INDUSTRY COMMISSION

Research Project

Australian Atlantic Salmon: Effects of Import Competition

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Forming the Productivity Commission

The Industry Commission, the former Bureau of Industry Economics and the Economic Planning Advisory Commission have amalgamated on an administrative basis to prepare for the formation of the Productivity

Commission. Legislation formally establishing the new Commission is before Parliament.

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ABBREVIATIONS

ABARE	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
ACI	Australian Consolidated Industries
ACRC	Aquaculture Cooperative Research Centre
ADA	Anti-Dumping Authority
AQIS	Australian Quarantine and Inspection Service
ASIC	Australian Standard Industry Classification
BRS	Bureau of Resource Sciences
CIF	Cost including insurance and freight
CSIRO	Commonwealth Scientific and Industrial Research Organisation
COAG	Council of Australian Governments
DFAT	Department of Foreign Affairs and Trade
DFO	Department of Fisheries and Oceans (Canada)
DPIE	Department of Primary Industries and Energy (Commonwealth)
DPIF	Department of Primary Industries and Fisheries (Tasmania)
EU	European Union
FAO	Food and Agriculture Organisation
FDA	Food and Drug Administration (United States)
FOB	Free on board
FRDC	Fisheries Research and Development Corporation
FWS	Fish and Wildlife Service (United States)
GATT	General Agreement on Tariffs and Trade
HOGG	Head-on, gilled and gutted

IAC	Industries Assistance Commission
IC	Industry Commission
IRA	Import Risk Analysis
JETRO	Japanese Export Trade Organisation
JTA	Japan Tariff Association
MIP	Minimum import prices
NFFA	Norwegian Fish Farmers' Association
OECD	Organisation for Economic Cooperation and Development
R&D	Research and development
SMIS	Salmon Market Information Service
TDA	Tasmanian Development Authority
TDR	Tasmania Development and Resources
TSGA	Tasmanian Salmonid Growers Association
WTO	World Trade Organization

GLOSSARY

Economies of scale	The long run reduction in average costs that occurs as the scale of the firm's output is increased
Economies of scope	The reduction in costs resulting from combining two or more product lines in one enterprise
Evisceration	The removal of the soft organs in the body, especially those organs in the abdomen
Export parity price	The price at which a commodity sells for in an overseas market, less the per unit costs of delivering it to that market
Feed conversion ratio	The ratio of kilogram dry weight of feed required to produce 1 kilogram of fish
Heat treatment	Process whereby the product is treated to a variety of temperature–time combinations, some of which can deactivate pathogens without necessarily cooking the product
Import parity price	The price of an imported product as it enters Australia, including or excluding customs tariffs, as specified
Salmonid	A species of the family *Salmonidae*, including trout and salmon
Smoked salmon (hot and cold)	Salmon that is smoked to produce a smoked flavour. Hot smoking involves smoking the salmon at a higher temperature and/or for a longer duration than used for cold smoking. Hot smoked salmon is effectively cooked. Cold smoked salmon is not cooked but may be heat treated sufficiently to deactivate pathogens
Smolt	A young salmon that has undergone smoltification

Smoltification	A physiological process undergone by young salmon in fresh water that allows them to survive in saltwater
Vertical integration	The practice of firms entering into upstream and/or downstream production activities in an industry

TERMS OF REFERENCE

The Industry Commission is requested to undertake a study of the potential effects of fresh and frozen North American 'wild caught' Pacific salmon imports on the performance of the Australian farmed Atlantic salmon industry and the Australian economy.

In undertaking this study, the Commission's analysis should have regard to the overall economic performance of the Australian economy. It should specifically examine:

- the potential effects of imports on Australian fresh and frozen salmon prices, as well as on investment, incomes and profits in the short and long term;
- the potential effects of imports on Tasmanian farmed Atlantic salmon regions, in particular employment, regional economic growth and other social impacts;
- whether there are any impediments to adjustment of the farmed Atlantic salmon industry, including the ability of the industry to diversify aquaculture operations;
- export market opportunities and impediments faced by the Australian farmed Atlantic salmon industry; and
- the scope of the Commonwealth, States and industry to improve the efficiency and international competitiveness of the Australian industry.

The Commission should also take account of:

- the influence that current quarantine policy and World Trade Organisation requirements would have on the level and impact of imports;
- Commonwealth and State Government policies towards the industry; and
- the views of stakeholders, including industry, input providers, processors, retailers and consumers.

The Commission is required to report within three months of receiving these Terms of Reference. The report is to be published.

Received 12 September 1996

KEY FINDINGS

- Production and exports of the Australian Atlantic salmon industry have expanded rapidly since the industry commenced in the mid-1980s. Costs have fallen significantly as the industry has developed.
- Fresh Australian Atlantic salmon currently receives a price premium over other fresh salmon imports to Japan, mainly as a result of its high quality and largely chemical and disease free status.
- On average, fresh Atlantic salmon on the domestic market currently receives a small premium above prices received from exports to Japan. This premium has been declining.
- The Tasmanian Salmonid Growers Association stated that, disease apart, the effect of imports would be minimal, and that the industry would not seek assistance under an industry restructuring program.
- Imports of fresh and frozen North American wild caught Pacific salmon would expand the range of products available to Australian consumers, but the benefit is likely to be small. Provided no new salmon diseases enter Australia, no major effect on Australian Atlantic salmon producers is likely. (The Commission was advised to assume an absence of imported disease.)
- Any imports would be likely to be mainly high value frozen Pacific salmon. Imports would compete more strongly with medium priced fin fish and meat products than with fresh Atlantic salmon. Scope exists for cost reductions in the future which should permit adjustment to any likely competitive pressure from imports.
- The Tasmanian Government owns 51 per cent of the dominant supplier of smolts (young salmon). The rationale for continued government ownership is unclear. If the Government retains its ownership, it should be mindful of the competitive neutrality obligations of the Competition Principles Agreement.
- Competition and adjustment in the industry would be facilitated if the Tasmanian Government adopts a more open and transparent and less hands-on approach to industry regulation, and ensures that no unnecessary barriers to entry and expansion remain. Recent changes in regulations have removed some key potential barriers to entry, although much will depend on how the regulations are administered.
- Potential export market impediments include the availability and cost of air freight, the adequacy of cool storage facilities, and tariffs (particularly on smoked salmon) and quarantine restrictions in some foreign countries (including in New Zealand).

OVERVIEW

Imports of fresh and frozen salmon have been effectively banned in Australia under the Quarantine Act since 1975.

In January 1994 Canada, later joined by the United States, requested GATT (now World Trade Organization) consultations with Australia on the quarantine restrictions applying to Australia's salmon imports. As part of this process, the scientific basis for the quarantine restriction is under review by the Australian Quarantine and Inspection Service.

The Commonwealth Government asked the Industry Commission to undertake a separate study into the potential economic effects on Australia of allowing imports of fresh and frozen North American wild caught Pacific salmon.

In seeking clarification of the terms of reference, the Commission was advised to assume an absence of disease and this advice has been accepted.

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Production of Atlantic salmon in Australia began later than in most major salmon farming countries but has grown quickly. Annual production has increased from 20 tonnes in 1986–87 to around 7000 tonnes a decade later. By 1995–96, Atlantic salmon was the highest valued commercial fishery in Tasmania, with annual output valued at around $63 million. Exports comprise about 40 per cent of production. The Australian Atlantic salmon industry is still small on a world scale, accounting for around 1 per cent of world farmed salmon production. The industry is based largely in Tasmania, although small quantities are produced in Victoria and South Australia.

Australian Atlantic salmon have few of the serious diseases that occur in salmonids elsewhere and Australian Atlantic salmon farmers use few chemicals in salmon production. The industry's production and marketing strategies are built around these features.

While the Tasmanian industry was established using techniques and equipment developed in other countries, producers needed to modify management practices and equipment to suit Tasmanian conditions. Tasmania's relatively warm waters require low stocking rates, frequent net cleaning and cage rotation. Initial high rates of fish mortality (a result of gill amoeba) were addressed by freshwater bathing and other husbandry methods. Development of these practices and of new equipment has enabled the industry to reduce its production costs significantly while improving quality.

Currently, there are seven Tasmanian Atlantic salmon farming companies. In 1995–96, the largest company (Tassal) accounted for about 43 per cent of total farmed salmon production and around 57 per cent of salmon processing.

According to the Tasmanian Salmonid Growers Association, the industry directly employs around 570 full-time equivalent people in Tasmania, and perhaps 1500 indirectly. Unemployment is at least 14 per cent around Tasmania's main Atlantic salmon farming areas.

Around 60 per cent of Australia's Atlantic salmon production was sold on the domestic market in 1995–96 (mostly in fresh form), up from about one-third in the early 1990s. With substantially increased sales, particularly on the domestic market, average farmgate prices appear to have fallen markedly in recent years.

Australia's largest single export market is Japan where Australia supplies about 9 per cent of the market for fresh Atlantic salmon. Australian Atlantic salmon have consistently achieved higher prices on Japanese markets than have salmon imported from other countries — a premium averaging 16 per cent over the year to February 1996. This export price premium appears to be largely attributable to the high quality and chemical and disease free status of Australian Atlantic salmon.

From its inception, the industry made a deliberate decision to concentrate on the production and marketing of high quality products. Coupled with effective sales into niche markets, this has enabled the industry to market its product overseas successfully against competition from much larger salmon producing countries.

The Tasmanian Government has taken an active role in the development of the industry. It has done so via regulations and policies pertaining to smolts (young salmon), farming leases, licences and assistance to producers, ranging from direct equity participation in commercial ventures to financial support for research and development.

In 1985, the Tasmanian Government and industry jointly established a company (Saltas) to produce Atlantic salmon smolts. The Tasmanian Government continues to own 51 per cent of Saltas shares. From 1985 to 1995 legislation ensured that the supply of smolts was dominated by Saltas. Objectives were to manage the development of the industry and to develop quality stock. The right to purchase smolts from Saltas was restricted to shareholders in Saltas. Some smaller producers were able to circumvent the legislative restrictions on smolt production and grow some of their own, but Saltas was and is by far the largest supplier. Imports of smolts from outside Tasmania were, and still are, prohibited on quarantine grounds. The rationale for continued Government ownership of shares in Saltas is unclear.

The establishment of a salmon farm requires a lease for a suitable site (which permits marine farming on that site) and a production licence (which sets out conditions under which salmon farming can occur). Moratoria were placed on the granting of new licences and marine farm leases in Tasmania in 1988 and 1993 respectively, pending formulation of marine farming development plans. These moratoria probably have not prevented industry expansion, but they could have restricted new entry. Moratoria on new leases and licences were recently lifted for some locations and applications are being considered. The area potentially available to salmon farming has increased, but there are some practical obstacles for new entrants.

The expiry in 1995 of the legislative provisions intended to provide Saltas with a monopoly on smolt production, and the possibility of new leases and licences, will enhance the potential for new entry into Atlantic salmon farming in Tasmania.

However, some elements of the new regulations and the manner in which they are administered could protect existing producers from competition and obstruct efficient adjustment in the presence of imports. In particular, competition and adjustment could be restricted by the manner in which site leases and farming licences are to be granted. Potential farmers must be invited to apply by the Minister for Primary Industries and Fisheries. In this matter, the Minister is advised by a Board of Advice and Reference comprising a qualified legal practitioner, a person with knowledge and experience in marine farming, and a person with experience in business and commerce. There is no requirement for invitations to be open to all people, and the basis for such invitations is not public knowledge.

The substantial Ministerial discretion is no doubt intended to promote the development of the industry. But the process is not transparent and like all non-transparent administrative processes may be open to accusations of bias. There is a strong case for allocating leases by open tender and for using selection criteria that are clear and publicly known in advance.

To facilitate competition and efficient adjustment, the Tasmanian Government should make the administration of any future smolt regulation and the allocation of leases transparent and open to public scrutiny, and ensure that there are no remaining unnecessary barriers to entry. It could then assess whether and how to dispose of its shareholding in Saltas, being mindful of the implications for competition in the industry of ensuring that all existing and potential Atlantic salmon farmers have competitive access to smolts.

There is some evidence that barriers to entry to the Tasmanian Atlantic salmon industry have enabled domestic producers to sustain higher prices for fresh Atlantic salmon on the domestic market than on the export market, on average. However, there is evidence that the domestic price premium for fresh Atlantic

salmon has been declining and is now relatively small. Given recent legislative changes, it is likely that this premium will continue to decline, providing the Tasmanian Government administers the regulations so as not to deter competition in Atlantic salmon farming. If plans to expand production in South Australia come to fruition, additional competitive pressure will be provided.

If quarantine restrictions on imports of fresh and frozen wild caught Pacific salmon from North America are eased, fresh high value Pacific salmon are unlikely to be imported given the high transport costs to Australia and high prices available in Japan. Imports are more likely to be mainly high value frozen Pacific salmon.

The effect of allowing imports on Australia's price premium in Japan is uncertain (assuming no disease). If the reputation of Australian Atlantic salmon is unaffected by allowing fresh and frozen salmon imports from North America, then Australian producers are likely to continue to receive a price premium in Japan.

The Tasmanian Salmonid Growers Association considers that the effect of importing raw salmon would be minimal (in the absence of disease), and has stated that the industry would not seek any assistance under an industry restructuring program.

The Commission considers that the domestic demand for Australian Atlantic salmon is unlikely to be affected significantly by imports of fresh and frozen wild caught Pacific salmon from Canada and the United States. Imports of Pacific salmon are likely to be frozen, rather than fresh. Allowing for this quality difference, the landed cost of frozen Pacific salmon is unlikely to make it highly competitive with domestic salmon. Imports would compete more strongly with lower value fin fish and meat products than with fresh Atlantic salmon. Consequently, allowing imports is unlikely to have any major effect on profits, investment and employment in the Australian Atlantic salmon industry.

The Commission's view is that Australian consumers may benefit from having a wider choice of salmon products, including lower price/quality combinations of frozen and smoked salmon, but the benefits to domestic consumers and smokers are likely to be small.

The industry has some capacity to adjust to import competition. Australian Atlantic salmon producers are able to compete successfully on world markets and domestically against imports of heat treated smoked salmon. Current production costs appear to be high relative to those of some other world producers, but costs have been falling and the industry has indicated that it expects costs to fall further.

The industry's capacity to adjust to imports could be enhanced if the Tasmanian Government adopts an outcome oriented approach to industry environmental regulation, where appropriate, and ensures that there are no unnecessary regulatory or commercial barriers to competitive entry and further expansion in the Atlantic salmon industry.

The Commission has identified several export market impediments: the availability of air freight, the adequacy of cool storage facilities, and tariffs (particularly on smoked salmon) and quarantine restrictions in some foreign countries (including in New Zealand).

The industry is concerned that salmon production in some countries is subsidised and that dumping of lower quality Pacific salmon is occurring. If this should occur in Australia, countervailing duties and anti-dumping measures could be sought.

1 INTRODUCTION

Australian production of farmed Atlantic salmon began in Tasmania in 1985, with the first commercial sales in 1986–87. Almost all current commercial operations are located in Tasmania, which has suitable weather and geography for Atlantic salmon farming.

Since its inception, the industry has grown rapidly. Tasmanian production increased to around 7000 tonnes in 1995–96 from 20 tonnes in 1986–87. Currently around 60 per cent is sold domestically, with the remainder exported, mainly to Japan. By 1995–96, the Tasmanian Atlantic salmon industry had grown to become the second highest valued aquaculture industry in Australia and the highest valued commercial fishery in Tasmania.

Imports of live, fresh and frozen salmonids (which include most trout and salmon) have been effectively banned in Australia since 1975. Salmonids were originally introduced to Australia without most of the serious diseases that occur in salmonids elsewhere. The quarantine ban was introduced primarily to protect Australia's recreational trout fisheries from disease.

The relatively disease free status is a distinguishing characteristic of the Australian Atlantic salmon industry. From the beginning, the industry has focused on producing and marketing a quality product. An important part of this strategy is avoiding the use of chemicals and medications. The product is promoted as clean, pure and high quality.

In January 1994, Canada requested GATT (now World Trade Organization) consultations with Australia on the quarantine restrictions on Australian imports of salmonids. The United States later joined these consultations.

In response, the Australian Quarantine and Inspection Service (AQIS) has undertaken an import risk analysis on relaxing the quarantine protocols for imports of uncooked, wild, adult, ocean-caught Pacific salmon products from the United States and Canada (including fresh, frozen and some cold smoked salmon products). AQIS released its revised draft, *Salmon Import Risk Analysis*, in May 1996 and sought public comment. The final report has not yet been released.

Concurrent with the finalisation of the risk analysis, the Commonwealth Government asked the Industry Commission to assess the potential economic and social impacts on the Australian farmed Atlantic salmon industry of salmon imports that could result from any relaxation of the quarantine protocols.

This study relates only to potential imports of fresh and frozen wild caught Pacific salmon from the United States and Canada. Farmed salmon and wild caught salmon from other countries are not covered: a separate risk analysis process would have to be undertaken for Australia to import these products.

This study is completely separate from the AQIS risk analysis. Under the Agreement on the Application of Sanitary and Phyto-Sanitary Measures under the World Trade Organization, quarantine decisions are to be scientifically based, not trade based.

In response to its terms of reference, the findings in this report inform the Commonwealth Government about:

- the competitiveness of the Tasmanian farmed Atlantic salmon industry in both the domestic and export markets;
- the potential effects of salmon imports on the Australian farmed Atlantic salmon industry and on the overall performance of the Australian economy (potential effects include changes in prices, investment, incomes and profits);
- the potential effects of imports on Tasmanian farmed Atlantic salmon regions, particularly on employment, regional economic growth and other social impacts;
- whether there are any impediments to the adjustment of the farmed Atlantic salmon industry, including the industry's ability to diversify aquaculture operations;
- export market opportunities and impediments faced by the Australian farmed Atlantic salmon industry; and
- the scope of the Commonwealth, states and industry to facilitate the efficiency and international competitiveness of the Australian Atlantic salmon industry.

On seeking clarification of the terms of reference, the Commission was advised to assume an absence of disease and this advice has been accepted. Consideration of the economic impact of disease is part of the AQIS risk analysis process.

The Commission advertised that it was about to embark on the study, advised interested parties (including producers, processors, wholesalers, potential importers and government and industry organisations) of the terms of reference for the study, and invited contributions. The Commission received 30 submissions, visited farms and processing facilities, and conducted numerous consultations with interested parties. Lists of submissions and parties consulted are in Appendix A.

The Commission also sought information from several organisations in Canada, the United States and New Zealand regarding their salmon industries, and acknowledges with appreciation the assistance of these organisations provided.

Before the study was announced, the Minister for Primary Industries and Energy advised industry members of the objectives and terms of reference for the study. The Tasmanian Salmonid Growers Association (TSGA) responded that, among other things:

> ... it is the view of our industry that the trade effect of importing raw salmon would be minimal. (TSGA 1996b)

The TSGA's view was that Pacific salmon would not be a substitute for Tasmanian Atlantic salmon in the domestic markets and thus:

> Accordingly [the] industry would not be seeking any assistance under an industry restructure program. (TSGA 1996b)

The TSGA also drew the Minister's attention to its members' concerns about impediments to their ability to export, such as trade barriers in other countries.

The TSGA, the Tasmanian Department of Primary Industries and Fisheries (DPIF), the Tasmanian Department of Premier and Cabinet and others expressed their concern that the study was poorly timed with respect to the AQIS review. They stated that Australia could appear to be acting inconsistently with its obligations under the World Trade Organization regarding quarantine decisions. In addition, their view was that this study either pre-empted the quarantine decision or would be irrelevant should quarantine measures remain unchanged. As a result, little information was provided to the Commission in the early stages of the study.

The Commission distributed a copy of a working paper for this study to a number of interested parties on 21 November 1996 and sought comment by 29 November 1996. The TSGA subsequently requested extra time to respond and an opportunity for industry and the Commission to meet in Hobart to discuss the working paper. As a result, the Treasurer extended the reporting date to 24 December 1996, enabling the Commission to hold a roundtable conference with industry on 11 December 1996.

The structure of this paper is as follows: key industry and market information is provided in Chapter 2; the role of government in assisting the industry and in establishing the regulatory framework is outlined in Chapter 3; the competitiveness of the Australian Atlantic salmon industry is described in Chapter 4; and the potential effects of imports of Pacific salmon products from North America are discussed in Chapter 5.

2 KEY INDUSTRY CHARACTERISTICS

An overview of the Australian Atlantic salmon industry, its production techniques, its products, and its domestic and export markets is provided in this chapter. Additional details can be found in the appendixes to this report.

The Australian Atlantic salmon industry has developed into a profitable business despite some serious setbacks early in its development. Output is continually expanding and the industry successfully sells its products on the domestic and export markets.

2.1 Australian Atlantic salmon production

Atlantic salmon farming began in Australia in 1985, with considerable encouragement from the Tasmanian Government. The industry is based almost entirely in Tasmania, which has suitable weather and geography for Atlantic salmon farming. Tasmanian production has grown from an initial harvest of 20 tonnes in 1986–87 to around 7000 tonnes in 1995–96 (Table 2.1). By 1995–96, Atlantic salmon was the highest valued commercial fishery in Tasmania, with output valued at around $63 million.

Small quantities are produced also in Victoria and South Australia. South East Atlantic Salmon (Sub. 13) advised the Commission that it plans to expand its Atlantic salmon farming operations along the south east coast of South Australia, with potential production of up to 3000 tonnes. Farming is made possible by the presence of cool water currents during summer that keep water temperatures in the range suitable for Atlantic salmon.

From its inception, the industry made a deliberate decision to concentrate on the production and marketing of high quality products. Coupled with effective sales into niche markets, this has enabled the industry to market its product successfully against competition from much larger salmon producing countries.

Australia is a small producer of salmon on the world scale (Table 2.2) and produces mainly Atlantic salmon. Norway, Chile and Scotland are the major producers of farmed Atlantic salmon, jointly accounting for over 80 per cent of world supply of Atlantic salmon in the early 1990s (TSGA 1995). Atlantic salmon are more closely related to brown trout than to the various Pacific

salmon species, which are close relatives of rainbow trout. The United States, Japan, the Commonwealth of Independent States (CIS) and Canada are the major world producers of wild caught Pacific salmon.

Table 2.1 Atlantic salmon production in Tasmania

	Volume (tonnes)[a]	*Value* ($million)[b]
1986–87	20	na
1987–88	50	na
1988–89	380	6
1989–90	1 750	21
1990–91	2 650	32
1991–92	3 538	42
1992–93	3 910	55
1993–94	4 496	54
1994–95	6 084	55
1995–96[p]	7 000	63

a Head-on, gilled and gutted.
b Based on ABARE average farmgate prices.
p Preliminary estimate.
na Not available.
Sources : TSGA Sub. 12; ABARE *Australian Fisheries Statistics*

Production systems

Salmon are hatched in freshwater facilities. After 12–18 months the young salmon undergo smoltification (becoming smolts), after which they can survive in saltwater. The smolts are then transferred to sea farms where they are grown in sea cages located in estuaries and coastal inlets. In Tasmania these are mostly located in the south-east, particularly the D'Entrecasteaux Channel, the Huon River system and the Tasman Peninsula. Salmon farming also occurs in Macquarie Harbour on the west coast of Tasmania.

Because of relatively warmer waters, Tasmanian Atlantic salmon can grow to a harvestable size of up to 4.5 kilograms within 12–15 months after introduction to saltwater. This is a faster rate of growth than is achieved in other salmon producing areas around the world (TSGA 1995). However, the faster growth comes at a cost, particularly in the summer, as warmer waters cause the fish stress and encourage rapid growth of algae which fouls the cage nets.

Table 2.2 World production of salmon, 1995

	Wild caught[a] ('000 tonnes)[b]	*Farmed* ('000 tonnes)[b]	*Total* ('000 tonnes)[b]
United States	442	17	459
Japan	268	27	295
Norway	..	260	260
CIS	180	..	180
Chile	..	107	107
Canada	45	40	85
United Kingdom	..	73	73
Australia	..	7	7

a FAO estimates.
b Live harvest
.. Indicates that little or none is produced.
Source : FAO 1996

Salmon harvesting in the southern hemisphere originally occurred from September to March, with northern hemisphere producers harvesting in their summer. In recent years, most salmon farmers have been able to extend their harvest periods to achieve year round production. However, peak production continues to occur in the older harvest period because of higher demand at that time (transcript, p.77).

Salmon are produced in Australia without most of the serious diseases that occur in salmonids elsewhere (AQIS 1996), so Tasmanian production techniques remain almost chemical free. This relieves Tasmanian producers of much of the cost of disease control and underlies the production and marketing strategy that emphasises the highest quality. It also avoids environmental risks associated with the use of medicines.

Salmon farmers and processors

There were originally thirteen companies involved in growing Atlantic salmon in Tasmania. There are now seven but the industry is dominated by Tassal, Aquatas and Nortas.

In 1994–95, Tassal (1995) reported that it harvested over 2800 tonnes of Atlantic salmon and processed 3600 tonnes, the extra amount coming from contract growers (such as Huon Aquaculture). Based on the production figures in Table 2.1, Tassal accounted for around 47 per cent of industry harvest and around 59 per cent of processing in 1994–95. Reported figures for 1995–96

suggest that Tassal's industry share fell slightly, to around 43 per cent of industry harvest and around 57 per cent of processing (Tassal 1996, TSGA Sub. 12).

In 1995–96, Tassal (the only public company producing Atlantic salmon) reported operating revenue of just over $60 million and a before-tax operating profit of $4.9 million (Tassal 1996). Tassal's net debt to equity ratio was around 11 per cent in 1995–96, down from around 23 per cent in the previous year. Tassal earned an after-tax return of 8 per cent on shareholders' equity, a 12 per cent return on total assets (Table 2.3) and an 8 per cent return on sales in 1995–96, and has been profitable since 1991–92. Profit information for other Atlantic salmon companies is not available.

The three major companies have integrated processing facilities. A fourth company, Huon Aquaculture, farms salmon under contract, mostly for Tassal and some for Petuna Seafoods. Most of the companies are also involved with saltwater trout aquaculture (marketed as *ocean trout* or *salmon trout*).

Table 2.3 Tassal's return on equity and assets

	1991–92	*1992–93*	*1993–94*	*1994–95*	*1995–96*
			(per cent)		
Rate of return on:					
shareholders' equity after tax[a]	22	28	14	3	8
total assets before tax [b]	17	25	10	4	12

a Calculated as operating profit after-tax as a percentage of reported shareholders' equity.
b Calculated as operating profit, before-tax and interest, as a percentage of total assets.
Sources : Tassal 1996 and other years

Each of the three major companies also exports, although currently a majority of the sales of Tassal and Nortas are on the domestic market. Aquatas, which is majority Japanese owned, exports most of its production.

Hatcheries

Most smolts are provided commercially by the single largest smolt producer, Saltas. The Tasmanian Government owns 51 per cent of Saltas shares, Tassal 31 per cent, and other salmon growers the remaining 18 per cent. Smolt allocation is based on shares held in Saltas.

From 1985 to 1995 Tasmanian legislation ensured that Saltas dominated the supply of smolts. The right to purchase smolts from Saltas is restricted to shareholders in Saltas and the importation of smolts and eggs from the

mainland and elsewhere is prohibited by Tasmanian quarantine regulations. The future of Saltas, and the Government's share holding, are currently under review.

The Commission understands that there are currently six hatcheries actively producing Atlantic salmon, including the two Saltas hatcheries. The Commission also understands that some of these began operation before the Saltas legislation expired in 1995. The Inland Fisheries Commission (Sub. 11) reported that there is also one application for a new hatchery under consideration and there have been several other enquiries. Smolt supply is discussed further in Chapter 3.

Other inputs

Tasmanian Atlantic salmon growers appear to operate at higher average costs than major overseas producers. This, at least partly, reflects the decision to operate at low stocking rates to produce a consistently high quality product and the extra costs involved with operating in warmer waters.

Feed, labour and smolts are the major costs of salmon production. In Tasmania feed makes up around 40 per cent of operating costs (TSGA 1995). There is only one Tasmanian feed producer, Gibson's. There are no regulatory restrictions on other firms entering the market however, and other fish feed manufacturers operate in Australia. Both heat treated fish feed and fish meal (a major component of feed) can be imported and Gibson's imports substantial quantities of fish meal for its fish feed pellet production.

Improvement in both feed quality and feeding methods has enabled significant increases in feeding efficiency. Participants informed the Commission that operational feed conversion ratios had improved from around 1.5:1 to nearer to 1.2:1.[1]

Costs and investment

Several participants informed the Commission that salmon production costs and hence farmgate prices have been falling over time. A young industry that has grown so rapidly over its first ten years could be expected to lower unit costs as it 'learns by doing' and innovates. At the roundtable conference, major industry participants indicated that further cost reduction was to be expected in years to come.

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[1] The feed conversion ratio is the ratio of kilograms dry weight of food required to produce 1 kilogram of fish. Ratios below 1:1 are possible as a result of the water content of fish.

Participants also outlined to the Commission significant and ongoing investment plans. These include expansion on to new farm sites, new processing facilities and new hatcheries, as well as investment to improve current facilities. Combined with the potential development of a significant South Australian industry, these plans suggest that in the absence of disease the industry sees expansion as a profitable path.

Salmon production and costs are detailed further in Appendix B.

2.2 Regional importance of salmon farming

As noted in section 2.1, Atlantic salmon farming occurs mostly in the south-east of Tasmania, especially in the Huon River and D'Entrecasteaux Channel. The Tasmanian Department of Premier and Cabinet (Sub. 22) estimates that 90 per cent of Atlantic salmon production occurs in this area, with the remaining 10 per cent on the west coast.

According to the TSGA (1995), Atlantic salmon farming and processing employment was around 570 (full time equivalents) in 1994–95. The Huon Valley Council (Sub. 10) estimates direct employment of 350 people in its region. There are also jobs in related industries such as cage and net manufacture, feed production, veterinary services, transport and distribution. The jobs, while requiring specific skills, primarily need no formal post-school education. DPIF (1995d) estimates that when indirect employment is considered, the salmon industry accounts for as many as 2000 jobs.

Many of the jobs are located in rural areas where there are small populations,[2] limited employment opportunities and high unemployment rates. The Huon Valley Council (Sub. 10) stated that unemployment in its area is 14 per cent and the Tasmanian Department of Premier and Cabinet (Sub. 22) estimates 15 per cent unemployment across the whole Huon/D'Entrecasteaux Channel region. Tasmania's overall unemployment rate for September 1996 was 10.5 per cent (ABS 1996).

2.3 Environmental impacts of salmon farming

There are some potentially important issues concerning the interaction of salmon farming and the environment, including potential multiple resource use conflicts, water quality and seabed flora and fauna.

[2] For example, the Huon Valley local government area covers around 13 000 people and the West Coast local government area around 7000 people.

Atlantic salmon farming competes with other activities (such as recreational fishing and boating) for the use of coastal waters. Multiple use conflicts are addressed under the *Marine Farming Planning Act 1995*.

Salmon farmers have an incentive to maintain high levels of water quality and have worked with their local communities to reduce sewage and effluent problems from other land users. They also undertake on-farm measures that reduce environmental impacts such as:

- seabed and water quality monitoring in and around the farm;
- rotating cages within and between farms on a regular basis;
- fallowing areas; and
- encouraging improvement in the quality of fish feed and improving their feeding techniques to reduce waste.

Salmon farms are considered by some to be unsightly, while the discharge of surplus feed and faecal deposits can alter the composition of seabed flora and fauna, and the water quality.

Because of the potential impacts on communities and the environment, constraints have been placed on site availability under Tasmania's *Marine Farming Planning Act 1995*. The operation of this Act is discussed in Chapter 3.

The Commission heard no complaints of damage to water quality or to the seabed by Atlantic salmon farming during this study but is aware that the above issues have been raised publicly in Tasmania from time to time. The environmental impact of salmon farming is discussed further in Appendix G.

2.4 Domestic consumption

Australians are neither large consumers of fish and seafood generally nor of salmon in particular. Consumption of Atlantic salmon products has risen rapidly over the past few years, increasing by just under 300 per cent between 1990–91 and 1995–96. This partly reflects lower prices as supplies of Atlantic salmon to the domestic market have increased. Springs Smoked Seafoods (Sub. 2) reported that the price of fresh Tasmanian Atlantic salmon has fallen by over 20 per cent in the last two years.

Atlantic salmon is marketed in a variety of forms — fresh (chilled), frozen and smoked. In Australia, as elsewhere, Atlantic salmon is most commonly sold fresh (Table 2.4). It is a high value seafood, along with seafoods such as barramundi and lobster.

Australians consume at least a third of domestic production as smoked salmon.[3] Of the two varieties of smoked salmon — hot smoked and cold smoked — cold smoked is generally considered the superior product, though some varieties of flavoured hot smoked salmon are targeted at sophisticated markets. Cold smoking does not involve cooking.

Frozen salmon has been used largely as a means of supplying the market during the off-season. As the length of the on-season increased to the point where consistent year round production was possible, the quantity of salmon frozen declined. It now represents only 10 per cent of supplies to the domestic market. Participants commented that this proportion is expected to fall further.

Table 2.4 Domestic sales by the Tasmanian Atlantic salmon industry, 1995–96

	Volume (tonnes)	*Per cent*
Fresh[a]	2 440	60
Frozen[a]	410	10
Cold smoked, hot smoked, and other[b]	1 250	30
Total	4 100	100

a Some of these sales are to other processors.

b Mainly cold smoked, with some sales of hot smoked and other.

Source : TSGA estimates

Australia imported $46 million of canned salmon in 1994 (TSGA 1996c). Most canned salmon is Pacific salmon, particularly pink and sockeye salmon (British Columbia Salmon Marketing Council, Sub. 3). Currently there is no canning of Atlantic salmon in Australia. Around the world, Atlantic salmon is normally not canned because of higher returns in fresh or smoked form.

Under Australia's current quarantine regulations (*Quarantine Proclamation No. 86A*), salmonid products cannot be imported into Australia unless subjected to treatment deemed likely to prevent the introduction of disease. This effectively stops imports of fresh, frozen and some cold smoked salmon.[4] Consequently, Australian Atlantic salmon producers are currently the only

[3] Some of the fresh and frozen volume in Table 2.4 is smoked by independent smokers.

[4] Salmon products need not be cooked to meet the required standard of heat treatment for import. Therefore, some forms of cold smoked salmon can be imported, depending on the extent of heat treatment.

suppliers of fresh and frozen Atlantic salmon to the Australian market. Hot smoked salmon and some types of cold smoked salmon are imported.[5]

Atlantic salmon producers in Australia carry out much of their own marketing and distribution. They sell and distribute fresh, frozen and smoked product to a variety of customers including supermarket chains, restaurants, hotels and airlines. Atlantic salmon producers make little use of wholesale fish markets.

The Australian market for Atlantic salmon is discussed in further detail in Appendix C.

2.5 Export markets and trade

The Australian Atlantic salmon industry currently exports around 40 per cent of its production volume (TSGA Sub. 12). Although export volumes have continued to rise since the industry began, the share of production exported has declined (Table 2.5).[6]

Australia's exports of Atlantic salmon are around $40 million annually (Paterson 1996). Most exports are of fresh salmon, the rest being smoked and frozen.

The single largest export market for Australian Atlantic salmon is Japan, which is also the world's largest salmon consumer (OECD 1996). Most Japanese import demand in 1995 was met by the United States, Chile, Norway and the CIS. Fresh imports are dominated by Norway (57 per cent of fresh imports in 1995–96). Although Australia is a small salmon exporter by world standards, it accounts for around 9 per cent by volume of all fresh Atlantic salmon imports into Japan.

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[5] Spring Smoked Seafoods (Sub. 2) believe that some cold smoked imports have not been treated sufficiently to remove disease risk. These comments relate to the technical specifications for heat treatment under Australia's quarantine regulations.

[6] These figures differ significantly from those of the ABS in relation to exports. While the even 200 tonne per year increase in exports since 1991–92 may be questioned, the ABS figure for 1995–96 exports is below that claimed by Tassal alone (transcript p. 58).

Table 2.5: Tasmanian production: domestic and export sales

Year	*Production*	*Exports*		*Domestic sales*	
	(tonnes)	(tonnes)	(per cent)	(tonnes)	(per cent)
1988–89	380	315	83	65	17
1989–90	1 750	1 420	81	330	19
1990–91	2 650	1 750	66	900	34
1991–92	3 538	2 100	59	1 438	41
1992–93	3 910	2 300	59	1 610	41
1993–94	4 496	2 500	56	1 996	44
1994–95	6 084	2 700	44	3 384	56
1995–96[p]	7 000	2 900	41	4 100	59

p Preliminary estimate.
Source : TSGA Sub. 12

Japanese price premium

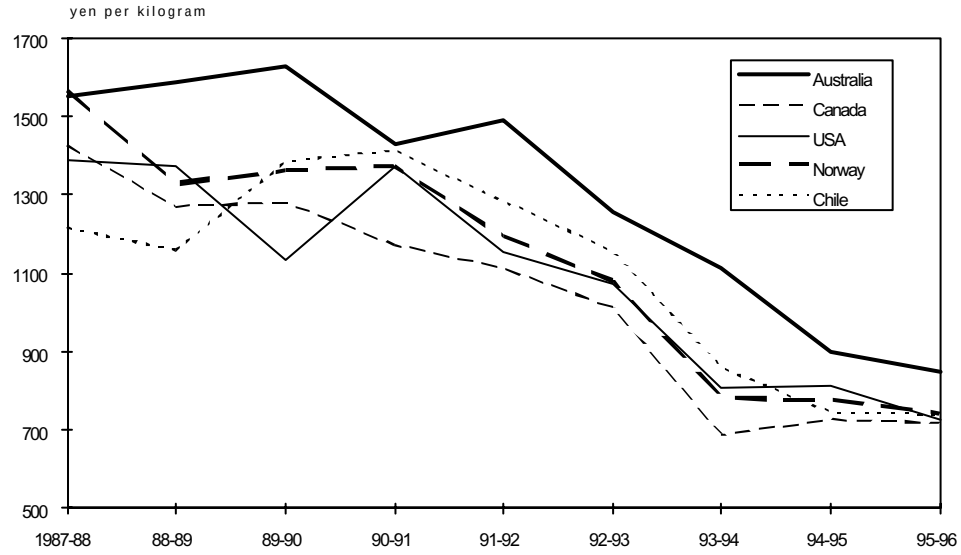
Japanese consumers are discriminating when it comes to quality and taste. Australian Atlantic salmon is marketed actively as high quality and clean and pure, based on Tasmania's reputation as the most disease free and chemical/antibiotic free salmon producer supplying the Japanese and other markets.

A number of participants commented that Australia commands a price premium over other foreign suppliers to the Japanese market. This is supported by the price information from the Japan Tariff Association (Figure 2.1) which shows that Australia has held a price premium over other suppliers to Japan despite an overall downward trend in prices (in yen terms). ABARE's (Sub. 26) analysis suggests that the current premium is largely due to Tasmania's reputation for quality rather than seasonality of supply.

Trade impediments

The Australian Atlantic salmon industry has identified a number of factors that constrain their ability to compete on world markets. These include availability of air freight capacity, adequacy of cool storage facilities, foreign tariffs and other forms of trade barriers.

Figure 2.1 Annual average prices for fresh Atlantic salmon imports in Japan, 1987–88 to 1995–96[a]



a Head-on, gilled and gutted and cif basis.
Source : JTA 1996

As fresh salmon must reach its market within three days, air transport is essential for export markets. With no direct scheduled international flights Tasmanian exporters rely on connections to the mainland. Salmon producers and other Tasmanian air freight users have expressed concerns about the costs and services offered.

With smaller planes flying to Tasmania, products have to be re-packed in Melbourne or Sydney for international flights. Holdover facilities are also an issue: there is a reported lack of adequate cool room facilities at Melbourne airport, resulting in some product remaining on the tarmac while awaiting connecting flights (Ballantine 1996). Tassal has switched to using land/sea freight to Melbourne (Tassal 1996).

Industry participants noted that freight costs for transport within Australia are significant and can be as high as transport from Australia to some international markets.

While tariffs on fresh salmon are generally low in the world's key markets (Japan, the United States and the European Union), they are substantially higher in a number of Asian markets (Table D.3). In most countries, tariffs on smoked and canned salmon are considerably above those on fresh salmon.

Other barriers are more significant. For example, New Zealand prohibits imports of Australian Atlantic salmon despite Australia's disease status.

Canadian salmon imports have been permitted into New Zealand since July 1995.

Although the European Union's tariffs on salmon products are comparatively low, in 1994 the European Union introduced minimum prices on Atlantic salmon imports — possibly in response to low priced imports from Norway. This measure has little direct impact on Australian competitiveness in the European Union as the landed price of Australian exports would typically exceed the minimum price by a significant margin (due to higher production and freight costs). However, as Norwegian exporters face minimum prices in the European Union and anti-dumping and countervailing duties in the United States, they have developed markets elsewhere. As a result, supplies of salmon to Asian markets have increased.

Participants claimed that production in some other countries (for example the United States, Canada and Norway) is subsidised and that dumping of lower quality Pacific salmon is occurring. It might be noted that, as fish and fish products are not deemed 'agricultural products' under the World Trade Organization, normal countervailing duty and anti-dumping measures can be sought with respect to subsidised or dumped imports.

Export markets and trade are discussed in further detail in Appendix D.

3 GOVERNMENT REGULATION AND ASSISTANCE

Tasmanian Government regulations and financial assistance have influenced the development of the Tasmanian Atlantic salmon industry. In the past, access to smolts was restricted by legislation. The expiry of the relevant legislative provisions in 1995 has improved access to smolts for both new and existing farmers. Although the new legislation governing access to marine farm sites is an improvement over the previous system, aspects of the new Act may still pose some obstacles to new firms entering the industry.

The Tasmanian Government has encouraged the development of the Atlantic salmon industry through regulations and by providing financial and other forms of assistance to the industry. Major elements of the regulatory framework which may form barriers to entry and expansion and restrict competition are examined in this chapter. The degree of competition in the market can affect the performance of the industry and its potential to adjust to import competition (Chapter 4).

Legislation which favours incumbent producers at the expense of new entrants could lessen competitive pressures. The threat of new entry can help discipline existing producers to keep prices and costs at competitive levels. Government legislation and regulations, and their implications for the industry are discussed in section 3.1. Assistance specifically directed to the industry by the Tasmanian and Commonwealth Governments is the focus of section 3.2.

3.1 The regulatory environment

The development of the salmon industry in Tasmania has been deliberately shaped by a number of Government policies and regulations (Appendix F). Although some apply across industries, others are specific to the salmon and marine farming sectors. Two important elements of the regulatory framework are the *Salt-Water Salmonid Culture Act 1985,* which regulates access to smolts, and the *Marine Farm Planning Act 1995,* which regulates access to farm sites.

3.1.1 Access to smolts

Salmon farming in Tasmania started in 1985 with the establishment of a commercial hatchery, Salmon Enterprise of Tasmania (Saltas), in accordance with the Salt-Water Salmonid Culture Act. The Act ratified an agreement between the Tasmanian Government and Noraqua Australia (a subsidiary of a Norwegian company) to establish Saltas to produce Atlantic salmon smolts for the industry. Saltas's rights and obligations were specified under the Act.

The Act was intended to provide Saltas with a 10 year monopoly on the production of smolts for sale. It restricted sales of smolts to Saltas's shareholders based on the size of their shareholdings.[1] Until 1995, the Tasmanian Government did not claim its entitlements to smolts for its 51 per cent shareholding. However, since January 1995, it has exercised an option under the Act to claim entitlements to smolt allocation, which it then reallocates to shareholders (Saltas, personal communication). The basis for redistribution is not publicly known.

In addition to the two hatcheries owned by Saltas, the Commission understands that there are currently four other hatcheries actively producing small quantities of Atlantic salmon smolts in Tasmania. The Commission also understands that a number of these began operation before the expiry of the Saltas's legislated dominance in smolt production in 1995. The Inland Fisheries Commission reported that there is also one application for a new hatchery under consideration, and there have been several other inquiries.

Access to smolts is also conditioned by Tasmania's long standing quarantine restriction on the import of live fish from mainland Australia (Wager and Jackson 1993).

Shareholdings in Saltas

The Tasmanian Government owns 51 per cent of the shares in Saltas, and Tassal and its subsidiaries own 31 per cent (Tassal 1996).[2] The remaining shares are owned by other Tasmanian producers. During the 1990s, Tassal increased its shareholdings in Saltas and therefore its access to smolts by acquiring other salmon operations (Tassal, various years).

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1 The Act controls the sale of smolts from Saltas to shareholders who possess fish farming licences.

2 Noraqua transferred its shares in Saltas to Tassal. At the time, Tassal was a subsidiary of Noraqua.

Implications of smolt regulations for industry expansion and new entry

Access to smolts is necessary for entry to the industry and expansion of production. Government regulations restricting access to smolts can have implications for competition and domestic salmon prices.

According to DPIF, the motivation for the controls under the Salt-Water Salmonid Culture Act was to avoid 'unrestrained expansion and [hence] the potential for a boom and bust cycle that has commonly accompanied attempts to start new industries' (Sub. 24, p. 5). The regulatory environment has nurtured the industry through the developmental phase, and it is now established. However, management of the industry may have inhibited competitive pressure.

The industry's view is that there have been few effective restrictions on the supply of smolts. According to participants, existing producers could buy smolts from Saltas or another existing hatchery (transcript, p. 16); they could also purchase an existing hatchery (transcript, p. 20). In the late 1980s, one farm also began producing smolts after receiving legal advice that the Act could not prevent it from operating a hatchery (transcript, p.16).

However, before 1995, the extent to which Saltas's dominance could have been contested in a major manner is unclear. Given the Government's legislated intention to manage the developing industry, it is unlikely that major challenges to Saltas's position would have been allowed. The Commission understands that other salmon hatcheries produced only relatively small numbers of smolts. Therefore existing salmon producers had to rely on Saltas for the majority of smolts.

Participants said that there were few effective restrictions on access to smolts for new entrants. However, while a new entrant could in principle buy shares in Saltas from another shareholder, the sale could be vetoed by the Saltas Board.[3] (Two of the four Board members of Saltas are nominated by existing producers.) Indeed, the Board could withhold consent to the share transfer without giving any reasons.[4] Alternatively, a new entrant could purchase smolts from a Saltas shareholder (if the Saltas Board agreed) or buy one of the existing small hatcheries (transcript, p. 16).

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[3] Another option would be for Saltas to issue new shares (as it has scope to do under the Act) but this would require a majority of shareholders (including the Government) to approve the new equity issue.

[4] Decisions on share transfers by the Saltas Board can be appealed under article 23A of Saltas's Articles of Association. Appeals are to be considered at a meeting of C class shareholders (salmon producers). However, the Commission has been informed that this has never been used.

As well as the restrictions imposed by the Salt-Water Salmonid Culture Act, Tasmania has had a long standing restriction on imports of live fish (including salmon) from the rest of Australia. Applications for imports of live fish (including salmon smolts and eggs) into Tasmania have to meet strict quarantine conditions. Although there may be provisions for some exceptions to the Tasmanian quarantine restrictions, the Inland Fisheries Commission states that:

> Tasmania is unlikely to accept smolts from mainland Australia under any circumstances because of disease risks. (Sub. 11, p. 2)

The Salt-Water Salmonid Culture Act and Tasmania's quarantine regulations have not prevented a rapid growth in output by the industry as a whole during the past decade as smolt production has increased rapidly over the years (Appendix A).

Since 1995, potential new entrants have been able to start their own hatcheries. The Commission understands that other hatcheries recently sold smolts commercially, providing some competition with Saltas (transcript, p. 17). The Commission has no information to gauge the extent of this competition.[5]

The industry has 'recognised that smolt production capacity will need to be increased to allow for expansion of the industry' (Sub. 11). In discussions, the Commission was informed by the industry that it could not currently obtain enough smolts. This view is supported by the fact that applications have been lodged to establish new hatcheries.

The Inland Fisheries Commission has stated that there is unlikely to be a constraint on future expansion in smolt production (Sub. 11). However, there are practical considerations before new hatcheries can become fully operational. New hatcheries with adequate capacity may require large capital injections and technical expertise.[6] Saltas's two hatcheries have 10 years' of operational and research experience, with a production capacity of about 2 million smolts per year (Saltas 1995).[7] Given lead times, possibly of up to 3 years, in the establishment of a hatchery, Saltas will continue to be the major supplier of smolts for the industry at least in the short term.

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[5] Neither the Inland Fisheries Commission nor the DPIF could provide the Commission with information on Saltas's share of smolt production.

[6] According to Saltas (personal communication), outlays of $1–4 million are required for a hatchery capable of producing between 500 000 and 1 000 000 smolts.

[7] Saltas produced 1.6 million smolts in 1995–96. Tassal has expressed an interest in buying one of Saltas's two hatcheries (Tassal 1996).

The Commission understands that the Tasmanian Government is considering the future operation of Saltas and the process for establishing new hatcheries is currently under review. Competition and efficient adjustment are likely to be enhanced if the Tasmanian Government adopts a more open and transparent and less hands-on approach to industry regulation, and ensures that there are no unnecessary barriers to entry into smolt production.

The Commission also understands that the Tasmanian Government is considering the future of its shareholdings in Saltas. The rationale for continued government ownership is unclear. If the Government disposes of its shares, it needs to be mindful of the implications for competition in the industry of ensuring that all existing and potential salmon farmers have competitive access to smolts. If the Government decides to retain its shares in Saltas, it needs to consider its competitive neutrality obligations under the Competition Principles Agreement, and to seek a commercial rate of return on its investment.

3.1.2 Access to farm sites

In addition to controls on smolt production, the Tasmanian Government regulates access to marine farm sites. To operate a salmon farm, a farmer has to apply to the State Government for a marine farm lease. When a lease has been granted, the lease holder then has to apply for a marine farm licence. A marine farm lease entitles the lease holder to use a specified area of state waters and seabed for marine farming. A marine farm licence specifies the species to be farmed on the lease and the conditions and restrictions which must be adhered to on the farm.

According to DPIF (Sub. 24, p. 4), 'the single most important limiting factor in entry into and expansion of the industry has been and continues to be access to marine farm lease area'. The granting of marine farm leases became a contentious issue in the late 1980s with increasing community concern about the impacts of marine farming. Availability of new leases was blocked by an increasing number of successful appeals in the courts against Ministerial granting of new leases under the *Fisheries Act 1959.*

To address these concerns, and criticisms by the courts and industry over the process for granting new leases, the Tasmanian Government made a number of legislative and policy changes concerning marine farm leases and licences. The current legislation governing marine farm leases and licences is the Marine Farming Planning Act and the *Living Marine Resources Management Act 1995*. These two Acts replaced the Fisheries Act.

Before these Acts were passed, the Tasmanian Government imposed a moratorium on the granting of new marine farming licences for salmon farming in 1988. In 1993, another moratorium was imposed on the granting of new marine farm leases until new legislation was enacted and marine farming development plans were prepared. Recently, restrictions on the granting of marine farm leases and licences were lifted for some parts of Tasmania's coastal waters.

Marine farm leases

The Marine Farming Planning Act is an improvement over the provisions on marine farming under the Fisheries Act. In particular, the method of allocation of leases by bidding is in principle more economically efficient than the previous process whereby leases were sold at a low fixed price. But to obtain the full benefits of bidding, it is necessary to ensure that it is open and competitive.

Under the Act, new marine farm leases will not be granted until a marine farming development plan for that area is approved.[8] Now that the Act is in operation, leases will be let in each area as the plans are approved.

Following the recent approval of marine farming development plans for the Huon River–Port Esperance and the Tasman Peninsular–Norfolk Bay regions, applications for new marine farm leases for these areas are to be invited, albeit from a restricted pool of potential applicants.

The Act sets out provisions for allocating marine farm leases. As provided in sections 56(1)(a) and (1)(b) of the Act, applicants must be invited by the Minister (who may be advised by a Board of Advice and Reference) to apply for a marine farm lease:

> The Minister is to invite the following persons to apply for a lease for marine farming:
>
> (a) any person or class of persons the Board has advised under section 52 should participate in the process leading to the allocation of a lease; [9]
>
> (b) any other person the Minister considers should participate in the process leading to the allocation of a lease.

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[8] These plans will cover whole districts or regions (such as bays and estuaries) as well as individual farms, obviating the need to undertake *ad hoc* and site-by-site assessment.

[9] Section 52 requires the Minister to seek the advice of the Board as to the persons or class of person who should participate in the lease allocation process. In providing advice to the Minister, the Board is required to consider the suitability of persons issued with certificates of preferences for participation in the allocation process.

The Board comprises three people consisting of a qualified legal practitioner, a person with experience and knowledge in marine farming and the seafood industry, and a person with experience in business and commerce. The Act requires Board members to disclose any relevant interests and, if necessary, not to participate in any deliberation of the matter.

The Act does not specify who the 'persons or class of persons' should be, but it says that the Board must consider whether a person who holds a 'certificate of preference' should participate in the allocation process. Only certain people may apply to the Minister for a certificate of preference to participate in the allocation of a lease.[10] According to Stuart (1994), Section 56 of the Act was introduced to prevent people entering the industry for short term gains.

The invited applicants are required to submit bids for new leases. The Minister is not required to accept the highest bid and may consider other factors such as financial benefits to the state, employment, previous knowledge, experience in the marine farm industry, contribution to industry research and capacity to address social and environmental issues relevant to the zone.

In addition to the bid price, a lease application fee of $1000 is payable. If granted a lease, the lessee is also required to pay an annual rental fee currently $1750 plus $100 per hectare.

Marine farm leases can be traded, providing Ministerial approval is granted and a fixed transfer fee is paid. The occupancy rights of a lease under the new legislation have been increased from 20 to 30 years. A lessee may apply to renew a lease within 10 years of the lease expiring.

Marine farm licences

As stated earlier, a marine farm licence specifies the species allowed to be farmed as well as the terms and conditions for the operation of the licence. Under the Marine Farming Planning Act, a licensee is required to undertake monitoring of the environment around the farm as well as meet prescribed environmental standards.[11]

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[10] People who qualify to apply for a certificate of preference include persons who hold or have held permits for scientific research in respect of an area included in the marine farming zone, who have prepared draft marine farming development plans (in areas where the government has not prepared a plan), or whose applications under the old Fisheries Act have been cancelled.

[11] For example, in the Tasman Peninsula–Norfolk Bay area, conditions include a maximum stocking limit of 25 kilogram of Atlantic salmon per cubic metre, and a minimum height for salmonid cages of at least 1 metre clear of the seabed at low tide under normal growing conditions.

The prescribed fee for a marine farm licence consists of an annual payment, currently a $1700 base fee, and $100 per fin fish species. The Commission understands that these fees will be reviewed and adjusted in 1997 to account for the additional government costs of environmental monitoring and compliance auditing (Appendix F).

A marine farm licence usually requires renewal every year, although it can be issued for up to 10 years. A marine farm licence is transferable with the marine farm lease. To renew, transfer or vary a marine farm licence, the applicant has to satisfy the same conditions as those required for the application of a new licence (Appendix F).

It might be noted that the current approach to marine farm licensing may not be the most cost efficient approach to encouraging farmers to attain environmental objectives because it focuses on inputs (such as maximum stocking rates) rather than the desired state of the environment. Adopting an output based approach would, for example, involve setting appropriate output standards (such as a minimum water quality standard), and allowing the licensee to choose the least cost method for attaining environmental outcomes (including choosing which species of fish is to be farmed.) Such output specifications may not always be feasible, however.

Implications of the Marine Farming Planning Act for industry expansion and new entry

Access to marine farm sites has been influenced by the changes introduced by the Tasmanian Government since the late 1980s. While the moratoria on the granting of new salmon farm licences and marine farm leases were in place, the potential for new entry was limited. Indeed it was limited before these moratoria as a result of environmentally based court actions. A potential entrant could enter the industry only by acquiring existing farms. Existing farmers wishing to expand production beyond the existing leases areas also had no options but to buy leases from other lease holders.

As noted above, the moratorium on the granting of new marine farm leases is still in effect except for two areas (Huon River–Port Esperance and the Tasman Peninsula–Norfolk Bay areas) where marine farming development plans were completed in October 1996. Plans for other coastal areas are still in the planning stages.[12]

[12] Areas currently developing these plans include the D'Entrecasteaux Channel, north west coast, Flinders Island, Georges Bay on the east coast, Great Oyster Bay, the mid-east coast, and the Derwent Estuary.

Completion of such plans for the Huon River–Port Esperance and the Tasman Peninsula–Norfolk Bay areas have led to an increase in leasable areas potentially available for marine farming of salmon and other seafoods (Table 3.1). Salmon farming leases in these two regions currently account for about 29 per cent of total lease area (DPIF 1996a, 1996b).

A marine farming development plan for the D'Entrecasteaux Channel is expected to be completed shortly, and may add 530 hectares to the area available for marine farming (DPIF 1995c).

The areas potentially available to salmon farming have increased and there is scope for existing farms to expand production because most of these areas are adjacent to existing farm sites (DPIF 1995c, 1996a, 1996b). Access to sites for new entrants is more limited because separately owned farms are required to have a buffer area between them to reduce the risk of diseases spreading from one farm to another (DPIF 1996a, 1996b).[13]

Table 3.1: Increase in marine farming areas under the *Marine Farming Planning Act 1995*

	Total area of existing leases (ha)	*Total maximum leasable areas* [a] (ha)	*Increase in leasable area* (ha)
Huon River–Port Esperance	131	380	249 (190%)
Tasman Peninsula–Norfolk Bay	227	467	240 (106%)

a Includes existing lease area.
Sources: DPIF 1996a,b

The new areas for marine farming may meet only the short term demands of the industry.[14] Nortas has indicated that many of the sites suitable for salmon farming will be used in the next 5 years (Dietzel 1996). Longer term expansion may require looking further offshore where stronger currents and

[13] Marine farming development plans for the Huon River–Tasman Peninsula area, D'Entrecasteaux Channel, and the Tasman Peninsula–Norfolk Bay area specify a buffer of at least one kilometre between fin fish farms except when farms are owned by the same company. Buffer areas are also required between fin fish and shell fish sites.

[14] The DPIF (1995c) state that these plans would satisfy site needs for the next 5 years after which a review will be undertaken.

deeper water would reduce the environmental impacts. Such sites may also reduce the risk of water becoming too warm in summer. Indeed, trials of offshore open sea cages are being conducted.

As noted above, the new approaches to planning for marine farm development and to environmental management and control are an improvement over the old system set out in the Fisheries Act. The new Marine Farming Planning Act aims to provide for 'greater objectivity and accountability in the allocation of new marine farm leases' for example, by establishing an independent Board to advise the Minister (Sub. 24, p. 7). However, the Commission is of the view that the legislation can be improved further by making some aspects of the processes more transparent.

The substantial Ministerial discretion is no doubt intended to promote the development of the industry. But the process is not transparent and like all non-transparent administrative processes may be open to accusations of bias. There is a strong case for allocating leases by open tender and for using selection criteria that are clear and publicly known in advance.

The ultimate effect of the new regulatory arrangements on new entry, industry expansion and competition in the industry rests on how certain provisions are administered. There is potential for provisions in the Marine Farming Planning Act to be interpreted in a way that could restrict competition.

3.2 Assistance

Since the salmon industry was established in 1985 the Tasmanian Government has provided significant assistance to it. This assistance has taken a number of forms ranging from direct equity participation in commercial ventures through to support for research and development. However, Tasmanian Government assistance has increasingly focused on research and development in recent times.

The industry also has been eligible for a number of widely available Commonwealth Government programs, such as research and development assistance and export development assistance. The focus of this section is on assistance specifically targeted at aquaculture and the salmon industry even though the industry may have used these more general forms of assistance. Additional details of Tasmanian and Commonwealth assistance to the industry are contained in Appendix E.

3.2.1 Assistance for research and development

The Tasmanian Government has funded the establishment of research facilities as well as providing financial support for particular research and development projects. The industry has used the services of several Government supported research facilities. For instance, the Government Animal and Water Quality Diagnostic Laboratory at Mount Pleasant in Launceston provides support for Tasmania's animal and aquaculture industry disease control programs. The Fish Health Unit of the Animal Health Laboratory also has an active research program on fish diseases and manufactures and supplies vaccine for immunising Atlantic salmon smolt against *vibrio anguillarum* (Appendix E).

From 1992 to 1996, the Tasmanian Government contributed up to 0.25 per cent of the gross value of fisheries and aquaculture production to the Commonwealth's Fisheries Research and Development Corporation (FRDC) in lieu of direct contributions by industry (DPIF 1995a, p. 41). The FRDC allocates 20–25 per cent of its funds to aquaculture (including salmon) research (FRDC 1995a, p. 65).

The Commonwealth Government also contributes to fisheries research and development in general and salmon research and development in particular. The CSIRO, BRS, ABARE and the ACRC have all researched the Atlantic salmon industry. The Commonwealth has contributed up to three-quarters of the FRDC's funding (Appendix E).

Commonwealth and State Government funding for research and development is complemented by the industry's own expenditure. Saltas was required under the Salt-Water Salmonid Culture Act to allocate 25 per cent of its gross revenue from smolt sales to research and development for the duration of its monopoly on smolt production. Saltas has not paid dividends to its shareholders to date. This could be seen as a form of levy on both producers and Government to fund research and development as all profits have been ploughed back into Saltas. However, the Tasmanian Government may be able to obtain a return on its investment if it should decide to sell its interest in Saltas.

Saltas's 10 year legislated dominance of smolt production has expired and the company has now scaled down its research expenditure. The majority of firms have invested in research directly as well as through Saltas. For example, Tassal supports research on new packaging technology which may extend the life of fresh and processed produce, and Nortas has been developing a 160 metre sea cage (CSIRO 1995, Dietzel 1996).

Many of the research and development projects sponsored by the Tasmanian and Commonwealth Governments seek to find solutions to specific problems and provide commercial benefits to the salmon industry. Such research is most appropriately funded by way of an industry levy. The Tasmanian Government, through the Living Marine Resources Management Act, has introduced provisions which allow it to levy industry but, as yet, has not yet announced that a levy will be collected. Government funded research would be best concentrated on proposals which probably would not be undertaken by industry because the major benefits do not flow directly to the salmon industry. Government assisted research and development projects should have transparent funding and well defined selection and evaluation criteria (IC 1995b).

3.2.2 Financial assistance

In the past, significant industry assistance was provided to the Tasmanian Atlantic salmon industry through the provision of equity for commercial ventures, loan guarantees and commercial loans.

The Tasmanian Government, through Tasmania Development and Resources (TDR), provided equity capital for several commercial ventures in the Atlantic salmon industry (Appendix E). In 1985, it contributed $1.3 million in equity to help establish the salmon hatchery company Saltas, thereby receiving 51 per cent of the shares in Saltas (which it still holds). At the same time, the Tasmanian Government, through TDR, acquired shares in Tasmanian Atlantic Salmon (Tasmas), which is now owned by Tassal. The Government purchased these shares to help Tasmas 'raise necessary funds' and to promote 'investor confidence in the emerging high risk salmonid industry' (Sub. 6, p.2). Tassal's merger with Tasmas means that the Tasmanian Government, through TDR, currently holds 4.3 per cent of Tassal's issued capital (Tassal 1996, p. 37).

The Tasmanian Government also provided financial assistance to the emerging industry through loan guarantees and commercial loans. It underwrote a loan guarantee to Tassal for a merger between it and another salmon farming company in 1990 (TDA 1991, p. 23). The guarantee secured a $1 million loan from a commercial bank from 1990 to 1992 (Sub. 6, p. 2). In addition, since 1985, the Tasmanian Government has provided four loans to the state's salmon industry to a total value of $1.2 million.[15] Currently, TDR

[15] The interest rates for these loans reflected the cost of funds, with an adjustment for risk, plus an administration cost (Sub. 6, p. 2).

(Sub. 6, p. 2) has a loan for $366 000 outstanding to one salmon producer (Appendix E).

3.3 Conclusion

In the past, restrictions on smolt access and, in particular, the availability of new marine farm sites have reduced the potential for new entrants into the Atlantic salmon industry. The effects of these restrictions may have contributed to the decline in the number of salmon producers and an increase in market concentration. As described in Chapter 2, the number of salmon producers in Tasmania has declined since 1985 from around thirteen to seven, of which only three are major producers. On the other hand, it should be noted that much of this concentration occurred when the industry suffered severe financial stress (partly as a result of high fish mortality) and that there were probably few potential entrants at that time. It should also be noted that total production has expanded rapidly.

Recent changes to the legislative framework appear to have eased some restrictions on entry into salmon farming. The Commission understands that there are currently four other hatcheries producing smolts, although Saltas is still the dominant producer. Over time, these changes could remove one of the potential barriers to entry. The Commission also understands that the Tasmanian Government is considering future smolt regulations and is reviewing its ownership of shares in Saltas. To enhance competition and efficient adjustment, the Tasmanian Government should make the administration of smolt regulation more open and transparent for example, by publishing the basis for allocating its smolt entitlements to existing farmers, and by ensuring that there are no unnecessary barriers to entry to smolt production and sale.

In deciding the future of its shareholding in Saltas, the Tasmanian Government needs to be mindful of the implications for competition in the industry of ensuring that all existing and potential salmon farmers have competitive access to smolts. The rationale for continued government ownership is not clear but, if it retains its shareholding, it also needs to consider its competitive neutrality obligations under the COAG Competition Principles Agreement.

In the past, access to farm sites for new entrants to salmon farming were limited. This constraint has been partly eased by the recent release of two new marine farming areas in the Huon River–Port Esperance and Tasman Peninsular–Norfolk Bay regions. The new regulatory arrangements under the

Marine Farming Planning Act offer the potential for continued industry expansion and, to a lesser extent, for new entry.

Although some aspects of the Act could still discourage new entrants to the industry, the Act has improved the system of allocating marine farms. However, there is a strong case for allocating leases by open tender and for using selection criteria that are transparent and publicly known in advance.

The Act is scheduled to be reviewed by the Tasmanian Government in 1999 in accordance with the COAG Competition Principles Agreement. In undertaking this review, the Government should consider ways of streamlining regulatory controls. The review could also examine the feasibility of moving to an output based approach to environmental and other regulation.

4 COMPETITION IN THE DOMESTIC SALMON INDUSTRY

Regulation of salmon farming has restricted potential new entry into and expansion of the industry. Recent changes to regulations have removed many of these barriers. Available evidence on prices for fresh Atlantic salmon suggests that, although local producers have sustained higher prices on the domestic market than on the export market, their ability to do this has declined. The current domestic price premium for fresh Atlantic salmon appears to be small.

In this Chapter sources of competition in the domestic salmon industry are considered as are the relative prices of salmon on different markets. The intention is to provide a basis for considering the effects of possible imports, were the quarantine restrictions to be eased, and the manner in which the industry may adjust.

4.1 Salmon prices

The extent of price discrimination between domestic and export markets can be assessed by comparing farmgate prices for sales of a product on export markets (the export parity price) with the farmgate price for sales of the same product on the domestic market (the domestic price).

4.1.1 Export parity prices

The Commission has estimated export parity price using import data published by the Japan Tariff Association, less transport costs (Table 4.1).[1] The average price of Japanese imports of fresh Australian Atlantic salmon (head-on, gilled and gutted) was calculated by converting the yen price of imports for each month into Australian dollars using the average exchange rate for the corresponding month. The annual average import price for Japan is a weighted

[1] The Commission used prices in Japan because that country is the industry's major export market (Chapter 2). A disadvantage of using this source is that export prices for frozen and smoked salmon cannot be reliably estimated by this method because Australia exports only small quantities of these products to Japan.

average price (with the volume of imports as weights). This price is on a 'delivered overseas port' basis, so the costs of transport and insurance to Japan (ranging from around $3.10 to $3.50 per kilogram) were deducted to obtain the export parity price.[2] On this basis, the export parity price of fresh (head-on, gilled and gutted) Atlantic salmon is estimated to have been almost $8 per kilogram in 1995–96. This is estimated to have fallen by around 30 per cent since 1992–93.

Table 4.1 Estimated export parity prices

	1992–93		*1993–94*		*1994–95*		*1995–96*[a]	
	High	*Low*	*High*	*Low*	*High*	*Low*	*High*	*Low*
Price ($A/kg)[b]	14.80	14.80	15.10	15.10	12.40	12.40	11.00	11.00
Costs (freight and insurance)[c]	3.50	3.10	3.50	3.10	3.50	3.10	3.50	3.10
Export parity	11.30	11.70	11.60	12.00	8.90	9.30	7.50	7.90

a For the period September 1995 to February 1996.
b Prices are for Australian fresh Atlantic salmon exports (head-on, gilled and gutted) to Japan.
c Commission estimates based on confidential information provided by participants.
Sources: JTA 1996, and Commission estimates

ABARE (Sub. 26) suggests that export parity prices are likely to be higher than the Commission's estimates. Average export values were estimated by ABARE using trade data collected by Australian customs officials (on the volume and value of Australia's salmon exports). One reason for the differences is that ABARE aggregated exports across a range of product forms (fresh, frozen and smoked salmon) to various countries. The ABS data used by ABARE also included exports of Pacific salmon and possibly some non-salmon species.

At the roundtable conference, Tassal's Managing Director said that Tassal's exports of fresh Atlantic salmon in 1995–96 were greater than the total quantity of fresh Australian Atlantic salmon exports reported by the ABS (transcript p. 58). Aquatas (Sub. 27) also said that two Australian companies alone exported around $33 million of Atlantic salmon products in the past year. ABARE (Sub. 26) using ABS data, reported Australia's total salmon exports at around $20 million in 1995–96.

[2] There is no published information on salmon freight costs to Japan. The Commission's estimate is based on confidential information provided by participants.

Given the importance of comparing prices of like products rather than aggregating, and the questions raised about the accuracy of the ABS data, the Commission has placed greater weight upon the JTA data in estimating export parity prices.

The Commission recognises that the prices in various markets may differ significantly in any given month, and that markets will not be vacated when a price dips for a short period. Furthermore, prices for smoked salmon vary significantly according to the nature of the product and the market. However, the Commission was unable to obtain a long run price series for publication better than that provided in Table 4.1. Some price data obtained in confidence supported these orders of magnitude.

4.1.2 Domestic prices

There are no reliable published sources of information on domestic salmon prices. Survey information is collected on average farmgate values of domestically produced Atlantic salmon, but this does not distinguish between product destined for domestic or export markets.

Participants provided some evidence suggesting that prices have been falling markedly over the past few years. One Atlantic salmon producer suggested, in confidence, that prices have fallen by as much as 20 per cent in nominal terms over the past four years. Springs Smoked Seafoods (Sub. 2), a major buyer of fresh Atlantic salmon, said that prices for fresh Atlantic salmon have fallen by 20 per cent in the past two years alone.

To estimate domestic prices, the Commission relied on confidential information provided by participants (such as producers and buyers of Atlantic salmon) and information from the Melbourne and Sydney fish markets. There is some variation, but information from industry sources suggests that the current domestic farmgate price for fresh salmon (head-on, gilled and gutted), without taking into account quantity discounts and other factors mentioned below, is $10–11 per kilogram. It also appears that frozen salmon (head-on, gilled and gutted) sells for about $2–3 per kilogram less than does fresh salmon.

Evidence received by the Commission on fresh and frozen salmon prices suggests that domestic producers have been able to earn a premium above export parity for domestic farmgate sales of Atlantic salmon. While a simple comparison for 1995–96 of data in Table 4.1 and the figure of $10–11 for the domestic price per kilogram suggest a domestic price premium of $2–3 per kilogram, the size of this premium is uncertain. A number of factors suggest that it is smaller than indicated by this simple comparison.

Industry sources said that domestic prices vary depending on the quantities purchased and relationships between the buyer and seller. Some evidence was provided that large and regular purchasers of salmon (such as wholesalers and salmon smokers) are able to negotiate lower prices or special 'volume' rebates and discounts.[3] In addition, some sales (for example to airlines) are made under long term contract arrangements. Evidence was provided that producers' own marketing costs are included in the information on domestic prices obtained by the Commission and that these costs for producers are higher on the domestic market than on export markets, where other parties bear a greater proportion of the costs. The Commission was also informed that prices vary substantially within the financial year.[4]

Several factors suggest that the domestic price premium has been declining. In particular, the quantities and proportion of fresh salmon sold domestically has been increasing (section 2.5), and participants suggested that the large increase in domestic sales was having an effect on domestic prices. Price information supplied confidentially by producers showed that the domestic price premium is now small.

The Commission's best estimate is that the average domestic farm gate price for fresh Atlantic salmon was just above the average export parity price in 1995–96 and that this domestic price margin has been falling.

The behaviour of Atlantic salmon producers suggests that the domestic price premium is likely to continue to decline in the absence of any other changes to the regulatory environment or to quarantine protocols concerning salmon imports.

Sources of competition in the Australian Atlantic salmon industry are considered in the remainder of this chapter.

4.2 Sources of competition in the salmon industry

Australian producers of Atlantic salmon face competition on the domestic market from some imported salmon products, substitutes for salmon and each other. Internal competition is conditioned by the fact that one firm (Tassal) accounts for around 43 per cent of salmon grown and 57 per cent of salmon processed (Chapter 2). However, the limited evidence available suggests that competition among firms for markets is increasingly active.

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[3] No information was available on the extent of use of rebates and discounts.

[4] No information was available on 'within-year' variations in production or prices. Figures report are annual averages.

4.2.1 Import competition

The quarantine ban on imports of fresh and frozen salmon products means that producers of fresh and frozen salmon are not in direct competition with imports.[5] Only domestic producers of smoked salmon face direct competition from imports in Australia.[6]

4.2.2 Competition between salmon and non-salmon products

There is a widespread view that salmon products compete with a wide range of seafood and meat products. Participants commented that rainbow and ocean trout also compete with Atlantic salmon, although buyers will pay a premium for Atlantic salmon. ABARE (Sub. 21) stated that salmon compete with other high value seafood (prawns, lobsters and tuna), and with poultry, beef and pork, especially when there are large price changes.[7] At the roundtable conference, Tassal's Managing Director said:

> ... pork, poultry, other seafoods [are] our competition ... we compete for the consumer dollar either in restaurants, or in food service, or in the retail chains. [One] of the reasons that [salmon] consumption has gone up in Australia ... is the decline [in production of] Sydney rock oyster[s]. (transcript p. 71)

In addition, salmon companies have targeted particular non-salmon products in their marketing campaigns. For instance, Tassal's product literature suggests that salmon be used as a substitute for bacon in salads and pasta dishes.

The Commission was unable to find any strong empirical evidence of close substitution relationships among fresh, frozen and cold smoked salmon and non-salmon products. Clearly, some substitution is likely to occur; there will be a switch to other products (such as rainbow and ocean trout) if the price of fresh Atlantic salmon rises substantially.

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[5] Tassal (1996, p. 3) has said that its margins for cold smoked salmon have been affected by competition from imported hot smoked salmon.

[6] The Commission understands that there are no Australian producers of canned Atlantic salmon and that local demand is met entirely by imports.

[7] There are studies other in countries: Bjorndal and Salvanes (1994), Herrmann, Lin and Mittelhammer (1990) and Shaw and Muir (1987). But, in most cases, no empirical evidence was provided or cited to support the conclusion that salmon face significant competition from non-salmon substitutes at current prices.

4.2.3 Competition in production

A number of barriers to entry in the salmon industry were discussed in Chapter 3. New entry into salmon farming in recent years has been constrained by the moratoria on the granting of new marine farming leases and licences by the Tasmanian government, although given that the industry passed through troubled times in the early 1990s, it is unlikely that potential entrants were significantly discouraged by the barriers. In addition, the near monopoly on smolt production granted to Saltas restricted access by potential new entrants to smolts and may have impaired the ability of existing producers to increase their output (because their smolt allocation was related to their shareholding in Saltas). However, it should be noted that the production and availability of smolts has greatly increased.

Recent changes may reduce some of the regulatory barriers to potential entry and expansion in salmon aquaculture. However, as discussed in Chapter 3, the ultimate effect of the regulatory framework on competition in Atlantic salmon production depends on how these new arrangements are implemented. The future situation regarding access to smolts is yet to be determined.

Economies of scale or scope (including economies from vertical integration)[8] could make it difficult for small enterprises to enter the industry and compete successfully. The Commission has been told that there are some benefits to being a large salmon farmer (including bulk discounts on purchases of fish feed and other inputs). In addition, there appears to be a trend in some salmon farming countries (Norway, Scotland and New Zealand) towards concentration and vertical integration in the salmon industry (FAO 1996, p. 47; transcript, p. 29). It has been suggested that vertical integration is a key to successful large scale aquaculture operation (Nel 1996, p. 229).[9]

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[8] Economies of scale means that unit costs of production fall as output in an in dustry or enterprise increases. Economies from vertical integration mean that it is less costly for a firm to undertake several stages of production jointly (for example, smolt production, salmon farming and processing) than for separate firms to specialise in each production stage. Economies of scope are reductions in costs resulting from combining two or more product lines in one enterprise. 'Vertical integration' refers to firms entering into upstream and/or downstream production activities in an industry. Tassal is an example of a vertically integrated company; it undertakes a range of activities including salmon farming, processing and marketing. There would be further vertical integration if it were also to grow smolts.

[9] For a discussion on concentration and vertical integration in the major salmon farming countries see Forster (1995).

While average costs appear to have fallen significantly over time in Australia, this may be more a result of innovation and 'learning by doing' than of economies of scale or scope as such.

4.3 Conclusion

The Australian Atlantic salmon industry faces competition on export markets and competes on the domestic market against heat treated smoked salmon. However, imports of fresh, frozen and some cold smoked salmon are currently prohibited on quarantine grounds.

There are substitutes for fresh, frozen and cold smoked salmon but there is no conclusive evidence, one way or another, on the strength of these relationships.

There is some evidence that barriers to entry to the Tasmanian Atlantic salmon industry have enabled domestic producers to sustain higher prices for fresh Atlantic salmon on the domestic market than on the export market on average. However, there is evidence that the domestic price premium for fresh Atlantic salmon has been declining and is now relatively small. Given recent legislative changes, it is likely that this premium will continue to decline, providing the Tasmanian Government administers the regulations so as not to deter competition in Atlantic salmon farming. If plans to expand production in South Australia come to fruition, additional competitive pressure will be provided.

5 POTENTIAL EFFECTS OF IMPORTS

In the absence of newly imported salmon diseases becoming established in Tasmania, allowing imports of fresh and frozen wild caught Pacific salmon from North America would provide greater choice for Australian consumers but the benefit is likely to be small. Rather, the effect will be dispersed over a variety of lower value fin fish products. Consequently, allowing imports is unlikely to have any major effects on profits, investment and employment in the Australian Atlantic salmon industry.

To analyse the effects of allowing imports of fresh, frozen and cold smoked Pacific salmon, information is needed on a range of matters, including:

- the quarantine protocols and border measures which would exist were imports to be allowed (section 5.1);
- the type, quality and price of potential imports (section 5.2); and
- the extent to which Australian consumers would view Atlantic and Pacific salmon as substitutes (section 5.2.4).

The likely effects of imports are discussed in terms of their impact on domestic prices, consumption, industry output and exports, and the price premium obtained for fresh Australian Atlantic salmon in overseas markets (section 5.3). Adjustment issues and regional effects are discussed in sections 5.4 and 5.5 respectively.

5.1 Quarantine protocols and border measures

Any future changes in Australia's quarantine protocols and border measures (tariffs and other duties) have the potential to affect the price and form of salmon imports entering the domestic market.

5.1.1 Quarantine arrangements

The Commonwealth Government is considering the recommendations from DPIE on quarantine protocols and is yet to announce its decision on whether to allow imports of fresh and frozen wild caught salmon from North America.

In its revised draft *Salmon Import Risk Analysis*, the Australian Quarantine and Inspection Service (AQIS 1996) proposed a number of options for addressing the disease risks arising from imports (Box 5.1). The options

varied in terms of the estimated levels of quarantine risk: the lowest risk option being to allow imports of heat treated products only; and the highest risk option being to permit imports of head-off, gilled and gutted product under specified conditions.[1]

Each option proposed by AQIS has implications for the type of salmon product allowed into Australia. For instance, restricting imports to frozen fillets[2] and retail ready fillets would prevent domestic salmon smokers from obtaining bulk supplies of whole Pacific salmon for further processing. The protocols could specify that only frozen imports are allowed. Also, health controls imposed on processing plants in Australia and North America and requirements for inspection, auditing and fish health certification may impose additional costs that should be factored into estimates of the likely price of imported salmon products.

Given the uncertainty over the nature of Australia's future quarantine controls, the Commission has not been able to estimate the costs to importers of meeting quarantine requirements, should imports be permitted.[3]

5.1.2 Border measures

As noted in Appendix D, the bound tariff rate on fresh and frozen salmon under Australia's World Trade Organization commitments is minimal. Hence, this border measure would not affect the landed cost of fresh or frozen salmon imports. If domestic salmon producers believed that salmon exports to Australia were selling at a price below the 'normal' price in North America, or that exports to Australia were being subsidised directly or indirectly, they could request anti-dumping and/or countervailing action against exporters.

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1 The high risk option was recommended by AQIS in an earlier draft *Salmon Import Risk Analysis* (1995).

2 According to one participant, imports of frozen fillets would be of lower quality if they were 'double frozen'. That is, the wild Pacific salmon would be caught at sea and frozen then later thawed, filleted and refrozen (transcript, p. 67).

3 There is some information on the costs of inspection and certification in other industries. For instance, the Commission noted in its report on meat processing that AQIS's charges for its export meat inspection service accounted for around 3 per cent of total meat processing costs (IC 1994, p. 88).

Box 5.1: Proposed quarantine protocols

AQIS recommended in its draft *Salmon Import Risk Analysis* (1995) that imports of head-off, gilled and eviscerated salmon in two product forms be allowed: retail ready for general distribution; and bulk product imported into 'quarantine approved' premises for processing into retail ready product for general distribution (AQIS 1996, p. 67).

In its revised draft *Salmon Import Risk Analysis* (1996), AQIS set out five quarantine policy options:

- to strengthen policies to require that salmon products be effectively heat treated to address pathogens of concern before or shortly after entry into Australia (under quarantine supervision);
- to maintain present policies unchanged or with amendment;
- to implement the recommendations of the Bureau of Resource Sciences report on aquatic animal quarantine. Set out in the report are minimum requirements for quarantine treatment (with some allowance for different disease risks of individual fish species and their source — that is, whether farmed or wild);
- to permit imports of retail ready fillets for distribution in raw form under specified conditions; and
- to permit imports that comply with international standards (evisceration being the sole requirement).

The options of either banning all imports of salmon products or removing all quarantine restrictions were not explicitly canvassed.

AQIS also stated that a number of additional health protocols should be put in place, whatever option is chosen. The proposed health protocols included, *inter alia*, official certification of the health status of source fish populations, and requirements that processing be undertaken only in government approved and audited establishments, that the fish be caught in Canadian, US or contiguous marine waters by Canadian or US registered fishers, and that the fish are not derived from aquaculture establishments. Other requirements are that the product must be 'A/first grade', that only adult fish will be allowed, and that fish must not be sexually mature (that is, not in spawning or post-spawning condition).

Source : AQIS 1996, pp. 64–71

However, this action can be taken only if the Australian industry producing similar goods has suffered, or is threatened with, material injury. The simplest form of action is to impose duties on the offending imports to offset the amount of dumping or subsidisation. Once imposed, these duties can remain in place for up to five years.[4] The industry has questioned whether it could afford to take such actions and whether delays would render them of no use (transcript, p. 76), but such matters are not appropriately addressed in the context of a report on a single industry.

The Commission's analysis of the effects of allowing fresh and frozen salmon imports has assumed that no dumping occurs and that no anti-dumping or countervailing actions are initiated or threatened by the domestic industry in either the short or long term.

5.2 Potential imports

The terms of reference request an assessment of the potential economic effects of allowing imports of fresh and frozen wild caught Pacific salmon from North America. The Commission's view is that, in the absence of any controls, imports would be more likely to come from farmed salmon producers such as New Zealand and Chile. New Zealand producers have indicated a strong desire to export farmed Pacific salmon to Australia. One New Zealand company advised the Commission that it saw a potential market for fresh, frozen and cold smoked New Zealand salmon of about 1000 tonnes per year (New Zealand King Salmon Company, personal communication).

However, any country wishing to export farmed salmon to Australia must first apply for market access and their applications would be subject to the import risk analysis process which examines the *scientific* quarantine issues associated with the requests. The focus of the following discussion is on the *economic* impact of wild caught Pacific salmon imports from North America, as specified in the terms of reference.

5.2.1 Characteristics of imports

Comments from participants suggest that a range of frozen Pacific salmon species would be imported. According to the Food and Beverage Importers

[4] Direct export subsidies are prohibited. When these occur, action can be taken through the World Trade Organization without establishing injury. See Appendix D for more detail on anti-dumping and countervailing duty arrangements.

Association (Sub. 4), the main species of imports probably would be spring (chinook) and keta (chum), although other species also might be imported. Some importers said that they would import a variety of species so that they could offer consumers more choice of smoked products (in terms of price and quality). Participants also said that little fresh Pacific salmon is likely to be imported from North America. For instance, the Food and Beverage Importers Association stated:

> Depending on quarantine conditions, most imports would be of frozen salmon. Owing to [high] air freight costs, [providing fresh salmon imports] for the Australian market would be extremely costly. (Sub. 4, p. 1)

It is difficult to be certain about the mix of Pacific salmon species that would be imported, but it is likely that most imports would be frozen. One reason for this is that processing ships in the wild salmon fisheries generally operate at sea for extended periods and must freeze much of the catch for storage. Furthermore, estimated import parity prices for fresh North American sockeye are significantly above current Australian prices for fresh Atlantic salmon. In Chapter 4, it was noted that the domestic farmgate price for fresh Australian Atlantic salmon, without taking into account quantity discounts and other factors, is around $10–11 per kilogram. In 1996, the estimated import parity price for fresh sockeye from the United States was well above this at approximately $14–15 per kilogram.[5] This suggests that imports of fresh, high value Pacific salmon would not be competitive with the local product.

In the following analysis, the Commission has assumed that most potential imports would be frozen and comprise both high value (such as sockeye and chinook) and lower value salmon (such as coho, chum and pink), even if fresh product is permitted under new quarantine rules.

5.2.2 Import parity prices

The import parity prices shown in Table 5.1 are based on prices for frozen sockeye and coho from the United States and Canada to the Japanese market.[6] A third category 'Other salmon' includes a mix of high and lower value salmon (chinook, chum and pink) for which a detailed breakdown of prices

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[5] The import parity price is calculated as the import price for fresh US sockeye in Japan less estimated air freight costs from Alaska to Japan ($1.50 per kilogram) plus estimated air freight costs from Alaska to Australia ($3 per kilogram). The import price is an average of monthly import prices (converted into Australian dollars using monthly exchange rates) weighted by import volumes.

[6] According to Kusakabe et al (1989, pp. 60–3), differences in prices exist due to perceptions of quality differences related to country of origin.

was not available. The figures are adjusted to reflect estimated sea freight costs from North America to the Australian market.

Table 5.1: Estimated import parity prices for frozen Pacific salmon, 1996[a]

Species	*Country of origin*	*Import price in Japan*[b]	*Estimated import parity price in Australia*[c]
		A$/kg	A$/kg
Sockeye	United States	6.60	7.10
	Canada	9.60	10.10
Coho	United States	4.90	5.40
	Canada	5.30	5.80
Other salmon[d]	United States	5.60	6.10
	Canada	3.00	3.50

a Head-on, gilled and gutted.

b Each import price is an average of monthly import prices (converted into Australian dollars using monthly exchange rates) from January to October 1996, weighted by monthly import volumes.

c The import parity price is calculated as the import price in Japan less estimated sea freight costs from North America to Japan plus estimated sea freight costs from North America to Australia.

d 'Other salmon' includes chinook, chum and pink.

Source : JTA (various); Commission estimates

Transport costs are typically determined by the size and frequency of shipments as well as the form of salmon product (fresh or frozen). The cost of shipping frozen salmon from North America to Japan by sea is estimated at about 50 cents per kilogram. The Commission estimates that sea freight costs from North America to Australia would be higher at around $1 per kilogram, largely reflecting additional fuel costs and small volume shipments.

While annual estimates of import parity prices are a useful guide to landed prices, they can mask considerable variability in import prices and exchange rates over the year. For instance, the monthly import price of frozen North American sockeye in Japan ranged from $4.90 per kilogram to $11.50 per kilogram between January and October 1996. The average monthly value of the Australian dollar varied between 78 yen and 89 yen over the same period.

The import parity prices have been estimated on a head-on, gilled and gutted basis. Processing beyond this stage to conform with quarantine protocols would increase landed and ex-factory prices.

5.2.3 Quantities of imports

Australia imported small quantities of uncanned salmon products before imposing the quarantine ban in 1975. According to the TSGA (1996c, p.42), Canada exported 123 tonnes of salmon to Australia in 1974. The Commission estimates that around half of this was fresh or frozen salmon.[7]

The Commission asked salmon industry representatives in Canada and the United States to comment on the likely quantities of salmon exports to Australia. The British Columbia Salmon Marketing Council was reluctant to 'offer a view on a hypothetical situation' (Sub. 3, p. 2).

There is some evidence suggesting that imports might occur, at least initially, on a relatively small scale. In 1995, Canada gained greater access to the New Zealand salmon market following a relaxation in quarantine restrictions. Although the Canadian producers obtained a permit for imports of 40 tonnes, only 10–20 tonnes of frozen chum salmon have been imported so far (New Zealand King Salmon, personal communication). The Food and Beverage Importers Association believes that quantities of salmon imports into Australia would be relatively small at first, and suggests that initial imports would be under 200 tonnes per year (Sub. 4, p. 1).

It may make commercial sense to test the market with trial shipments before committing to exports on a larger scale. If the North American product gained a foothold in the Australian market, then imports could increase.

5.2.4 Competition between Atlantic and Pacific salmon

As noted above, salmon imports from North American are likely to comprise both high and lower value frozen Pacific salmon species.

Prices on international markets reflect actual and perceived quality differences. The highest prices are generally paid for Atlantic, chinook, sockeye and to a lesser extent, coho salmon. US export prices provide an indication of the extent of perceived quality differences among Pacific salmon species (Table 5.2).

Different perceptions of quality may reflect many factors, including technical differences among salmon species (oil content and colour), consumer familiarity, country or region of origin, and the taste preferences of different markets for different species. For example, Atlantic salmon have more oil and

[7] This estimate is based on data provided in the Industries Assistance Commission report, *Fisheries and the Fish Processing Industry* (IAC 1978, pp. 124–30).

a 'richer' colour than have some other salmon, and these characteristics are considered desirable in some markets.

Table 5.2: Export prices for Pacific salmon species, United States, 1996

Species	*Export price*[a] US$/kg	*Quality premium*[b] US$/kg
Chinook	4.80	0.40
Sockeye	4.40	0.80
Coho	3.60	1.20
Chum	2.40	0.30
Pink	2.10	–

a Each export price is an average of monthly US export prices from January to August 1996 weighted by monthly US export volumes.

b The quality premium is calculated as the difference between the price of the species and the price of the next lowest value species.

Source : Salmon Market Information Service (University of Alaska)

There is little empirical evidence on substitution among salmon species in the Australian market. Local salmon growers expressed the view that Pacific salmon imports would not compete with Atlantic salmon products. The TSGA (1996b, p. 2) said that '... the inferior Pacific variety will not be seen as a substitute for the Tasmanian Atlantic salmon.'

However, this view is not shared by Pacific salmon producers in New Zealand (Big Glory Seafoods and New Zealand King Salmon Company, personal communication). Producers in that country believe that chinook salmon would compete with Atlantic salmon despite some minor differences in presentation.

Most of the empirical studies also support the proposition that some substitution among salmon species does occur (Box 5.2). In particular, consumers are likely to pay more for higher value species (Atlantic, chinook and sockeye) than they would for lower value species (coho, chum and pink).

Based on the available evidence, the Commission considers that Australians are likely to view Atlantic salmon and high value Pacific salmon as reasonably close substitutes when presented in the same form (fresh or frozen). Lower value species of Pacific salmon are more likely to compete with lower priced frozen fish (such as frozen cod and flake) in the Australian

Box 5.2: Empirical evidence on substitution between Atlantic and Pacific salmon

Overseas studies found that some substitution does occur between (Norwegian) farmed Atlantic salmon and certain high valued species of wild Pacific salmon. In a survey of US seafood wholesalers, Rogness and Lin (1986) found that almost 80 per cent of wholesalers considered fresh Pacific salmon to be a substitute for Norwegian salmon while around one-quarter of respondents considered frozen Pacific salmon to be a substitute for Norwegian salmon (which are predominantly available in fresh form).

In another study, Herrmann, Lin and Mittelhammer (1990) pointed out that Norwegian salmon are mainly handled in the fresh form, suggesting that substitutability may also depend on whether the product is fresh or frozen. However, they found that when fresh salmon are unavailable, frozen Atlantic and frozen Pacific varieties are close substitutes.

Herrmann, Mittelhammer and Lin (1993) also examined substitution relationships among different species of salmon in the world's major markets — North America, Japan and the European Community. Their results suggest that wild caught high value Pacific salmon and farmed Atlantic salmon are substitute goods in the European and North American markets. Substitution effects between Atlantic salmon and lower value Pacific salmon were not found to be significant in these markets.

seafood market. For any given salmon species, Australian consumers are likely to pay a premium for fresh over frozen product.[8]

5.3 Potential effects on consumers and producers

The TSGA has stated that it does not consider the trade effects (as opposed to disease effects) of allowing fresh and frozen North American Pacific salmon imports to be a major issue. The industry believes that these imports would have only a minimal effect on the market for Atlantic salmon. As evidence of the local industry's competitiveness, the TSGA points to the significant growth in the demand for Australian sourced smoked product which competes

[8] It was noted in Chapter 4 that the 'premium' for fresh over frozen Atlantic salmon is $2–3 per kilogram.

with imports. It also believes that imported Pacific salmon would not be seen as a substitute for the Tasmanian product (TSGA 1996b).

In deriving an import parity price for imported salmon to compare with the farmgate price of fresh Australian Atlantic salmon, it is important to choose a quality of imported salmon as close to the Australian product as possible. Among the products shown in Table 5.1, sockeye salmon would be closest to Australian Atlantic salmon in quality. Taking the import parity price of $7.10 per kilogram of US sockeye and adding $2 per kilogram for a frozen/fresh differential would bring the price to $9.10 per kilogram (which is conservative). This price would be above the estimated current Australian domestic farmgate price for fresh Atlantic salmon after allowing for quantity discounts and other factors discussed in section 4.1. Thus there would appear to be little direct price competition from imported frozen Pacific salmon for fresh Australian Atlantic salmon on the Australian market at current prices.

But would there be a significant switch in demand away from Atlantic salmon arising from the availability of frozen Pacific salmon? Evidence on the degree of substitution is not available, although the industry suggests that the substitution is likely to be no greater than that for a number of other fish products. Ocean trout, a reasonably close substitute, is already available at a significantly lower price per kilogram.

ABARE doubts that smoked salmon producers would benefit from the removal of the import ban:

> They [smoked salmon producers] would need a strong cost advantage over processors from other countries to make it viable for them to import frozen salmon, process it and then compete with smoked salmon suppliers from other countries ... There is no conclusive evidence to indicate that Australian smoked salmon producers do have any comparative advantage. (Sub. 26, p. 22)

However, Springs Smoked Seafoods, a large producer of smoked salmon for the domestic market, states that:

> If the [quarantine] barrier is dropped ... [we] would immediately import frozen Pacific salmon from Canada to allow [it] to offer ... clients across Australia ... a [wider] range of smoked salmon of different qualities at a range of prices. (Sub. 15, p. 1)

The Commission's view is that Australian consumers may benefit from having a wider choice of salmon products, including lower price/quality combinations of frozen and smoked salmon, but the benefits to domestic consumers and smokers are likely to be small. This is because it would be cheaper for salmon to be smoked in North America before being shipped to Australia.

For the above reasons, the entry of North American imports is unlikely to alter the domestic demand for Australian Atlantic salmon significantly. Furthermore, Australian firms have demonstrated their capacity to compete successfully on export markets and against heat treated imports on the domestic market. Australia accounts for about 9 per cent of the fresh import market in Japan, where it competes against the world's major salmon producing countries. In the domestic market, Australian sourced smoked product has progressively displaced imports since the late 1980s and now accounts for around 90 per cent of the smoked market segment in volume terms.

Evidence was presented that the Australian Atlantic salmon industry has the ability to adjust if imports generate increased competitive pressures. As noted in Chapter 2, average costs of Australian producers have been declining since the early 1990s. While costs appear to be higher than overseas, there may be scope for further efficiencies if local producers and feed suppliers adopt 'best practice' technology and processes, adapted to local conditions

Recent plans for expansion suggest that domestic producers anticipate a growing market for salmon. The sea cage trial at Trumpeter Bay, for example, indicates that producers are seeking ways of overcoming the limits on production resulting from constraints on the availability of suitable inshore sites. Production is also expanding in mainland states; for instance, a firm is currently growing Atlantic salmon in South Australia. It expects that salmon production in that region will grow to around 3000 tonnes over the next fifteen years (South East Atlantic Salmon, Sub. 13, p. 1).

As noted in Appendix D, Australia's exports of fresh Atlantic salmon receive a premium price in Japan — the premium averaged 16 per cent over the year to February 1996. The Commission was told by a number of participants that the industry's clean and pure image and disease free status underpin its marketing strategy abroad. If consumers in overseas markets view the quarantine ban as a form of quality assurance, its removal could adversely affect the premium. However, perceptions are probably more closely related to Australia's actual disease status. Thus, allowing imports is unlikely to have any effect on the export price premium, unless disease is introduced to Australia.

The local salmon industry argues that any decision to allow fresh and frozen salmon imports would impose additional costs on producers, given the increased risk of disease. The TSGA (1996c) anticipates that a relaxation in quarantine protocols would undermine investor confidence, change the industry's risk profile and insurance costs, and necessitate further spending on health surveillance programs.

5.4 Adjustment issues

The potential adjustment options facing the Australian farmed Atlantic salmon industry include cost reductions, further product differentiation and diversification. The Tasmanian Government may also be able to play a role through ensuring that the regulatory environment does not impede industry adjustment.

While there are several possible adjustment paths, detailed assessments of many of these are outside the scope of this study because they require specific expertise on biological and environmental matters.

5.4.1 Cost reductions

In Chapter 2, it was noted that the Australian industry has deliberately chosen to produce a high value product by operating at low stocking rates. However, the ability to move toward higher stocking rates is limited as a result of the warmer Tasmanian waters: the industry claims that significantly higher stocking is not a viable option (transcript, pp. 50–2).

Although the Commission does not have specific evidence other than industry statements at the roundtable conference (transcript, pp. 40–7), there appears be scope to reduce production costs without significantly compromising quality. As noted in Chapter 2, the industry has reduced costs significantly over recent years because it has been learning by doing and innovating, and the industry expects these developments to continue in what is still a young industry. The cost savings may occur in activities such as packaging and distribution, as well as in fish production.

5.4.2 Product differentiation

Rather than foregoing product quality, the industry could respond to Pacific salmon imports by further product differentiation. This would entail raising Australian consumer awareness of differences between their product and imported Pacific salmon, given that most imported salmon is likely to be frozen rather than fresh. The industry has successfully emphasised its quality product and image abroad; it could also be expected to devote resources to this marketing in Australia.

However, marketing efforts directed at the general consumer market may not be as effective as marketing to restaurants and hotels; these buyers may be more receptive to quality differences than are the general public.

5.4.3 Diversification

There may be scope for growers to move into the production of other aquaculture species. Most companies also grow ocean trout and some are involved in the production of shellfish.

Participants suggested that the current investment in equipment and skills has only limited ability to be used for other fish. The most likely immediate option is ocean trout, but this product would also be subject to competition from the North American Pacific salmon (and probably even more so than Atlantic salmon). There are also differences between the ideal growing conditions for salmon and trout.

The Commission is aware of research into alternative species but industry participants were sceptical about their commercial viability in the short to medium term.

5.4.4 Impediments to adjustment

The industry's ability to adjust its production and marketing can be limited by commercial as well as regulatory barriers. For example, the ability to increase output depends on the access to farm sites, smolts and air freight.

As noted earlier, site availability has been restricted since the 1988 moratorium, but the recent release of marine farm development plans may permit further expansion. It is unclear yet as to whether the operation of the new system will allow for the efficient allocation of marine farm sites.

Until 1995, smolt access was somewhat restricted under Tasmanian smolt legislation. There is interest in new hatcheries but participants expressed uncertainty regarding the Tasmanian Government's plans for Saltas.

In Chapter 2, it was noted that air freight accounts for a significant part of the total cost of producing and distributing salmon. Several participants claimed that current air freight services are inadequate. These matters are subject to review by the House of Representatives Standing Committee on Communications, Transport and Microeconomic Reform.

Potential impediments to trade are described in Appendix D (section D.3).

5.5 Regional effects

Given available evidence, imports of fresh and frozen wild caught Pacific salmon from North America are likely to have little effect on the quantity of Australian Atlantic salmon produced. Thus, regional effects are unlikely to be

significant, although cost saving could have implications for employment expansion.

APPENDIX A: PROCESS AND PARTICIPANTS

The terms of reference for this research project were signed by the Treasurer on 12 September 1996. They are reproduced before the key findings at the front of the report.

This study is a result of a request by the Minister for Primary Industries and Energy to the Treasurer for the Industry Commission to examine the possible economic and social impacts that could result from imports of uncooked, wild, adult, ocean caught Pacific salmon product from Canada and the United States if permitted into Australia. In January 1994, Canada requested GATT consultations with Australia on the quarantine restrictions on the imports of salmonids into Australia. The United States later joined these consultations. In a letter to the TSGA, the Minister for Primary Industries and Energy pointed out that the Commission's study is completely separate from the AQIS import risk analysis.

The Commission was originally requested to complete its report within three months.

Although the reference was not an inquiry under the terms of the *Industry Commission Act 1989*, the Commission has encouraged the maximum public consultation and participation possible given the short timeframe of the study. Advertisements for the reference were placed in the press, and a circular inviting submissions was sent in mid-September 1996 to a range of individuals and organisations thought likely to have an interest in the inquiry. Attached to the circular was a brief guide for those preparing submissions and an outline of the Commission's information requirements. In total, 30 submissions were received (Table A1).

As well, the Commission held a number of informal discussions with industry representatives and Commonwealth and state government agencies (Table A2) to seek information and discuss the effects of salmon imports.

On 21 November 1996, the Commission forwarded a working paper to participants for their comment. In response, the TSGA requested that the Treasurer extend the length of the study by 30 days and asked that the Commission provide the opportunity to discuss formally the findings of the working paper.

In response, the Treasurer extended the report date to 24 December 1996, enabling the Commission to hold a roundtable conference with participants (Table A3) in Hobart on 11 December 1996.

Table A1: List of submissions

Participant	*Submission number*
ABARE	26
Anthony Ritchie	1
Aquatas	27, 28
AQIS	18
Australian Trout Foundation	9
BC Salmon Marketing Council (British Columbia, Canada)	3
Department of Natural Resources and Environment (Victoria)	17
Department of Premier and Cabinet (Tasmania)	22
Department of Primary Industry and Fisheries (Tasmania)	7, 16, 24
Food and Beverage Importers Association	4
Huon Valley Council	10
Inland Fisheries Commission	11, 21
Kingborough Council	8
New Zealand King Salmon Company	19
Nortas	29
Pacific Seafood Management Consulting Group	23
Paramount Seafoods	5
Senator Shane M. Murphy	14
South East Atlantic Salmon	13, 25
Springs Smoked Seafood	2, 15
Tasmania Development and Resources	6
Tasmanian Salmon Growers Association	12
Tassal	30
Victoria Atlantic Salmon	20

Table A2: List of visits

ABARE
Aquatas
Big Glory Seafood Company (New Zealand)
Commerce Commission (New Zealand)
Department of Environment and Land Management (Tasmania)
Department of Premier and Cabinet (Tasmania)
Department of Primary Industries and Energy (Commonwealth)
Department of Primary Industry and Fisheries (Tasmania)
Department of Treasury (New Zealand)
Gibson's
Goulburn River Trout
Huon Aquaculture Company
Marine and Freshwater Institute (Snobs Creek – Victoria)
Ministry of Fisheries (New Zealand)
Mures Tasmania
New Zealand Fishing Industry Board
New Zealand King Salmon Company
Nortas
Senator Shane M. Murphy
Tasmania Development and Resources
Tassal

Table A3: Roundtable conference participants, Hobart 11 December 1996

Aquatas
Department of Primary Industry and Fisheries (Tasmania)
Huon Aquaculture
Nortas
Salmon Enterprises of Tasmania (Saltas)
Tasmania Development and Resources[a]
Tasmanian Salmonid Growers Association
Tassal

a Participated as observers only.

APPENDIX B: SALMON PRODUCTION

Aspects of Atlantic salmon production are covered in this appendix, including:

- *the various commercial salmon (and related) species;*
- *stages in Atlantic salmon production;*
- *Australian Atlantic salmon industry statistics;*
- *the structure of the Australian Atlantic salmon industry; and*
- *production costs.*

Australian farmed Atlantic salmon producers originally transferred salmon aquaculture techniques used overseas. However, since beginning they have had to develop methods to suit specific local conditions in order to achieve production efficiencies.

B.1 Salmon species

Atlantic salmon (*Salmo salar)* are a close relative of the popular recreational fish, brown trout *(Salmo trutta)*. They are found naturally around the North Atlantic, from the United States and Canada to Scandinavia and Europe.

The term 'Pacific salmon' refers to a number of salmon species (Table B1) found around the North Pacific, from the United States and Canada to Russia and Japan. These salmon, along with another popular recreational (and commercial) fish, the rainbow trout, are species of the genus *Oncorhynchus*.

All of these salmon are members of the family *Salmonidae*, commonly known as the salmonids. Australia's quarantine restrictions apply to all salmonids.

Fish identities can be confusing in commercial markets because varying combinations of marketing names, common names and scientific names are used in different markets. This can be particularly confusing in the case of rainbow trout, which is also sold as ocean trout, salmon trout and steelhead. The so-called *Australian salmon* (*Arripis trutta* and *Arripis truttaceus*) are actually marine perch and not salmonids.

There are moves toward standardisation of fish marketing names in Australia (FRDC 1995b). The existing published list of marketing names is only a recommended list.

Table B1 Salmon species

Common name	*Genus*	*Species*
Atlantic salmon	*Salmo*	*salar*
Brown trout	*Salmo*	*trutta*
Rainbow trout	*Oncorhynchus*	*mykiss*
Sockeye salmon	*Oncorhynchus*	*nerka*
Chum salmon	*Oncorhynchus*	*keta*
Coho salmon	*Oncorhynchus*	*kisutch*
Pink salmon	*Oncorhynchus*	*gorbuscha*
Chinook salmon	*Oncorhynchus*	*tshawytscha*

Source : McGraw-Hill 1982

B.2 Atlantic Salmon production

Atlantic salmon pass through a number of readily identifiable stages of development to maturity. Farming salmon allows control over development to improve growth and quality. It also seeks to spread production across the whole year rather than be constrained by salmon's natural seasonal cycles. There are four distinct commercial operations: the hatchery, the farm, processing and distribution.

B.2.1 The hatchery

In the hatchery, ova are stripped from spawning salmon broodstock, then fertilised, hatched and grown in fresh water until the young fish undergo smoltification. At this point the young salmon are called smolt, and are sold to salmon farmers for grow-out in sea cages. The process from spawn to smolt normally takes over a year, although faster development can occur.

A hatchery maintains broodstock especially selected for their ability to produce numerous quality offspring. Continual monitoring of disease and breeding outcomes contributes to ongoing stock improvement.

Natural spawning occurs in May and the new stock hatch out in incubators in June and July. The new fish (fry) are small, so large numbers can be contained

in small volumes of water where it is economic to maintain an environment that promotes growth and survival. Controllable factors include water temperature, water velocity, feed intensity and light exposure.

Hatcheries are land based but require fresh water for operation. For this reason they are usually located near perennial streams. Some tap a continual supply of fresh water, others capture water and reticulate it, only taking further water to top up losses and maintain water quality (Thomas 1995).

As the young salmon grow, the cost of environmental control (especially heating and moving water) increases. Ponds, channels, tanks or a combination of each may be used in these later stages.

B.2.2 The marine farm

Salmon farming begins by introducing smolts into saltwater cages for grow-out into commercially harvestable sizes. The time taken to produce a harvestable fish varies among locations but is often 18–24 months (Bjorndal 1990). In Tasmania, Atlantic salmon can spend as little as 12–15 months in sea cages, during which they grow from around 80 grams as smolts to around 4–4.5 kilograms (TSGA 1995). This rate of growth makes Tasmanian Atlantic salmon among the fastest growing farmed salmon in the world and is attributed to warmer and disease free waters. However, warmer water comes at a cost because it can contribute to greater fish stress in summer and also faster algal growth (leading to cage net fouling).

The description that follows relates to the sea cage type of operation found in Tasmania, although there is one commercial Atlantic salmon farm in inland Victoria that has access to fresh water only. While scale of operation of Victoria Atlantic Salmon is relatively small, it demonstrates that other salmon farming technologies are possible.

After release into saltwater cages, the salmon are fed, kept healthy, protected from predators and eventually harvested. Tasmanian Atlantic salmon grow quickly but grow-out rates are sensitive to many factors that are not always readily controlled, such as water quality and weather conditions. Those that are more controllable, such as feed composition and stocking rates, become the mainstay of salmon husbandry.

Water quality and weather can be indirectly influenced by the selection of suitable sea cage sites. Preferred sites tend to be estuarine because these provide moving saltwater and protection from severe weather for both the sea cages and the associated equipment such as boats and moorings. It can also be

useful to maintain a variety of sites along a river, with upstream brackish water being useful for the early introduction of smolts.

In Tasmania, farm sites are obtainable by lease from the Tasmanian Government. Sites are limited both by suitable area and competition for space with other uses such as recreation. The allocation of sites is described in further detail in Appendix F.

Salmon cages are generally round with circumferences of 60–80 metres. The cages can be equipped with double netting, stronger single nets, covers or placed in caged enclosures to protect the salmon from predators, such as birds and seals. Nortas is currently testing a larger 160 metre circumference cage for use in more open waters. Such sites would increase the area potentially suitable for farming Atlantic salmon and may also reduce the impact of salmon farming on other estuary/sea users. However, offshore caging requires sturdier design and materials to withstand wilder weather and thus is more expensive (Dietzel 1996).

Salmon health maintenance depends upon factors such as environmental conditions, disease prevalence and stock susceptibility, and can involve inoculation and antibiotics. However, health problems are best avoided by maintaining a well fed, clean and stress free population of fish. Therefore, activities undertaken to promote fish growth and quality — such as cleaning nets, fallowing cage sites, selecting low stocking rates and maintaining feed — simultaneously contribute to fish health.

Feeding salmon is a critical part of the production process. Feed accounts for around 40 per cent of operating costs, and problems with feed efficiency can significantly affect industry competitiveness (section B.5). Recent feed development has led to a fall in feed conversion ratios,[1] which can reduce the cost burden of feed.

Salmon are fed a combination of fish meal, oil and other additives such as colouring pigments[2] and vitamins. Feeding rates are designed to promote growth but in a manner that lowers the likelihood of the early onset of maturity. Feeding can be manual or automatic, with more recent automatic feeders being linked to feed sensors. These permit feeding to occur as needed, rather than automatically dispensing food at predetermined intervals (Purser 1995). Some operators prefer to maintain manual feeding because it encourages inspection of salmon stocks.

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1 The ratio of kilogram dry weight of feed required to produce 1 kilogram of fish.

2 For example, carotenoid pigments give salmon its pink colour. Wild salmon obtain these pigments by eating crustaceans.

Maintaining meat quality is a paramount concern in harvesting for both enabling the fish to be deemed fit for human consumption (such as being free of faeces and residues) and maintaining sales value. Harvesting that does not overly stress the salmon assists quality maintenance. For example, cold water and carbon dioxide slow the salmon's metabolism. A natural sedative is also being tested by Aquatas (O'Sullivan 1996) which calms the fish before they are harvested.

B.2.3 The processing plant

Once harvested, salmon are processed for consumption. As with fish generally, conversion to market form can be as simple as gutting a whole fish. However, Atlantic salmon are often sold as higher value products such as fresh fillets or smoked salmon. The final products are discussed in Appendix C.

Being a food product, salmon processing must be carried out in a manner that meets state hygiene standards. AQIS certification of the processing plant is also required for export purposes (Appendix D).

B.2.4 Distribution

A final but important part of this stage of salmon production involves transporting the prepared fish to market. This is particularly important for Tasmanian growers because most of their product goes to mainland Australia or abroad. Transport of fresh product must be carried out quickly and with minimum disruption. Difficulties that salmon producers face with air freight are discussed in Appendix D.

B.3 Australian Atlantic salmon industry production

Almost all production of farmed Atlantic salmon in Australia occurs in Tasmania, although small amounts are also grown in inland Victoria and South Australia. Production began in Tasmania in 1985 and the first commercial harvest of Atlantic salmon in that state occurred in 1986–87 (Table B2). Production grew rapidly over the first ten years from 20 tonnes in 1986–87 to around 7000 tonnes in 1995–96.

There is also a commercial rainbow trout industry, largely based in Victoria and Tasmania, that produces around 2000 tonnes a year. Rainbow and brown trout and some salmon species are also grown for release into recreational fisheries across Australia.

Table B2 Atlantic salmon production in Tasmania

	Volume (tonnes)[a]	*Value* ($million)[b]
1986–87	20	na
1987–88	50	na
1988–89	380	6
1989–90	1 750	21
1990–91	2 650	32
1991–92	3 538	42
1992–93	3 910	55
1993–94	4 496	54
1994–95	6 084	55
1995–96[p]	7 000	63

a Head-on, gilled and gutted.
b Based on ABARE average farmgate prices.
p Preliminary estimate.
na Not available.
Sources : TSGA Sub. 12; ABARE *Australian Fisheries Statistics*

B.3.1 Related industries

The presence of the Atlantic salmon aquaculture industry (hatchery, farm and processing) has attracted investment in ancillary supply industries, including cage builders, net makers, feed makers, veterinarians, boat builders, transporters and distributors, financiers and marine insurers. It is not known how much of the development of these related industries can be attributed to the presence of salmon over other aquaculture or fishery activities, nor to what extent their development has moved investment away from other activities.

B.4 Industry Structure

B.4.1 Hatcheries

The Commission understands that there are six hatcheries actively producing Atlantic salmon in Tasmania. Saltas operates the largest two, and had

legislated dominance over smolt production until 1995 (Chapter 3). Other hatchery operators include Nortas and Petuna–Sevrup.

B.4.2 Marine Farms

Although 36 marine farm sites are leased, farm production is in the hands of seven companies and dominated by only a few of these. Tassal is the largest and the bulk of the remaining production is with Aquatas, Huon Aquaculture and Nortas. Others are Petuna Seafarms–Sevrup (part of Petuna Seafoods), Southern Ocean Trout and Seafarms.

B.4.3 Processing and sales

Processing is mainly in the hands of four companies — Tassal, Nortas, Aquatas and Petuna–Sevrup — with the first three dominant. Tassal processed around 57 per cent of Tasmanian production in 1995–96 (Tassal 1996; TSGA Sub. 12). Huon Aquaculture grows Atlantic salmon but does not process fish. It is contracted to sell most of its output to Tassal and some to Petuna. There are also some independent smokers such as Springs Smoked Seafoods in South Australia (Sub. 2).

B.4.4 Feed

The sole domestic producer of salmon feed to the Tasmanian industry is Gibson's. However, there is no regulatory barrier preventing another manufacturers from entering the market. Other fish feed manufacturers operate in Australia, such as Ridley Agriproducts in Brisbane.

Imports of fish feed and fish meal are possible, although quarantine rules require that they be heat treated. Gibson's mostly relies on fish meal imports, mainly from Chile.

B.4.5 Cages and nets

There are numerous cage and net providers in Tasmania, elsewhere in Australia and around the world. Local suppliers may have some advantage from their local presence, but the Commission was informed that cages, nets and related services are traded across state and national borders.

B.5 Production costs

A number of sources and participants have suggested that Tasmania is a relatively high cost salmon producer by world standards. Although the 1994 costs in Table B3 support this view, they must be treated with caution as relative on-farm costs are affected by site availability and production biases. Further, the Australian cost data are based on costs for a model farm compiled as a result of a DPIE industry survey, rather than being the direct results of a wider industry survey. Costs have been falling since the industry began (transcript pp. 38–9) and the gap between Tasmanian costs and other countries' costs probably has narrowed since 1994. However, roundtable participants considered that the costs presented were a reasonable representation.

Possible explanations for Tasmania's relative cost disadvantages are that:

- it is a young industry that has yet to reach lowest cost production possibilities;
- extra costs are imposed by the warmer waters, such as more net cleaning, larger net inventories, gill amoeba problems and a more vigorous seal population;
- a deliberate decision was made to produce a high quality product by using high quality but high cost inputs and running at lower stocking rates; and/or
- it is a small industry that is unable to take advantage of economies of scale in feed supplies and/or markets.

Tasmania has the advantage of not requiring much expenditure on disease control. The major problems faced in Tasmania are the gill amoeba and *Vibrio anguillarum*, both being normal seawater micro-organisms. The former is treated by bathing the salmon in fresh water. The latter can become a problem when smolts are first introduced into saltwater, and is controlled by vaccinating smolts while still in the hatchery and good husbandry.

Table B3 Total average on-farm salmon production costs by country, 1994

	Cost ($US/live kg)
Chile	2.26
Norway	2.30
Canada — west	2.66
Canada — east	3.06
Tasmania	3.72

Sources : Forster 1995; Commission estimates

Like salmon aquaculture in other countries, the major costs of production for the Tasmanian industry are fish feed, labour and smolts (Table B4).

The disease costs presented in Table B.4 appear to be small relative to other costs. However, the stresses imposed by the warm water climate would make Tasmanian Atlantic salmon more susceptible if new diseases enter their environment (TSGA 1996c).

Table B4 Average on-farm salmon production costs by item and country, 1994[a]

	Chile	*Norway*	*Canada west*	*Canada east*	*Tasmania*
	($US/live kg)				
Smolt	0.30	0.34	0.64	0.78	0.50
Feed	1.10	1.16	1.20	1.30	1.60
Labour	0.18	0.38	0.32	0.54	0.68
Health	0.04	0.02	0.06	0.06	0.00
Insurance	0.04	0.04	0.04	0.04	0.16

a The total on-farm costs in Table B3 include cost items not listed in this table, such as capital costs. Therefore the costs in this table do not sum to the totals in Table B3.

Sources : Forster 1995; Commission estimates

APPENDIX C: AUSTRALIAN MARKET FOR ATLANTIC SALMON

Despite Australian per person consumption of fish stagnating in the 1990s, the market for Atlantic salmon in Australia has experienced strong growth. Nevertheless, Australian consumption of salmon remains small relative to total consumption of other protein products such as beef and veal. Fresh, frozen and smoked are the main forms of Atlantic salmon available, but there is no clear evidence on the relative proportions in which each of these products is consumed.

In this Appendix the Australian market for Atlantic salmon is examined. In particular, Australian per person consumption of fish is compared with the per person consumption of other protein sources (section C.1). Trends in Australia's consumption of Atlantic salmon are described in section C.2 and the product forms in which Australian's consume Atlantic salmon are noted in section C.3. The trend of imports of Atlantic salmon is described in section C.4 and the distribution of Atlantic salmon in the Australian market is discussed in section C.5.

C.1 Per person consumption of fish

Fish products account for only a small share of the Australian diet. In 1994–95, fish comprised only 11 per cent of total per person consumption of meat and fish products (Table C1).

Australians consume a small amount of fish relative to consumption levels in other high income countries. According to the most recent data available, per person consumption of fish in 1993 totalled 68 kilograms in Japan, 23 kilograms in the United States and 17 kilograms in the United Kingdom.[1] Given its high level of per person consumption, Japan is considered to be one of the most developed and sophisticated markets for fish and seafood (Appendix D).

After experiencing strong growth over the 1980s, per person fish consumption in Australia stagnated in the 1990s. According to ABARE (1991, p. 5), per person fish consumption rose by around 16 per cent over the 1980s. Factors

[1] Data provided by the FAO.

such as higher disposable incomes and an increased health consciousness in the community may have contributed to this rise. The recent slowdown in growth in per person consumption of fish may be due to rising fish prices resulting from declining availability of supplies of wild caught fish.

Table C1: Per person consumption of beef and veal, sheepmeat, pigmeat, chicken and fish, 1994–95

	Per person consumption	*Proportion of total per person consumption*
	(kg)	(%)
Beef and veal	40	36
Sheepmeat	25	22
Pigmeat	20	18
Chicken	15	13
Fish[a]	12	11
Total	112	100

a Calculated by dividing total fish production (less exports) by the population.
Source : IC 1995a

C.2 Consumption of Atlantic salmon

Whereas overall consumption of fish stagnated in the 1990s, consumption of Atlantic salmon grew strongly. Between 1990–91 and 1995–96, consumption of Atlantic salmon products in Australia increased by just under 300 per cent (Table C2).

Higher consumption may partly reflect lower Atlantic salmon prices as supplies to the local market have increased and as many other fish prices have risen. The proportion of Tasmanian Atlantic salmon production supplied to the domestic market has steadily increased over the 1990s from around 35 per cent in 1990–91 to around 60 per cent in 1994–95 (Table 2.3). According to Springs Smoked Seafoods (Sub. 2, p. 1), the price of fresh, chilled Tasmanian Atlantic salmon has fallen by 20 per cent since 1994.

Despite the marked increase in consumption of Atlantic salmon products, Atlantic salmon remains a relatively small proportion of the total fish market and of protein product consumption in general. In 1994–95, consumption of Atlantic salmon comprised around 2 per cent of the 206 589 tonnes of fish consumed in that year. On a per person basis, consumption is negligible (around 0.3 kilograms in 1995–96) compared to the large per person quantities of beef and veal, sheepmeat and pigmeat consumed (Table C1).

Table C2: Australian consumption of Atlantic salmon

Year	*Domestic consumption*[a] (tonnes)
1988–89	450
1989–90	601
1990–91	1 152
1991–92	1 585
1992–93	1 762
1993–94	2 214
1994–95	3 629
1995–96	4 277

a Head-on, gilled and gutted, and includes imported smoked Atlantic salmon.
Source : TSGA Sub. 12, Attach. 1

The three-fold increase in domestic consumption and the decline in the domestic price of Atlantic salmon products since the early 1990s suggests that Australians are acquiring a taste for salmon and/or demand is quite price elastic. However, there are no studies which provide evidence on the own-price elasticity of demand for Atlantic salmon in Australia. Atlantic salmon has been found to have a high own-price elasticity in the European Community, Japan and North America (Herrmann, Mittlehammer and Lin 1993; Wessells and Wilen 1994; and Bjorndal 1990).

There is little empirical evidence on the effect of changing income levels on demand for Atlantic salmon in Australia or elsewhere. However, it is generally considered that Atlantic salmon competes on the domestic market with other high value fish and seafood species such as barramundi and lobster (section 4.2). This suggests that Atlantic salmon is viewed as a luxury item with a relatively high income elasticity.

C.3 Consumption by form

The principal forms in which Atlantic salmon are consumed are fresh, frozen and smoked. Fresh Atlantic salmon are available as whole, head-on, gilled and gutted fish or as steaks and fillets. As noted in section C.2, the wholesale market price of fresh salmon has fallen significantly in the 1990s.

Smoked salmon are available as either cold smoked or hot smoked. ‘A cold smoked product is fundamentally a smoked flavoured raw product’ produced by smoking the salmon at a temperature between 25 to 28 degrees (transcript pp. 32 & 34). Hot smoked salmon are produced by smoking the product at a temperature high enough (usually around 80 degrees) to cook the flesh

(transcript p. 32). This produces a product very different in appearance from the cold smoked product.

In the past, frozen salmon were largely used as a means of supplying the market during the off-season. However, as fresh salmon have become available year-round, very little frozen salmon are now sold on the domestic market. Salmon growers use the majority of frozen salmon for their own processing:

> ... frozen salmon to the domestic market is almost finished in terms of the wholesale situation because of our year-round supply. I think that most of us are only using frozen salmon now to give us some right sized fish for our own internal processing of value added products ... there would be very little frozen salmon sold in Australia any more. (transcript p. 80)

When frozen salmon are sold on the domestic wholesale market, it generally sells for around $2–3 per kilogram less than the wholesale market price for fresh salmon (section 4.1).

Atlantic salmon are not generally used in canning as Atlantic salmon can earn a higher price as a fresh or smoked product than it could as a canned product. Most canned salmon is Pacific salmon, especially pink salmon.

There are no reliable data on Australian consumption of Atlantic salmon by product type. Information is available on production of different products (Table C3) and shows that the majority of Atlantic salmon produced is in fresh form.

These figures may under or overstate final consumption of different salmon products. Significant quantities of fresh salmon and most frozen salmon are sold to other companies who may smoke or process the fresh product for sale to domestic and export markets. Springs Smoked Seafoods, a salmon smoker in South Australia, alone will purchase ‘around 500 tonnes of Tasmanian raw salmon’ (Sub. 2, p. 1) in 1996–97. This suggests that final consumption of smoked salmon may be much higher than indicated in Table C3.

Table C3: Domestic sales by the Tasmanian Atlantic salmon industry, 1995–96

	Volume (Head-on, gilled and gutted equivalent tonnes)	*Proportion* (per cent)
Fresh[a]	2 440	60
Frozen[a]	410	10
Cold smoked, hot smoked, and other[b]	1 250	30
Total	4 100	100

a Some of these sales are to other processors.

b Mainly cold smoked sales.

Source : TSGA estimates

C.4 Imports

Under current quarantine regulations, salmon products cannot be imported into Australia unless subject to treatment deemed likely to prevent the introduction of disease. This effectively stops imports of fresh, frozen and some cold smoked salmon. Consequently, Australian Atlantic salmon producers do not face competition in the supply of these products to the Australian market. Imports of hot smoked salmon originate predominantly from New Zealand, Denmark and Norway (Springs Smoked Seafoods Sub. 2, p. 1).

There is concern in the industry that protocols surrounding the importation of smoked product may not be adequate. Springs Smoked Seafoods, for example, suggested that not all imported smoked salmon is hot smoked. Because of incorrect labelling 'Australia has continued to allow cold smoked salmon imports which have ... not been heat treated ...' (Springs Smoked Seafoods Sub. 2, p. 2).

However, AQIS (Sub. 18, p. 3) has investigated many of these allegations and found them to be:

> ... without basis. One of the points of confusion has apparently arisen as some countries legally define smoked salmon that meets the lower temperatures of Australia's quarantine requirements as cold smoked.

Some clarification of this issue was provided at the Commission's roundtable conference where it was pointed out that there 'is a big difference between heat treatment and hot smoking' (transcript p. 33). Thus some forms of cold smoked product are allowed access to the Australian market.

The share of the expanding Australian Atlantic salmon market held by imports has been declining over the 1990s (Table C4) as Australian production and supplies to the domestic market have increased.

Table C4: Imports of smoked Atlantic salmon, 1988–89 to 1995–96

	Imports (tonnes)	*Proportion of total domestic consumption*[a] (per cent)
1988–89	385	85
1989–90	271	45
1990–91	252	22
1991–92	147	9
1992–93	152	9
1993–94	218	10
1994–95	245	7
1995–96	177	4

a Calculated on total domestic consumption including imports.
Source : TSGA Sub. 12, Attach. 1

C.5 Distribution

The Commission has been unable to obtain reliable information on the ways in which Atlantic salmon products are distributed. Based on discussion with participants, many Atlantic salmon producers undertake their own marketing and distribution of fresh, frozen and smoked product in Australia. Salmon producers sell to a wide range of customers including salmon smokers, restaurants, hotels, motels and clubs, wholesale fish markets and supermarket chains.

APPENDIX D: OVERSEAS MARKETS AND EXPORT OPPORTUNITIES

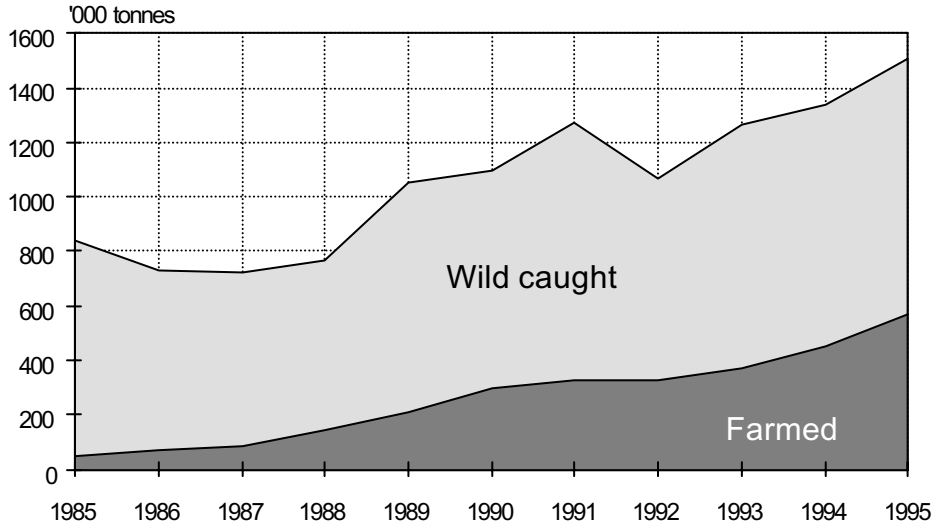
World salmon production has increased significantly over the past decade, reflecting the rapid growth of salmon aquaculture. Australia exported about 40 per cent of its output of farmed Atlantic salmon in 1995–96. Australia has consistently received a price premium over other imported salmon for its exports of fresh Atlantic salmon to Japan, largely reflecting product quality. However, Australia's salmon exporters face impediments to selling on international markets.

In this appendix information is provided on world salmon production and markets (section D.1), Australia's exports of Atlantic salmon and the price premium they attract in Japan (section D.2), trade impediments facing Australian exporters (section D.3), and the growth potential of overseas markets (section D.4).

D.1 World salmon production and markets

World production of salmon has increased from about 840 000 tonnes in 1985 to around 1 500 000 tonnes in 1995. This growth primarily reflects the rapid expansion in farmed salmon production (Figure D1).

Figure D1: Trends in world salmon production, 1985–1995



Sources : Lem and Di Marzio 1996; OECD 1996

D.1.1 Production of farmed salmon

Farmed salmon production was 571 000 tonnes in 1995; most of which was Atlantic salmon (Table D1). Norway — a pioneer of salmon aquaculture — produces about 46 per cent of the world's supply of farmed salmon. Chile and the United Kingdom are also major salmon producers, whereas Australia only produces around 1 per cent of the world's farmed salmon.

Table D1: World production of farmed salmon, 1995

	Atlantic ('000 tonnes) [a]	*Pacific* ('000 tonnes) [a]	*Total* ('000 tonnes) [a]
Norway	260	np	260
Chile	65	42	107
United Kingdom	73	np	73
Canada	32	8	40
Japan	np	27	27
United States	17	np	17
Ireland	15	np	15
Faeroe Islands	13	np	13
Other	15	4	19
Total	490	81	571

a Round weight; the conversion from live weight to round weight is 93.5 per cent.
np Not applicable because little or none is produced.
Source : Lem and Di Marzio 1996

D.1.2 Wild caught Pacific salmon

Landings of Pacific salmon in 1995 were estimated at around 935 000 tonnes (Table D2). The bulk of salmon landings are of pink, chum and sockeye varieties. The annual catch is quite variable, ranging from 620 000 tonnes to 940 000 tonnes over the past ten years. The United States[1], Japan, the CIS and Canada are the major suppliers of wild caught Pacific salmon, a large proportion of which is frozen or canned to ensure year round supply.

[1] According to Lem and Di Marzio (1996), US chum landings have been increasing steadily year by year, aided mainly by successful hatchery programs in Alaska.

Table D2: World production of wild caught Pacific salmon, 1995

	Catch[a] ('000 tonnes)[b]	*Proportion of total* (per cent)
United States	442	47
Japan	268	29
CIS	180	19
Canada	45	5
Total	935	100

a Estimates.
b Live weight.
Source : Lem and Di Marzio 1996

D.1.3 Markets for salmon

Japan is the world's largest consumer of salmon in absolute and per person terms — Japanese consumption of salmon has grown strongly over the past decade to more than 500 000 tonnes (round weight) a year — and Japan is a net importer of salmon despite being a major producer of Pacific salmon. The United States, Chile, Norway and the CIS supplied over 90 per cent of Japan's imports of fresh and frozen salmon in 1995.

The United States is the second largest individual market for salmon in the world. Although consumption varies with the size of the wild catch, it was estimated to have been at least 250 000 tonnes (round weight) in 1995 (Lem and Di Marzio 1996). In per person terms, United States consumption of salmon has more than doubled since the mid-1980s. The United States supplies most of its own needs but also imports fresh salmon from Chile and Canada.

Major salmon markets in Europe are France, the United Kingdom and Germany. France is the biggest single market for salmon in that region, with total annual imports of about 90 000 tonnes product weight (Lem and Di Marzio 1996). The trend in France throughout the past decade has been to substitute Pacific salmon with Atlantic salmon because the latter has become more available (OECD 1996). Norway is the main supplier to the French market.

The UK market for salmon was estimated at 65 000 tonnes in 1995 (Lem and Di Marzio 1996). The United Kingdom imports substantial quantities of canned salmon from the United States and Canada. Scottish and Irish farmed salmon are mainly delivered to the United Kingdom and other parts of the

European Union. Germany imports about 35 000 tonnes of salmon products a year, mostly from Norway (Lem and Di Marzio 1996).

D.2 Australia's salmon exports

The Australian Atlantic salmon industry exports product worth about $40 million a year (Paterson 1996).[2] The volume of Atlantic salmon exports has increased significantly since the industry's inception (Table 2.5), and exports comprise a large but declining share of production. In 1995–96, exports accounted for about 40 per cent of industry output compared with around 80 per cent in 1989–90.

Australian exporters have targeted high value niche markets abroad. Most salmon exports are of fresh product; frozen and smoked product each accounts for a small proportion of total exports. Virtually all Australia's salmon exports are destined for Asian markets, and around 70 per cent are imported by Japan (DPIF 1996c).

A number of supplier industries have evolved in tandem with the farmed salmon industry. These industries have also exploited opportunities presented by a fast growing aquaculture industry overseas. For example, a local fish feed producer exports feed to New Zealand. Equipment manufacturers have exported salmon pens to Canada and Asia, and computerised feeding systems to Japan (transcript, p. 36).

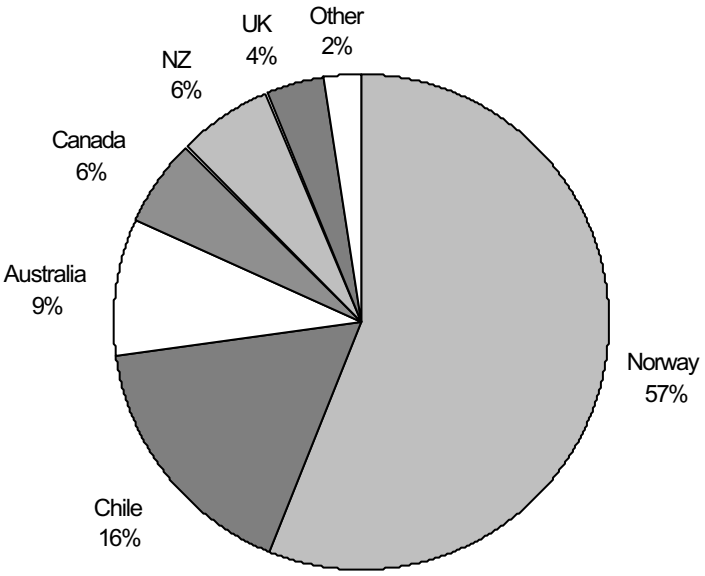
D.2.1 The Japanese market

Most of Australia's Atlantic salmon exports are to in Japan so developments in this market are of particular significance to local producers.

Frozen Pacific salmon accounts for around 90 per cent of Japan's salmon imports but the demand for fresh imports has been growing. Australia's share of fresh imports in Japan was about 9 per cent in 1995–96 (Figure D2). Total imports of fresh Pacific and Atlantic salmon were 21 000 tonnes in that year. The Japanese fresh import market is dominated by Norwegian produce.

[2] These figures differ significantly from those of the ABS in relation to exports. The ABS figure of $17 million for 1995–96 exports is below that claimed by Tassal alone (transcript p. 58). Tassal reportedly earns $28 million annually from its salmon exports (Paterson 1996).

Figure D2: Japanese imports of fresh salmon by country, 1995–96[a,b]



a Includes Atlantic and Pacific varieties.
b Volume basis.
Source : JTA (various)

D.2.2 Price premium in Japan

As shown in Figure 2.1, Australian fresh Atlantic salmon have consistently sold at premium prices on the Japanese import market since the late 1980s. In 1995–96, the average price was around 16 per cent above the average price for Atlantic salmon from other countries. Measured on a financial year basis, the premium averaged about 20 per cent in the early 1990s (varying between 10 per cent and 40 per cent).

Despite being above the world price, the price for Australian Atlantic salmon closely tracks movements in the world price. The general decline in prices on the Japanese market has reflected the strong growth in world supplies of farmed salmon. However, the falling exchange rate in the early 1990s helped sustain the prices received by local producers (in Australian dollar terms) in the face of declining world prices.

Product quality and marketing

According to the DPIF, Tasmanian Atlantic salmon attracts a premium price in Japan as a result of attention to quality (including disease free status) and to servicing the needs of the market (DPIF 1996c). The health and, therefore,

quality of salmon is influenced by factors such as fish husbandry practices, stocking densities and environmental conditions (water temperature and cleanliness).

As ABARE notes, Australia is free of the salmon diseases listed in the *International Aquatic Animal Health Code* (Sub. 26, p. 17), but some diseases can occur even with quarantine regulations in place. For example, gill amoeba sharply increased mortality rates of Tasmanian salmon in the early 1990s. The industry was able to bring this problem under control by flushing Atlantic salmon in fresh water. The current disease free status provides the industry with certain advantages in production and marketing. That is, the absence of exotic diseases means that Atlantic salmon are not treated with antibiotics so the product can be marketed as being chemical free.

It is probable that Tasmanian Atlantic salmon are less exposed to external pollution (for example, sewage and industrial effluent) than are farmed salmon in Europe. In Japan, Australian product is promoted as being clean and pure. Most farms are located in the south-east of Tasmania, which is relatively remote and sparsely populated. There also appears to be a greater risk of pollution from shipping accidents in Europe. For example, following the Braer oil tanker disaster in January 1993, eleven salmon farms in Shetland were put under closure order (Drummond 1993).

The local industry has used promotional materials, advertising campaigns, attractive packaging and informative labelling to re-inforce the quality reputation of Tasmanian Atlantic salmon. ABARE argues that, while superior marketing and packaging could contribute to the premium, this is unlikely to be sustained as a significant factor unless the product is genuinely of a higher quality than salmon from other countries (Sub. 26, p. 18)

Seasonality in production and demand

Several participants told the Commission that Australia is able to supply fresh Atlantic salmon to export markets at times of the year when northern hemisphere producers cannot. In the past, most Tasmanian Atlantic salmon were harvested between September and April while northern hemisphere producers harvested from April to November. The peak months of the wild catch from the north Pacific Ocean are May to October.

Japanese demand for salmon imports is seasonal, with the peaks being from December to April. The end of the calendar year is a period of particularly high salmon consumption in Japan because this is when salary bonuses are paid to employees and new year celebrations take place (ABARE Sub. 26, p. 13). These peak months broadly coincide with the southern hemisphere's

(and thus Australia's) production season and could help to explain the premium prices.

However, in recent years, Atlantic salmon farmers around the world have been able to move toward year round production. For example, Norway has been producing salmon year round since the 1980s (Bjorndal et al 1993). Australian Atlantic salmon producers have exported to Japan on a year round basis since 1994–95. ABARE also observed that Australia receives a premium over the major southern hemisphere producer, Chile, which suggests that factors other than seasonality are important (Sub. 26, p. 14).

In sum, the current price premium mostly reflects buyer perceptions about product quality rather than seasonality.

Risks to the price premium

The domestic industry has expressed concerns about the possible effects of allowing imports on the reputation of its products. This, in turn, may adversely affect Australia's Atlantic salmon exports and the premium prices they attract overseas (section 5.3).

Another concern raised by some industry members is the potential for product relabelling: that is, imports might be processed and/or packaged locally then labelled and re-exported as Australian product. Relabelling practices of this kind mean that foreign producers and local processors and importers are 'free riding' on the local industry's reputation for high quality. The specific concern is that if poor quality imports are re-exported, they may harm the local industry's reputation with consequent effects on the price premium.

These are genuine concerns but appropriate standards and regulations regarding labelling should prevent, or at least deter, such unfair trading practices. Labelling issues were addressed in the Commission's recent report on packaging and labelling (IC 1996).

D.3 Impediments to trade

Australian Atlantic salmon exporters pointed to problems in transporting product by air to overseas markets, and to trade barriers in other countries.

D.3.1 Freight services

Australia's Atlantic salmon exports are mostly of fresh product so the efficiency of air freight services can have an important bearing on the

industry's competitiveness on export markets — not only in terms of price and quality but also in terms of reliability and continuity of supply.

A significant problem encountered by the industry has been the difficulty in securing adequate freight capacity on air services between Hobart and the mainland (Melbourne and Sydney) and on connecting air services to major export markets. Tassal, a large exporter of salmon, has commented that the domestic airline business revolves around passengers and gives perishable freight a low priority (Bailey 1995). In addition, Melbourne has fewer international services than Sydney and has only one direct flight a week to Japan (Ballantine 1996).

Refrigerated storage capacity at Melbourne airport is for only 6–7 tonnes of product, whereas a wide bodied freight aircraft routinely carries 110 tonnes (Ballantine 1996). According to the Tasmanian Government, this facility has insufficient capacity to meet peak demand so fresh product is often left standing in the open, exposed to heat and bad weather (Ballantine 1996).

Restrictive work practices and the lack of heavy handling equipment have delayed and even prevented product from arriving in overseas markets. Another problem is double handling. That is, product flown out in containers built for medium sized aircraft must then be re-packed in containers suitable for larger aircraft. According to the Tasmanian Government, the handling of product by airline cargo staff has been poor at times (Ballantine 1996).

The cost of air freight is also of concern to the local industry. Freight costs are a significant component of total costs for both domestic and overseas markets; for example, Tassal spends more than $6 million a year on freight (Bailey 1995). Other fresh fish exporters have commented that Australian freight costs are higher than cargo services overseas, and several firms told the Commission that freight was a major factor contributing to the high production costs of Tasmanian Atlantic salmon.

D.3.2 Tariffs and minimum prices

Tariffs on fresh salmon are generally low in key overseas markets (Japan, the United States and the European Union). Smoked salmon typically faces substantially higher tariffs (Table D2),[3] and a number of countries impose heavy tariffs on both fresh and smoked products.

[3] Tariff barriers are typically lower for unprocessed products than for processed products, because the principal purpose in most countries is to protect the processing sector while providing access to imported raw materials.

If quarantine changes permit, salmon could be imported into Australia duty free. The scope to impose a tariff is limited because Australia's bound tariffs for fresh, frozen or smoked salmon products are only 1.7 cents per kilogram.[4]

[4] Each country establishes tariff bindings on particular products through negotiation with other members of the World Trade Organization. When a country binds a tariff, it agrees that this is the maximum tariff level it will impose on imports of that product from any other member country. If a country wishes to increase its tariff bindings, it must provide compensation to member countries adversely affected by the changes. Bindings do not prevent countries from countering dumped or subsidised imports (IC 1995a).

Table D3: General tariffs on salmon products, 1995

	Fresh	*Frozen*		*Smoked*	*Prepared or preserved*		
		Pacific	*Atlantic*		*a*	*b*	*c*
	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Australia	0	0	0	0	0	0	0
Brunei	na	na	na	20	na	na	na
Canada	na	na	na	0	0	na	na
China	25	30	25	55	0	65	0
Germany	2	na	na	13	na	na	na
Hong Kong	0	0	0	0	na	na	na
Indonesia	30	30	30	30	60	60	60
Japan	5	5	5	15	na	na	na
Malaysia	0	0	0	10	5	na	na
New Zealand	0	na	na	na	0	na	na
The Philippines	0	d	d	50	50	na	na
Singapore	0	na	na	0	na	na	na
South Korea	20	na	20	20	na	80	na
Taiwan	25	25	30	30	20	na	na
Thailand	60	60	60	60	na	na	na
United States	0	0	0	5	na	na	na

a Not minced, in cans, bottles or the like.
b Not minced (excluding cans, bottles or the like).
c Minced, in cans, bottles or the like.
d Tariffs on frozen salmon not specified by species. Tariffs range between 10 per cent and 30 per cent.
na Not available on database.
Sources : ABARE; Australian Seafood Industry Council, personal communications

Although the European Union levies a low tariff on fresh salmon, it has recently installed another kind of protective barrier — minimum import prices. In 1993, the European Union introduced minimum import prices on third country vessel landings of the most important species (in an economic sense) of white fish. Similar 'safeguard measures' were later extended to cover Atlantic salmon (OECD 1996). The price for fresh Atlantic salmon in European wholesale markets is sometimes half the minimum import price of about US$4.60 per kilogram (*Infofish International*, March/April 1996, p. 37). This means that imports into the European Union may be disadvantaged when competing with European Union production.

Some international developments have lowered tariff barriers. For instance, Canada and the United States obtained freer access to each other's markets under the US–Canada Free Trade Agreement signed in 1989. This Agreement was later superseded by NAFTA which requires signatories to phase out tariffs and other barriers to trade among the United States, Canada and Mexico in fish and other products. Tariff reductions under NAFTA commenced in January 1995 (OECD 1996).

Dumping and anti-dumping actions

Under Australian legislation and international trade rules, action can be taken against dumped imports when the dumping causes or threatens material injury to the Australian industry producing like goods. Similar action can be taken against subsidised imports (Box D1).

Several participants pointed to the possibility of overseas producers 'dumping' salmon on to the Australian market. Dumping occurs when a foreign supplier exports goods at a price which is lower than the 'normal value' in its home market. At various times, both United States and EU producers have alleged that Norway was dumping in their respective domestic markets.

The United States imposed anti-dumping and countervailing duties (23.8 per cent and 2.27 per cent respectively) on Norwegian Atlantic salmon exports to the United States in April 1991 (Bjorndal et al 1993). The US International Trade Commission determined that Norwegian farmed salmon was being both dumped and subsidised.

The duties led to a major reduction in Norway's exports of fresh Atlantic salmon to the United States. Chile subsequently took over much of Norway's share of the US market. EU authorities are undertaking similar investigations against Norway following complaints from Scottish and Irish Atlantic salmon farmers (*Seafood International*, September 1996, p. 12).

Box D1: Dumping and subsidisation

Part XVB of the *Customs Act 1901*, the *Customs Tariff (Anti-Dumping) Act 1975* and the *Anti-Dumping Authority Act 1988*, as amended, protect Australian producers against two types of import competition which are widely regarded as unfair:

- dumping whereby goods are exported to Australia at prices lower than their normal value in the country of export; and
- subsidisation whereby goods are exported to Australia that have been produced or delivered with the benefit of certain kinds of government assistance.

Protection under Australian law against these practices is available only if it is established that dumped or subsidised imports have caused or threaten to cause, material injury to an Australian industry producing like goods, or threaten to materially hinder the establishment of such an industry. An anti-dumping or countervailing duty may then be applied to the imports to offset the price advantage caused by the dumping or subsidisation.

Complaints of injurious dumping or subsidisation are made, in the first instance, to the Australian Customs Service. Customs examines the complaint to see if the matters alleged would *prima facie* justify government action. If so, Customs accepts the case for examination, collects relevant information and reaches a preliminary finding as to whether action is warranted. If that finding is positive, Customs refers the matter to the Anti-Dumping Authority (ADA) for final investigation and may impose provisional anti-dumping or countervailing measures. The ADA recommends to the responsible Minister what action, if any, should be taken. Australia is one of the world's most frequent users of anti-dumping action (IC 1996).

Source: ADA 1992

D.3.3 Import regulations

According to AQIS (1996), Canada, the United States, the European Union and Taiwan have requirements similar to those in the *International Aquatic Animal Health Code*.[5] In the case of salmonids, the Code recommends

[5] The Code aims to facilitate trade in live aquatic animals (excluding amphibians, birds, reptiles and mammals) and aquatic products by providing detailed definitions of minimum health guarantees that should be required of trading partners to avoid the risk of spreading aquatic animal diseases. The principles underpinning the Code are

evisceration of dead product before import if an importing country has a better health status than the exporting country for the diseases listed in the Code.

Canada

If Australia were to export to Canada, it would be required to meet certain standards of safety and quality. The Department of Fisheries and Oceans (DFO) is responsible for fish health and processing matters in Canada. The movement of live cultured salmonids and eggs of wild salmon into Canada or among provinces requires a permit, and salmon must be certified to note the absence/presence of diseases and disease agents. In 1993, the DFO and AQIS signed a memorandum of understanding which provides for the mutual acceptance of processing standards which apply in Australia and Canada. This eliminates the need for multiple product inspections.

United States

Exports of salmonid products to the United States must comply with requirements established by the Food and Drug Administration (FDA) and the Fish and Wildlife Service (FWS). The FWS has legislative authority over health status and disease surveillance; the FDA oversees post-harvesting practices. Salmon importation regulations require the product to be inspected within 6 months before shipment, and a certificate to be issued which notes the absence of certain diseases in live fish, eggs and dead eviscerated salmonids. Eviscerated fish are not required to be inspected.

Taiwan

Tasmanian Atlantic salmon producers have to certify their salmon to be free of certain diseases before exports are allowed into Taiwan.

New Zealand

New Zealand permits the import from Canada (only) of the following products derived from wild ocean caught Pacific salmon:

- headless and eviscerated salmon derived from ‘Grade A’ fish;
- salmon fillets; and
- products derived from the above.

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those of pre-export inspection and certification to decrease the risk of disease transfer through goods moving in trade.

All other salmon imports, including Canadian and Australian farmed salmon, continue to be prohibited. The product must also be either commercially packaged for *direct* retail sale or consigned to an approved premises for further processing. Canadian processing facilities must be certified by the Canadian quarantine authority. AQIS (1996) notes that the New Zealand policy is more conservative than the *International Aquatic Animal Health Code*.

D.3.4 Government assistance

Governments have played a key role in developing salmon aquaculture industries in a number of countries including Norway, Scotland and Canada. For example, the farmed salmon industry in British Columbia has access to soft loans, tax preferences and pardons, and labour and production subsidies (ABARE 1996).

The Australian Atlantic salmon industry has pointed to the government subsidies available to overseas salmon producers. For instance, the TSGA noted that the US Government provides several forms of assistance to its wild caught salmon industry, including marketing grants and government procurement of salmon (Sub. 12, p. 3).

Assistance to the Australian Atlantic salmon industry is described in Chapter 3 and Appendix E.

D.4 Future prospects in overseas markets

The future export performance of the Australian industry will depend on a variety of factors including:

- market growth;
- the local industry's cost structure and marketing strategy;
- production and export strategies of competitors; and
- progress on removing impediments to Australian exports.

Japan is likely to remain Australia's most important market in the medium term. Although the Japanese market for salmon has expanded rapidly in past decade, the increase is expected to slow in coming years. Norwegian analysts predict that total Japanese consumption will reach 600 000 tonnes a year by early next century (Lem and Di Marzio 1996). Most of this growth is expected in the sashimi market segment so it would primarily benefit exporters of fresh Atlantic salmon.

Potential exists for increased exports to other countries in the Asian region which are experiencing rapid economic growth. Examples of such markets include Hong Kong and Singapore, which have high per person incomes and high seafood consumption. Taiwan is a growing market for frozen fish. There may also be scope to develop niche markets in other countries such as Indonesia, Malaysia, the Philippines and Thailand. These countries could become significant export markets as their income levels rise. However, across all Asian markets, Australian exporters will face competition from Norwegian and, increasingly, Chilean producers.

The US market for salmon is relatively underdeveloped (Egan 1993), which may present opportunities for Australian exporters. US salmon consumption is predicted to reach 450 000 tonnes (round weight) annually in the next 5–10 years with most of this growth in demand being met by imports of farmed salmon. Chile and Canada are expected to increase their exports to the United States but Norwegian exports are currently limited by anti-dumping and countervailing duties (Lem and Di Marzio 1996). The US and Canadian wild caught salmon industries might divert more product to the large US market as they encounter increased competition in their traditional markets.

Europe is unlikely to become a major destination for Australian Atlantic salmon exports, given the high freight costs and the presence of large rival producers — Norway, Scotland and Ireland — who are well-established in the market.

As noted earlier, tariffs imposed on salmon imports are relatively high in a number of Asian countries. For instance, Thailand imposes a tariff of 60 per cent on fresh salmon and China, a potentially large market, imposes a tariff of 55 per cent on smoked salmon. South Korea, Taiwan and Indonesia also levy high import duties on salmon products (Table D3). If freer trade in seafood products is achieved through APEC reductions in trade barriers, this would provide greater opportunities for Australia's Atlantic salmon industry to increase exports to existing markets as well as to developing new markets.

Improvements in air freight services would also enhance the competitiveness of Australian products on overseas markets.

APPENDIX E: ASSISTANCE TO THE ATLANTIC SALMON INDUSTRY

A range of state and Commonwealth schemes are available that offer assistance to the Australian Atlantic salmon industry. Some are specific to the salmon industry or to aquaculture while others are more broadly available. This appendix concentrates on assistance specifically directed to the salmon and aquaculture industries.

The Tasmanian Government has encouraged the development of the Atlantic salmon industry by providing financial and other forms of assistance to the industry. The industry has also used generally available Commonwealth assistance schemes.

Examined in this Appendix are Tasmanian and Commonwealth government schemes which have provided assistance to the industry. Tasmanian Government assistance is discussed in section 3.1. The focus in section 3.2 is on Commonwealth research and development and fisheries (including aquaculture) assistance schemes available to the Atlantic salmon industry.

E.1 Tasmanian Government assistance

When salmon farming was established in Tasmania in 1985 local expertise in Atlantic salmon aquaculture was limited. To overcome this limitation the Tasmanian Government established a joint venture with a Norwegian company, Noraqua.

In addition to its agreement with Noraqua, the Government initially provided assistance ranging from supporting research and development, the establishment of research and development facilities, through to advancing capital to selected firms. Much of this assistance is generic in nature because it is difficult to specify what proportion of particular programs is of specific benefit to the salmon aquaculture industry.

E.1.1 Research and development

Between 1992 and 1995 the Tasmanian Government contributed 0.25 per cent of the gross value of fisheries and aquaculture production, or $285 000, to the Commonwealth's Fisheries Research and Development Corporation (FRDC)

in lieu of direct contributions by industry (DPIF 1995a, p. 41). These contributions were made because the Government lacked the legislative authority to levy industry. Tasmanian Government provisions in the recently introduced *Living Marine Resources Management Act 1995* allow it to levy industry for research and development funds, though such a levy has not yet been introduced.

In 1994–95, DPIF funded a $1.5 million upgrade of the Animal and Water Quality Diagnostic Laboratory at Mount Pleasant near Launceston. This facility supports Tasmania's animal and aquaculture industry disease control programs (DPIF 1995, p. 7).

In 1993–94 and 1994–95, the DPIF received $24 900 and $103 586 respectively from the Aquaculture Cooperative Research Centre (ACRC) for fisheries research (DPIF 1995b, p. 31).

The Fish Health Unit of the DPIF's Animal Health Laboratory has an active research program on fish diseases, and Saltas supports this research, for example, by contributing to the development of a vaccine to control *flexibacter*, a potential cause of significant loss to the industry (Saltas 1994, p. 6). The Unit continues to manufacture and supply vaccine to Saltas for immunising Atlantic salmon smolt against *Vibrio anguillarum* (Saltas 1994, pp. 4–6). The Unit and Saltas also have a project to determine the cause of infection that leads to amoebic gill disease in Atlantic salmon.

A new $2.1 million aquarium to extend the Marine Research Laboratory at Taroona, near Hobart, was completed in 1994–95 (DPIF 1995a, p. 17). These facilities have been used by the Australian Atlantic salmon industry in the past — for example, to study the stages of development of the economically significant amoebic gill disease in 1989–90 (in conjunction with Saltas and the University of Queensland). The facilities were also used to assess the use of coated food pellets to treat *flexibacter* disease (in conjunction with Saltas). The Tasmanian State Institute of Technology and Sevrup Trout Hatchery used the facilities to investigate a potential vaccine to combat the disease streptococcicosis (DPIF 1990, p. 23).

Industry contribution to research and development

As well as government contributions to research and development, industry funding for research and development has been substantial. Saltas was required under the Salt-Water Salmonid Culture Act to contribute 25 per cent of its gross revenue from smolt sales to research and development for as long as it retained its legislated dominance over smolt production. Saltas developed its own research station and facilities for research into salmon production. Saltas's research has focused on improving smolt supply: on-farm survival;

improved feed and feeding techniques; extended the harvest period; and improved farm efficiency. As indicated above, Saltas supported research undertaken by DPIF. Saltas has scaled down its research expenditure following the expiry of its monopoly in 1995. The DPIF recorded that Saltas contributed $135 750 and $117 471 to it in 1993–94 and 1994–95 respectively to carry out fisheries research (DPIF 1995b, p. 31).

Tassal also supports research and development by contributing to collaborative research with CSIRO, ACI and Pacific Dunlop on new packaging technology that will extend the life of fresh and processed produce (CSIRO 1995, p. 31). Other companies conduct research and development. For example, Nortas has been testing a 160 metre sea cage off Bruny Island's east coast (Dietzel 1996, pp. 10–11).

E.1.2 Financial assistance

The Tasmanian Development Authority (TDA) was established by the Tasmanian Government in March 1984 to stimulate industry development in that State. It has since been merged into the Department of State Development and Resources and is now known as Tasmania Development and Resources (TDR). TDR offers many forms of assistance to industry, including loans, loan guarantees and extension and facilitation services.

In 1987, the Tasmanian Government purchased shares (through TDR) in Tasmanian Atlantic Salmon Limited (Tasmas) from Saltas, enabling Saltas to raise funds to assist the development of the salmon industry (Sub. 6, p. 2). Tasmas has since merged with Tassal. The Tasmanian government held 4.3 per cent of Tassal's issued capital as at 6 September 1996 (Tassal 1996), and also owns 51 per cent of Saltas.

While Saltas has not paid dividends, the price at which the Government sells its 51 per cent shareholding — should it sell it — could provide the Government with a return on its investment. The price the Government sells its shares will determine the extent of any industry assistance.

TDR has provided four loans to the salmonid industry since 1985 with a total value of $1.2 million (Table E1). The Tasmanian Government also underwrote a $1 million loan guarantee to Tassal which was used to secure a commercial loan from 1990 to 1992. In addition, TDR has provided $400 000 in direct funding to the industry since 1985. Currently, TDR has one loan outstanding to a salmon producer for $366 000 (Sub. 6, p. 2). The extent of industry assistance implied by these loans is unclear — the rates at which the loans were made is not public.

Table E1: TDR loans to the salmonid industry

	Amount ($)
1986	145 000
1988	500 000
1989	120 000
1993	450 000

Source : TDR Sub. 6

E.2 Commonwealth assistance arrangements

A number of Commonwealth Government assistance programs are available to industry generally, including salmon producers. These assistance arrangements provide financial and other assistance as a means of improving productivity in industry and encouraging exports. These Commonwealth schemes include the 125 per cent (formerly 150 per cent) research and development tax concession, the Competitive Grants Scheme, the diesel fuel rebate and Austrade schemes such as the Export Market Development Scheme.

E.2.1 Fisheries Research and Development Corporation

The FRDC is the Commonwealth agency responsible for planning, funding and managing fisheries research and development programs. The research it funds is carried out by various research institutions and government agencies.

FRDC is funded by the Commonwealth Government with contributions from state and territory fisheries departments and industry, including aquaculture operators. The FRDC allocates 20–25 per cent of its funds to aquaculture (including salmon) research (FRDC 1995a, p. 65).

As shown in Table E2 the Commonwealth government has contributed approximately 75 per cent of total funding to the FRDC over the past two years. Research on aquaculture has the most relevance to the salmon industry of the four broad programs (Table E3).

Table E2 FRDC funding sources

	1993–94 ($ million)	*Proportion* (per cent)	*1994–95* ($ million)	*Proportion* (per cent)
Government	6.5	59	6.9	56
Industry	2.0	18	2.4	19
Government matching revenue	2.0	18	2.3	19
Other	0.5	5	0.8	6
Total	11.0	100	12.4	100

Source : FRDC 1995a

Table E3: FRDC expenditure by program

Program	*1994–95 expenditure* ($ million)	*Proportion of total expenditure* (per cent)
Natural fish resources	6.5	56
Aquaculture	2.9	25
Harvesting	0.8	7
Marketing	1.4	12
Total	11.6	100

Source : FRDC 1995

Two FRDC projects that have specific relevance to Atlantic salmon farming, as well as other aquaculture industries, are:

- bio-fouling of nets[1]; and
- the development of cost-effective feeds for aquaculture (see section E.2.3).

Generic research may still benefit the industry. For example, a project on the development of molecular probes for use in bacterial disease diagnosis and health monitoring of farmed and wild fin fish in Australia may benefit salmon producers. Also, a project with the Queensland Department of Primary Industries to develop live fish transport techniques could assist salmon farmers.

[1] Bio-fouling is a problem caused by seaweed, algae or other organisms growing on the nets of sea cages. Bio-fouling reduces the flow of oxygenated water to the salmon.

E.2.3 CSIRO

The CSIRO Division of Fisheries is involved in a research project to provide the world's expanding aquaculture industry with an alternative feed source to the heavily exploited ocean fish stocks that form the basis of the current feed used. The demand for high quality fishmeal, currently costing $1100 per tonne, is expected to rise dramatically over the next 5 years as Asian countries increase aquaculture production. World supplies of fish meal made from whole caught fish, or fisheries waste, are vulnerable to fluctuations in supply and price. CSIRO scientists are working on the project with the Queensland Department of Primary Industries, NSW Fisheries, and scientists from industry and a number of universities. The project is funded by the FRDC (CSIRO 1995, pp. 17–18).

CSIRO also participates in joint research with the ACRC (section E.2.4).

E.2.4 Aquaculture Cooperative Research Centre

The ACRC is undertaking several research projects on salmon farming in conjunction with the Aquaculture Department of the University of Tasmania. One project is testing various net coatings as a means of dealing with bio-fouling of nets which requires the industry to change and wash nets every seven to ten days in summer (ACRC 1995, p. 26). The project involves cooperation among the University of Tasmania, the University of New South Wales, the CSIRO Division of Fisheries, and the CSIRO Division of Materials Science and Technology. Other projects include two for which the aims are to develop a set of highly sensitive diagnostic tests for identifying bacteria responsible for amoebic gill disease in Atlantic salmon, and to study the effects of harvesting, slaughter and handling to improve product quality (ACRC 1995, p. 9, p. 27).

University of Tasmania

The University of Tasmania Department of Aquaculture, Launceston, provides undergraduate and postgraduate training via diploma, degree, masters and doctoral courses. It also undertakes postgraduate research into salmon projects. The department has 250 full-time students (including 33 doctoral students) and its research is partially funded by private industry. Government funding is received from the CSIRO, the ACRC and the Australian Research Council. Current projects include an ARC funded project on Atlantic salmon triploid jaw deformity, development of 'smart feeders' to reduce off-site waste, reduction of net fouling, gill amoeba research and a project on sex

reversal of male fish as a means of delaying sexual maturity for a year to produce larger marketable salmon (University of Tasmania 1995).

APPENDIX F: GOVERNMENT REGULATION OF THE SALMON INDUSTRY

The development of the salmon industry has been shaped by a number of Government policies and regulation. The focus in this appendix is on the regulatory environment that directly affects the salmon industry, particularly the legislation governing smolt production and marine farm leases.

Government policies and regulations affect the salmon farming industry in the following broad areas:

- smolt production;
- allocation of leases;
- allocation of licences;
- use of marine waters;
- health standards of products for consumption;
- environmental management and pollution;
- pesticide use;
- veterinary medicine;
- diseases breakout;
- quarantine policies (for exports and imports);
- industry assistance; and
- taxation policies.

Most of these (such as health and safety regulations) are applicable across industries, others such as smolt production and the allocation of marine farm leases and licences are specific to the salmon and marine farming sectors respectively. They are significant in that they affect access to key inputs to salmon production.

F.1 Smolt production

Production of smolts in Tasmania is regulated by the *Salt-Water Salmonid Culture Act 1985*. This Act ratified an agreement between the Tasmanian Government and Noraqua Australia to establish the first commercial salmonid

hatchery to supply smolts and to provide a research and advisory base for the industry. Noraqua was also committed under the agreement, to provide technical expertise.

In addition to Saltas, the Act also established Tassal (then a subsidiary of Noraqua).[1]

F.1.1 Ownership of Saltas

The Tasmanian Government owns 51 per cent of Saltas shares. These are described in the Salt-Water Salmonid Culture Act as A class shares. Noraqua was issued B class shares, and was limited to 19 per cent of total shares issued. These shares were later transferred to Tassal.[2] Other salmon producers were issued C class shares which comprise the remaining 30 per cent of total shares issued. Tassal currently owns a total of 31 per cent of total shares in Saltas through acquisitions and transfers (Table F1).[3]

F.1.2 Legislation affecting smolt production

The Salt-Water Salmonid Culture Act granted Saltas dominance in the production of Atlantic salmon smolts from 1985 for a period of 10 years. In return, Saltas was directed to finance and operate a research and breeding centre and a hatchery capable of producing at least one million smolts each year. Saltas was also required to contribute at least 25 per cent of its gross revenue from smolt sales for research and development, which Saltas recovered from the industry through smolt sales.

The Commission was informed that other hatcheries started producing smolts before 1995 (transcript p.17). According to participants, there are two hatcheries in existence before the Salt-Water Salmonid Culture Act was enacted (transcript, p. 17). In the late 1980s, one farm also began producing smolts after receiving legal advice that the Act could not prevent it operating its own hatchery (transcript, p.16). These are small scale producers compared to Saltas that has a production capacity for 2 million smolts.

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1 Noraqua is now a subsidiary of Tassal.

2 Under the Act Noraqua could transfer its B class shares to Tassal (then a subsidiary of Noraqua).

3 This consists of 19 per cent B class shares (transferred from Noraqua) and 12 per cent C class shares.

Since 1995, some Atlantic salmon farmers also bought smolts from other hatcheries other than Saltas.[4] The Commission understands that other hatcheries recently sold smolts commercially (transcript, p. 17). There are currently six hatcheries producing Atlantic salmon smolts or eggs (section 2.1). The Inland Fisheries Commission reported that there is also one application for a new hatchery under consideration, and there have been several other inquiries.

Table F1: Tassal's investment interests, 1996

Name of Entity	*Country of formation or incorporation*	*% interest*
Tasmanian Atlantic Salmon(Tasmas)	Australia	100
Noraqua Australia	Australia	100
Seafood Exporters of Tasmania	Australia	100
Tasmanian Fine Food Company	Australia	100
Tasmanian Smokehouse	Australia	100
Tassal Japan	Japan	100 **a**
Saltas	Australia	31 **b**
Seafish Tasmanian Partnership	Australia	26

a Comprising 23 per cent interest by Tassal Ltd, and 8 per cent from its subsidiaries.

b Principal activity is the processing and marketing of fish meal, fish oil, bait and related products.

Source: Tassal 1995

F.1.3 Smolt sales

Access to Saltas smolts under the Salt-Water Salmonid Culture Act is restricted to B and C class shareholders in Saltas who possess fish farming licences. Until recently, the amount of smolts available to each shareholder was linked directly to its shareholdings in Saltas (excluding the Tasmanian Government's shares). For example, Tassal and its subsidiaries hold 31 per cent shares in Saltas and thus Tassal was eligible to purchase a maximum of 63 per cent of total smolts produced by Saltas, other than any bought by the Tasmanian Government.

From January 1995, the Tasmanian Government, for the first time, exercised an option which entitles it to smolt allocation from its 51 per cent shareholding in Saltas.[5] The Government reallocates this smolt share to the B and C class shareholders although the basis for the redistribution is unclear.

[4] Huon Aquaculture stated that it recently bought smolts from Saltas, Purves Fisheries and Sevrup (transcript, p. 17).

[5] Under the Salt-Water Salmonid Culture Act, only B and C class shareholders are entitled to a share of Saltas smolts. By converting its A class shares to D class shares,

In addition to the restrictions imposed by the Act, salmon growers cannot purchase smolts from other producers on mainland Australia. This is because the Tasmanian Government has a quarantine restriction on imports of live fish from mainland Australia (Wager and Jackson 1993).

F.1.4 Hatcheries

Hatcheries producing Atlantic salmon smolts are being licensed under the *Inland Fisheries Act 1995*. The Tasmanian Inland Fisheries Commission is responsible for administering hatchery licences.

Operating a hatchery also requires approval from local governments for land use planning, from the Rivers and Water Supply Commission for access to fresh water, from the Department of Environment and Land Management for environmental guidelines on effluent discharge, and from the Inland Fisheries Commission for fish farm licensing.

Application and annual renewal fees apply to hatchery licences.

F.2 Access to marine farm sites

In addition to regulations covering smolt production, the Tasmanian Government also regulates access to marine farm sites. To operate a salmon farm, a farmer has to apply to the state government for a marine farm lease. When a lease has been granted, the lease holder then has to apply for a marine farm licence. A marine farm lease entitles the lease holder to use a specified area of state waters and seabed for marine farming, while a marine farm licence specifies the type of species that may be farmed on the leased site, and the conditions and restrictions by which a licensee must abide.

The current legislation governing marine farm leases and licences is the Marine Farming Planning Act and the Living Marine Resources Management Act. These two Acts replaced the *Fisheries Act 1959*. The Tasmanian Government made these changes in response to community concerns about the environmental impacts of marine farming. It imposed a moratorium on the granting of new marine farming licences for salmon farming in 1988. A moratorium on the granting of new marine farm leases was also imposed in 1993 to allow marine farming development plans to be completed.

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the Tasmanian Government is also eligible for smolt allocation according to its shareholding in Saltas.

The Tasmanian DPIF is responsible for administering the Marine Farming Planning Act, and for granting marine farm leases and licences.

F.2.1 Marine farm leases

Until recently, the Fisheries Act set out the relevant provisions concerning marine farm leases. Under the Act, marine farm leases were granted and issued upon payment of a flat application fee of $1000. Applicants generally chose the site for the lease, subject to DPIF approval. The approval process required public advertisement of the application with provisions for appeals by some individuals.[6] If an application was granted, then appeals against the decision could be made in courts before the lease was issued (McLoughlin 1996).

The leases were tradeable, subject to approval by the Minister and upon payment of a small fee. Thirty-six marine farm leases were granted under the Fisheries Act.

Limitations of the Fisheries Act

Given the rapid growth of the industry, particularly in the south east of the State, concern over the effects of marine farming activities within local communities (such as the ecological impact on water and the seabed, and the adverse visual impact from farm structures) led to an increase in appeals against the granting of leases. In 1988, the Government responded to these concerns by imposing a moratorium on the processing of applications for new salmon farming licences.

According to DPIF (1993), the provisions of the Fisheries Act were inadequate to deal with community concerns. In particular, there was no explicit provision in the Act for developing and implementing management plans governing marine farm activities. No account was taken of other competing uses of coastal waters (such as fishing, boating and tourism) and the need to ensure sustainable development of natural resources. There was also no framework for considering environmental consequences of marine farm proposals. Furthermore, there was limited opportunity for public consultation, and the right to object to a lease application was restricted to certain individuals.

Under the Act, planning controls were found to be limited. For example, there was no provision to reallocate marine farm leases for emergency relocation of marine farms to reduce the spread of diseases.

[6] Appeals were limited to persons directly affected (McLoughlin 1996).

The Act also did not provide criteria by which leases should be allocated. Leases were granted at the discretion of the Minister.

Marine Farm Planning Act

The Tasmanian Government enacted the Marine Farming Planning Act to address these perceived limitations of the Fisheries Act.

The new Act requires the drafting of marine farming development plans for marine waters before leases can be allocated.[7] Under the Act, a marine farming development plan is required for all or part of State waters, before applications for leases in the area are considered. The marine farming development plan uses the zoning technique to allocate areas for marine farming (much like a land use planning scheme). Marine farming will only be allowed in designated marine farming zones.

Marine farming development plans also include requirements to monitor and manage the environmental impact of all marine farming proposals.

Allocation of marine farm leases

Application for a new lease can only be made for an area designated as a marine farming zone within the marine farming development plan. An application is invalid unless the applicant has been invited to apply by the Minister. A Board of Advice and Reference has been established to advise the Minister on the persons or class of persons who should participate in the process.[8] The Minister can then invite these people and any other persons the Minister considers suitable to participate in the lease allocation process.

Leases are to be allocated by a bidding process. The Board will advise the Minister on the method of allocating the leases — by tender, auction or ballot. Although applicants must go through a bidding process, the Minister is not required to accept the highest bid. Other factors such as financial benefits to the state and employment effects will also be considered. In advising the Minister, the Board may also take into account: any previous knowledge or experience of the person in marine farming or related commercial activity; any contributions made by the person to industry research or site specific research; any proposal by, or capacity of, the person to address social and

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[7] These will cover whole districts or regions (such as bays and estuaries) as well as individual farms, obviating the need to undertake *ad hoc* and site-by-site assessment. A marine farming development plan is usually prepared by the Tasmanian Government.

[8] The Board consists of three persons — a qualified legal practitioner, a person with experience and knowledge in marine farming and the seafood industry and someone with experience in business and commerce.

environmental matters likely to affect the marine farming zone; and any other matters the Board considers appropriate.

A lease is subject to any condition and restrictions that the Minister may specify in the lease. A system of demerit points is used against lessees who fail to comply with the terms and condition of their leases. The accumulation of 200 or more demerit points within 5 years may disqualify a person from holding or obtaining a lease. Occupancy rights under the new legislation, have been increased from 20 to 30 years. A lessee may apply to renew a lease within 10 years before the lease expires.

To apply for a lease, an application fee of $1000 is payable. The successful applicant must also pay an annual rental fee of $1750 and $100 per hectare.

Marine farm leases are tradeable, subject to Ministerial approval and payments of fixed transfer fees of $300. The Minister also has the authority to approve applications for variation, or subdivision of leases.

The provisions of the Marine Farming Planning Act that cover the allocation of leases only apply to new leases for marine fish farming and to the re-allocation of cancelled leases. Existing leases continue to operate subject to the new legislation.

No new leases have yet been granted under the Act. Given the recent release of marine farming development plans for the Huon River—Port Esperance region and the Tasman Peninsular—Norfolk Bay region, the Minister will be inviting applications for new marine farm leases.

F.2.2 Marine farm licenses

An application for a marine farming licence will only be granted if a lease is held under the Marine Farm Planning Act. There are currently thirty-six salmon farming licences.

Marine farm licensing is administered under the Living Marine Resources Management Act, and the Minister is responsible for granting the licences.

The Minister may grant an application if satisfied that:

- the applicant has complied with the Act;
- the applicant, within 5 years before the date of the application, has not been convicted of any offence under this or any other Act that the Minister considers relevant to the holding of a licence;
- the applicant is not disqualified from holding the licence;
- granting the application is not likely to contravene a management plan;

- there are no environmental or resources constraints in granting the application;
- the applicant is a fit and proper person to hold the licence; and
- the applicant has paid the appropriate fees and charges.

A licence is granted when the prescribed fees have been paid and the licensee must comply by the terms and conditions of the licence. The current prescribed payment for a marine farm licence consists of an annual $1700 base fee and $100 per fin fish species.

A marine farm licence can be issued for up to 10 years and is transferable with the marine farm lease. To renew, transfer or vary a marine farm licence, the applicant has to satisfy the same conditions required for the application of a new licence.

APPENDIX G: ENVIRONMENTAL IMPACT OF SALMON FARMING

The focus in this appendix is on the potential impact of salmon farming on the environment and how environmental issues affect the performance of the Atlantic salmon farming industry.

Salmon farming has some adverse effects on the environment. These effects are concentrated near the farms, providing a direct incentive for the industry to control pollution. However, the Tasmanian Government also has a role in controlling the level of these effects on the environment.

G.1 Environmental and social impact

Marine farming has a number of environmental impacts. The farming of species such as salmon, oysters and mussels in inlets and estuaries compete with other activities for the use of coastal waters (such as recreational fishing and boating) and has raised community concerns. For instance, Tassal's plans to relocate its Badger Cove salmon nets to deeper water in Parsons Bay to reduce environmental impacts met with strong opposition. Residents of Parsons Bay claimed that it would leave insufficient room for boats to navigate the Bay and threaten the region's annual regatta (Lovibond 1996).

In addition, salmon farming may have adverse effects on nearby property values, because farm structures, excessive noise and the glare of lights may result in a loss of amenity to residential properties on adjacent foreshores.

Salmon farming may affect the coastal ecology. Surplus feed and faecal deposit may settle on the seabed, causing changes to the flora and fauna and affecting water quality. In addition, soluble deposits may increase nutrients in the water, causing excessive growth of toxic algae (algal blooms).[1]

[1] Studies by Woodward et al (1992), and Ye et al (1991) found evidence of ecological impacts of salmonid farming in Tasmania. Overseas studies by Johannessen et al (1994) and Gowen and Bradbury (1978) also found evidence of impacts in their countries of study.

Further, chemicals used on farms and waste from processing salmon may add to the discharge and pollution problems. However, chemical use in salmon farming is minimal because of Australia's relative disease free status.

Species escaping from a marine farm may also affect the ecology of the area, although little information is available on its impact (DPIF 1995a).

Australian research finds that the environmental impact of fish farming is localised around cages, and is less significant beyond the immediate vicinity of the farm site (Woodward et al 1992, Ye et al 1991). Woodward (1992) also found that there is a good chance of the seabed recovering from the pollution if it is left fallow.

The industry said that the high environmental standards required of salmon farming have benefited the community. For instance, the need for clean water to grow salmon has provided incentives for the industry to clean up the waterways. The industry claims it has worked with the community to reduce sewage and dairy effluent from the Huon river.

In this respect, the industry believes that a salmon farm:

> ... is much like the canary in a cage used by coal miners to detect problems in the atmosphere inside a mine. If there are any environmental problems, the fish farm is likely to provide an early detection system, as well as providing incentives to have the problem fixed. (TSGA 1996a, p. 5)

G.2 Constraints on site availability

As discussed in Chapter 3, concerns about the environmental impacts of salmon farming intensified in the late 1980s. This resulted in a moratorium on the allocation of new salmon farm licences (DPIF 1993). In addition, the Tasmanian Government enacted the *Marine Farming Planning Act 1995*, and under this Act leases for new sites are granted only in designated marine farming zones. These marine farming zones have been identified by accounting for factors such as the likely impact of farming on the environment (Appendix F). The effect of considering environmental issues is to limit further the number of suitable sites for farming in estuaries and inlets. McLoughlin (1996, p. 15) has said that:

> ... in many apparently promising areas there are fragile and ecologically significant sites that are not suitable for aquaculture ...

Further expansion is likely to require the development of farms in deeper offshore waters which are more exposed to rough water and stronger ocean currents. These offshore sites may lead to higher production costs because they are further away from land based facilities (such as storage sheds,

moorings for boats, processing plants) and amenities for employees. However, some salmon farmers are already investigating the feasibility of this type of farming (Dietzel 1996).

G.3 Cost of managing the environmental impact

As outlined above, salmon farming imposes some costs on the community and the industry. The extent and incidence of these costs depend largely on the measures adopted to minimise environmental degradation and the incentives placed on farmers to factor these into their costs of production. The salmon industry has an incentive to undertake its own environmental management.[2] According to TSGA (1996a, p. 5):

> ... the fish farmer has a strong vested interest in ensuring any impact is kept to a minimum, as the farm will be the first, and probably only, casualty of any environmental problems created by the farm.

The Tasmanian Government is responsible for ensuring that farm management plans are implemented and ensuring compliance. Salmon farms should be able to implement their management plans as far as possible in a manner which allows them to minimise their costs. This approach to regulation is known as outcome orientated regulation because where technically appropriate, the government determines the desired outcome and allows industry to chose the manner of achieving this goal (IC 1993, p. 105).

G.3.1 Cost to salmon producers

Salmon farmers have adopted a number of measures, as part of good husbandry practices, to minimise the impact of effluent discharge. Some of these include:

- monitoring the seabed flora and fauna and water quality surrounding the farm;
- rotating cages within and among farms on a regular basis;
- fallowing farmed areas; and

[2] Effluent discharge from the farms mainly affects salmon farms. Fish are particularly vulnerable to the resultant release of poisonous gases from the seabed because they are not able to escape from the cages, so exposure to these gases reduces growth and increases mortality (NFFA 1990).

- improving the quality of fish feed to increase growth and reduce waste.[3]

Farmers were not required under the previous marine farm leasing arrangements to lessen the environmental effects of salmon farming. However, under the Marine Farming Planning Act, marine farmers are required to meet certain environmental standards, and to monitor water quality and the seabed around farm sites. The new program also provides a framework to ensure effective rehabilitation of sites that have been abandoned, revoked or relocated.

G.3.2 Costs to the Tasmanian government

The DPIF is required under the Act, to ensure that environmental outcomes of marine farming are at the desired level. Thus the Department:

- sends marine inspectors to marine farms to ensure compliance with management plans;
- assesses the results of environmental monitoring programs;
- undertakes environmental monitoring before new leases are allocated; and
- collects environmental data to ensure that results are accurate and that standard sampling procedures are being used (DPIF 1995c).

The Commission has been unable to determine who bears the majority of these costs.

The Tasmanian Government receives revenue from fees and charges on marine farm leases and licences (Appendix F). The new system of granting leases requires the applicant to both pay an application fee and to tender for an initial access fee. If valued appropriately, this should reflect some of the environmental costs of salmon farming. Salmon farmers must also pay an annual rental fee for marine farm leases and licences.[4]

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[3] Government and industry have been sponsoring research into fish feed to develop better feeding regimes and less wastage of fish feed. For instance, fish feed that can stay solid and suspended in the water for a longer period of time has been developed and trialed.

[4] The current fees for a new lease include a $1000 application fee and an annual re ntal charge of $1750 plus $100 per hectare. In addition, salmon farmers pay $1700 plus a $100 fin fish species fee each year for a marine farm licence. These fees are reviewed annually.

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