement and Regulation of the Oyster Fisheries in Van Diemen's Land; 17 Victoria No 10
2. An Act to vest in the Municipal Council of every Rural Municipality the Control and Management of the Oyster Beds and Fisheries, if any, situate upon or adjacent to the Shores of such Municipality, 1861; 25 Victoria No 10
3. The Oyster Fisheries Act, 1868; 32 Victoria No 16
4. The Fisheries Act, 1889; 53 Victoria No 11

The abundance of the Mud Oyster in the 1860s was reported by the Commission to be so great that it was hard for the Commissioners to comprehend the decline in population numbers. The best recorded annual harvest for Tasmania was 22 350 000 oysters in 1860, a massive figure which indicates the size of the fishery. The Commissioners found that the value of the oysters for the peak harvest was worth more than the combined exports of grain, hay, flour, and bran from Tasmania in the three years prior to 1882. The levels of oysters harvested declined after 1860, and by

1882, 100 000 oysters were being harvested annually, one half of a percent of the peak total harvest. It appears that the oyster fishery was a case of gross resource mismanagement or, rather, nonmanagement. The oyster beds had probably suffered from the constant disturbance of the benthos; the same reason was often put forward for the demise of the scallop industry in the D'Entrecasteaux Channel and the Derwent Estuary in later years. In 1882, Tasmania was importing 288 000 oysters per annum from Sydney, and the Commission recommended that an oyster culturing industry should be fostered in the State, and indicated that use could be made of the experience being gained in New South Wales. The Commission also noted that the Common Blue Mussel was abundant in Tasmania and of good quality, but little commercial use had been made of it. At the time of the writing of the report by the Commission, the public and private oyster beds were controlled by the Oyster Fisheries Act, 1868 (Tas.).

Attempts were made to improve the lot of the native oyster industry in Tasmania when a Mr Saville-Kent was appointed Inspector of Fisheries in 1884 and took an interest in the development of public and private culturing of oysters. Saville-Kent attempted to develop an oyster farming technique for Tasmania and six government reserves were set up for this purpose. The government reserves were designed to replenish the surrounding stocks of oysters, as well as serving as model farms for private reserves. Two of

the reserves contributed to the return of the oyster industry within their regions (Saville-Kent 1889). After Saville-Kent's resignation in 1888, the work on oysters was stopped, supposedly to allow for the determination of the "... whole question of the future management of the Government reserves..." (Tasmania, Fisheries Board 1889, p.4).

From this point on, the Mud Oyster industry declined in importance and little success was had in propagating further reserves. It would seem that the acclimatization of alien fish was given greater importance than that of revitalizing the oyster industry. For instance, in the year 1907/1908, the report of the finances of the Fishery Commission (Tasmania, Commissioners of Fisheries 1908) showed that over 80% of the disbursements for that year could be directly attributed to the expense of salmon and trout hatcheries in the State.

The earlier oyster farming industry did not succeed because the stated purpose of granting private leases for propagating Mud Oysters was not implemented. It is more likely that the private leases were used as a means of protecting an individual's claim to a Mud Oyster bed until it was fully exploited. The legislation covering this period was very explicit on the rights of the lessee to the ownership of the oysters within a lease. A likely scenario might have been as follows: upon discovering a new oyster

bed, a person gained a lease and proceeded to remove all oysters from the lease while continuing to look for new oyster beds. Indeed, it was stated in all colonial legislation that the finder of a new bed should be given preference for the lease, and there was no size limit on oysters harvested from leases. If genuine attempts were made to farm the animals using the method proposed by Sackville-Kent, it would have been unlikely that the industry should collapse as badly as it did. After all, the culturing method was very similar to the method used successfully in New South Wales at the time, and the present day method in Tasmania. The fact that most of the Fisheries funds were channelled to the introduction of freshwater species indicates that the Commission for Fisheries was "captured" administratively by people favouring freshwater fisheries. There is no indication that the expenditure on freshwater species was economically justified, as no industry ever came of salmon and trout fishing at that time. After the collapse of the industry at the turn of the century, no attempt was made to develop marine farming until the introduction of the Pacific Rock Oyster into Tasmanian waters.

### 2.2.3 Introduction of the Pacific Rock Oyster

The next era for the oyster industry in Tasmania was heralded by the introduction of the Pacific Rock Oyster, Crassostrea gigas. The failure of the introduction of other

species of oysters prompted the newly formed Commonwealth Scientific and Industrial Research Organization (C.S.I.R.O.) to attempt to introduce the Pacific Rock Oyster (Thomson 1952). Oysters were introduced into Port Sorell (in the north) during 1952 because of the higher summer water temperatures found in the region, as these were thought to be a decisive factor in successful breeding (Thomson 1959). Successful spatfalls were noticed in the following years in the Tamar Estuary and the Mersey Estuary also in the north. The Pacific Rock Oyster has, since that time, increased to great numbers in the Tamar Estuary and has gradually replaced the populations of Ostrea angasi that existed there (Sumner 1974).

The restarting of the oyster culturing industry in Tasmania was made after an interchange of information between N.S.W. and Tasmanian fisheries officers in the early 1960s. During this early period the Department of Agriculture, Division of Sea Fisheries controlled marine farming. Initially, the culturing method in Tasmania was very basic, with the relocation of wild young oysters from the rocks along the Tamar Estuary to trays until they matured, resulting in cleaner and better quality meat. The sophistication of the culturing methods increased over the years, following much the same techniques as used in N.S.W., until the oysters were cultured from spat which were mainly collected from the Tamar Estuary. The later discovery that the Tamar and the Derwent Estuaries were unsuitable for

culturing due to the high levels of pollution (Thrower and Eustance 1973) meant that these areas had to be abandoned and new locations found. This was not difficult, as parts of the north-western and eastern coasts of Tasmania were found to be very suitable for the growing of oysters. At this time, however, the Tamar Estuary was the only commercial source of oyster spat and the production of spat from this location was seen as the limiting factor in the growth of the oyster industry in Tasmania. The levels of pollution did not obviously interfere with the production of spat, although climatic factors did make the yearly production of spat irregular and, hence, planning by the oyster farmers difficult.

#### 2.2.4 Changing Administration of Marine Farming

From the introduction of the Pacific Rock Oyster in 1952 to the 1982 Marine Farming Amendment Act, it would have been administratively difficult to start a marine farm as The Fisheries Act 1935 (Tas.) and The Fisheries Act 1959 (Tas.) were aimed at the cultivation of the native Mud Oyster. The Fisheries Act 1959 (Tas.) is the legislation currently in force but the sections relating to marine farming were substantially amended by the Fisheries Amendment (Marine Farming) Act 1982 (Tas.). Under the original Fisheries Act 1959 (Tas.), the sea fisheries were administered by a board incorporated into the Ministry for Agriculture. One administrative difference between the 1959



Act and the 1935 Act was that the Commissioner of Crown Lands was given the power in 1959 to grant leases for the purpose of oyster farming, as opposed to the Governor in the earlier legislation. The 1935 and original 1959 legislation, however, were very similar in respect to oyster farming. In both, the lease was conditional on adjoining land owners not being prejudiced without their written consent. This stipulation had been included in the very earliest of Tasmanian legislation. The process of granting leases was very slow with the major obstacle being dealing with objections to the lease from the adjoining land owners. This in turn, according to the general consensus of people involved in the industry at the time, was the major reason for prospective marine farmers using moorings to grow mussels and oysters. Mooring permits were relatively easy to obtain from the Hobart Marine Board and other similar authorities.

The Fisheries Development Act 1977 brought into existence the Tasmanian Fisheries Development Authority (T.F.D.A.). The role of the T.F.D.A. was to provide initiative and direction for the marine fishing and farming industries. Research and fiscal support were offered. The new Minister for Sea Fisheries had direct control over the Authority. The T.F.D.A. carried out many of the functions of a Department of Sea Fisheries and indeed many of its staff were public servants from the old Division of Sea Fisheries. The Authority, however, was clearly set up to develop sea

fisheries which includes marine farms. As part of its duties the T.F.D.A. was given the job of allocating leases and permits to marine farmers by the Minister of Sea Fisheries.

Soon after the formation of the T.F.D.A., the problem of unpredictable spat falls was overcome by the establishment of Shellfish Culture Pty Ltd, which built and continues to operate a commercial oyster hatchery at Bicheno (Fintas 1979). This development was initiated and funded jointly by the T.F.D.A. and private industry. The production of young oysters in large numbers revolutionized the oyster industry, both in structure and techniques. The previous techniques had been designed for settled spat and new techniques had to be designed using bags and other means to hold the young oysters. The structure of the industry was changed with many new farms being started and a large increase in production. It is estimated that the industry will peak in the next few years at 1.7 million dozen (Johnson, A., personal communication).

It is interesting to reflect back on the 1880's production of Mud Oysters, peaking in excess of 2 million dozen, although the present day yield will be sustainable in the long term. It has taken over one hundred years for the oyster industry to recover to its previous magnitude from the mismanagement which allowed the industry to deteriorate. The government has helped the industry with both finance and information over the last two decades. Government

intervention has been an important and integral part of the development and continuity of the marine farming industry in recent times.

The Fisheries Amendment (Marine Farming) Act 1982 (Tas.) was introduced in order to bring the legislation up to date with the present day industry. This Act was aimed at rationalizing the process of granting leases and permits for marine farming in general, not just for oyster farming, as with the Fisheries Act 1959 (Tas.). The permit allows for the use of the sea for the purpose of marine farming, but does not include the use of the seabed. The permit was a new allowance peculiar to the 1982 Amendment, and sought to cover the marine farms operating under a mooring permit. The new legislation was introduced to facilitate the granting of marine farming licences as, under the old legislation, the process was taking up to two years to complete. The way that the Fisheries Amendment (Marine Farming) Act and the pre-existing legislation, designated areas of common usage for marine farming are discussed in detail in Chapter 3.

The T.F.D.A. was disbanded after the Fisheries Development (Repeal) Act 1985 was passed by parliament. The function of the T.F.D.A. was taken over by the Department of Sea Fisheries, and the staff of the T.F.D.A. were transferred to the new department. The Department of Sea Fisheries was not set up to develop sea fisheries as was the T.F.D.A. under the Fisheries Development Act 1977 (Tas.); however, the

Fisheries Amendment Act 1985 (Tas.) does state that the Minister for Sea Fisheries was responsible for the development of sea fisheries. The 1985 amendment also introduced the Fish Farm Development Committee.

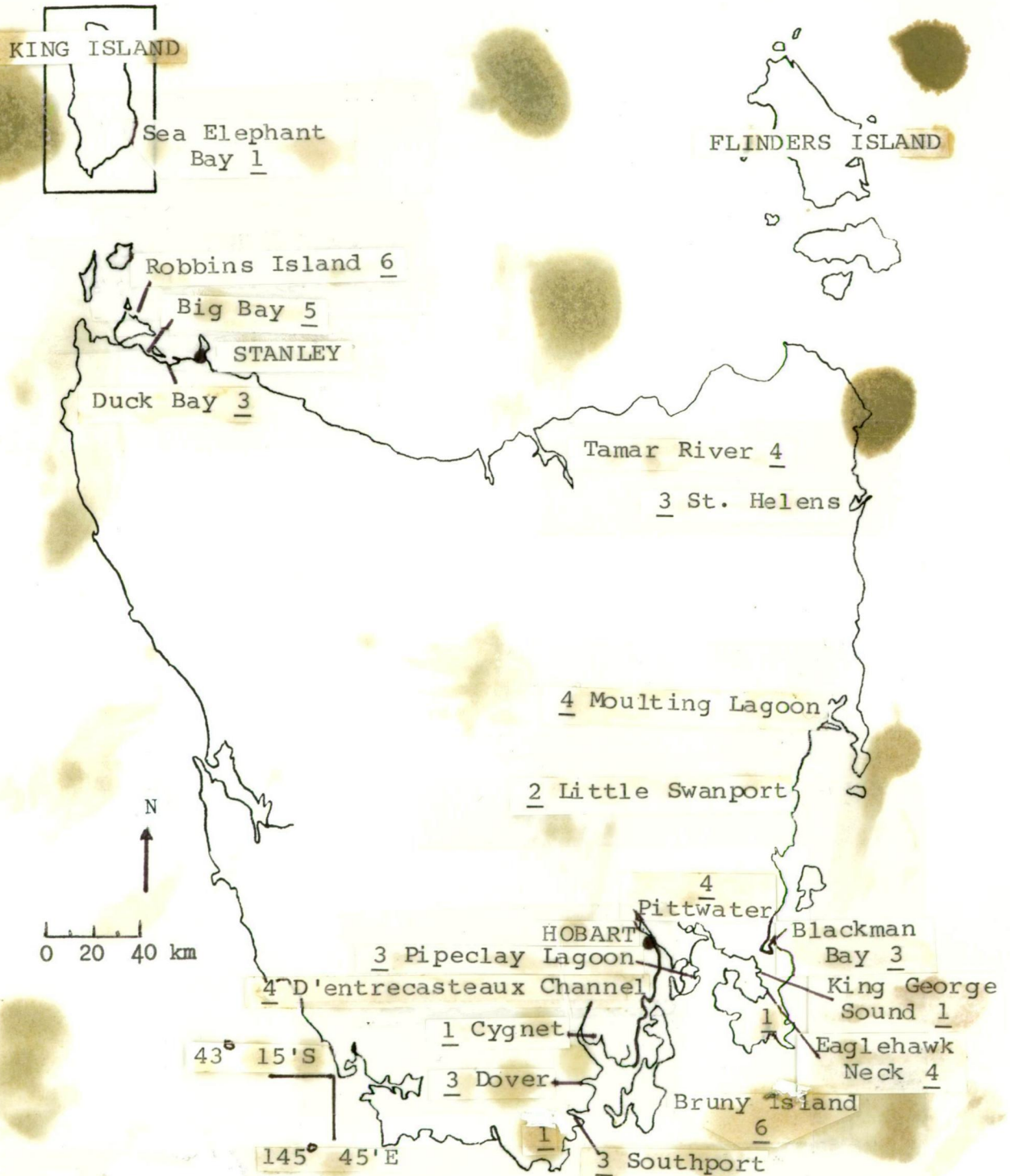
### 2.3 Expansion of Marine Farming in Tasmania

This section will describe the present contribution by the marine farming industry to the State's economy and argue that Tasmania is most likely to see an expansion of the industry. The latter point is important, as it implies that the conflicts that the thesis shows as remaining unaddressed and unresolved will intensify.

#### 2.3.1 Distribution of Marine Farms in Tasmania and Employment Figures

In 1984, there were 69 marine farms concentrated mainly in the north-western and south-eastern region of Tasmania (Figure 2.1). In the north-west, the Big Bay and Duck Bay areas are well utilized because they provide good protection from rough seas. In the south-east, there are many ideally sheltered bays and inlets, and this is reflected by the number of marine farms to be found in the region. Both the Derwent and Tamar Rivers are unsuitable for oyster farming due to high levels of pollution, although spat can be collected from the Tamar.

Figure 2.1  
Distribution and number of  
marine farms in Tasmania in 1984



Most marine farms are owner operated and it is very difficult to estimate employment in the industry. Most are run part-time by land farmers and fishermen who find that marine farms complement their other occupations. On the other hand, there are some large marine farms and a hatchery that employ people full-time. John Baily (then President of the Tasmanian Fish Farmers Co-operative Society) estimated that roughly 80 people were employed full-time and 60 people were employed part-time in 1984. This figure is very difficult to confirm, and must be treated as an estimate only.

The farming of oysters and mussels is discussed separately in the next two sections because of the different potential of each species.

### 2.3.2 Oyster Farming

In 1983, approximately 807 hectares had been leased for oyster culturing and it has been estimated that 70% of this area is usable and that 50% of the usable area (35% of total) had been developed (Tasmanian Fisheries Development Authority n.d.). The possible harvest of the 1983 leases, if all the usable area was put into production, is estimated as being between 2.8 million and 7.9 million dozen oysters. The difference between the figures is basically due to the relative maturity of the lease (it takes at least two years for a lease to reach full production) and the relative

productivity (holding capacity) of the lease. The industry is currently producing in the region of 1 million dozen oysters and this is expected to increase over the next five years to 1.5 million dozen oysters (Johnston C., personal communication). The level of production in Tasmania has been progressively increasing over the recent years as Table 2.2 shows below.

Table 2.2

Recent yearly production of oysters in Tasmania  
and its value in 1980/81 dollars.

Year	Production		Average return for a dozen oysters**
	Dozens	Value (\$)	
1979/80	133 781	140 470	1.05
1980/81	211 349	246 929	1.17
1981/82	396 826	440 476	1.11
1982/83	647 299	699 083	1.08
1983/84	850 000	1 028 500*	1.21*

Source: Tasmanian Fisheries Development Authority (n.d.)

\*Estimated.

\*\*To the farmer.

The New South Wales production will decrease in the next few years as urban development and pollution increase in the oyster growing areas of that State (Stuart, personal communication). This will mean that traditional New South Wales markets will probably become available to the Tasmanian producer. The fact that the Tasmanian proportion of the total Australian production has been gradually increasing over the last few years supports this statement.

Table 2.3 illustrates this trend. The other States have very low production levels, and are unlikely to compete with Tasmania. As can be seen in Table 2.3, New South Wales has dominated oyster production, and still produces approximately 90% of the total Australian output. Over the last ten years, this domination of the market has slowly decreased and will probably continue to do so, unless the industry in New South Wales is revitalized. In 1984, fresh Tasmanian oysters had a price advantage over N.S.W. oysters with Tasmanian oysters being sold at \$1.76 (1984) per dozen in Sydney as compared to \$2.00 (1984) for N.S.W. oysters (Locke, personal communication).

Table 2.3

Relative production of oysters in Tasmania,  
New South Wales and Australia as a whole.

Year	New South Wales		Tasmania		Total Aust.
	Tonnes	%	Tonnes	%	Tonnes
1973/74	10 259	97.9	209	2.0	10 479
1974/75	8 787	98.6	105	1.2	8 908
1975/76	10 175	99.0	94	0.9	10 273
1976/77	10 644	98.6	149	1.4	10 793
1977/78	9 632	98.4	138	1.4	9 786
1978/79	8 007	98.5	116	1.4	8 128
1979/80	8 143	98.7	105	1.4	8 251
1980/81	8 080	97.6	190	2.3	8 277
1981/82	7 409	95.0	353	4.5	7 771
1982/83	-	-	575*	6.7	8 575**
1983/84	-	-	756*	8.6	8 756**

source: Australian Bureau of Statistics (1978-1984)

\*Based on production reported by T.F.D.A. as 647 299 dozen in 1982/83 and estimated production of 850 000 dozen in 1983/84.

\*\*Based on an estimated production of 8 000 tonnes by the other States in these years.



Production in Tasmania increased after 1980 because the Bicheno oyster hatchery was started, freeing the industry from relying on the natural recruitment of spat in the Tamar Estuary. The earlier reliance on natural recruitment meant that production and marketing forecasts were difficult to make and often inaccurate.

The Tasmanian oyster industry has a reliable source of spat, and a price advantage over oysters produced in other States. Given the favourable return for capital outlay by the farmer (Stuart 1983), there is every reason to predict further expansion in the Tasmanian industry.

### 2.3.3 Mussel farming

Mussel production in Tasmania is relatively small compared to the rest of Australia, approximately 2% of the total. The national production of mussels is based mainly on harvesting wild populations, with Victoria producing nearly 80% of the catch (Table 2.5). Most mussels are dredged up by scallop boats and sold as a secondary catch. Wild mussels, however, are considered a far inferior product to cultured mussels and several wholesalers and processors have indicated that the wild product is unsatisfactory for the trade (Ball 1980; Mure 1980). The market could be supplied by Tasmanian cultured mussels.

Table 2.5

Production of mussels per State  
(Tonnes of live weight)

Year	N.S.W.	Vic.	W.A.	Tas.	Total
1979/80	122	857	202	19	1200
1980/81	154	801	181	11	1147
1981/82	164	836	199	18	1117
1982/83	-	-	-	21*	-

Source: Australian Bureau of Statistics (1984)

\*Estimated from production of 58 000 dozen in the year 1982/83 (Tasmanian Fisheries Development Authority n.d.).

The price of mussel meat did not change from 1979 to 1984 (Stuart 1980; Locke personal communication). This represents a drop of 31% in real terms in the price. In line with the calculations used by Stuart (1980), the farming of mussels could be expected to show little or no return for the capital invested (Table 2.6).

Table 2.6

Effect of the relative changes in the price of mussels on the return on the capital invested in the venture before tax (modified from Stuart (1980) in 1980/81 dollars)

Change in price	Return on capital
10% price increase.....	32%
stable price at 40 cents (1980/81).....	24%
10% price drop.....	15%
20% price drop.....	6%
30% price drop.....	-2.3%

Mussel farming is a very small industry in Tasmania with only three permits for exclusive mussel culturing. With the possible exception of one farm, these three permits are all run on a part time basis. Stuart (1980) showed that one owner operator controlling a modest lease could produce 90 tonnes of mussels per year. This would mean that 10 small lease operators could produce in excess of the current production of mussels in Australia. An over supply of mussels in Australia is possible, so any potential increase in labour and capital in this industry is very risky.

A large proportion of the cultured mussels are taken as an incidental crop with cultured oysters. Mussels, being part of the normal fouling community which colonizes oyster cultures, are allowed to mature and are harvested when they reach the preferred size. Also, some farmers run a mussel culture, usually a long line, next to their oyster culture in order to save on capital equipment, like boats and sheds. The potential of an integrated mussel and oyster farm development is high for the following reasons:

- (a) integrated use of the depot facilities and work boat;
- (b) it allows rationalization of labour, thus overcoming dependence on tidal cycles for oysters;
- (c) it makes use of complementary harvesting seasons and therefore reduces cash flow problems;
- (d) it creates diversification in produce and reduced risk in marketing.

Mussel farming, by itself, is not profitable but since it complements oyster farming it is likely to continue to expand in the near future. The small market potential and low return for mussels could change in the future with the introduction of advertising and greater acceptance of mussels as a delicacy by the public.

#### 2.4 Concluding Comments and Summary

The fortunes of the oyster industry have changed radically during the years of European colonization of Tasmania. The industry had collapsed after bad management in the 1880s, but is now growing again with the introduction of the Pacific Rock Oyster. Before the turn of the century, the management of fisheries was essentially laissez faire and, after the initial burst of enthusiasm for oyster culture, tended to concentrate on the introduction of exotic species of freshwater fish.

The 19th century legislation was very protective of the lessee's right to the oysters within the lease. This protection is also present in the modern legislation, but the populations "farmed" in the previous century were natural populations and represented no investment by the lessee. It is believed that the implied policy of encouraging marine farming was not enforced (circa 1860) and the leases were used to monopolize natural populations until

they were fully exploited by the lessee. The legislation did very little to encourage marine farming, and did not change much until the 1982 amendment to The Fisheries Act 1959.

Marine farming has been actively encouraged and developed by the Tasmanian Government over the last 35 years. Government involvement, in the form of the C.S.I.R.O. initially and then the Tasmanian Division of Sea Fisheries, introduced and developed the present day marine farming industry centred on the cultivation of the Pacific Rock Oyster. The formation of the T.F.D.A. was another step in government encouragement of the marine farming industry. In particular the T.F.D.A. assisted in developing and financing a shellfish hatchery, which effectively removed the major limitation to the expansion of oyster farming in Tasmania. The newly formed Department of Sea Fisheries also has a policy of developing marine farming.

The fortunes of marine farming in Tasmania can be best described by the the changing number of oyster leases. In 1884, there were 3 government reserves in operation. This number rapidly expanded to 17 government reserves and 16-18 leases in 1887, and equally rapidly declined to none in 1893 (Sumner 1972). With the introduction of the Pacific Rock Oyster, the number of leases/permits in Tasmania increased from none in the 1950's to one in 1973 and 68 in 1983 (Johnson C., personal communication). Oyster culturing is a rapidly growing industry and will continue to grow in the

forseeable future, largely as a result of encouragement by the State Government.

The mussel fishery was very small until the introduction of modern culturing techniques in the last thirty years. The main advantage of mussels as a farming venture is that they can be cultivated as a sideline to oysters. As a result, the production of mussel meat in Tasmania should continue to increase if only for this reason alone. The start of mussel farming in Tasmania was the stated reason for the inclusion of permits in the Fisheries Amendment (Marine Farming) Act 1982 (Tas.), as mussel farming usually takes place in midwater and does not require the use of the sea bed as with oyster farming.

The next Chapter describes the public's rights to the use of the sea and the seabed as a common, and shows that this common has been ceded to the government as the representative of the public. In the face of the potential rapid expansion of marine farming in Tasmania, public access to these areas may be further eroded.

## Chapter 3

### THE ROLE OF GOVERNMENT IN MARINE FARMING

#### 3.1 Chapter Outline

Section 3.2 of this chapter reviews the legal situation with respect to control of the seabed and what rights an individual has to the sea and seabed. This section will provide the basis for discussion of the allocation of areas of the seabed for the specific purpose of marine farming.

After describing the legislative process whereby marine farmers are given the exclusive use of parts of the sea (Section 3.3) the chapter goes on to argue that the processes for the allocation of sectors of the marine environment should involve the public at a very early stage. The details of what actually occurs in Tasmania are explained.

#### 3.2 Legal Issues Relating to Marine Farming in Australian Coastal Waters

Australia's Territorial Sea is controlled by the Crown via ownership of the seabed. That is, the seabed is Crown Land. This land is uncommitted and by virtue of usage and

preconceived notions is thought of as a common, that is, common usage is to be upheld. These rights are specifically protected in the case of fishing and navigation in Australian Law, reflecting its origins in British Law (Wisdom 1962). Under common law, fish are merely profits of the soil, which means that the owner or controller of the soil is the owner or controller of the fish. This is the basis of the right of the public, via the Crown, to fish in tidal waters (Wisdom 1962). Similarly, it can be shown that there is a right of the public to navigate on tidal waters under common law. The right of navigation extends to all areas, but when it is in conflict with fishing it must be exercised reasonably, that is, the right must not be abused to effect an injury to a fishery (Wisdom 1962). The only rights that the public have concerning tidal waters are the rights to fish and navigate, which have come about through common usage of the seabed.

In Tasmania, the powers of management and sale of Crown Land are vested in the Minister under the Crown Lands Act 1976 (Tas). This Act gives the Minister total control of Crown Land within the boundaries of the State so that, although there is a body called the Crown, the power to control the land is elsewhere. This situation holds for the other States and the Federal Government. The sovereignty of the seabed belongs to the Federal Government but, for the moment, the State Governments have control of the seabed up to three nautical miles from the low watermark (Coastal



Waters (State Powers) Act 1980; Evans 1984). If the control of the seabed was taken from the Tasmanian Government, then the use of the seabed for marine farming under the current legislation could not be allowed.

The States at present have the power to grant leases and permits to individuals, which give proprietary rights to an area of common to the holder. The granting of the leases and permits, and any objections thereto, are separate from any jurisdiction under common law. The licence for a marine farm is merely an administrative decree and can be challenged in law. However, nowhere is there any provision, either under legislation or at common law, for an individual to exercise any right to the aesthetic or physical enjoyment of the sea. No individual claim in law, such as the public trust action in the U.S.A., can be made in Australia. It is only through political mechanisms that such rights can be sought.

### 3.3 Administrative Process for Changing a Common to Private Usage

The previous section described the basis of the Government's power to allow areas of the seabed to be used for private marine farming. This section describes in detail the Tasmanian legislation that defines the rights of marine farmers and the right of the public to object.

The principal Act governing marine farming in Tasmania is the Fisheries Act 1959 (Tas). In 1982, the Fisheries Act was amended by the Fisheries Amendment (Marine Farming) Act 1982 (Tas) which is of prime importance to the marine farming industry in Tasmania. The 1982 amendment changed the legislation governing marine farming quite radically, but since some existing farms were established under the original legislation, the pre-1982 legislation will be reviewed first. It was the stated intention of the 1982 Amendment to protect the interests of the public (Tasmania, Parliament, Legislative Council 1982). Comparisons between the new and old methods of allocating public areas for marine farming will be made while reviewing the 1982 Amendment in Section 3.3.2.

### 3.3.1 Pre-1982 Legislation

As in a previous chapter the history of marine farming was reviewed, it will only be necessary here to briefly reiterate some of the main points. The legislation was specifically designed for the native oyster species, Ostrea angasi. When the industry was overexploited prior to 1880, the legislation relating to oyster farming remained static and was religiously transferred from fisheries Act to fisheries Act over the last 100 years until 1982. The relevant section in the Fisheries Act 1959 which was repealed in 1982 was called Oysters (Part 2, Division 2).

Before choosing a marine farming site, a prospective oyster farmer would normally approach the scientific staff employed by the Government for advice. The biological prerequisites for a successful marine farm are quite complex, and it is probable that several sites would be rejected before a satisfactory site would be selected. The applicant would then have to supply details of the proposed farm to the T.F.D.A. (prior to 1985 and since then to the Department of Sea Fisheries) which would process the application.

Under the pre-1982 legislation (Fisheries Act 1959) the Minister for Agriculture, upon request from a potential marine farmer, recommended to the Commissioner of Crown Land (Section 12) that a lease of the shore, bed of the sea, estuary, or tidal water, be granted for the purposes of oyster farming. Section 12(2), however, clearly stated that the Commissioner could not grant a lease "...whereby the rights of any person in the land or in any land thereto adjoining, may be prejudiced or interfered with without the consent in writing of that person". From the submissions to the Tasmanian Legislative Council Select Committee (1976), it would seem that this section created some difficulty, with many applications being held up for long periods of time. At least one applicant thought that all that was necessary was the verbal assurance by the adjoining landowners that the marine farm would not prejudice or interfere with the landowner's livelihood. However the case

was that if adjoining land owners did not wish to have a marine farm adjoining their land, they could effectively veto the application by not supplying a letter of consent. The landowner did not have to show that he would be prejudiced or interfered with by the presence of the marine farm. Local councils were also eligible to comment on some applications on the grounds of being an adjoining landowner (for instance, of foreshore reserves and access roads).

The Act also required that public notification of the application be made. In practice, comments from the Marine Board concerning navigation and anchorages were solicited. No further action was required under the pre-1982 Fisheries Act 1959 (Tas) and no formal procedure for objections was outlined in the legislation. A person who objected to a marine farm submitted their objections to the Minister for Lands. If, after objections to the granting of a lease for marine farming had been assessed, a decision was made in favour of the farm by the Minister for Lands, and written permission from the adjoining land owners had been obtained, the lease was usually granted. There was no reference in the Act, nor any written policy directive, that governed the processing of objections or appeals either by the objectors or the potential marine farmer.

The deficiencies of the Fisheries Act 1959 (Tas.) are not, at first, obvious from reading the Act; however, one witness to the Tasmanian Legislative Council Select

Committee (1976) stated that the provisions of the Act were so encumbrant that, to their knowledge, only one of the marine farms existing at that time was approved under this Act. In some cases, the Lands Department was inundated with petitions and objections to proposed marine farms. The most frequently voiced concerns were for the loss of recreation and aesthetic enjoyment of an area as well as potential danger to navigation. It was stated by Johnson and Sumner (personal communication) that the Lands Department did not have the specialized knowledge to make decisions about marine farming which subsequently caused extensive delays in the processing of marine farming applications.

Not only was the Fisheries Act 1959 (Tas.) awkward to use, but there were several loopholes in the legislation. The alternatives to the above Act were to apply for occupation permits from the Lands Department and/or mooring sites from the Marine Board. Both methods resulted in the granting of permission on a year to year basis. When using these methods, only one authority was involved and no objections from outside were heard (Tasmania, Parliament, Legislative Council Select Committee 1976). These types of leases were unsatisfactory. In the case of the Lands Department permit, the farms could have caused a navigation hazard. Both methods denied any right to objections from the public.

The fact that the Lands Department was granting

temporary permits for marine farming without public scrutiny, whilst at the same time there were long delays in processing marine farming leases, suggests that the difficulty lay not in lack of specialized marine farming knowledge, but in an inability to come to grips with the equitable use of the coastal region under pressure from the public within a time span considered reasonable by the marine farming industry.

The problems associated with the industry were an obvious factor behind the formation of a Select Committee of the Legislative Council in December 1974 with a view to investigating various aspects of shellfish farming in Tasmania. This Committee expressed amazement that "...in spite of all its difficulties the shellfish industry in Tasmania has proceeded as far as it has..." (Tasmania, Parliament, Legislative Council Select Committee 1976, p.3). The difficulties that were referred to were mainly bureaucratic in nature and the Committee in its report obviously thought highly of the New South Wales system.

It was as a result of the report of this Select Committee that a Crown Lands Amendment Bill 1976 was tabled in the Tasmanian Parliament. Essentially, this Bill was aimed at granting the control of marine farming to the Lands Department. It is doubtful that such an amendment would have benefited the marine farming industry as the Lands Department was neither qualified to achieve nor truly

interested in the better running of a fishing industry. This Bill was seen as a stop gap measure aimed at overcoming delays in the allocation of Crown Land for the purposes of marine farming. For these reasons, it was probably best that the bill was not passed.

It was not until 1982 that the Fisheries Amendment (Marine Farming) Act 1982 (Tas.) was passed by Parliament. It is a cause of puzzlement as to why this legislation was so long delayed, as the Select Committee stressed some urgency in the need for the better management of the industry.

Mr Lowrie, the leader for the Government in the Legislative Council, stressed in his speech to Council the importance of recreational use of the sea and to this end spoke of how the leasing system would be changed by the inclusion of the permit system to allow for culturing to take place out to sea away from the shallow areas where recreation mainly takes place (Tasmania, Parliament, Legislative Council 1982). The importance of freedom of navigation was also stressed, as was the close working relationship between the Government and marine farming organizations. The point was made that a more efficient process for leasing waters for marine farming was needed, especially since this Act was designed for all forms of marine farming, not just oysters as in the previous legislation. Both the State Government and the Select

Committee stated the importance of the general public's interest in the marine environment. How these interests were balanced against a swifter and more streamlined processing of marine farming applications under the 1982 admendment is the subject of the next section.

### 3.3.2 Changes brought about by the Fisheries Amendment (Marine Farming) Act 1982 (Tas.)

In order to regain control of marine farming enterprises using mooring permits, the amended Act allowed for two types of leasing arrangements, namely, a lease where substantial use is to be made of the seabed, and a permit where little use of the seabed is envisaged and the culture is to be suspended. The latter was designed to make use of new techniques of suspending the shellfish culture which originated when it was difficult to obtain a lease. It is argued later in this section that by gaining control of marine farms operating outside the Fisheries Act 1959 in the form of the permit system, the rights of the public to object to these farms was overlooked.

A major difference with the 1982 admendment was the shifting of the adjudication of objections to marine farms away from the Lands Department. Before the 1982 amendment, the Minister for Sea Fisheries recommended to the Minister for Crown Lands that an area be leased. The Crown Lands Department then had to evaluate the benefits of marine



farming and the objections of the alternative coastal users. Under the new legislation, the Minister for Sea Fisheries with the Minister for Lands predetermines without public input, general areas within which marine leases could be granted. In other words, the Minister for Lands effectively vested areas of the sea bed in the Minister for Sea Fisheries. The Lands Department was removed from the task of allocating specific leases and only needs to allocate general areas to the Department of Sea Fisheries via the Minister for Sea Fisheries. The Lands Department views the selection of areas for potential privatisation as merely an administrative task; it sees the responsibility for the impact of marine farming as resting with the Department of Sea Fisheries (Price, personal communication).

In contrast to the pre-1982 legislation, the 1982 Amendment was quite specific as to who could object and the time allowed for objections to be considered. Section 17 specifies that a copy of the application must be sent to the Minister for Public Health and the Marine Board. Objections will be received only from the Marine Board, the councils of adjacent municipalities, persons owning or occupying land adjoining the area, and persons who claimed that their use of the waters would be adversely affected in the case of an application for a lease. In the case of a permit, only the Marine Board and a person who claims that his livelihood or use of the waters will be adversely affected may object. Section 17 also specifies that 28 days should elapse from

the public notification of the application to the notification of the grant/refusal of the lease/permit. A shorter period of time before the applicant is notified has the merit of not protracting the decision making process, but gave the T.F.D.A. and now the Department of Sea Fisheries little time to investigate when there were substantial numbers of objections. The authorities have had to rely heavily on the opinions of their field officers as to the impact of marine farming on the public amenity of the area. These are the same officers who have the responsibility for developing marine farming in Tasmania.

There are several points to note about the new legislation. Firstly, the types of objectors specified by the Act were different for lease and permit applications. The stated rationale (Tasmania, Parliament, Legislative Council 1982) was that permits would create less of a disturbance to the adjoining landowners and therefore their objections would not be relevant. Permits can be as much a hindrance to people wishing to use an area for recreation as are leases. It is more likely that the principal reason for permits was to legalize the existing marine farms operating outside the old Fisheries Act 1959, and to avoid any issue about the sovereignty of the seabed. In addition, permits are not restricted to any set area and do not have to be approved by the Lands Department. The use of the permit system avoids public scrutiny by allowing only a very limited range of coastal users to register their objections

and, because permits are not restricted to predetermined areas, make it difficult for public opinion to be organized within the 28 days allowed for objections to be submitted. Secondly, no mention is made of land bases in the Act. Land bases are required to store equipment and produce, and need to be close to the farm, preferably on the foreshore. The foreshore in most cases is Crown land, and therefore available for public use. Obviously, ramps, jetties, sheds, and the like restrict the use of the foreshore, but were not considered when the legislation was enacted. In the old Act, the adjoining landowner had the power of veto over an oyster farm and thus over any planned land base, but this capacity does not exist in the new legislation.

The only right of veto left in the Act is given to the Marine Board in the case of navigational hazards and even the Minister of Sea Fisheries, the representative of the public, does not have such power. In a recent court case over a marine farm application in southern Tasmania, the Minister's decision to support the public's claim of loss of amenity due to a marine farming permit was overturned, and the permit had to be granted. Compare this situation to that of the Environment Protection Act, 1973 (Tas.) where the Minister for the Environment is given absolute power in such circumstances.

The framers of this legislation were concerned about the possibility of the Department of Sea Fisheries making

the decisions and being given the responsibility of judging whether those decisions were reasonable and within their powers: in most cases, the Act quite specifically states that a person who feels aggrieved by a decision has the right to appeal to a magistrate, who can make a judgement within the confines of the Act. This is true for both applicants (Section 23C[1]) and objectors to a new application (Section 23C[2]). The inclusion of an appeal to a magistrate does not protect the public's right to the marine environment. The magistrate can only make judgements relating to the implementation of the Act, and since the Act does not specify the public's rights to the sea as a common, the magistrate can not protect these rights.

The most conspicuous failing in the legislation relates to objections to the renewal of a lease/permit. In this case there is no allowance for even the objection to be heard. If the lease/permit is granted for the maximum term of 20 years, then it is very likely that the situation would have drastically changed in the period between granting the lease/permit and the time of the renewal. The changes that might occur could be increased recreational use of the area, and evidence of environmental damage to the area. The argument that the marine farmer has invested so much capital in the venture and that it would be unfair not to renew the lease/permit need not be absolute. True, such an argument should have a great bearing on any decision, but, as the legislation presently stands, the circumstances of the other

coastal users need not be officially considered at all.

In summary, the most important difference between the new and old legislation as far as privatization of public land is concerned is that the Minister for Sea Fisheries can grant the lease directly without forwarding the application for a lease to the Lands Department, the custodian of Crown Land. This has come about by the allocation of certain coastal areas to the Minister for Sea Fisheries, who can dispose of them as applications are received. The unofficial criteria used for selecting and locating marine farming areas are dealt with in the next chapter, but they are not specified in the legislation. The areas are described in a Schedule of the Fisheries Act 1959 (Tas.). For the purposes of administering the Act, there have been no formal regulations or policy directives published.

### 3.4 Concluding Comments and Summary

In Australia, sovereignty over the seabed and the resources within the sea belongs to the Crown. The Crown has relinquished the control of the seabed in favour of the elected governments of Australia. The States have constitutional control of the fisheries and control of the seabed to three nautical miles from the low water mark. The rights of the public with respect to the sea are restricted to the right of fishing and navigation. There is no direct right of the public to any area of the sea and aesthetic

values are not recognized in law. The government controls the sea and access to the control of this common by the public in Australia is restricted to the elective and lobbying processes. Marine farming is controlled solely by the legislators unless it transgresses the public rights of fishing and navigation, whereupon it may become a matter for the judiciary. It is unlikely that the Tasmanian legislation can effectively protect the interests of the public.

The appointment of a magistrate to adjudicate appeals might have been introduced to allow for some review, but it has also allowed the Department of Sea Fisheries to partially wash its hands of questions regarding the equitable use of the marine resources. The use of a magistrate might intimidate prospective appellants and thus negate the notion of an alternative means of reaching a decision. The cost of seeking a judgement is more likely to be sought by someone who has a financial commitment, such as the lessee. It is less likely that an individual who will lose recreational enjoyment will seek a magistrate's decision. This method should be compared with that in South Australia which relies on the lease applicant and objectors coming to an agreeable decision under the chairmanship of the State's Fisheries Department.

Permits can be as detrimental as leases to the public amenity of the marine environment. They do not, however, use the seabed and, as such, by law are the responsibility of

the Minister for Sea Fisheries. A common refers to land, and permits do not make use of the seabed. For this reason, any discussion about permits and alternative public uses via rights to a common are further complicated in law. For this reason, the conflict between the lease system and public amenity is far more tangible.

The Department of Sea Fisheries is responsible for adjudicating the equitable use of the designated marine farming areas for all users of the coastal region. The Department of Sea Fisheries is also responsible for the development and encouragement of marine farming. The T.F.D.A. had similar responsibilities under the repealed Fisheries Development Act 1977 (Tas.). These two responsibilities are in direct conflict. As has been shown, the public can only influence the allocation of marine farming leases and permits by appealing to the pro-marine farming Department of Sea Fisheries. The Department of Sea Fisheries is the sole protector of the public's rights to use the sea within the areas ceded to the Department of Sea Fisheries by the Lands Department. However well intentioned the Department of Sea Fisheries might be, as more marine farms are started and the area available becomes restricted, the Department will be under pressure to favour marine farms at the expense of alternative uses. The emphasis on the equitable use of the coastal zone should shift to the process of designating marine farming areas by the Lands Department. At the present time, the vesting of land

(seabed) by the Lands Department in the Department of Sea Fisheries is an interdepartmental exercise and does not involve any visible determination of the wider public interest.

The next chapter will focus on some of the scheduled marine farming areas set aside for leases in order to determine how sensitive the Government has been to the requirements of other coastal users. The sorts of arguments used will be in general applicable to permits as well. The investigation will concentrate on how well the public amenity of the areas was considered without input from the public.



## Chapter 4

### SELECTION OF MARINE FARMING AREAS

#### 4.1 Use of the Coastal Zone

The Tasmanian Lands Department granted large tracts of the coastal zone for the purpose of marine farming under the amended Fisheries Act 1959. In the previous chapter it was argued that the equitable use of the coastal zone should be determined by allowing public objections to be heard before marine farming areas are granted to the Department of Sea Fisheries. The aim of this chapter is to give the results of case studies of the 8 marine farming areas within the Bruny Island and D'Entrecasteaux Channel region in south-eastern Tasmania to establish whether sufficient consideration was given to alternative users of these areas before designation for marine farming.

Initially, a general description of the designated marine farming areas within Tasmania is given so as to explain the significance of such areas within the coastal zone. This is followed by outlines of the possible impacts of marine farming on the biological and social environments. The impacts of marine farming on the coastal ecosystem are of major concern, but have not been studied here because they are beyond the scope of this thesis. However, because

they influence the public appreciation of an area by reducing its environmental richness and conservation value, they have been described in Section 4.1.2. The more direct displacement of other coastal users by marine farming is described in Section 4.1.3. These impacts are evaluated for the Bruny/D'Entrecasteaux region in order to determine whether the process of selecting marine farming areas was sensitive to conflict over use of the coastal zone. The case studies refer mostly to losses of public amenity, as these are often easily observable. Biological effects, on the other hand, can be extremely difficult to detect, but they are noted whenever possible.

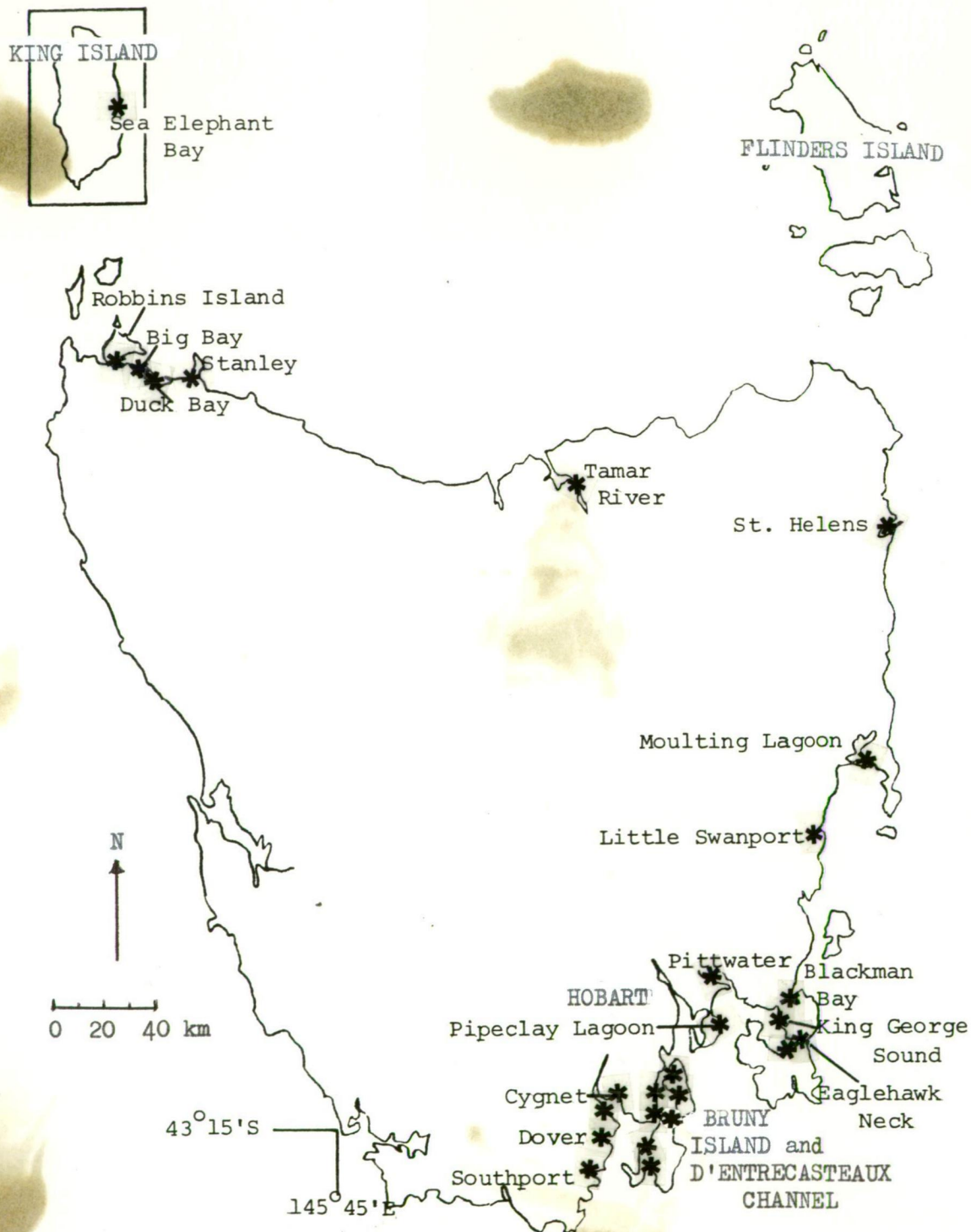
#### 4.1.1 Marine Farming Areas in Tasmania

There are about 30 main areas set aside for marine farming (Figure 4.1). An exact number is hard to give as the areas are sometimes segmented into sub-areas. The areas vary in size from 7.5 hectares (King Island) to 600 hectares (Western Montagu Island in Duck Bay).

The total area set aside in Tasmania is about 4 000 hectares. This figure is relatively small compared to the total area of Tasmania's coastal zone, but, in terms of accessible, sheltered estuaries favoured for marine farms, it is significant.

Figure 4.1

Location of the areas vested in the Department of Sea Fisheries for marine farming purposes (leases) in Tasmania. The place names are of the nearest well known localities, not necessarily the actual name given to the marine farming area. (Source: Schedule to the Fisheries Act 1959 (Tas.) amended in 1982)



In addition, marine farms also exist under the permit system, but these are not included in the above calculations. Permits do not involve the use of Crown Land (sea bed) and are therefore not required to be located within a marine farming area.

#### 4.1.2 Effects of Marine Farming on the Coastal Ecosystem

The environmental effects of marine farming are not documented in Tasmania. This is not to say that marine farming is a passive use of the environment, but simply that it is common that degradation is diffuse and relatively unstudied. However, it is possible to build up a general picture of the potential effects of marine farming on the inshore environment.

Odum (1974) provides a comprehensive review of the effects of aquaculture on inshore coastal waters. Marine farming is an intensive farming system which implies that biomass has been artificially concentrated. This has ramifications for the near environment by increasing the level of waste products and increasing the level of nutrients immediately downstream. The latter is hard to substantiate, other than intuitively, due to the lack of published comparative data on nutrient levels near marine farms. The level of wastes, however, has been documented by Dahlback and Gunnarsson (1981) who found that a build-up of

sediment rich in organic material and sulfide takes place under mussel rafts. This indicates that the organisms under a mussel/oyster culture are mainly detritus feeders and that primary producers cannot survive. The waste products from farmed animals are likely to spread further than directly beneath the culture and so influence larger areas, although to a smaller degree. A build up of organic sediment normally implies anoxic conditions and the loss of nontolerant organisms, such as benthic fish, molluscs, and algae.

The increased level of biodeposits coincides with an increased rate of sedimentation near mussel and oyster farms. Siltation occurs at a rate 3 times greater under a blue mussel culture, for example, than it would otherwise (Dahlback and Gannarsson 1981). The increased sedimentation rate is partially due to the increased biodeposits, but is also due to the baffling effect of the rafts and racks. Sornin (1981) found that shell fish cultures reduce the bottom current by a factor of 2 to 3, as well as reducing the amplitude of the waves. In the Philippines, increased sedimentation from shellfish culture, in some cases, has changed the shape of the coastline (Davis 1956). Hruby (1978, p15) was of the opinion that "...the net effect of coastal farms will be to produce a saltmarsh like environment regardless of the original conditions in the area." It has been suggested that the problem of sedimentation can be dealt with by dredging, suction and blowing the sediment away using high pressure water or air

(Sumner 1976). It is doubtful whether Tasmanian marine farmers are equipped or have any intention of using such methods of cleaning away sediment buildup. In areas where sedimentation has occurred, as at Gordon in southern Tasmania, nothing has been done about it.

Chemicals have been pollutants of the marine environment in other parts of the world: they have been used to control predators of shellfish, such as starfish. The most common method is to lay down quicklime at a dosage of 2500 kg per hectare, but organic chemicals are also used (Milne 1972; Loosanoff 1961). The long-term effects of chemical poisoning of predators is not known, but there are likely to be serious environmental effects. Although such methods are not known to be used in Tasmania, there is no published policy for the control of predators in Tasmanian marine farms.

Invariably, when high technology and marine farming are discussed together, schemes to raise nutrient rich cold water to the surface are mooted. In Tasmania, although schemes have been suggested, none has been put into practice. There are many potential problems with such a scheme, not least of which is the increased level of phytoplankton resulting in more turbid waters and the loss of phytobenthic communities. With larger upwelling schemes, climatic changes in the form of fog banks will become a problem (Hruby 1978).

Living pollutants in the form of exotic organisms are a problem with marine farming. Exotic organisms can be in the form of diseases, parasites, or the farmed organisms themselves. Bacteria, fungi, and viruses are well recognized as being transferred by importation of new stock. Very little is known about the effects of these organisms on native species (Odum 1974). Indeed, it is hard to imagine that new micro-organisms could not have been introduced as, historically, no regulations have governed the introduction of marine invertebrates to Tasmania. Similarly, parasites have also been introduced to many different continents (Hoffman 1970) but, again, there is no information about the Australian situation as a whole, let alone for Tasmania.

More is known about the spread of the introduced Pacific Rock Oyster around Tasmania. The species was introduced in the 1950s and gained a foothold in the Tamar Estuary which, due to hydrological conditions, proved very suitable for the oyster's reproduction. The spread of the Pacific Rock Oyster has not been so pronounced anywhere else in Tasmania as the environmental conditions are not usually suitable for the proliferation of the animal. However, the high density of oysters in the farms enhances the likelihood of a successful spatfall, hence accounting for the increased numbers of Pacific Rock Oysters found on the foreshore near marine farms. Without the farms, Pacific Rock Oysters would not normally be found in any numbers on

the foreshore, except for a few isolated estuaries around Tasmania which are suitable for the reproduction of the animal.

The shell of the Rock Oyster is very sharp, and, even after the animal dies (or is eaten), the bottom valve of the shell remains cemented to the rocks. Hence, large numbers of the animals seriously limit the enjoyment of the foreshore by the public. The oysters will produce gametes in most locations around Tasmania - indeed, it is a problem for the farmers as breeding oysters lose condition. However, in most cases, the animals will not develop past the larval stage due to cold water temperatures. The animals that do live then need a substrate to which they can adhere. The spat cannot live on sand, mud or silt, so the presence of larger substrate units, such as rock, means that more oysters survive to become adults. It would make sense, for these reasons, to locate oyster farms near the former types of foreshore. This would lessen the problem of oysters hindering recreational use.

The problem of settling may not be limited to recreation; it was claimed in a submission to the Select Committee on Shellfish Farming in Tasmania (Blackwood Yachting Association 1976) that oysters settling on eel grass would eventually kill the plants and, hence, contribute to the erosion of the seabed.



The biological sensitivity of any proposed marine farming area should be evaluated as the presence of a marine farm could be detrimental to the existing native biota via competition for food and organic pollution. The frequent movement of vehicles associated with marine farming on the beaches disturbs nesting and breeding birds. This latter problem has been reported in several instances around Tasmania (Newman, personal communication).

The Legislative Council Select Committee which was set up to report on shellfish farming in Tasmania was charged, in its principal terms of reference, with investigating the effect of oyster and other shellfish farming on the environment (Tasmania, Parliament, Legislative Council Select Committee 1976). The Select Committee did not, however, address the public's concern for biological problems associated with marine farms even though these were clearly pointed out in submissions. This lends credence to a view that the government's policy of rapidly developing marine farming has overwhelmed the appreciation of biological problems associated with marine farming.

#### 4.1.3 Other Users of the Coastal Zone

There are many users of the coastal zone. In this section, the ways in which marine farming can interfere with other users will be briefly described.

In general, the only other commercial use of the areas used by marine farming is fishing. Net fishing (seining) would not be possible where there is an oyster or mussel rack/raft. Monetary comparisons per unit of area between the two enterprises would be in favour of marine farming as it is an intensive user of the sea. However, if a fisherman traditionally used an area proposed for a marine farm, the loss of that livelihood must be considered before a lease/permit is granted. Line fishing is not seriously hindered as it usually takes place in deeper water.

Recreation is the major use of the coastal zone which will be restricted by marine farming. In most cases, access will be the biggest problem. This is the case with swimming, fossicking, and the exercise of animals along the beach. At low tide, oyster racks can restrict all three forms of recreation. Often there are other structures above high water such as boat ramps and sheds that can also restrict movement along the beach.

With yachting and boating, marine farming will restrict navigation, anchorages, and access to and from the shore. Marine farming structures need sheltered areas, as they are susceptible to wind and wave damage. Boats, of course, have the same need in rough weather and there is a great deal of conflict over availability of sheltered areas for anchorages. This sort of objection has been put forward for nearly all proposed marine farming ventures in Tasmania.

Navigation has not been a major problem for large boats which ply deeper water than would normally be used by marine farms. Marine farming definitely creates a navigation hazard for smaller boats (Plates 4.1 and 4.2). An additional problem for smaller boats is the large amount of debris in the form of broken racks, long lines, and wooden structures in general that are invariably lost from marine farms.

Amateur fishing can be greatly restricted by marine farms in terms of access and navigation. The pre-1982 legislation allowed for the pursuit of recreational activities as long as they did not interfere with marine farming. However, this section was omitted under new legislation, and the legal status of a person fishing in and around a marine farming area is unclear.

Aesthetics are very much a matter of personal values, but it is easy to see that with intensive oyster and mussel farming, conflicts could arise. Structures that are only visible momentarily and do not dominate the view, such as fishing boats, are usually considered as being aesthetically pleasing (Ulrich 1977). Oyster racks viewed from the foreshore at low tide would not generally be considered aesthetically pleasing and commonly dominate the view from the foreshore.

## Plate 4.1

Mussel longlines can be a hazard to unwary sailors  
(Fleurty's Point, D'Entrecasteaux Channel)



## Plate 4.2

Submerged behind this notice is several hectares of oyster  
farm: a potential hazard to boats (Simpsons Bay, Bruny  
Island)



The problem of the aesthetics of oyster farms was addressed by the Select Committee (Tasmania, Parliament, Legislative Council Select Committee 1976). The Committee acknowledged the unattractiveness of some forms of marine farming, but thought the disadvantages would be outweighed by the benefits to the State. Proper management, they went on to say, would lessen the undesirable environmental [aesthetic] impact. Visual impact studies are not part of the formal area/lease allocation system in Tasmania. Aesthetics are only considered when processing facilities are planned and an environmental impact statement is required under the Environment Protection Act 1973 (Tas.) for the discharge of effluent. In this case the applicant is asked in the initial application form to summarize the possible environmental impact of the lease/permit development.

The resolution of problems arising from conflicting uses must be initiated by the State Government as the public has no other recourse. Objectors, including alternative users of the coastal zone, can oppose individual marine farming projects as potential farmers apply for a lease, but the formation of marine farming areas is at the public service level and not accessible to the public.

## 4.2 Bruny Island and D'Entrecasteaux Channel: a Test Case

### 4.2.1 The Marine Farming Areas and Regional Description

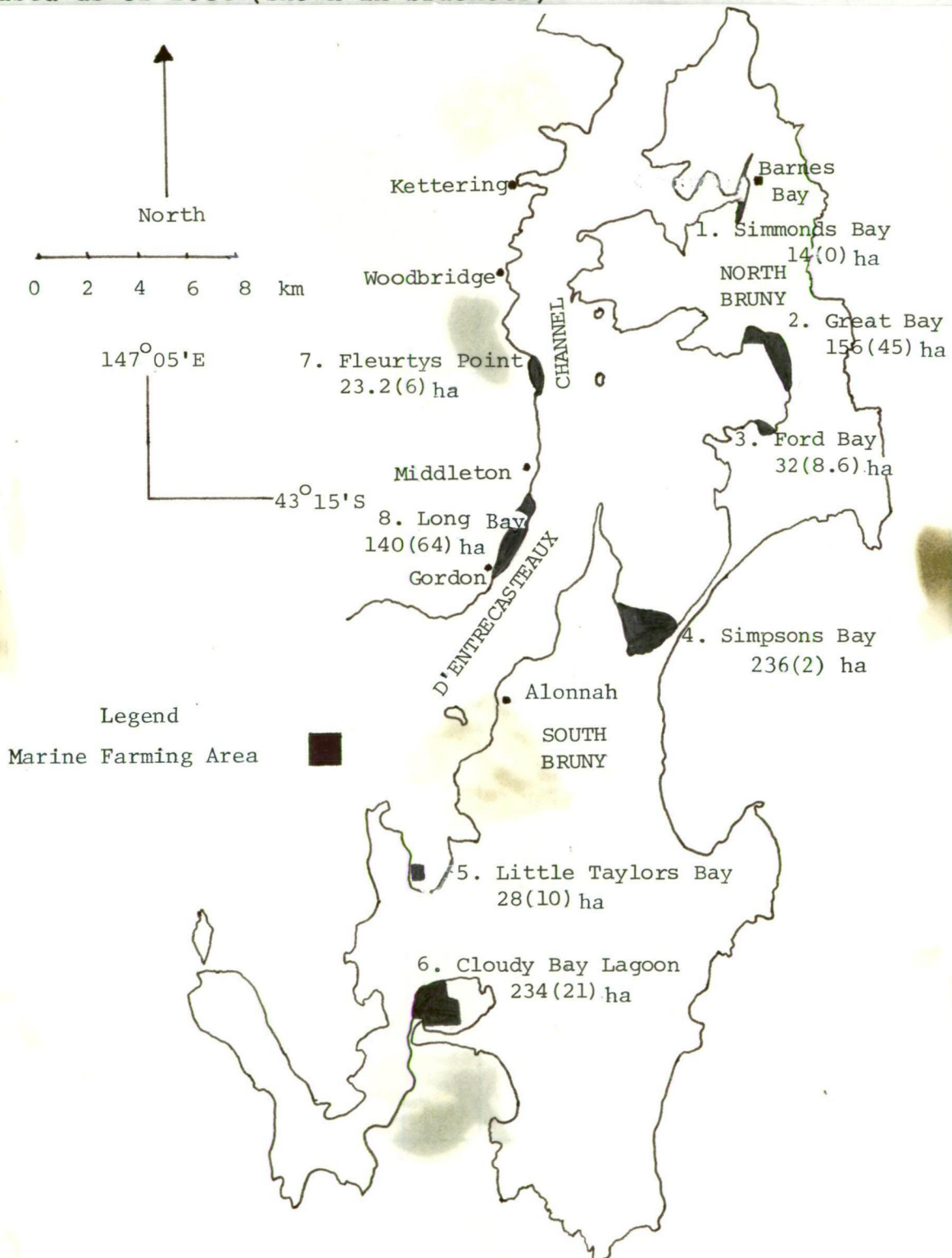
The Bruny Island and D'Entrecasteaux Channel region was selected to test whether existing marine farming areas and enterprises show evidence that social and environmental impacts were adequately considered before areas were designated. The region was chosen because of considerable recreational demands, as it is close to Hobart, Tasmania's capital city, and because of the high number of areas within the region set aside for marine farming.

The areas set aside for marine farming are illustrated in Figure 4.2, which also shows the sites within the areas presently used for marine farm projects. The coverage of the areas currently being leased for marine farming varies from over 40% at Long Bay to 0% in the Simmonds Bay area.

The general region is scenic, with a history of berry and fruit growing. Small farms and craft industries dominate the economy now and an increasing proportion of the residents commute to Hobart to work. Bruny Island is similar to the mainland, although less people commute, as the island is served by ferry only. The region is popular for recreation and tourism.

Figure 4.2

Details of the eight scheduled marine farming areas in the D'Entrecasteaux Channel and Bruny Island region. The size of the marine farming areas is given as is the actual area leased as of 1984 (shown in brackets).





#### 4.2.2 Evaluation of Conflict Between Marine Farms and Other Users

The method used to evaluate each area was to inspect each location and search out existing and potential conflicts with respect to conservation and public amenity. The opinions of various organizations, government authorities and departments, as well as recommended individuals were also solicited for information on each area and its usage. Published material was also sought but was rarely available. The conservation of wild marine species has not been discussed because very little information is available at a locality specific level.

A summary of the data collected in a standardised format for the study is appended to the thesis. Results for each area are now discussed in turn.

##### 1. Simmonds Bay

Simmonds Bay is a small bay within Barnes Bay and is near the small townsite of Barnes Bay. It was originally chosen as a marine farming area because it has historically been used for oyster farming although it is no longer used for that purpose (Sumner, personal communication). The total area set aside for marine farming is 14 hectares, which is quite small in comparison with other areas.



The marine farming area consists of a mud flat which is exposed at low tide (Plates 4.3 and 4.4) but has some areas of rock. Both the native Mud Oyster and the Pacific Rock Oyster are present. The latter probably remain from past oyster farming.

The bay is very popular for boating and, because it is virtually fully enclosed (Plate 4.3) is a very good anchorage in any weather (Marine Board n.d.). Although the marine farming area is mainly too shallow for yachts and most boats to anchor, a marine farm would block access to the deep anchorage further out from the beach. Floundering, a popular pastime in this bay, would also be restricted if marine farms were present. The area is well frequented by birds feeding on the mudflats and sheltering from poor weather.

The area has been rescinded as a marine farming area for recreational reasons since the study was undertaken in 1984. This supports the argument that the allocation process did not adequately take public amenity into account. It appears that the designation of the bay as a marine farming area had been based on one criterion only, namely, previous usage as an oyster farm.

Plate 4.3

View northwest across Simmonds Bay



Plate 4.4

Birdlife in the southern reaches of Simmonds Bay



## 2. Great Bay

The second marine farming area studied occupies 156 hectares within Great Bay. The area follows the coastline. An oyster lease was granted in the southernmost portion of the farming area under the pre-1982 legislation. Since it was the policy of the T.F.D.A. to schedule areas with pre-existing leases as marine farming areas, the southern portion of Great Bay was so dedicated. It was found at a later date that the northern section was better for oyster farming and so the area was extended.

There are two operating oyster leases and one permit in the area. The northern part of the Bay is backed by private farms while the southern section has public land between the main road and the beach. Like Simmonds Bay, a large proportion of the marine farming area consists of mudflats with rocky foreshore (Plates 4.5 and 4.6) but, in this case, a greater proportion of the area is deeper water.

Plate 4.5 shows the southernmost lease in quite deep water with the foreshore that abuts the northern section in the right middleground. The oyster lease shown interferes with boat access to the south of the Bay. Small boats are often launched from the southern boundary of the marine farming area, and, at high tide, the lease is not easy to see and is a navigation hazard.



Plate 4.5

View westward from the shore across the Great Bay marine farming area to the oyster lease



Plate 4.6

Foreshore of Great Bay being used for recreation



Great Bay also forms a significant wading area for birds. Although disturbance already occurs from recreational pursuits, there is concern that increased use of the area for marine farming might decrease seriously the area available to the birds (Newman, personal communication). As far as aesthetics go, the leases in the southern and northern portions do not have a high profile because of the viewing distance from the shore and, as such, are not obtrusive.

The high recreational value of the southern portion of the marine farming area due to road access and boat launching facilities makes this choice of area unsuitable. The northern end of the marine farming area, by itself, would have been more suitable as its use for farming would not conflict seriously with other users of the coastal zone as it is little used for recreation. At the present time, use of the area as a whole for marine farming must be considered to be in serious conflict with recreation.

### 3. Ford Bay

Ford Bay is an area that the Department of Sea Fisheries inherited from the Lands Department. Most of the area backing onto the bay is private farming land, although there is a small track giving public vehicle access to the top of the bay (to the left in Plate 4.7). Pacific Rock Oysters can be found on the foreshore and these probably come from the existing oyster lease. Although 8.6 hectares



of the total 32 hectares has been leased, very little has been developed and what has is out of view from the minor road. The area has little special value for bird conservation as the bird species found in the Bay are well represented in other areas (Newman, personal communication).

Plate 4.7

Access to Ford Bay is limited and marine farming would have only a minor impact on recreation.



The area also has limited value for recreation due to the difficulty of access and the relative shallowness of the water. If marine farming was concentrated on the foreshore away from the road, very little aesthetic impact would result. However, the road in this case is a minor road and public aesthetics, it could be argued, are less important.

This area was a reasonable choice for marine farming on the basis of low levels of conflict with other users.

#### 4. Simpsons Bay

Simpsons Bay is large, and forms the western border of the Bruny Island isthmus. The Bay is known for its scallops and recreational fishing. The surrounding land is mainly forested, with some pasture and a number of houses. The bottom of the bay is sand/mud (Plate 4.8) with sand beaches, and a narrow belt of sand fringes the foreshore.

Plate 4.8

Simpsons Bay looking westward, showing the sand/mud beaches





There are good roads on two sides with a hamlet on the north western corner of the marine farming area. There is only one 2 hectare lease in the area. The scheduled marine farming area is large (236 hectares) to allow for flexibility to move leases, given the difficulty in predicting the productivity of an area.

The area has a high recreational value for boating and swimming. Its recreational value is accentuated by the presence of the hamlet and jetty. On the other side of the narrow isthmus is a popular surfing beach with views of Cape Queen Elizabeth, a major local landform, and any marine farming in Simpsons Bay would be obvious to the many coastal users of the area as a whole. Development of any marine farming which is unsightly would have an impact on the considerable aesthetic value of the region.

Simpsons Bay is also an important bird habitat. As well as penguins, large flocks of Pied Oystercatchers and Red-necked Stints use the Bay over winter, and any greater usage by humans would be detrimental to the bird populations (Newman, personal communication). Most recreational usage is during summer and therefore would have a smaller impact on the birdlife than marine farming, which requires year round vehicular and human movement on the beach. A low productivity (Sumner, personal communication) and high value alternative uses of the area suggest that Simpsons Bay was a poor choice for marine farming.



### 5. Little Taylors Bay

Little Taylors Bay marine farming area is 28 hectares, of which 10 hectares have already been leased for oyster farming. The land abutting the area is mainly forest with some pasture to the south of the lease. The area has a mud substrate with rocky outcrops. The foreshore is steep and rocky (Plate 4.9).

Plate 4.9

Little Taylors Bay is a small isolated bay.



The Bay has a history of good productivity (Sumner, personal communication). There is some use of the area for boating, although there are no amenities such as boat ramps or jetties. The pristine nature of the area might attract

low density usage by people seeking isolation (indeed the area was recommended for this purpose by Goldin (1980)). Marine farming need not dispel this sense of isolation if its development uses the many smaller embayments to remain unobtrusive. The marine farming area only occupies a relatively small section on one side of the Bay. Other than by boat, the area is difficult to get to and the low profile of marine farms against the high foreshore would not be highly visible and might not detract from the area's scenic value to any great extent. The biggest problem might be the spread of oysters on the rocky foreshores. In terms of productivity, low alternative usage, and unobtrusiveness, the area is a good choice for marine farming. The scale of the marine farming area is appropriate as well. One could foresee conflict if the area was to be appreciably enlarged, however, as relatively isolated, undeveloped bays are becoming a rare resource in the region.

## 6. Cloudy Bay

Cloudy Bay Lagoon is topographically different from all the other case study locations. The lagoon is enclosed by land with a narrow entrance to the sea and the influences of the sea on the lagoon are minor. The land surrounding the lagoon is mostly virgin bush with a road along the western side. The vegetation comes right down to the water's edge whereupon the bottom of the lagoon is mud and small rocks. Within the lagoon and the marine farming areas are several islands (Plate 4.10) which are used as nesting sites by

various species of sea birds (Newman, personal communication; Watts, personal communication).

Plate 4.10

Looking eastward across Cloudy bay Lagoon



The area was chosen because of the desire of oyster growers at Little Taylors Bay to use the lagoon, plus the presence of filter feeding molluscs in the lagoon. The lease that is presently operating has been moved three times within the scheduled area and is not highly productive.

The lagoon is not used for boating as it is mainly shallow with a few deep channels. The main values, as far as alternative uses are concerned, are aesthetic and the

conservation of the bird populations on the islands. The road that runs down the western side of the lagoon is used by tourists visiting the lighthouse on Cape Bruny. The same road serves the spectacularly scenic Labillardiere State Reserve. Any further development of Cloudy Bay Lagoon for marine farming should be in keeping with its scenic value. Marine farming is not necessarily incompatible with scenic values, but care is needed in the selection and maintenance of the sites. At present, the lease is not detrimental to the aesthetics of the area as it is hidden by the islands, but any buildings on the foreshore need to be carefully sited. The islands in the lagoon, which are the important bird rookeries, should be protected, and access to the islands for marine farming should not be allowed. Cloudy Bay is an important scenic and conservation area and there is potential for conflict with marine farming if the large area dedicated for marine farming is utilized to any great extent. However, the large area was dedicated for marine farming to allow for flexibility in selecting suitable lease locations due to the very low productivity of the area. It is anticipated that, if the density of the marine farms in Cloudy Lagoon remains very low, there will be no great conflict with the aesthetic and conservation values of the region.

#### 7. Fleurty's Point

The area at Fleurty's Point on the mainland side of the D'entrecasteaux Channel is moderately small, but has a



current lease of 6 hectares and another oyster lease pending. Outside the marine farming area, on the other side of Fleurtys Point, is a marine farming permit which is used for long line culturing of mussels. The surrounding land use is rural, mainly orchards and pasture. There is a fringe of trees on top of the foreshore cliff which is moderately steep and rocky (Plate 4.11). On the southern boundary is a public road, little used at present, ending at a foreshore reserve. The area was scheduled as a marine farming area because it has a history of oyster farming and has favourable biological conditions.

Plate 4.11

View northward to Fleurtys Point  
showing the steep foreshore



There is little recreational use of the foreshore by people coming by road, as several other bays nearby are more easily accessible, but the entire Channel is a popular boating area. Like Little Taylors Bay on Bruny Island, Fleurty's Point has scenic value for boaters wishing to anchor, but unlike Little Taylors Bay it is the rural aspect of the scenery that is attractive. It could be argued that marine farming would not detract from this value because it is consistent with a primary industry landscape. The conservation value of the area is not outstanding. The only potential problem would be if the foreshore reserve was to be upgraded, which is not proposed in the near future.

The nearby orchards might pose a problem due to pesticide and herbicide run-off contaminating the oyster meat. Sumner (1978) monitored Simmonds Bay in the D'Entrecasteaux Channel for some pesticides and did not find any that were near the tolerance standards for food. However, run-off channels from the orchards are not far from the oyster leases, and in this case there is a very real chance of the oysters and mussels being contaminated.

This marine farming area was well selected for the small impact on the public amenity of the location. There is, however, a question as to whether it is a suitable location where unpolluted seafood can be produced reliably.

## 8. Long Bay

Long Bay is near the southern entrance of D'Entrecasteaux Channel. The land abutting the northern end of the scheduled marine farming area has a narrow strip of trees between the farmed area behind, and the Channel. At the southern end of the marine farming area there are numerous houses and the small town of Gordon. The foreshore is mainly rocky with some patches of sand. Adjacent to the southern end of Long Bay is a large foreshore reserve which is well developed with an oval, toilets, cooking facilities and boat ramps. The area has a long history of oyster farming, as the present lease holder is one of the pioneers of oyster farming in the southern region. The Lands Department at the request of the T.F.D.A. designated the marine farming area in Long Bay because of the large pre-existing oyster farm dating from the period when the Department controlled marine farming leases. As might be imagined from the existing recreational facilities in the area, there is extensive use of the Bay for recreational purposes except where precluded by marine farming.

Recreational uses include boating, fishing, sports on the oval, or merely admiring the view over a picnic lunch. Access to the foreshore by boats through the marine farming lease is very difficult, and navigation along the western shore of the Channel would be hazardous as the structures used for oyster farming extend well into the Bay (see Plate 4.12). These structures are also regarded by many local



people as unsightly and are in full view from the foreshore reserve and the houses along the shore.

Plate 4.12

An eastward view of the large number  
of oyster racks in Long Bay



In this case, the oyster farm quite markedly detracts from the recreational and scenic value of the area. The area does not have great biological conservation value due to the existing high level of human activities, including marine farming. It is also highly likely that the septic disposal from the surrounding houses would increase the levels of organic pollution in the area. This is a hazard for the marine farm. However, it should be noted that the farm pre-dates the T.F.D.A. and so it was not responsible for choosing the site. Nevertheless, the Department of Sea Fisheries is responsible for the large scheduled area that



has not yet been used. The area designation implies to people interested in marine farming development that further expansion of the area is envisaged, and a further depletion of the scenic and recreational resources of the location.

It is very likely that sedimentation has taken place to a marked degree at the existing oyster lease. Records are not available on sediment depth over time, but an examination of the lease shows large sediment deposits which are not found in similar nearby bays. Associated with the marine farm are a number of buildings on the foreshore which limit the use of the foreshore.

Many complaints about the loss of access, navigation, and aesthetic values in the area have been received by the Kingborough Council (the pertinent local government authority), the Lands Department, and the now defunct T.F.D.A. (personal communications from Churchill, Johnson, and Sumner respectively). The conflict with other users and the possible sedimentation of parts of the Bay suggests that the initial choice of the area was not backed by research and that marine farming should be limited to the existing lease and not expanded.

#### 4.3 Concluding Comments and Summary

Marine farming is an expanding industry in Tasmania. In order to facilitate the growth of the industry, extensive areas were set aside for marine farming. It is wrong, however, to assume that the interests of marine farming do not often conflict with other interests, and as marine farming expands, the conflicts of interests have become more frequent. It is important that in the hurry to develop marine farming in Tasmania, the detrimental aspects of marine farming are not overlooked. The government report on shellfish farming in Tasmania emphasised this point (Tasmania, Parliament of Tasmania, Legislative Council Select Committee 1976) but the legislation and its administration failed to adequately protect the interests of the public. The report made mention that proper provisions and regulations would be necessary to reduce the impact of marine farming on an area, but no recommendations were forthcoming. In Chapter 3, it was argued that the designation of marine farming areas effectively indicated the process whereby areas of the sea cease to be a common, and it is at this point that the public's interest in the coastal zone should be taken into account.

In this chapter, a small region of southern Tasmania was chosen to test the sensitivity of the process of selecting areas for marine farming by the T.F.D.A. and the Lands Department in respect of the effects of marine

farming, principally on recreational usage, navigational needs, and aesthetic qualities. It was not possible to ascertain the effect of marine farming on the natural environment, other than by means of passing observations, because of the immense and expensive task of collecting scientific data that would be involved.

Three of the eight areas were judged as reasonable to good choices for marine farming areas (Ford Bay, Little Taylors Bay, and Fleurtys Point). Two areas, Cloudy Bay Lagoon and Great Bay, were only partly suitable, and the development of marine farms would need to be managed with great care. Three marine farming areas were found to be in conflict to a high degree with other uses. These were Simmonds Bay, Simpsons Bay, and Long Bay.

The reasons for the above conclusions are briefly: Ford Bay was found to be a good marine farming area, based on the criteria used in this chapter, and suitable for high density marine farming. Little Taylors Bay, similar to Ford Bay, was found to be a good choice, but care would be needed in order not to detract from the naturalness of this safe small boat anchorage. Fleurtys Point was another good choice as a marine farming area as far as public use is concerned, however there is real potential for pollution from the surrounding orchards. The value of choosing Cloudy Bay Lagoon as a marine farming area would depend on what sort of development was envisaged. It would be very easy to detract

from the aesthetic value of the area for the many tourists going there, as well as disturb the many nesting birds on the islands within the Lagoon. For aesthetic reasons, the southern part of the scheduled marine farming area in Great Bay is also not suitable for marine farming. Fortuitously, this region has a low productivity and will probably be little used if not also rescinded. Simmonds Bay was found to be poorly selected as it has a high recreational value. Since the study in 1984, this area has been recinded as a marine farming area due to pressure from the public who use the Bay for recreation. Simpsons Bay was thought to be a poor choice for reasons of aesthetics, recreation, and conservation of bird habitats. Long Bay was found to be a poor choice due to conflict with recreational uses and aesthetics.

In conclusion, there is ample evidence that the process of selecting marine farming areas is not sensitive enough to the demands placed on the coastal zone by other users. That there are conflicts is inevitable as unpolluted, sheltered inshore waters of the type sought by marine farmers are also those of high value for recreational use. Many potential sites will also be of high nature conservation value, especially those located within estuaries. At the present time there is little chance of resolving such conflicts as the areas designated for marine farming leases are determined at the interdepartmental level without public input. Even if the Department of Sea Fisheries was always

scrupulously conscientious about investigating objections to lease applications (despite the short time at its disposal), public rights have been jeopardised by the process of predetermining areas. The facility for objection can only be seen as belated, and the Department itself is in the invidious position of being initially a development authority for marine farming, and the judge over conflicting interests. Even the present limited case study has been able to establish that in many instances there is room for compromise in conflict situations in this industry. The evidence is that present arrangements do not allow the public's side of the argument to be considered adequately.

## Chapter 5

### CONCLUSION AND SUMMARY

#### 5.1 The Problem

Marine farming involves the establishment of structures in a common. Marine farmers need property rights, but the locus of their activities is in a part of the sea, which is commonly thought of as being public property. It was explained in Chapter 3 that the sea bed up to three nautical miles from the coast, the property in question, is controlled by the State Governments in Australia. The State Government is the proper authority to grant rights over a common. The Government, however, must consider the rights of all coastal users in the allocation of parts of the sea bed to individuals. This thesis has examined how successfully the State Government resolves the conflict of interests when public property is allocated for the exclusive use of marine farming.

#### 5.2 The Thesis Findings

It is only the very recent and present fisheries administrations which have developed marine farming to a large degree. Since the introduction of the Pacific Rock Oyster, there have been many innovations initiated by the Department of Sea Fisheries and its predecessor the T.F.D.A.

to improve marine farming. One such innovation was the shellfish hatchery. The level of oyster production in Tasmania is now reaching the level of wild oyster harvests in the late 19th century and will continue to expand in the foreseeable future. This rapid increase in production caused pressure to be placed on the system of granting leases and permits.

Prior to 1982, there was a large backlog of lease applications, with people waiting up to two years for a lease before starting a marine farm. The Lands Department was the controlling Government Department at that time, and there were long delays in allocating Crown Land. The Lands Department made enquiries of interested organisations and people, thus delaying the process (Tasmania, Legislative Council Select Committee 1976). The general consensus within the industry and the T.F.D.A. at the time was that the soliciting of submissions from all interested parties by the Lands Department was unduly time consuming, and that adjacent property owners had too much power to delay or veto marine farming proposals.

When the power to grant leases was given to the T.F.D.A., the opposite was true. It was in the T.F.D.A.'s interest to expand marine farming, and the processing of applications under the 1982 amendment is a lot faster. In fact, only 28 days can elapse from the public notification of the application to the notification of the

granting/refusal of the lease/permit under the new legislation. This situation has continued with the Department of Sea Fisheries.

The Minister for Sea Fisheries, hence the Department of Sea Fisheries, is responsible for adjudicating over the interests of all people whose use of the water will be adversely affected (Section 18, Fisheries Act 1959) with respect to aesthetics, recreation, navigation, and fishing. The Department of Sea Fisheries was not set up for this function, and such a role is in conflict with its charter to develop sea fisheries. The legislation does allow for an appeal to a magistrate by objectors to marine farms, but to rely on the judiciary for fair allocation of Crown Land is to neglect government duty as the custodian of that land. Also, it is doubtful whether the judiciary is empowered to make any decision about the fair usage of the sea as a common under the Fisheries Act 1959 (Tas.). This is particularly true in the case of marine farming permits. In any case, the decision by a magistrate comes too late: the investigation of the impact of marine farming should take place before an area is designated for the purpose.

The thesis case studies found that the marine farming areas within the region studied are commonly located where conflict with other users is evident. Three of the eight areas were judged as poor choices for marine farming on this basis, two were judged as suitable for limited marine



farming, and three were well chosen. An unstated policy, if it is found that applications for leases are continually being refused on the grounds of conflicts with other users, is that the area will be rescinded as a marine farming area and returned to the control of the Lands Department (Sumner, personal communication). The Simmonds Bay area has reverted to the Lands Department since the study in 1984. As the marine farming industry expands and the leasable area within noncontentious regions becomes restricted, however, the Department of Sea Fisheries will be under increasingly severe pressure to maintain control and grant leases within areas that are contentious. The case studies thus tend to confirm that the process of designating parts of the seabed as marine farming areas does not take into consideration the interests of all coastal users.

The case studies were limited by the lack of documented evidence on how marine farming has specifically affected the public use of marine farming areas. A detailed study on the loss of public amenity could not have been accommodated within the broad scope of this thesis. Nonetheless, a great deal of effort was made to collect the views and experiences of people using the Channel region for professional and amateur purposes. In the author's opinion, the soliciting of information for this thesis was likely to have been as much, if not more, than that undertaken by the T.F.D.A. in their original determination of the marine farming areas. The point is that the paucity of information severely restricts

the ability to make balanced decisions on the allocation of public land for private use, yet irreversible decisions are being made frequently by the Department of Sea Fisheries.

The analysis in the thesis of the effects on coastal users in general has been based on only a few of Tasmania's marine farming areas, but those studied are closest to the State's largest city and in a popular area for recreation and tourism. It would be expected that the most attention to evaluating impacts beforehand would have been given to such areas. If, as it has been argued, the Department of Sea Fisheries cannot be an unbiased adjudicator, then the Government must establish a suitable mechanism and assume a conscious role on the public's behalf when allocating marine farming areas in future.

### 5.3 Recommendations

#### 5.3.1 The Allocation Process

If the Department of Sea Fisheries is not the right organisation to make an impartial decision on the fair allocation of Crown Land, is there any mechanism possible under the present legislation for the equitable use of the coastal zone? The act of designating an area for marine farming and granting it to the Department of Sea Fisheries is the administrative changeover of Crown Land to marine farming land (seabed). It is at this stage that the Lands

Department should make a decision about the equitable use of the coastal zone, even if this means some delays in soliciting public opinions. The Lands Department cannot totally absolve itself of all responsibility for marine farming activities. Under the new legislation, it is still the custodian of Crown Land. The Department of Sea Fisheries can only grant leases within the marine farming areas and, in order to grant leases in other areas, it must request the control of the seabed from the Lands Department.

How the Lands Department will treat future requests for additional marine farming areas by the Department of Sea Fisheries is unknown. With the last, and only, vesting of Crown land in the T.F.D.A., there was very little soliciting of comments from outside the two organizations. Under the present legislation, the public input in the form of objections to the Department of Sea Fisheries with each individual farm application should not be confused with the lack of public perusal of the process that designates public land as suitable for private use in the first place.

A possible approach would be for the Lands Department to develop criteria for evaluating potential marine farming areas that takes into account all coastal values, and then use these to identify the preferred marine farming areas in Tasmania. This might not be a massive task as much relevant data has been assembled by Goldin (1980). The Lands Department could then actively seek public input about the

proposed marine farming areas before they are declared without the pressure for a quick decision.

### 5.3.2 Zoning to Reduce Impact

One issue that has not been addressed by the Government organizations involved is the density of development in the marine farming areas. In some cases, a single marine farm might complement the aesthetics of a region whereas a number of marine farms might dominate and destroy the existing aesthetic and recreational values. This situation appears to have been overlooked by the Government, as the Lands Department does not specify the number of marine farms allowed within an area, and the Department of Sea Fisheries cannot be seen to consider formally the cumulative impact of existing marine farms on the environment when considering further leases/permits in an area. This form of planned development by the administrators is plainly lacking. As the survey of the areas in the Channel region showed, of the eight marine farming areas, two were suitable for partial development only. Cloudy Bay, for instance, could be developed as a marine farming area but only in a low intensity manner, as very intensive culturing would seriously disturb the aesthetic qualities of a tourist resource and the wildlife of the area. Marine farming areas could be vested in the Department of Sea Fisheries conditional on acceptance of a management plan by the Lands Department which specified an acceptable density of marine

farms and other possible uses of the area. Clearly, there is a need for work to be done which to date has not been recognised.

#### 5.4 Conclusion: Responsibility for the Public's Claim to the Sea

The present system only functions at all because there is ample room for the expansion of marine farms in the allocated areas. If the rapid expansion of the industry continues, as is most likely, space for marine farming will become limited. In this case, the Department of Sea Fisheries should not act as the adjudicator in disputes between potential marine farmers and other coastal users as it will have difficulty in resolving its conflicting role of developing marine farming in Tasmania. One option is that the Lands Department must play a greater part in the actual allocation of marine farming areas, paying close attention to alternative coastal users and allow for public debate before the areas are vested in the Department of Sea Fisheries. The Lands Department fulfills this role with terrestrial Crown Land, and is well positioned under the prevailing legislation to do the same for the marine environment. Whatever mechanism is chosen, the Tasmanian Government will have to accept its responsibilities for the public interest. Public outrage at new applications for marine farming ventures is occurring increasingly frequently in Tasmania.

The thesis has defined the problem and provided information that is a prerequisite to deciding upon a clear path for the future allocation of coastal resources to marine farming: this has involved historical analysis, an examination of the legal origins of public rights to the sea, and a case study of some of the consequences for the public of decisions made in isolation by an authority with a particular developmental interest.

### Postscript

This thesis was completed over a period of three and a half years. The bulk of the thesis was documented in the earlier part of this period with only the integration of the information taking place in the later part. This situation allows for some reflection and hindsight that is relevant to this controversial topic, but would not have been practical to incorporate in the thesis.

The issue of marine farming since the writing of the thesis has attracted much publicity and public debate. As a result of anti-marine farming feeling, the Government has declared a moratorium on the allocation of marine farming leases and permits for one year with the option of a second year at the discretion of the Minister. In essence, the Fisheries Amendment (Marine Farming) Act 1982 (Tas.) has failed to resolve conflict over the use of marine areas.

If the thesis was to be undertaken in late 1987, it would now be possible to more accurately define the objections to marine farming and evaluate public opinion. The greater incidence of first hand experience with marine farming, due to the greater number of areas being farmed, would mean that surveys of fishing and boating groups and other users of the marine environment would be more

informative. Actual loss of amenity could be evaluated. In addition, the functioning of the judiciary as the adjudicator of conflicting interests could be documented, and the basis of any decisions made by the appeal magistrate would be very informative. This and other information was not available for the present thesis, but would be very valuable for any future work investigating the administrative framework for marine farming.



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## Appendix 1

### The Biology of Mussel and Oyster Farming

A summary of the culturing techniques and the relevant biology of mussels and oysters is given here. The description is not comprehensive but is aimed at familiarizing the reader who might lack background knowledge. Mussels and oysters have several common characteristics so a general description will be given first, followed by two sections describing the more specialized aspects of culturing each animal.

Both organisms are bivalves: their exoskeleton is made up of two valves or shells hinged on one edge. A large muscle in a central position keeps the valves closed and an elastic ligament at the hinged edge opens the shell when the central muscle is relaxed. Oysters and mussels are often called fouling organisms; in their adult form they rapidly colonize any available substrate. The oysters attach themselves to the substrate by a cement type excretion, while mussels have threads (called the byssus) passing between the valves near the hinge region. Oysters, however, are more restricted to the intertidal zone in nature than mussels, which are found in both deep water and intertidal zones. To live in the intertidal zone the animals need to be

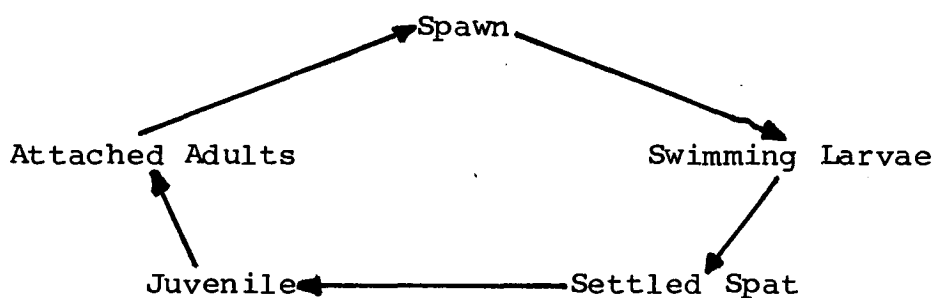


## Appendix 1.2

able to resist dessication. The organisms form tight, but not completely watertight, seals with the two edges of their valves and can resist dehydration for several days. Since they are filterfeeders and feed on suspended marine animals and plants, the animals do not feed when out of the water. Hence, the amount of time that they are submerged in water has a direct bearing on their growth rate. The life cycle of the organisms has been generalized in Figure A.1. Water temperature and salinity play a critical role in the life cycle of both types of animals, particularly in the spawning, fertilization and larval development stages.

Figure A.1

Generalized life cycle of both mussels and oysters showing the principal stages of their development



Source: Dix (1980)

## Appendix 1.3

### A.1 Oysters

The oyster commercially harvested in Tasmania is called the Pacific Rock Oyster, Crassostrea gigas (Plate 1) and was introduced into Tasmania. The environmental conditions in Tasmania are not generally suitable for the reproduction of Pacific Rock Oysters. For this reason, the recruitment of young oysters in Tasmania used to almost entirely rely on the spat falls in the Tamar Estuary, one of the few areas suitable for the reproduction of the oysters. The Pacific Rock Oyster needs water temperatures above 20 C for spawning, fertilization and larval development (Gallahar unpublished). It has been found that, due to stratification and the long flushing time of the Tamar River, the water will often reach the required temperature for breeding (Sumner 1974). The quantities of spat in the Tamar Estuary varies from year to year due to the variable water temperature and, as a consequence, the industry suffered from the lack of consistent supplies of young oysters.

To solve this problem, a commercial hatchery was started and, in 1984, could provide 10-15mm long spat from October to March at a cost of 3 cents each (Stuart 1983). The T.F.D.A. initially developed a pilot scale hatchery in 1978-79 that established the feasibility of a hatchery in Tasmania. Subsequently, Shellfish Culture Pty Ltd built a hatchery in 1980.

#### Appendix 1.4

##### Plate A.1

##### Pacific Rock Oyster (Crassostrea gigas)



The hatchery has an improved breeding program and selected oysters are induced to breed by manipulation of the water temperature. The spawn and eggs are combined to allow fertilization and are then placed in rearing tanks where they develop into free swimming larvae. The food is in the form of algae cultured in aseptic conditions. The species of algae used as food are changed as the oyster grows. The oyster larvae metamorphose at about two weeks of age, at which time they lose their swimming appendages. The larvae are then allowed to settle on finely ground shellgrit, as opposed to sticks or whole shells in the "wild". The spat, as the larvae are now called, outgrow the shell grit and

## Appendix 1.5

remain as single shells or "cultchless" oysters. The oysters are easily transported in this form and are more acceptable for the higher paying half shell market. Most of the production takes place in late winter/early spring as it has been found that the best time to introduce the young oyster into the farm is spring/summer.\*

There are three basic methods of oyster cultivation practised in Tasmania, the tray, stick and suspended culture methods. The tray method involves placing large juvenile oysters in a wire mesh tray within the intertidal zone. This method was developed in New South Wales (Gallahar, 1982) and was subsequently introduced into Tasmania. The stick method involves a framework of battens called a stick. A number of sticks are bundled together and placed into the water at the time of a predicted spatfall. The sticks are then separated and wired to intertidal racks in the growing area. When the oysters have reached market size, the oysters are shaken off and sorted. Undersize oysters are recultured using the tray method. The suspended method uses rafts or long lines, similar to the technique used in mussel farms. The spat are collected on scallop shells or any other suitable substrate, such as mesh, and suspended from rafts or longlines. By 1975, approximately half of the oyster leases in Tasmania were using this method. The advantage of using the suspended

\* The above summary of the function of a hatchery was derived from an article in Australian Fisheries (Anonymous 1982).

## Appendix 1.6

method is that the oysters grow much faster than when they spend a fair proportion of their time out of the water and are not feeding, as with the other two methods. The disadvantage is that suspended oysters do not live as long as intertidal oysters out of water, 3 days as compared to 7 days, and must be processed much faster when harvested (Anonymous 1980). For instance, the intertidal oysters in New South Wales can be transported live to most other States, but suspended oysters usually have to be processed, then frozen, before they are sold.

### A.3 Mussels

The mussel cultured in Tasmania, Mytilus edulis planulatus, is native to Australia, and the spawning takes place when the water temperature averages between 12.5 C and 19.0 C (Maclean 1972). In Tasmania, the main spawning period is from September to December (Ball 1980) and the fertilization and development of the larvae takes place in the ocean. The settlement of mussels has two phases, but the young mussels, or spat, generally adopt their final settling site when 1-2mm long (Dix 1980). Farmers recruit their animals from a common spawning using both wild and cultured populations as the source of the spat. This spawning occurs naturally and consistently in Tasmanian waters, in contrast with that of the introduced oysters. The mussel farmer provides a suitable settling site for the young mussels in the form of collecting ropes, which are then transferred

## Appendix 1.7

the main culturing area. The mussels take between 12 to 18 months to reach a marketable size.

In Australia, two techniques are used to suspend the mussels in the water (the "bouchot" method using stakes in the intertidal zone has not been used). The two methods are: (1) a raft with up to 500 suspended ropes, moored by a single anchor in a sheltered place; and, (2) a long rope (usually 110 metres, hence the name "longline") moored at both ends and buoyed at intervals along the rope. The ropes with the settled mussels are suspended from this buoyed line and can be up to 10 metres long (Figure A.2). The longline method is usually preferred in Tasmania as it is cheaper than the raft to set up for commercial operations. By using a method of mussel culturing that suspends the animals, the ravages of predators such as crabs and starfish are reduced. Predation by fish, however, still occurs.

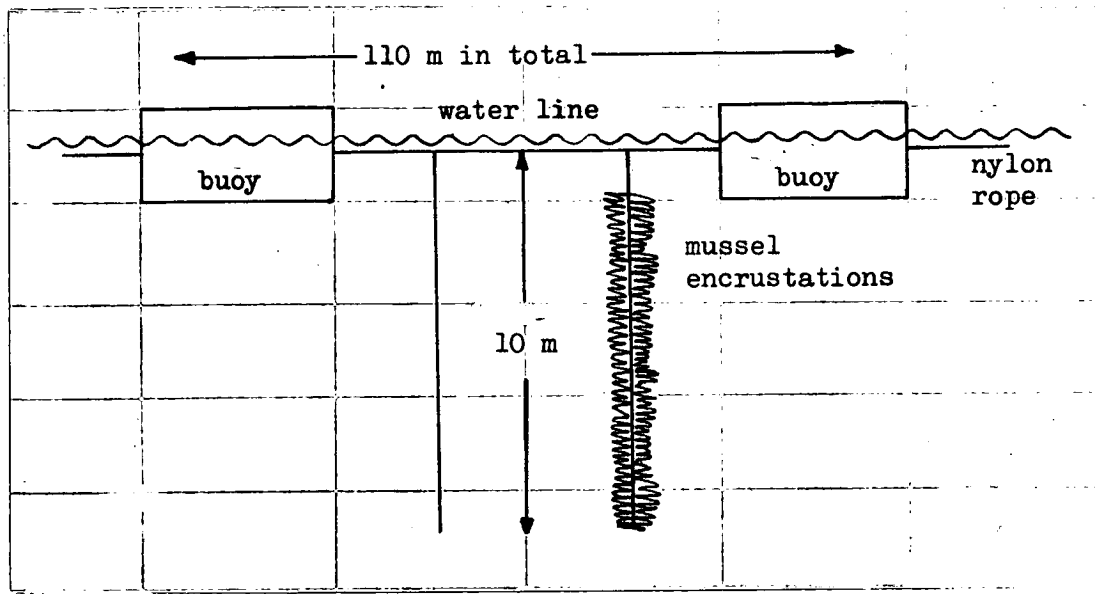
### A.4 Water Quality Requirements for Cultivating Bivalves

Both mussel and oyster culturing require a water quality conducive to the growth and health of the animals. The most significant factors are the levels of dissolved oxygen, salinity, temperature, food availability, depth, exposure and pollution. In general, semienclosed inshore waters are suitable, unless high levels of pollution are to be found in an area (Jenkins 1979).

## Appendix 1.8

Figure A.2

A generalized diagram of a longline mussel culture method



In practice, the best method to determine whether an area is suitable for marine farming is to sample the area for existing oyster and mussel populations (Sumner, personal communication). In this way, it can be determined whether the animals will grow in the area, but the question of farm productivity can only be determined from an existing farm as the interactions amongst growth-related environmental parameters is too variable to make any prediction.

Technology and environmental parameters play an important part in the yield of a culture. For these reasons, the location of marine farms has been somewhat arbitrary with heavy reliance on social factors and accessibility for the marine farmer.

## Appendix 1.9

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Appendix 1.10

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## Appendix 2

### Summary of Data Base for the Case Study of Bruny Island and D'Entrecasteaux Channel Marine Farming Areas

The following information was collected from reference sources and field observations. Goldin (1980) is Tasmania's only major coastal study. The publication classified all coastal areas in Tasmania by their usage, and, in certain cases, recommendations for the management of the area were made. This thesis used Goldin's classification so that the usage of the marine farming areas could be graded on a State wide basis. The description for each classification is as follows:

Primary Industry A; low intensity grazing pasture.

Nature Conservation low use; conserving nature by dint of low use, no formal protection.

Recreation A; low intensity recreation.

Recreation B; facilities provided but recreational use is not intensive.

Recom. Scenic; management plan before any major development.

#### Locality 1: Simmonds Bay

Area available for marine farming (ha): 14

## APPENDIX 2.2

Area leased for marine farming (ha): 0  
Terrestrial land use: forest, pasture  
Description of seabed: mud with rocky outcrops  
Description of foreshore: reeds backed by casuarina,  
eucalypts  
Access to marine farming area: gravel road  
Aesthetic impact of marine farm: rural  
Relief (view) of marine farm: unobtrusive  
Wildlife: feeding plovers, gulls and herons  
Amenities: boat launching and B-B-Q  
Recreational use: boating  
Pollution potential: none  
Depth of water: <2M ISLW  
Goldin (1980): Primary Industry A

### Locality 2: Great Bay

Area available for marine farming (ha): 156  
Area leased for marine farming (ha): 45  
Terrestrial land use: pasture  
Description of seabed: sand  
Description of foreshore: rocky backed by low shrubs  
Access to marine farming area: good road with tracks to  
Smoothey's Point and Adam's Bay  
Aesthetic impact of marine farm: rural  
Relief (view) of marine farm: unobtrusive  
Wildlife: feeding gulls and plovers  
Amenities: boat launching  
Recreational use: B-B-Q at Smoothey's Point, general fishing,

## APPENDIX 2.3

boating

Pollution potential: none

Depth of water: < 2M ISLW

Goldin (1980): Primary Industry A, Recom. Scenic

### Locality 3: Ford Bay

Area available for marine farming (ha): 32

Area leased for marine farming (ha): 8.6

Terrestrial land use: pasture

Description of seabed: sand/mud

Description of foreshore: sand, reeds with the occasional  
low shrub

Access to marine farming area: minor track

Aesthetic impact of marine farm: visible briefly from the  
road

Relief (view) of marine farm: fairly obtrusive from a small  
section of the road

Wildlife: ducks, gulls and terns

Amenities: none

Recreational use: minor boating access

Pollution potential: none

Depth of water: <1.2 ISLW

Goldin (1980): Primary Industry A, Recom. Scenic

### Locality 4: Simpsons Bay

Area available for marine farming (ha): 236

Area leased for marine farming (ha): 2

Terrestrial land use: forest, pasture, some houses

## APPENDIX 2.4

Description of seabed: sand

Description of foreshore: sand, reed, backing onto eucalytus shrub

Access to marine farming area: good roads on two sides

Aesthetic impact of marine farm: potential for large impact

Relief (view) of marine farm: obvious

Wildlife: penguins, gulls, Oyster Catchers, swans, terns

Amenities: jetty on north-west side

Recreational use: bird watching, fossicking and swimming, boating

Pollution potential: sewage from small settlement (minor)

Depth of water: 0.5M above ISLW

Goldin (1980): Recreation A, Recom. Scenic

### Locality 5: Little Taylors Bay

Area available for marine farming (ha): 28

Area leased for marine farming (ha): 10

Terrestrial land use: forest

Description of seabed: mud with rock outcrops

Description of foreshore: steep rocky, eucalypt forest

Access to marine farming area: very limited by boat only

Aesthetic impact of marine farm: well hidden

Relief (view) of marine farm: unobtrusive

Wildlife: gulls

Amenities: none

Recreational use: boating

Pollution potential: none

Depth of water: 1 - 2M ISLW

## APPENDIX 2.5

Goldin (1980): Nature Conservation, low use, Recom. Scenic

### Locality 6: Cloudy Bay Lagoon

Area available for marine farming (ha): 234

Area leased for marine farming (ha): 21

Terrestrial land use: virgin bush

Description of seabed: mud with small rocks, reed covered islands

Description of foreshore: eucalypt forest with healthy understory

Access to marine farming area: small road along western side of Lagoon

Aesthetic impact of marine farm: not visible

Relief (view) of marine farm: unobtrusive

Wildlife: nesting location for a variety of sea birds on islands

Amenities: none

Recreational use: bird watching, scenic

Pollution potential: none

Depth of water: variable

Goldin (1980): Nature Conservation, low use, Recom. Scenic

### Locality 7: Fleurty's Point

Area available for marine farming (ha): 23.2

Area leased for marine farming (ha): 6

Terrestrial land use: rural, orchard

Description of seabed: sand, small rocks

Description of foreshore: forested, steep banks (10M) to low

## APPENDIX 2.6

bank (1m)

Access to marine farming area: public road to Flowerpot Rock on southern boundary

Aesthetic impact of marine farm: minor as consistent with rural view

Relief (view) of marine farm: not very visible

Wildlife: terns, gulls

Amenities: foreshore reserve

Recreational use: boating, very little use of reserve

Pollution potential: chemicals from orchard runoff

Depth of water: 0.3m to 1.0m above ISLW

Goldin (1980): Primary Industry A, Recom. Scenic

### Locality 8: Long Bay

Area available for marine farming (ha): 140

Area leased for marine farming (ha): 64

Terrestrial land use: northern end forested, southern end rural and small hamlet of Gordon

Description of seabed: sand/mud

Description of foreshore: northern - coastal shrub, southern - reeds and public reserve

Access to marine farming area: via public reserve and Channel Highway

Aesthetic impact of marine farm: major

Relief (view) of marine farm: obvious from reserve, road and houses

Wildlife: cormorants, gulls

Amenities: playing field on reserve as well as a jetty and

## APPENDIX 2.7

boat ramp

Recreational use: boating, fishing

Pollution potential: sullage from Gordon

Depth of water: < 2m ISLW

Goldin (1980): Recreation B, Primary Industry A