charting our future

National Abalone Convention

Adelaide, South Australia
19 - 21 August 2001

Proceedings

Hosted by
Abalone Industry Association of South Australia Inc

Sponsored by

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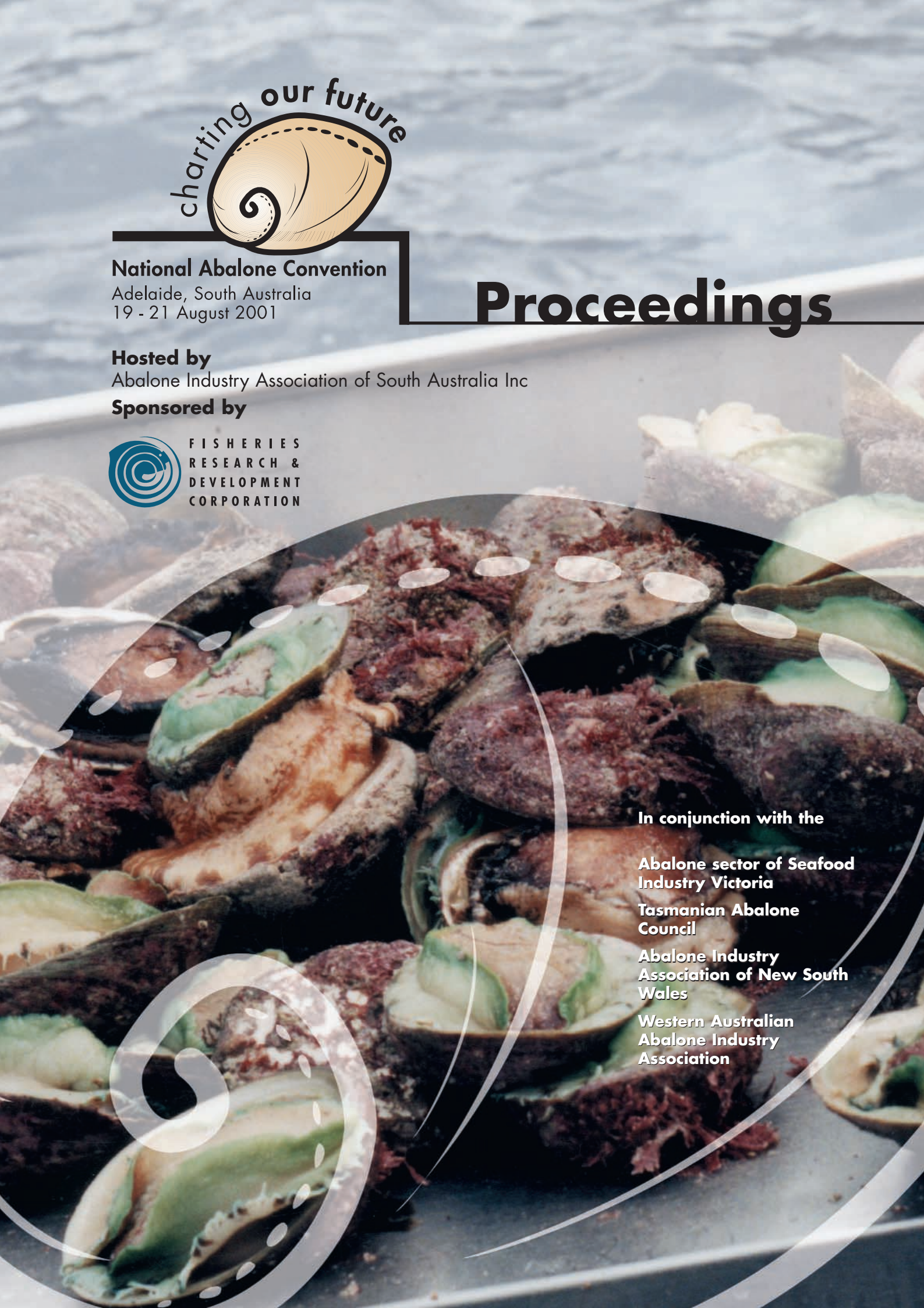

In conjunction with the

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Inaugural National Abalone Convention

The Inaugural National Abalone Convention held in Adelaide from 19 – 21 August 2001 was, by all accounts, a huge success. Registrations were far in excess of the numbers budgeted and the staying power and attentiveness of the delegates throughout the Convention, after two gruelling days of intense sessions concentrating on issues relevant across all abalone fisheries of Australia, was amazing.

It was both a pleasure and an honour to be part of the very first occasion where a large number of industry participants from across Australia gathered in one location to hear, listen, learn, discuss and debate the issues dear to their hearts and for their future.

The event heralded a landmark for the nation's abalone fisheries being together for the benefit of their future, and to ensure the sustainability of such a vulnerable resource.

The high calibre of presentations from around Australia and New Zealand consisted of speakers from industry, as well as specialists on dive health, markets, aquatic health, resource protection, resource allocation, economics, research and management. These presentations included dive health and safety, markets and market trends, pests and diseases, resource sharing and resource protection. R&D initiatives from three States offered tools that will capture more accurate catch and effort data on which to base management decisions.

The second day of the Convention was designed to encourage people to think outside the square we live in and to look to the future and observe what could be achieved and what has been achieved in other parts of the world, and in particular, New Zealand.

Sessions were also dedicated to ecosystems interactions, environmental management systems and ESD. Papers offered different views on Marine Protected Areas and in all sessions, audience participation was encouraged and heartily contributed.

204 registrations were received, but due to unforeseen circumstances, seven had to cancel at the last minute.

The breakdown of delegates and speakers from all over Australia are as follows

State	Delegate	Speaker
Western Australia	30	6
South Australia	62	7
Victoria	46	3
New South Wales	17	1
Tasmania	25	4
Queensland	0	1
ACT	6	2
New Zealand	11	1
Total:	197	25

Of those who attended, the breakdown between government, industry and other are as follows (*Four Fisheries Compliance Officers from SA attended one session)

State	Other	Industry	Government		
			Research	Management	Compliance
Western Australia	1	22	3	4	
South Australia	8	42	8	3	1 *
Victoria	1	38	4	2	1
New South Wales		11	5	1	
Tasmania		16	6	2	1
Queensland			1		
ACT				6	
New Zealand		9	1	1	
Total:	10	138	28	19	3

I am confident that the abalone fisheries of Australia will benefit from the Inaugural National Abalone Convention and that the next few years will witness the extent to which we will have *Charted Our Future*.

Michael Tokley

Peter Dundas Smith, Sponsor FRDC

It's always a concern of sponsors, and more so of the organisers of conventions such as this that there is not going to be the participation level to make the conference a success. I think those concerns are behind us all now, and I congratulate you on the level of participation – it's indicative obviously of the value you place on this convention and what you want to get out of it. I hope that by tomorrow afternoon that we look back on the conference and recognise it as a turning point for the industry.

Personally, I would like to look back and think it was a turning point for the way in which the wild catch abalone sector does business with the Fisheries Research and Development Corporation.

Prior to 1992, and the Hon Minister Wilson Tuckey implied this, research in wild catch fisheries in Australia was largely driven – exclusively driven I would say – by fisheries managers and researchers working together to get a feel of stock levels and how those fisheries should be managed sustainably. And this was understandable. It could have been done no other way. But the R&D landscape changed in 1992 when the Fisheries Research and Development Corporation was established. Primarily, it brought a lot more money into fisheries R&D through the Commonwealth matching industry contributions paid to the FRDC. For the first time there was a national leader on the block that could look at R&D and the way it was planned, funded and managed right across Australia.

And consistent with that the FRDC established a number of forums at which researchers, managers, industry and other stakeholders could sit and decide what R&D priorities needed to be addressed. In other words, I would like to think that the FRDC took away industry's excuse for criticising researchers for doing research that the industry didn't want.

Some of those forums you would be familiar with – they're the Fisheries Research Advisory Bodies (FRABs) which are established in every state and one for Commonwealth fisheries, and later we established subprograms which could manage a number of generic projects addressing species or regions, and there have been other forums that we've established on a national scale.

In addition to that, the FRDC took on a whole of chain approach to the way in which it planned, funded and managed R&D and became, overnight, the biggest investor in post-harvest seafood technology in Australia.

More recently we took on and encouraged the development of an ecosystems approach to get away from research which focussed simply on the fish, and not on the environment in which the fish bred and lived.

Also, we have endeavoured to include in the industry an R&D planning mentality, to put the emphasis on planning rather than necessarily just leaping into doing research which will not achieve planned outcomes.

So what's our scorecard look like? I think generally we've done a pretty good job. We now manage over 600 projects, at a value of about $50 million per year. If you look at terms of developing capacity, which we're often criticised for, we have under employment something like 400 full time equivalent researchers and we invest in over 60 research institutes which gives you some idea that we are maintaining competition in the research community.

I think that our plans are coming to fruition, we are finding that more and more applicants realise the success of their applications means that they have to clearly identify the needs, the needs that emanate from these R&D plans, and they must clearly identify and achieve the planned outcomes.

The quality of applications is getting better.

I could go into, if I had time, some of the success stories with projects, but I won't. Some of those success stories and the progress towards success will come out in the course of this conference.

But let's have a look at the scorecard with respect to abalone wild catch.

How well have we done there?

To be generous, I'd say we're improving. I think that we haven't done as well in this sector, given the value of this sector in Australia.

Up until about 3 or 4 years ago, our research investments were very much state oriented. There was a very strong influence in the way we invested imposed by managers and researchers.

So about 3 years ago we recognised that this is not the way to do business, and we commissioned the development of an R&D plan, which some of you would be familiar with and disappointingly, some of you would not be familiar with.

The industry associations and managers in the states and research agency heads signed off on the R&D plan, and we then set to to implement the plan, but that wasn't easy either. We still had very state oriented projects aimed at further development on stock assessment methods and management models, and it wasn't quite coming together. There are reasons for this and they have to be recognised.

One is that there has not been a national way in which the abalone sector could engage in R&D priority setting. The other thing which has to be recognised, and I think there is unjustifiable criticism sometimes in this area, and that is research organisations are increasingly under pressure to obtain external funding. And that external funding is by way largely of money coming from the FRDC. It doesn't mean to say that that should, in itself, influence the directions of R&D. What it does say though, that if you as an industry don't get hold of the agenda and determine what priorities you want to be addressed in R&D, then researchers will do it for you, and you can't blame them for doing that.

So what would I like to see come out of this conference – 2 things:

1 I would like to see a national mechanism through which the industry can determine its national priorities. And even further, that they could identify who are the best people to undertake the research, and then commission those people to undertake the research, recognising that there are state differences, and we are dealing with a number of species.

2 The second thing that I'd like to come out, and this seems to be the hardest sell for us, and that is you must plan R&D. You wouldn't go into battle without planning for the outcome, and therefore we need to get serious about the planning. It's all very well to say 'we're too busy fishing', but, as I said in the beginning, all you're doing, if you don't get involved in the planning, is trying to give yourself the reason for condemning researchers for doing the research you don't want. You invest heavily in R&D, and regrettably, there is not the level of accountability for those investments that there should be. But you do invest heavily, and some of you would probably put more time into planning your shopping list than you would planning your R&D.

I would hazard a guess that for every 40,000 minutes that is spent in R&D on any one project, 1 minute goes into planning.

I wish you well at the conference – thank you.

Brian Jeffriess - Executive Officer, Tuna Boat Owners Association of Australia

This is certainly the most pro-active federal minister that I've encountered – he is getting out and committing himself to a timetable, which is almost physically impossible and mentally hard to keep up with. Certainly at the Commonwealth level, we very much appreciate it.

As far as Peter is concerned, FRDC, and I think we should always remember this, is the best business deal going around. It's one thing to have that business model, it's another thing to turn it into something positive and sustainable for the Australian fishing industry and Peter certainly has done this with FRDC, and it's very much appreciated.

What I'll try and do, is put the global view and just talk in general, because other people will be talking about specifics during the couple of days, and put that in the abalone context.

As far as a non-abalone person is concerned, I think this is an industry you should be proud of. We've tried to generate a pride in the tuna industry, its history, its future, its contribution and things like that, which a lot of people in the industry have balked at. They find it's almost projecting a public point of view, which we are trying to get them to do. But I think that without that public image, without that more positive view, without that pride in the industry, then I think a lot of us have a limited future. Because, even within the Australian context, abalone is a first class industry, and I think within the industry and some people external to it, even though it's considered by many within the industry with pride as the last frontier, I really think it is a model for the rest of Australia.

Until 2000, it seems to me as an external observer, until the Victorian Marine Parks issue came along (as in tuna) we were dealing with the problems of prosperity, licence values, a whole range of things, rather than difficulties themselves.

The thing we should never forget, and this is something we were trying to get through in other fisheries, is that the successes today are being built on risk taking, and they will continue to be built on risk taking.

I had an encounter, from a boat, with a great white shark the other day, and that scared the hell out of me. Now that's one thing, to be physically in the water, it's another thing that all the risks people have taken.

I wasn't around when abalone Licences could be bought for $5. People were handing them in and I don't think we should ever forget those days. We should never forget selling abalone overseas is not just a matter of turning up on someone's doorstep. I think the abalone aquaculture industry is finding that lesson at the moment. There are a lot of marketing people in this room, and those from the past who have done a lot of hard work and have taken a lot of risks, and that shouldn't be forgotten.

That prosperity that this has all generated brings its problems, and we have them in some of our other fisheries. The 3 things it seems to me in abalone, as with some other fisheries, it has brought what we call the 3 T's – you have a future Territory problem (in other words a marine park problem), future problem in getting a sustainable Tonnage out of the fisheries being allowed to take it out (not that it's not there), and problem of potential future Taxes, particularly at the state level.

As I said, I'll outline some of these bigger picture issues and not go into great detail because a lot of people will in the next couple of days.

In global seafood demands – here we are sitting on the edge of the fastest growing area of the world with the highest income growth, whose favourite food is fish. When you think about it, only we can stuff it up. There's no point in blaming the managers, the scientists, people from the government, or whoever it may be, in many ways it's within our control. The management of fisheries in Australia has put a lot of responsibility in the hands of industry and we really need to take advantage of that.

All these benefits of the low dollar, strong Asian growth will be sustained. When you apply that to abalone, it's not so easy to answer.

Even at a lower price it's basically a niche tonnage market that can't be increased anyway, and I think that abalone aquaculture people are finding out a bit of a lesson at the moment.

With the pegging of some of the currencies we too often forget, eg with the weakening US dollar this week, and it probably will weaken over the longer term, a lot of the Asian currencies are pegged to the prosperity of that dollar, so let's not automatically think that Australia is better off.

On value adding, for example, what more can you do with abalone than what you are doing now. There are a lot of other fisheries where there's a lot of value-adding potential left, but with abalone it's a lot harder and I think us and other fisheries are a bit sympathetic towards that.

Basically the tariff levels – with abalone there's still a fair way to go in terms of getting into these markets – in getting tariffs down. You can see that abalone in some areas Chinese-Taipei, Japan – there are still barriers there that still need to be broken down. I think in the bigger picture we shouldn't forget that the new round of trade negotiations is about to start, and that will include the entry of China and Taipei into the world trade organisation which will be an important opportunity to get these barriers to abalone trade down.

In terms of the economic growth in Asia, these are the very latest figures out last week from the Federal Government on the assumed growth in various Asian countries, and you can see it's still very rapid, it mightn't be up to historical standards, but we certainly won't be able to use the lack of growth in these markets as an excuse if we don't succeed.

In property rights and licence issues – in many fisheries this is the most important future issue in the next five years. At the state level, call it access rights, property rights, call it what you like, the progress on entrenching those as property rights isn't anywhere near as progressed in general as it is at the Commonwealth level. I think just as at the Commonwealth level we have learned a lot of things from state governments and state fisheries, on property rights there's something for the states to be learned from the Commonwealth.

The property right (compensatable right we call it) is now entrenched in Commonwealth legislation although the risk obviously needs to be there as far as fluctuating quotas, fluctuating entitlements are concerned, but the basic right is now compensatable, and much of this we hope in case law will carry over to the states.

A strategic approach is still required I think to gain those opportunities at the state level.

One issue there is every time I hear a state fisherman complain about having to pay cost recovery, and my experience in SA is that the abalone fishery doesn't complain, it's very progressive on that issue – don't – because cost recovery is obviously the best avenue in many ways to better access rights.

Selling of industry benefits – this industry does not do a good job on selling its benefits to the economy. In fact when the minister mentioned some of those highlights this morning, the benefits that this industry contributes to Australia, it's the first time I've ever heard those figures.

On taxes – you've got quarantine and a breakout – obviously we all know about the Tasmanian problem – that's now spreading disease to some extent. You only have to look at the most recent national competition policy paper on South Australia to understand that the whole concept of how things like resource rent taxes is gaining some credibility.

Abalone and lobster and now tuna are now obviously the targets – another 1% resource rent tax on abalone to pay for another 100 nurses and 'coppers' that's the best political selling point around.

Marine Parks – first all congratulations to the Victorian Fishing Industry Council for what they achieved on the Marine Parks issue – as Ross Hodge said this morning, that's only a battle, the war is not won. I must say in some states they've done very well on this issue. WA for example, it's entrenched in legislation that before any Marine Park can be declared, then various interests, various utilisers have to be taken into account.

I think on Marine Parks we have to bring things into context. Australia has more area under Marine Parks now than the rest of the world combined. But the reality is, and Gordon's here from EA, there's no stopping that juggernaut. A lot of these marine parks are being declared for good reasons, a lot of them are being declared, as the minister inferred this morning, for image reasons rather than reasons of substance. We see all the terrestrial parks where there is very little supervision and there is substantial deterioration. There's the risk of the same thing happening in the marine environment as far as parks are concerned.

All those complaints and laments from the industry and other users of the marine environment have no impact – the actual momentum is there for parks, the governments, particularly at Commonwealth level, have the power to declare them. This is an international issue – Australia is sometimes trying to meet its international responsibilities, sometimes it's trying to establish a better international image, but the reality is that these things are going to continue, the momentum is there and it's not going to stop.

Now, what do you do about it? First of all you live with it. If the park and your part in it can be identified very clearly - the problem always is the slippery slope. You can see that a multi-use park will be declared and over time, of course, the multi-use declines.

The South East of Australia is obviously under by far the most pressure, that's where the national oceans office is carrying out its first regional plan, and there's no doubt that even inshore areas will be to some extent affected.

How to manage that process? There's no substitute for a more positive public image – be pro-active about identifying areas that you need – and that's being done very well by SAFIC in South Australia I might say – and you've got to have a relationship with the non-government organisations (the conservation groups). There's no point in walking away from that reality.

In aquaculture – the minister briefly referred to it – the impacts are obviously in the market sites and interaction that he referred to, disease for example.

The growth in aquaculture is inevitable – there's no point in hoping it will go away – in abalone it's still very slow of course and we all see that every day, and people sit back in the whole sector, like we in the tuna sector did, in a more relaxed way, but the fact is that the performance of the Australian abalone aquaculture area has not been anywhere near as good as it should have been, and we've seen in Tasmania with one of the foreign take-overs the injection of capital expertise and things like that has accelerated the gains in abalone aquaculture.

Again, the challenge is to strategically manage it. In some fisheries they've actually taken over the aquaculture rights, and the best example of that is pearls, and to some extent tuna. Somehow you have to get product differentiation in the longer term into the system – it won't be enough in the longer term just to be a cocktail versus larger abalone.

Joint marketing – that's inevitable I think. Protect your own interests in South Australia. The whole sector has done very well on at sea aquaculture and reseeding reefs is obviously one other way to look at it.

On sites interaction – there is a problem, and we in tuna are very sensitive to that. Not as sensitive as we should have been on the practices that we have in say for example tuna aquaculture and the implications for predators and we certainly weren't as aware as we should have been of the potential disease impact of waste that goes into the sea from various other aquaculture.

Just to show you the world trend, just quickly, in aquaculture – that black area at the bottom is aquaculture worldwide – you can see that global production of fisheries is generally static and aquaculture is an increasing part of it. This applies to all fisheries, abalone is a special niche of course, but it's no less relevant.

On government management policies – again the thing is to think globally and act locally. Most of the pressures, most of the changes in management, most of the new management rules are coming from international developments – ecosystem management. Precautionary principle – when I first heard the words 'precautionary principle' in the early '90s I thought it was the name of a new racehorse. But now every day we live with these realities. The precautionary principle is being used – Northern prawn meetings this week – the sustainable level was established of a certain catch (8,000 tonnes) but by requirement almost the implied catch quota had to be set well below the sustainable level simply because of the precautionary principle.

Abalone, of course, is the most obvious example of that where you have ITQ's in all states (that I'm aware of anyway).

These are completely non-abalone agreements, these international agreements, they're completely non-tuna agreements. The EPBC act is the new Commonwealth environment act and it includes things like schedule forums, strategic assessment which to many people are just new terms, they don't really mean anything, but they will in 2 or 3 years time. If you have a financial interest in this industry, or a professional interest, then you will be very aware of these terms as they apply to you in the next couple of years.

Under the EPBC act, Environment Australia is entitled, and properly does in many cases apply things – their policy under this act, first of all is no reseeding of reefs. States are going ahead with constructive work and FRDC's financing some it – it's a very positive development in my view, but the view of Environment Australia in interpreting the EPBC act is no reseeding of reefs.

The second development under that act is that in trawl fisheries people are being asked to restrict their future activity to the current trawled areas even if there is a history of new trawling areas. Abalone is obviously a candidate for that. Obviously somewhere in the near future you will be asked to restrict your future activity to the current reefs.

The third issue under the EPBC act is of course that it gives Environment Australia effective control over exports. I'm confident that that power will be used judiciously in the foreseeable future, but there's no walking away from the fact that it's now a very very sensitive issue.

All these other international agreements - the FAO plan of action on sharks – under that plan of action the actual protection of sharks will increase, whether we at the state or Commonwealth level like it or not, those are international agreements. We're rarely participating in the development of those agreements. We need to be. The national fisheries body, the Australian Seafood Industry Council is very poorly funded and everyone in this room, including myself, is the loser because of it.

The impact on abalone quota levels under the precautionary principle will be inevitably set lower or below what you see as a sustainable level. Predators will be more common, parks will be more common, and you'll get labelled at some stage in some states that abalone may be endangered, as white abalone has been declared the first endangered marine species in the USA.

Marine compliance – national compliance – it's always seemed to me as an outsider participating in the wider arenas, trying to do something about, for example the national docketing system, now trying to do something about addressing some of the national export loopholes – the national abalone industry has not done as well on these types of issues as it should have.

More recently, there's now more urgency in the system, more accountability I notice from all the state abalone industries and their representatives, there's now more urgency by customs etc.

That has partly been driven by the Standing Committee of Fisheries, abalone sub-committee which has done a tremendous job and deserves first class congratulations for its efforts. But we need to continue to address these loopholes and somehow you have to look at long term differentiation on aquaculture identification because there will be little sympathy in some ways at the commonwealth departmental level to addressing those issues, you've got to address them yourselves, and be more proactive with these federal agencies.

Finally, on environmental management systems – although abalone in many ways is the most benign fishery you could ever perceive. There's no by-catch, there's no waste or significant waste, etc – so what could be the problem.

What I'm saying is that many of us thought that about many of our industries, and we've had to develop a self-protection and it was the proper course.

Environmental management systems – this includes the accreditation – there's no reason why this industry shouldn't be accredited before virtually any other marine user.

Emphasise sustainability – it's an ecosystem friendly industry – get in and tell people. Don't assume people know that type of thing. There will be an inevitable challenge one day.

Schedule 4 revisits – that's the power to export or not to export – these things will be constantly revisited. If there's any kind of hiccup at any kind of state level on the viability of the quota, then Environment Australia will properly examine that, so don't let's assume that everyone understands that the abalone industry is sustainable etc.

There is a need to work with New Zealand on these issues – they are ahead of the game in a lot of these things, but Australia, as far as abalone is concerned, has something to teach them.

The last point I'd like to make, which I haven't made in detail is occupational health and safety issues.

I notice Derek Craig is down to speak on this issue and I'll let him go into the detail. All I can say is that while abalone has had in recent years a first class performance on OH&S issues, it's not something we can take for granted.

We in tuna farming turned our head and partly ignored the problem. It's only through strong cooperation with governments and them being proactive that we've now lifted our game and got a much better public image because of it.

Jonas Woolford - State Papers, South Australia

South Australian Abalone Fishery
Second Generation Western Zone Diver

History

The modern South Australian abalone fishery commenced in about 1965. In 1968 the number of licences were capped at 100, at which time the Abalone Divers Association was formed to look after the interests of divers. By 1970 the number of licences were restricted and in 1971 the fishery was divided into three geographical zones and a minimum harvestable length of 130 mm shell length was introduced. In 1976 the number of licences was reduced to 30 and later increased to 35. In 1980 licences became transferable and in 1985 quotas were introduced in the Western Zone and extended to the Southern Zone in 1986 and to the Central Zone by 1990. There are twenty three licences in the Western Zone and six in both the Central and Southern Zones.

In 1993 the Fisheries Act 1982 was amended and management of the fishery was given to the Abalone Fishery Management Committee ("Abalone FMC"). The abalone fishery has proven to be one of the more valuable commercial fisheries, currently generating approximately $32 million GVP annually.

South Australia accounts for about 15% of the Australian catch. The Total Allowable Catch (TAC) for 2001/02 is approximately 900 tonnes whole weight. Each licence holder is issued with a number of units of quota and the average individual quota is about 24 tonnes per licence.

In any one year licence holders may increase or decrease their quota through annual Individual Transfer Quotas (ITQ) with other licence holders within their zone.

Our quota year commences on the first of January and finishes on the thirty first of December. We are however looking at bringing it forward a month to start on the first of February and therefore finish on the thirty first of January. This will better suit the spawning cycle of the green lip abalone. The quota year has been brought forward on previous occasions for this very reason.

In any one-year licence holders may increase their quota through an Individual Transfer of Quota with other licence holders within their zone. Currently, transfers of quota are not permanent, but the National Competition Policy Review recommended this be changed.

Commercial Species

Of the abalone species that inhabit South Australian waters, two main species support commercial and recreational fisheries and is the source of broodstock for abalone aquaculture. They are blacklip abalone and greenlip abalone. The other species, roei, scalaris and cyclobates are not currently exploited.

Current regulations require that abalone is landed in-shell in the Southern zone whereas in the Western and Central zones, abalone is permitted to be shucked at sea and landed as meat. Divers are only allowed to sell to Registered Fish Processors or the licence holder can register as a fish processor if wanting to sell the catch to people other then registered fish processors.

Management Plan

The Abalone FMC has formulated an Abalone Fishery Management Plan stating its major goal is for an ecologically, sustainable, economically efficient, socially just and accountable fishery.

The main objectives of the Plan are to:

- Maintain a catch which maximises sustainable economic benefits;
- Minimise costs of harvesting the catch by appropriate measures;
- Enhance the resources by stock enhancement programs and by research;
- Maintain effective liaison between industry, management and government;
- Reduce conflict within and between sectors of the industry;
- Recover management costs and reduce illicit fishing.

Illegal harvesting

It is well known that a lucrative market for illegally obtained abalone exists most of which is exported. Both Government and Industry recognise the ramifications this could have on the potential loss of Australia's current high standing in the market and the resource. Industry has initiated its own surveillance program.

Fishdowns in the southern zone

Since 1984 there have been periodic fishdowns of smaller abalone in the southern zone of the fishery, harvested at 110 mm shell length. These smaller blacklip abalone are considered to be 'stunted' populations which do not reach the minimum legal size of 125 millimetres. Whether this growth is a response to genetic, environmental or density dependent mechanisms has yet to be determined.

Southern zone divers developed and managed the fishdown areas between 1984 and 1988, without regulation, in response to their concerns about increasing fishing effort on the more productive abalone fishing areas. Since 1989 formal management arrangements have been developed and formalised in regulations.

Experimental Roei Program

The Minister for Primary Industries approved a recommendation to investigate the extent of roei stocks in the fishery, with the view to determining whether exploitation of the resource can be maintained at a sustainable rate.

The program has commenced and will be conducted over a three year period, including a full scientific program that will assess, amongst other things, the reaction to varying intensities of fishing pressure applied to the stock.

Indeed, many areas of the South Australian abalone fishery contains smaller or stunted abalone that are not harvested as they never reach the legal minimum length that could be assigned an exploitation rate that is sustainable, and that initially, could be in lieu of the 'normal' wild catch, but in years to come, if proven sustainable, could be exploited over and above the current TAC.

Translocation of Abalone

Translocation of abalone has already been completed in three areas, with others to be conducted soon. Those already completed have experienced varying degrees of success to date. On average it appears the survival rate to be about 60%, but with improved techniques, methodology, cooler water temperatures and weather conditions, it is expected that the survival rate to increase by at least 10%.

The two hypotheses being tested in this exercise are:

1. That larger sized abalone can survive to reproduce and increase the abundance of current populations; and
2. That stunted abalone will experience greater growth rates due to better environmental conditions conducive to growth and productivity.

Environmental Management System

Industry is in the process of implementing an Environmental Management System, to be incorporated into daily operations a system of continual improvement in methods of operating.

The EMS is accredited at the ISO 14001 level and allows for an independent third party audit mechanism as part of its certification. The EMS will prove to be an excellent initiative, one that will assist in appeasing concerns from those interested in minimising the impact on the ecosystem when harvesting a natural resource.

Marine Protected Areas

The industry will combine resources with other stakeholders as we desire a pristine marine environment for the healthy production of marine fish.

The Abalone FMC has a representative from the Conservation Council as a member to provide the committee with input on issues affecting the fishery, or the marine environment.

Industry is keen to eliminate or reduce threats, or risks, to the marine environment from pollution, effluent, introduction of pests and diseases, land and coastal degradation all of which add to the growing pressure on the marine and aquatic resources.

Industry Code of Conduct

Industry has designed and implemented its own code of conduct to provide a framework and guidelines within which to operate along side other marine users.

The objectives of the Code are to:

- Promote ecologically sustainable development;
- Facilitate and promote technical, financial and foster cooperation in the conservation of living aquatic resources and their management and development;
- Promote the trade in seafood and seafood products in conformity with relevant regulations, customer requirements and conservation principles;
- Promote world's best practice in all sectors of the seafood industry;
- Identify and promote technological advances relevant to the seafood industry.

Industry Dive Code

In July 2000, the Association launched its own Dive Code which will ensure industry best practices are adopted and complied with. The code requires all participants in the fishery to be suitably qualified and experienced to undertake such activities, without harm or danger to oneself or others.

It is a comprehensive code that considers and provides for all aspects of diving operations under abalone harvesting conditions.

Future Management of the Fishery

The Fisheries Act, general regulations and regulations in the Scheme of Management are currently under review, and as such, will present a significant opportunity for industry to capture issues such as access security, property rights, avenues to compensation and the incorporation of a Fishery Management Committee. This will provide for the Corporatisation of the Fishery and for industry to undertake more responsibility for management of the fishery for the future. It is with this ideal in mind that we must endeavour to "Chart Our Future".

Thank you.

Dean Lisson - State Papers, Tasmania

President
Tasmanian Abalone Council

The Tasmanian Abalone Industry

Tasmania has the world's largest commercial abalone fishery currently producing around 2800 tonnes per annum which represents over 50% of Australia's catch and 28% of the world's supply.

Over 97% is exported to Asia and the industry was worth over $110 million at the beach in 2000.

The industry is well known throughout Tasmania as a solid investor not only within the fishing industry but in many areas not related to fishing, e.g. agriculture, viticulture and wine making, retail, wholesale, property development, tourism, aquaculture, etc, etc, creating further employment and generating new and substantial wealth throughout the state, particularly in regional areas.

The capitalised value of all abalone related licences in Tasmania is in excess of $1billion!!!

There are 3500 quota units; each unit allows 800kg of live weight to be harvested as follows;

- Western zone; 360kg
- Eastern zone; 320 kg
- Northern zone; 80kg
- Greenlip zone; 40kg

Tasmania is the only commercial fishery in the world to operate under a Deed of Agreement rather than an annual licence system.

The Tasmanian industry has the dubious honour of paying the highest level of resource rent of any wild fishery in the world.

1965 The commercial fishery began with few regulations and very limited markets.

1968 The number of abalone licences was capped at 120 due to the rapid expansion of the industry. A further 5 licences were issued to Flinders Island residents in 1972 taking the total number of Tasmanian abalone divers to 125; this number has remained fixed ever since.

1972 Licence fees were set at 1.5% of the mean annual production value for the previous 3 years.

1975 Approval for transferability of licences from retiring diver to nominee.

1985 Concerns amongst divers in the early eighties regarding potential over-fishing led to the introduction of Individual Transferable Quotas. Licence fees were increased to 2.5%.

1985-89 Further concerns amongst divers regarding potential over-fishing led to voluntary quota reductions in each of these years. The largest voluntary reduction occurred when divers voted in 1988 in support of a massive 30% reduction for the 1989 quota year.

1986 Licence fees were increased to 5% of annual production.

1989 First under-sized blacklip abalone Bass Strait fishery

1991 Licence system massively restructured with the diving entitlement being uncoupled from the entitlement to hold quota units. Second Bass Strait under-size abalone fishery.

1993 Third Bass Strait under-sized abalone fishery.

1994 Introduction of the Abalone Deed of Agreement with access rights granted in perpetuity to all deed holders. Massive increase in royalties payable for the right to access Tasmania's valuable abalone resource.

1995 Fourth Bass Strait under-size abalone fishery held in April. Government wants to charge a royalty equivalent to 50% of the beach price. Abalone divers say no; Urchin divers say yes. Resource plundered as a revenue raising exercise for the Government. Living Marine Resources Management Act 1995 replaces 1960s legislation.

1997 TAC increased to 2520 tonnes; a 20% increase. This is the first time ever that a Tasmanian wild fishery has been able to sustain an increase in fishing effort made possible by prudent self–management practices.

1998 First Abalone Management plan introduced. Pre and post reporting required for divers and very stringent controls on processors implemented.

2000 Zoning system introduced; like the introduction of ITQ's in 1985, this was an industry driven initiative – certain catch limits assigned on a regional basis around Tasmania's coastline. This new system was used to significantly reduce fishing effort in the Eastern part of the fishery where there were record harvests in 1997, 1998 and 1999. Additionally, the zoning system was used to significantly increase fishing effort in the Western part of the fishery where there was clear evidence of under-fishing in some areas. TAC further increased by 9% to 2730 tonnes.

2001 Fourth zone introduced; northern blacklip zone. TAC further increased by 2.5% to 2800 tonnes.

The Tasmanian abalone industry is currently dealing with a range of management issues including;

Fine tuning of the 'new' zoning system to ensure the optimal 'spreading' of fishing effort; The zoning system is effectively a 'third' management strategy that is overlaid onto the pre-existing management strategies of minimum size limits and total catch limits. The management of the Tasmanian abalone fishery is a 'work in progress' and size limits, regional catch limits and zonal boundaries are under continual review and may be changed from one year to the next.

The creation of special legislation to allow for the creation of an 'ABALONE CERTIFICATE OF PROPRIETORSHIP' for abalone quota units based as closely as possible on the Lands and Titles registration system. This system will allow for the formal registration of beneficial ownership and third party interest details for abalone quota units. A separate 'Certificate of Ownership' will be issued for each abalone quota unit. A registrar will be responsible for the proper administration each time an interest is registered or withdrawn, ownership changes, or any other details on the certificate change.

Negotiating with the Tasmanian Government on a proposed change to the abalone royalty tax. When the abalone Deed of Agreement was implemented in 1994, it included a sliding scale 'ad valorum' royalty system. As the beach price increases, the actual rate of tax increases as well meaning that the Government takes an ever increasing share of the profits on a rising market. Therefore there is a strong disincentive to industry to invest in productivity and marketing infrastructure/improvements;

- for prices between $10 and $35/kg, the marginal rate is 10.9%
- for prices between $35 and $55/kg, the marginal rate is 26.5%
- for prices between $55 and above, the marginal rate is 38.1%

Clearly, these tax rates are punitive and anti-business; as such, ever since 1994, we have been actively lobbying the Government to accept a flat rate royalty tax of 8%.

Finalising new protocols for the collection of broodstock for the burgeoning abalone aquaculture industry. Prior to now, Tasmanian abalone farmers have been issued annual ministerial permits to harvest broodstock. These abalone have been harvested outside of the quota system by non-abalone divers.

The Tasmanian Abalone Council is currently negotiating to phase out this system and ensure that in future, all abalone farmers source broodstock from within the quota system and use abalone divers as harvesters.

There are a range of challenging issues that confront our industry in the future. Some of these include;

Industry 'SELF MANAGEMENT' i.e. industry taking control of more of the management functions currently performed by the Department of Primary Industry. Abalone stakeholders are keen to investigate the possibility of increasing the Tasmanian Abalone Council's formal role in the overall management of the industry. Using the principle of 'User Pays – User Says', the industry will be seeking a much greater input into how abalone taxes are utilised on fishery research, resource protection and licensing administration.

How the wild fishery interacts with the burgeoning abalone aquaculture industry; i.e. broodstock collection, disease control protocols, market interactions etc.

How do we deal with the illegal operators who seem to be more prolific and more professional than ever? How effective is a national approach to resource protection and compliance likely to be?

How is the Australian abalone industry interacting with the ever-changing marketplace? What are the challenges and what are harvesters/processors/exporters doing to optimise the future market potential for Australian abalone?

Is there any value in a national product development and marketing campaign that seeks to highlight the positive attributes of Australian abalone over its competitors in the marketplace?

The Australian market has traditionally been a very segmented entity made up of a large number of separate operators 'doing their own thing'.

This characteristic allows the shrewd overseas buyer to play one processor off against another!!!

Other exporters in other industries have had this problem in the past – maybe we should investigate the strategies of other exporters/ producers who have taken steps to overcome the problems created by a fragmented market supply network.

How do we deal with the ongoing issue of Marine Parks?

Len McCall - State Papers, Victoria

Victorian Abalone Industry

In the Beginning...

- Victoria's abalone industry developed from infancy in 1961 to become the State's most valuable fishing resource with a landed value of about $73 million.
- This development has been due largely to the foresight and perseverance of industry participants.

Management

The industry is managed by a combination of methods including

- Legal Minimum Lengths
- Limited Entry
- Licence Transferability
- Fishing Zones
- Total Allowable Catch
- Individual Transferable Quota

Victorian Abalone

The industry is spread across the State with key regional centres including:

- Portland/Warrnambool
- Mallacoota
- Geelong
- Melbourne and surrounds

1968

- 300 commercial participants.
- Industry was characterised by instability, fluctuating markets, poor quality and little formal management.

Late 1960s

- Concerns about potential over utilisation was voiced across the state.
- Pressure from industry led to the introduction of conservation measures including
  - Fishing zones
  - Restrictions on entry
  - Shell size limits
  - Licence fees for us on research and management

Early 1970s

- Number of divers had reduced to 107
- Industry saw the introduction of the requirement that fish be landed in shell to facilitate compliance

1980s

- Further effort reduction measures were introduced in 1984.
- The two for one arrangement effectively reduced diver numbers to current levels by 1988.
- Introduction of current licence fee arrangement which collect about 8% of the landed value of the catch

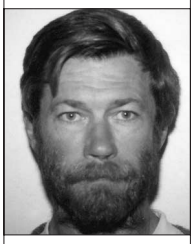
1988
- Following pressure from industry the current output controls, namely ITQs and zonal TACs were introduced.
- (the TAC was considerably less than previous annual harvests)

Current
- Industry has been relatively stable with no changes in structure or TACs.
- Greenlip abalone are subject to a closed season and harvests are now minimal.
- Annual licence fees and royalties continue to amount to about 8% of the landed value

Processing...
- Substantial developments
- The bulk of the harvest continues to be exported in canned or frozen form.
- Live market has developed and new techniques of value adding are continuing to emerge.

Current Issues
- Marine Parks
  - Erosion of access to areas
  - Dilution of property rights
  - Reduction in TACs
  - Must have multiple use and involvement
- Management Plan
  - Changes in quota ownership arrangements, transfers, industry concentration
  - Cost recovery
  - Royalties
- Structures
  - Co-management/ Fisheries management
  - Industry organisations
- Sustainability
  - Fish theft – resource depletion – enforcement
  - Fishery models/ TAC
- Parliamentary Inquiry
- Research
  - TAC model
  - Industry relevant/ directed

The Future...
- Integration of harvest and port harvest
- Greater involvement by new entrants to the industry as a result of the management plan
- Better use of so called by-products
- Increased research to ensure the sustainability of the resource
- Unity of purpose throughout all sectors of industry



John Smythe - State Papers, New South Wales

Proving the Theory of Survival of the Fittest

Many pioneer abalone divers began their abalone diving careers in NSW, with many moving south in pursuit of the resource and better management.

As more abundant grounds were discovered in Vic, SA and Tassie these early pioneers formed the backbone of a new developing fishery.

Abalone divers as fisherman immediately became aware of their potential impact on the resource and lobbied for input controls to conserve the stocks.

Whilst this happened in the southern states it did not occur in NSW.

A director of NSW Fisheries at the time applied the economic theory of laissez-faire to abalone resource management.

The theory went: if divers do well others will enter the fishery to a point where they don't do too well and will drop out (the weaker). The fitter will remain longer but will gradually leave as stocks dwindle until only the fittest will survive.

When the fittest has it to himself things will gradually improve and he will do better and then others will come in until...

NSW divers were not convinced of this and lobbied the director against it saying that if licence numbers weren't limited the resource will be fished out.

But the clever director had another theory to combat this concern for the resource:

'give me a bucket of salt water and two abs and I'll reseed the whole coast.'

When someone later said abalone were related to snails, and we all knew that snails were hermaphrodite, a new version of the directors theory was proposed: 'Give me a bucket of salt water and one ablone and I'll reseed the coast.'

Not having confidence in the director's theory, and noticing how well the Victorian abalone fishery was being managed, industry lobbied and in 1980 restricted licences were granted.

During the eighties NSW industry initiated further conservation measures aimed at the long term sustainability of the stocks.

These included:

1 increasing minimum size limits
2 reducing diver numbers through a two for one transfer scheme, and an industry funded 'buy back',
3 introducing quotas
4 NSW has also maintained a six week summer closure

By the late eighties a stable fishery existed with a strong co-operative and a mostly united group of divers.

This all ended with the collapse of the co-op, a north/south split in the fishery over zoning proposals, and a territorial war that lasted until everyone was sick of fighting and the Minister didn't know which side was right or wrong so he solved it by reducing everyone's quota and then introducing the FISHERIES MANAGEMENT ACT 1994 which led to another battle over access rights between divers who had bought in and original restricted licence holders.

The FM Act 1994 introduced statutory property rights and enabled the fishery to be managed as a share managed fishery.

All 37 holders of restricted abalone licences were issued with 100 shares (similar to units).

To dive, one needed a minimum of 70 shares.

Shares were tradeable in lots of 10.

A shareholder could either dive himself or nominate someone else to dive.

The share management regulations were encapsulated in the Statutory Management Plan for the fishery which was implemented in Feb 2000.

This permanent statutory right, where the government can only cancel shares if it pays compensation, comes at the price of full cost recovery and the payment of resource rent or a community contribution; a payment for the right to harvest from the community owned resource.

Under full cost recovery we now pay for five dedicated abalone officers, all research conducted for the management of the fishery such as stock assessments, and the cost of quota management and other administrative services.

The main focus of the Abalone Management Advisory Committee has become the accountability, by NSW Fisheries, for the usage of funds.

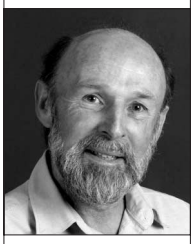
Our main criticism is that we are hamstrung by the usual inefficiencies inherent in any government department, and we are not receiving the best value for our dollar.

We may be the smallest ablone fishery in Oz with the smallest quotas and the lowest catch rates and perhaps the most disturbed history but we do excel in other fields:

- We have more recreational divers taking an estimated 52 ton of abalone.
- We have more resource thieves with more access to the coast.
- We have more coastal development and subsequently more environmental degradation.
- We have more sewage outfalls, particularly between Newcastle and Kiama.
- We have more perkinsus which has caused the closure of practically the entire coast from Newcastle to Kiama.

But not is all doom and gloom and signs are positive for the future:

- Extra policing and heavier fines and jail terms is leading to a decline in illegal activity by all but the hard core.
- Better research has allowed for better management decisions.
- Catch rates are increasing: since the beginning of 2000 divers are achieving quota easier, CPUE is on the increase and recruitment stocks seem much healthier.
- A high demand has meant an increase in the value of shares.
- The processing sector seems relatively viable as well.
- If there is a lesson to learn from this story, it is about the resilience of the abalone.
- If we were to do a case study on how not to manage a fishery perhaps the NSW would be it.
- If we are to learn anything from the past, perhaps it is the resilience of the abalone.
- How any animal could have withstood the tirade of abuse it suffered in NSW, and still show signs of recovery today, is testimony to the survival of a species.
- Perhaps the old Director was right when he mentioned only the fittest will survive.
- Luckily for us and the need to maintain biodiversity, the fittest must surely be the abalone.



Bob Lester - Control of Perkinsus disease

R.J.G. Lester and S.N. Kleeman
The University of Queensland

In South Australia, Perkinsus occurs in:

- Abalone Haliotis spp.
- Scallop Chlamys bifrons
- Ark shell Barbatia pistachia
- Cockle Katelysia rhytiphora
- Razorfish Pinna bicolor
- False oyster Cleidothaerus sp.

To delineate the parasite population under study, we first sought to determine what species or strains of Perkinsus were present?

This is also important for international trade because P. marinus and P. olseni, and not other Perkinsus species, are notifiable diseases according to the Office International des Epizooties (OIE).

257 molluscs other than abalone were examined (18 species) in two groups.
None were infected with Perkinsus.

Conclusion: no important host at this site other than abalone.

Prevalence in resident abalone

June 2000	30%	(9/30)
January 2001	50%	(8/16)
February 2001	57%	(17/30)
May 2001	57%	(13/23)

131 uninfected blacklip tagged and introduced into experimental site.

Prevalence

January	0%
February	4% (2/45)
May	86% (18/21)

Do blisters of large abalone rupture and spread infection? (Thus if large infected abs removed would parasite life cycle be broken?)

Do small infected abalone die and release parasites?

Why is the infection so localised?

A mathematical model incorporating the density of abalone, mortality rate, force of infection and other parameters is being developed to clarify the conditions which enable the parasite to persist in localised areas.

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- Dr Hamish McCallum

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Judith Handlinger - Disease risks to the abalone industry.

Fish Health Unit, Department of Primary Industries, Water and Environment, Tasmania.

Abstract

Disease risks are of increasing concern, after emergence of several diseases which pose potentially serious risks to abalone stocks if introduced to new areas, and the increasing likelihood of movement with live abalone. An example is the disease Withering Foot which devastated abalone stocks of west coast America, which may have been introduced to California, in way similar to the sabellid shellworm introduction into their farmed stocks. These and other recently discovered diseases will be discussed. Perkinsus olseni infection, which is present in parts of Australia, is recognised by the international disease control body OIE (Office International des Epizooties) as a risk to international trade. Due diligence is required to ensure that only healthy abalone are marketed, to protect both the marketplace and consumers. A limitation on this is the lack of knowledge of other diseases in wild stocks. Strategies to rectify this will be proposed.

Background

The invitation to discuss disease and pest risks to the abalone industry is timely as such concerns are increasing world wide. This is in part due to recognition that disease has played a part in the decline of some abalone populations, though this is only one of the threats to abalone stocks. It is also a response to the emergence of more abalone diseases with the rapid development of abalone aquaculture, and the increasing opportunity for spread of disease through the increase in international movement of live abalone. However this increased concern is also related to a general increased awareness of disease risks across all fisheries activities, and the incorporation of these concerns into international trade agreements.

The provisions of the SPS agreement stipulate that any claims of disease status that are used as the basis for trading arrangements must be based on scientifically sound approaches. The aim is to prevent the use of animal disease as a de facto barrier to trade. Australia has already seen legal challenges to quarantine conditions on this basis, and is therefore reviewing quarantine conditions in all areas.

With abalone, there are still relatively few diseases known from either Australia or the rest of the world, but some of these have been shown to have the potential for major effects on population. We should also recognise that while the low number of known diseases appears in part to reflect a robust animal type, it also reflects a lack of examination (an absence of knowledge). There have been very few comprehensive surveys of diseases of abalone in the wild, and none on what diseases are present (or absent) across Australia. Without this knowledge, Australia will be unable to justify maintaining strict quarantine rules for the importation of aquatic animals and their products, increasing the likelihood of introduction of exotic pathogens that could devastate our aquatic animal industries.

So far the only abalone disease listed by the international animal disease control body OIE as a risk to international trade, is Perkinsus olseni, which is present in Australia. As concern is also increasing in other countries, Australia could potentially lose access to international markets for our products, if we cannot demonstrate disease freedom in the stock marketed.

Types of disease risk/disease expression:

In considering disease risks we need to include risks to abalone stocks, to the consumer, and to the market.

The major risks to abalone, as for most animals, occur when infected animals are stressed, or a disease is introduced into a new population which has not become adapted to the disease.

In either of these cases, the level of disease may rise from insignificant levels to become a major problem. Sometimes this results in the loss of the whole population, but even with the worst outbreaks it is usual for a few animals to survive. These survivors may, over time if they are continuously re-exposed, form the basis of a more resistant population (although this may take many years to develop). These animals may carry the disease at lower levels, so that they only become a problem when the animals are stressed. They also act as a reservoir for infection and may pose a risk to other populations. Thus disease may often be present even though it may not be detectable as sick fish during normal fisheries operations. Detection of sick animals in the wild is made even less likely where predation is likely.

The situations where diseases are likely to reach problem proportions are where animals are crowded by either aquaculture or a population build up (boom and bust type wild population changes), or where animals are stressed by unusual environmental conditions, or where animals are moved between countries or regions. Given the very large Australian coastline, there are concerns regarding translocations between states/regions, as well as internationally. Wild abalone fisheries are increasingly moving stock for processing, and holding prior to live shipment (which can also be a high stress situation).

Other than crowding and stress effects, both aquaculture and wild fisheries share the same diseases. They also share the same risks if Australia is required to relax quarantine if it does not have the data to support these, if animals are moved between Australian regions without health risks, or if market opportunities are lost.

Known disease risks

The most internationally recognised risk is Perkinsus olseni. This will be covered in detail by a separate presentation (R Lester, this Symposium). Because it is an OIE listed disease present in only some parts of the country, it is necessary to know its distribution within abalone stocks to ensure that animals which are marketed live are only derived from Perkinsus free populations, and that animals processed from areas where it sometimes occurs are healthy and of good quality. Knowledge of the distribution is also required to manage the disease, particularly as it may affect a number of species and may be carried (inapparently) by a number of bivalve species. In early infection and where abscesses are few and buried, it may also be difficult to detect in infected abalone stocks.

Another disease of international importance is Withering Disease of Californian abalone, which has been recognised since early 1980s, though the actual cause (an intracellular bacteria of the Rickettsia family) was only discovered in recent years (Friedman et al, 2000). Even though the cause was initially unknown, the disease was shown to spread from the initial region and has decimated Californian abalone, particularly the Black abalone. Both Black and Red wild industries were subsequently closed. Culture of the more affected Black abalone ceased due to Withering Disease, which has also placed considerable restriction on Red abalone culture, and defined the species and conditions of culture. The Rickettsia appears to be a primary pathogen in black abalone, causing progressive disease and massive losses even in the absence of stress, and to cause severe disease under heat stress conditions in red abalone.

Surveys have commenced or are planned in Central and South America, and the disease has recently been found in parts of Mexico (Martínez et al, 2000).

Sabellid shell worm: This small as then unnamed worm was first discovered in California and subsequently shown to be a native of South Africa. It is now a major problem of both Californian and South African farmed stock. Worm infestation deforms the abalone shell, reduces growth, produces domed brittle shells without respiratory pores and may produce deaths. Its significance may best be described as significant not catastrophic in abalone. Mild infestations also occur in other gastropods (e.g. limpets). Larvae are benthic (crawling rather than water dispersal). They settle on shell margins, and are covered by the host. More larvae settle on this, so that a stack of worms plus host response builds up, deforming the shell. Multiple branchial crowns of approximately 20 tentacles are visible on the outer shell.

Subsequent investigations showed that this sabellid polychaete had been introduced into California from South Africa, where it is now the major problem for South African abalone culture. The likelihood of introduction was high because the worms are simultaneous and functional hermaphrodites (so the species can be translocation with one worm), and was increased because light infestations are difficult to detect. Light infestations are common at low temperatures, though reproduction is high above 16°C. Control is also possible because the larvae crawl rather than are undergo planktonic dispersal, so that spread is only local.

The translocation issue and Californian abalone decline, then, became more complex when a Withering Disease like Rickettsia was found 1999 in South African abalone. There is no associated mortality. DNA comparison with Californian RLP is not yet complete, but this has raised the question of whether Withering Foot was also introduced, with the same stock which translocated the sabellid worm. It is noteworthy that pre-movement tests were done, but the RLP look similar to bivalve Chlamydia, about which there is no international concerns, and the sabellid worm was unknown at that time. Nor had there ever been international concern regarding translocation of shell dwelling organisms. This episode illustrates the dangers of a lack of background data.

Whether Withering Disease Rickettsia are a major exotic risk to Australian abalone or a common finding worldwide cannot be answered until there is data available of disease agents present in wild abalone in Australian and elsewhere. However surveys have shown the sabellid organism to be absent from Australia (Armond Curis, pers comm). The importance of the South African experience of the importance of farm management to coping with endemic diseases has, however, relevance for our own shell and health problems.

Other potential candidates for translocation concern include a Japanese withering disease (abalone amyotrophia), due to a virus, which causes tumours on nerves which restrict feeding; a fungal shell disease from New Zealand; and a recently discovered Haplosporidian infection, also from New Zealand.

Abalone amyotrophia is a virus disease of hatchery juveniles of Japanese black abalone (Nordotis discus discus), in which tumours (gliomas) occur in nerve trunks of foot and other organs. Virus particles are visible in tumours, and the disease has been transmitted. The tumours affect movement, and consequently the abalone starve. Grossly they appear withered (Nakatsugawa et al, 1999).

Shell fungal disease is so far only recognised in New Zealand. It affects wild and cultured New Zealand Paua, Haliotis iris, H. australis, and H. virginea. The fungal lesions occur on the inner surface of shell, under respiratory pores and at the apex of the shell. (Generally this would be regarded as an issue of quality). The lesions may be covered by host with recovery, but death occurs if the lesions spread under the adductor muscle which may detach. (There is possibly some population threat.) The distribution is not known, therefore the level of risk is uncertain.

Haplosporidia are protozoan parasites, which are common in bivalves. Some are serious pathogens, listed by OIE. None had been known from abalone until 1900/01 (pers comm B Diggles, M Hine). Serious losses occurred in juveniles, with massive infection of non-spore stages throughout the tissues. It is noteworthy that while the OIE notifiable disease list for fin-fish and crustacean feature viral diseases, those of molluscs are all protozoa or protozoa like parasites. Of the Protozoa like organisms, Perkinsosis is listed for both oysters and abalone. The true protozoa diseases listed are restricted to bivalves. These include Bonamiosis, Haplosporidiosis (H. nelsoni or H. costale), Mikrocytosis, and Marteiliosis. Parasites of most of these groups are common in a number of bivalve species, but until the recent New Zealand discovery, none were known in abalone, which had generated a perception that perhaps abalone are susceptible to a different parasite spectrum. This now warrants re-examination.

Other diseases that are known or suspected to be geographically restricted include a juvenile disease from British Columbia, and a coccidian which was present in high levels in Californian stock. The coccidian (which briefly was suspected to be the cause of Withering Disease, but is now known not to be major factor but may have been a contributing stress), has been tranlocated, but without devastating losses. The Canadian juvenile disease, caused by the single celled fungus-like thraustochytrid organism Labyrinthuloides haliotidis affected juvenile Pinto (H. kamschatkana) and Red (H. rufescens) abalone in British Columbia, causing up to 100% mortality in abalone less than 6 months old, which mounted no response. (Older animals did, and survived.) However this was seen as a limited outbreak in the 1980s, and has not been seen since. As it is not known to be occurring, it probably currently reflects a low risk.

Translocation risks within Australia:

There are currently two recognised risks for which restrictions have been imposed within Australia. These are Perkinsus olseni, which is an interstate as well as international issue, and the spionid shell 'mudworm' Boccardia knoxi.

'Mudworms' are generally not a movement issue. Many spionids invade mollusc shells (quality and production issue, occasionally death), but most species are probably ubiquitous. This one became an issue due to the suspected severity (after heavy mortalities were seen in pilot abalone sea-barrel culture), and limited known distribution (NZ, TAS). However the apparent distribution may be because this worm occurs only sub-tidally and may therefore have been missed from earlier surveys, or it may be restricted by temperature. The effect is at most moderate, but the precautionary principal has been applied until full information is available and it is currently an issue, and has resulted in interstate restrictions for oysters as well as abalone.

Subsequent research (CRC, FRDC/ FHU – Lleonart et al, 2001) has shown that most such infections are in fact mixed infections, with similar effects on production from the major species. There were negligible deaths in subsequent years, with the conclusion that the initial trial systems favoured the mudworms, and were carried out in worst known seasons for dispersal of this mudworm. It was also shown that B. knoxi can be readily controlled and if necessarily treated, on farms.

Factors affecting the level of risks for translocation of Perkinsus olseni are that it affects many species (Greenlip, Blacklip, other abalone, other bivalves), and is easy to miss in buried abscesses and less affected species. There is therefore a need to know the distribution (surveys are underway through SA/FRDC, NSW), regarding harvest and interstate movements.

Pests and predator are also potentially major risks, but are generally taken less as an issue, with even less knowledge of the risks, and no effective tests.

Endemic Australian diseases

Farms and holding facilities share similar risks to the market place through endemic diseases, but bear more of the direct costs than the wild fisheries sector.

An example is tubercle mycosis (fungal disease), which has recently posed some market concern. Historically, Abalone Tubercle Mycosis, was a disease originally described from H. sieboldii in Japan.

Two fungi have been implicated (Atkinsiella awabi and Haliphthoros milfordensis). White lumps (tubercles) occur on the foot, mantle, peduncle or epipodium. There is a variable host response. Outbreaks can be controlled in tanks: Formalin (31.3 ppm), H202 (50 ppm), Betadine (7% iodine, 250 ppm).

Abalone Tubercle Mycosis has occasionally been seen in wild stocks, especially when these have been brought into culture or holding facilities, in which it may spread readily, (TAS, NSW, VIC). History suggests a free living opportunist, rather than normally an abalone associated fungus. Tasmanian and Victorian isolates have been identified as Atkinsiella awabi. The disease has also recently been described from Australian abalone dying on receipt at overseas market, possibly involving another fungus. This episode demonstrates not only a quality risk, but also a potential threat to the market.

Bacterial infections are perhaps the major diseases of farmed abalone, but as the organisms are common in the environment, represent a risk only to the stock on hand. Vibrio harveyi causes a disease similar to pustule disease in China, Japan and Europe (caused by V. fluvialis II and V. carchariae, a sub-species of V. harveyi). All cause abscesses, which persist, and outbreaks recur with stress. Other Vibrio species generally cause only acute or terminal infections. Most Vibrio species are probably world-wide in distribution (possibly not all strains), so unlikely to be a translocation issue. This is the major production issue on farms.

Other bacterial infections include Flexibacter skin erosion and skin loss. These are long flexible bacteria that don't invade living tissues, but produce toxins that cause necrosis, and thus erode the surface producing white, flaking skin. History of outbreaks suggests abalone are predisposed by skin loss (trauma, heat stress, wild harvesting). One holding system case occurred after gradual evaporation produced high salinity which favoured the Flexibacter. Control is through control of the stress and salinity. This is a potential issue of quality and holding losses, but not a translocation or wild population issue.

A second more aggressive form of Flexibacter like disease involving a large form or this bacterial group has been seen on two occasions. This shows much more aggressive penetration, pus like dead tissue, very rapid progress. In both outbreaks atypical large Flexibacter-like bacterial were seen, death was too rapid for much tissue reaction. One outbreak has been seen in holding facilities. The main significance was the direct losses. This disease is too severe to be missed and to continue live processing, so in-transit losses affecting markets are unlikely.

The status of other known Australian diseases is minor. Other parasites are known, but are not causing significant disease.

In summary, Australian diseases include no viral diseases to date, ubiquitous, opportunist bacteria causing farm problems, fungal disease, Perkinsus olseni, minor protozoan parasites, and a number of metazoan (large parasites), including several causing minor lesions internally and moderately severe shell forms. Environmental factors are suspected to influence the variability of spawning success, on farms at least.

Human health risks:

Recent experience from South Africa and other countries has provided a warning with regard to Paralytic Shellfish Poisoning (PSP). Filter feeding bivalve molluscs accumulate toxins produced by some algae, but shellfish are generally unaffected by these. Abalone are grazers and were generally not considered either at risk or to be a risk, but high levels of PSP were found in South Africa (Pitcher et al, 2000), posing a consumer risk. The South African industry was closed for months, many abalone died, larva abnormalities were demonstrated and poor reduced larval recruitment noted.

Generally there has been insufficient testing done here to assess the risk of similar episodes. The situation may not necessarily reflect the same risks as filter-feeders, and the toxins involved are not necessarily from blooms of micro-algae. Though micro-algal blooms producing PSP toxins occurred at the same time in South Africa, two separate sources may have been stimulated by the same cues. It would be advisable here to test abalone when filter feeders are affected, as proof is needed that PSP toxins are not a risk here. This is more relevant to wild stock as accumulation from food sources is less likely in artificially fed stock.

The way forward:

I draw your attention to the need, purpose and benefits of disease surveillance recently outlined by Baldock, 2001, and the need for inclusion of wild populations. To meet our SPS obligations and gain these benefits, there is a need for disease surveillance, and to achieve this background data is needed on the diseases present.

To increase health surveillance for abalone (both farmed and wild), the FRDC Abalone Aquaculture Sub-Program has proposed a background survey of wild and farmed stock. (The format of such a program is as yet unestablished but it is suggested that a combined program come under the FRDC Health Sub–program). Such a survey would be part of an overall surveillance program, include samples from both wild and farmed stocks, and provide joint benefits to both sectors. A limited budget is anticipated, as this would need to be spread round 5 states (over 1-2 years, for an initial survey), and joint funding is being sought. The suggested program would be structured to include both structured and opportunist sampling (to reduce costs), with link to existing Perkinsus surveys and routine stock surveys both to further reduce cost and to benefit those programs. Input from the wild industry both at an industry level, and possible through sampling opportunities through individual processors/ harvesters is requested.

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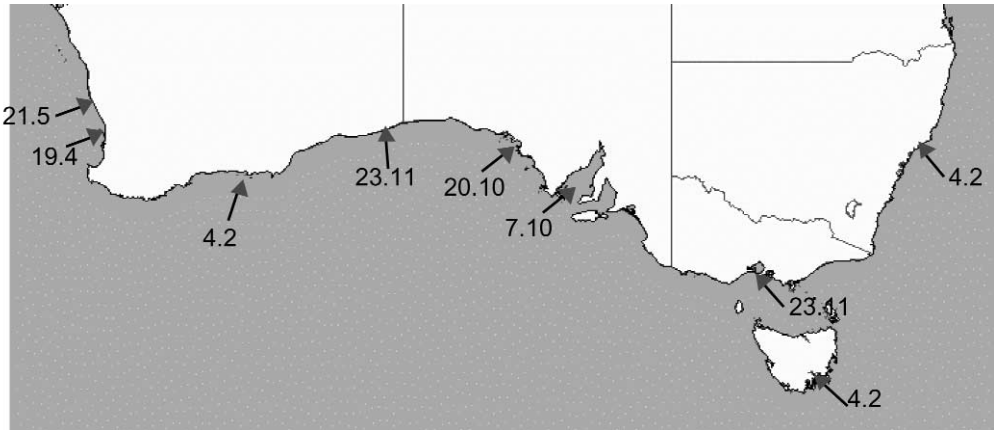
Iain East - Planning for Emergency Diseases

Aquatic Animal Health Unit

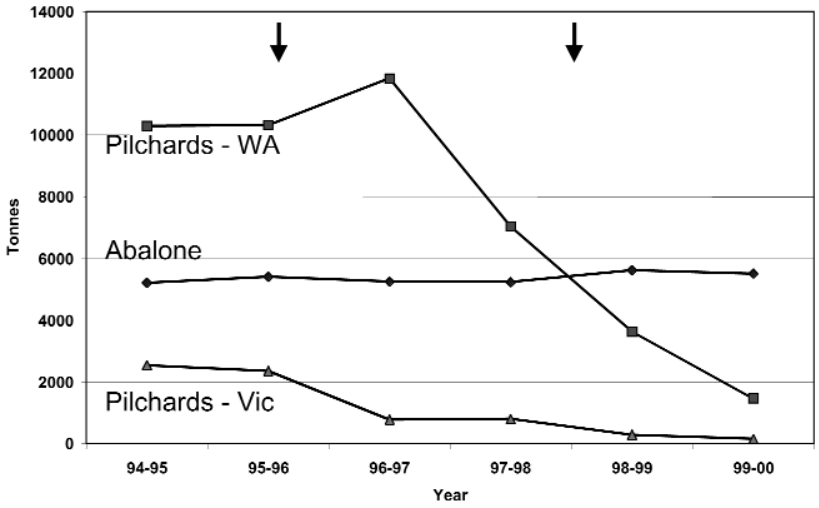
Why do we need to control disease?

Because it has a direct impact on your profitability

Spread of pilchard deaths 1998/99



Impact of Disease on the Pilchard Industry



How does disease spread?

Sabellid Polychaete - '...was probably introduced with cultured abalone from South Africa that were not quarantined on arrival in California'.

Perkinsus olseni - 'In both cases H. rubra taken from an infected site had been introduced to the facility prior to the outbreaks (Goggin and Lester 1995)'.

Abalone kidney coccidia - '...the vegetative stages of the parasite were observed in 2 of 40 Haliotis rufescens illegally imported from California into barrel culture in Bamfield, British Columbia'.

The history of disease in aquaculture and fisheries is a simple litany of unwise movement of live animals, both legal and illegal .

'An ounce of prevention is worth a pound of cure' *Benjamin Franklin*

Controlling the Spread of Disease

- Australia is a signatory to the Asia Regional Technical Guidelines for the Responsible Movement of Live Aquatic Animals.
- All States and Territories have endorsed the National Policy for Translocation of Live Aquatic Animals.
- Each jurisdiction will introduce specific legislation based on the policy guidelines to control movement of live animals and prevent the spread of disease.
- SA has already legislated to control the importation of Pacific Oyster spat from Tasmania.

But what if disease occurs?

In closed or semi-closed systems, disease can be effectively managed and eradicated

- Edwardsiella sp. in a quarantine facility
- WSSV in Darwin Aquaculture Centre
- black striped mussels in Darwin marinas

In semi-open systems, disease can be effectively managed

- zoning for disease control in the Western Australian pearl industry
- aquabirna virus and Aeromonas salmonicida in Macquarie Harbour

Disease Management in Macquarie Harbour

1 No live fish moved out of Macquarie Harbour
2 Harvested fish must be processed at a registered facility
3 Disease has not spread to other salmon producing areas

Abalone in South Australia

- On May 22nd, a meeting with representatives of PIRSA and the abalone industry was held to start the process of developing a disease emergency management plan.
- A report of the meeting was circulated to participants for comment
- Issue on hold pending appointment of a new Fish Health Manager for SA

Draft Emergency Response Outline

1 Disease incident identified on farm
2 Disease incident reported to PIRSA Fish Health Manager via Fishwatch
3 Disease reported to CVO/Director of Fisheries
    – Incident communicated to Commonwealth (where necessary)
    – Incident communicated to EPA
    – Incident communicated to Dept of Health (where necessary)
4 Fish Health Committee assembled to provide advice
5 CVO/DF decides on and institutes selected response plan
    – Based on FHC advice
    – Based on prepared response plans for particular diseases
6 Response plan implemented
7 Official debriefing conducted

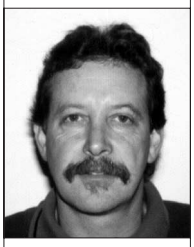
Disease Strategy Manuals

- AQUAVETPLAN includes a series of Disease Strategy Manuals for specific diseases
  - each includes a predetermined response plan for the disease
- Funds are available to write DSMs
- Call for industry priorities will occur prior to Christmas
- May meeting identified Perkinsus as an industry priority

The way forward

- Ensure that appropriate legislation covering translocation of animals in your industry is enacted
- Develop the Emergency Response Plan
- Respond to priorities exercise for Disease Strategy Manuals

'It is the disease of not listening, the malady of not marking, that I am troubled withal'
Shakespeare (Henry IV Part 2)



Harry Gorfine - Assessing illegal catches of Australian abalone

Progress on FRDC Project 2000/112

Need

- Illegal catches of Australian abalone are believed to be large.
- Little detailed information exists to confirm the size or distribution of the illegal catch.
- Illegal activities are well described.
- No previous attempt to comprehensively collate and analyse intelligence and compliance data at national level.
- Perceived need to develop data collection strategies to facilitate quantitative estimates of the illegal catch.

Background

High priority given to obtaining estimates of the illegal catch in Australia by the:

- 1999 National Abalone Compliance Workshop.
- 1999 National Abalone Research Workshop.
- Wild Abalone Fisheries R&D Needs Review commissioned by FRDC.

FRDC facilitated meeting that adopted strategic approach:

- to assess potential of existing resources via current study.
- use results to determine priorities for extension to further studies.

Project Team

- Principal Investigator:
  - Harry Gorfine (MAFRI)
- The Australian Institute of Criminology (AIC) was contracted to undertake the research on behalf of MAFRI.
- AIC is an organisation of high international repute and is our nation's leading criminological research organisation.
- AIC Researchers:
  - Rebecca Tailby
  - Peter Grabosky
  - Frances Gant

Operational objectives

- Identify, summarise and evaluate existing data
- Develop processes for compiling and analysing data.
- Analyse existing data and if feasible estimate illegal catches.
- Check validity of estimates and revise if necessary.
- Recommend strategies for future data collection.

Progress

- As of June 2001 all tasks associated with first four operational objectives were completed.
- Interim report submitted to the NFCC in accordance with project brief.
- Some of report must remain confidential as contains information that cannot be divulged without compromising the operational integrity of fisheries intelligence and compliance systems.

Findings to date
- Intelligence databases were not designed for quantitative research.
- Estimates of illegal catch could not be made using current data.
- Intel databases were designed for strategic enforcement and are highly effective for this task.
- There are jurisdictional differences among intel databases and their functional criteria.
- New data collection strategies are required to estimate illegal catches.

Synopsis of report to NFCC
- It is a significant report that will clearly provide strategic direction for improving fisheries compliance in the future.
- It is not a public report due to its confidential content and interim nature.
- The report demonstrates that all project milestones have been met.
- The inability of the study to estimate illegal catches increases rather than diminishes the value of the study.

Key issues
- Intelligence and compliance holdings only contain information on detected crime.
- How do we put a figure on unknown operators, particularly in the absence of field-based research?
- Most intelligence information tends to be inherently qualitative rather than quantitative.
- Intelligence information originates from a range of sources of varying but often unknown reliability.
- Prosecuted cases generally under-represent the quantities involved in offences.
- Jurisdictional differences in the format of both compliance and intelligence systems databases means systematic extraction of quantitative information is difficult.
- Geographic origin of illegal catches is often impossible to determine.
- Legal barriers exist to access of certain data e.g. ATO.

Summary statistics

Total quantities of meat weight for the 5-year period 1 Jan 1996 to 31 Dec 2000.

- Summing across all State and Commonwealth intelligence databases the total amount of illegal abalone was 21,973 kg.
  - Largest amount was Victoria = 13,096 kg.
  - Least amount was Western Australia = 120 kg.
- Summing across the compliance databases of all state fisheries services, the total amount of illegal abalone listed for the 5-year period was 14,611 kg.
  - Victoria had largest amount = 5,414 kg.
  - Queensland had least amount = 1,376 kg.

Future directions
- NFCC has recommended to FRDC that the project continue with the final phase.
- Final phase (second half of 2001) will develop recommendations for appropriate data collection and analysis strategies Australia-wide.
- Final report to FRDC is due before March 2002.
- Consistent with the project brief :
  'Separate reports may be required for enforcement agencies, stakeholders and the public to protect the integrity of compliance instruments and systems'.

Extension of results

- Strategies developed in the final phase of the project will:
  - enable fisheries enforcement agencies to establish baseline statistics to enable more objective quantification of illegal activity.
  - be transferable to the broader range of fisheries compliance activities beyond abalone.
  - assist with testing the sensitivity of fisheries assessments to effects of illegal catch.

Nick Elliott - Genetic Diversity in Australian Abalone Populations

Nicholas Elliott, Brad Evans, Jason Bartlett and Natalie Conod
CSIRO Marine Research

Introduction

A key issue for the management and conservation of abalone is identification. The level or scale at which identification is both warranted or in fact possible is a matter of debate, and depends on the needs for such information. From a genetic viewpoint, identification can extend from species to stocks to individuals and eventually to genes of economic importance. The latter is a long-term goal for the aquaculture industry while stock identification is of interest to fishery managers. Delineation of stocks or management units can be achieved by various means including biological data (such as growth data) and more expedient means (such as State boundaries); genetic diversity, reflecting gene flow between groups of individuals is a biologically meaningful method for defining fishery management units.

The use of molecular genetics for identification of management units of abalone commenced in FRDC project 1999/164. This established a genetic method for differentiating between ten Southern Hemisphere species, and is examining the genetic diversity within subsections of two of Australia's commercial species of abalone in an effort to determine if genetic stocks can be defined.

Species Identification

Genetic identification of plant and animal species when morphological characters have been removed (e.g. identification of shell and mantle tissue in abalone) is possible using either protein or DNA-based methods. The protein based methods are very dependent on tissue quality; generally requiring fresh or frozen material. Often identification for commercial needs requires analysis of processed (dried or canned) or degraded tissue. DNA-based methods are relatively independent of tissue quality, and those that rely on amplification of small DNA fragments are less likely to be affected by degradation. A number of DNA-based techniques are available for species identification including random amplification of polymorphic DNA (RAPD), restriction fragment length polymorphism (RFLP) analysis, and direct DNA sequencing of PCR (polymerase chain reaction) amplified fragments.

To differentiate between the more common Southern Hemisphere abalone species a PCR-RFLP method was developed using short fragments (less than 200 base pairs) of the mitochondrial DNA (mtDNA) molecule. Differences between and within eleven species were examined, and a test for separation of the species designed. The developed test allows the identification of abalone species from fresh or processed tissue, and mucous samples. The methods are straightforward and suitable for use in any laboratory with basic DNA analytical equipment.

The test involves a mitochondrial DNA PCR-RFLP analysis of fragments of the cytochrome oxidase I (mtCOI) and II (mtCOII) genes. Eleven Southern Hemisphere species of abalone were investigated (Table 1). These include five temperate and one tropical species from Australian waters, three temperate species from New Zealand and two temperate species from South Africa. All species, with the exception of the Haliotis rubra/ H. conicopora complex, can be unequivocally identified using the combined profiles of these two fragments. An example of the species separation using a set of four restriction enzymes for three species (H. rubra, H. laevigata and H. midae) is shown in Figure 1. Only very minimal DNA sequence variation (< 0.6%) was observed between H. rubra and H. conicopora; the latter may be a subspecies of H. rubra.

Table 1. Species for which the identification test was developed, and the number of individuals examined for intra-species variation.

Species	Sampling Location	No.
Haliotis asinina Linnaeus	Queensland	30
Haliotis australis Gmelin	New Zealand	10
Haliotis conicopora Péron	Western Australia	11
Haliotis iris Gmelin	New Zealand	10
Haliotis laevigata Donovan	Tasmania & Victoria	62
Haliotis midae Linnaeus	South Africa	10
Haliotis roei Gray	Western Australia	10
Haliotis rubra Leach	Tasmania, Victoria & New South Wales	50
Haliotis scalaris (Leach)	Tasmania, Western Australia	20
Haliotis spadicea Donovan	South Africa	10
Haliotis virginea Gmelin	New Zealand	10

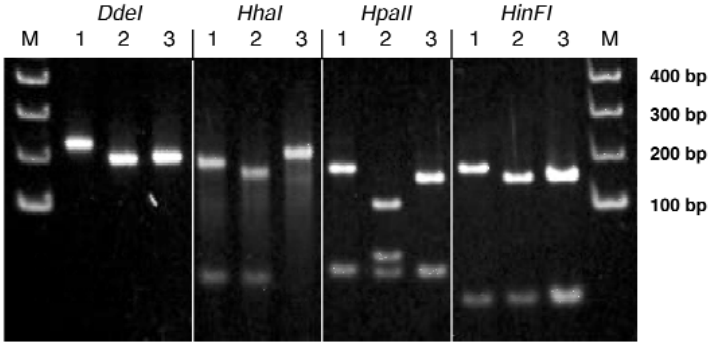


Figure 1. RFLP patterns on a polyacrylamide gel of the 193 bp mtCOI fragment for three abalone species produced with four restriction enzymes. Species 1 – H. midae, species 2 – H. rubra, species 3 – H. laevigata, M – 100 bp DNA ladder.

Population genetic diversity

Blacklip abalone (Haliotis rubra)

Over 35 sites within the Tasmanian blacklip abalone fishery have been sampled (each site with 100 individuals sampled) to enable a thorough examination of genetic diversity within this major fishery. Repeat samples have been collected from some sites to examine inter-annual variation, and six outlier samples have been obtained from along the mainland coast from NSW to South Australia. The genetic variation within these samples, consisting of over 4,000 individuals, is being examined at a suite of eight microsatellite DNA markers. This type of DNA marker is typically highly variable, and in principle more informative than other genetic markers in determination of fine-scale population structure.

Preliminary analyses of the genetic diversity in the Tasmanian samples suggest genetic homogeneity within the Tasmanian population. These early results do not show any consistent pattern of differentiation among the samples, with the data unable to refute (at statistical probability, P, less than 0.05) the null hypothesis that there is no genetic structuring to the Tasmanian section of the Australian blacklip abalone population. However, significant differences ($P < 0.01$) were observed between the Tasmanian samples and those from the mainland coast (Figure 2). Further analyses of samples we have recently obtained will reveal the extent of the differentiation along the mainland coast.

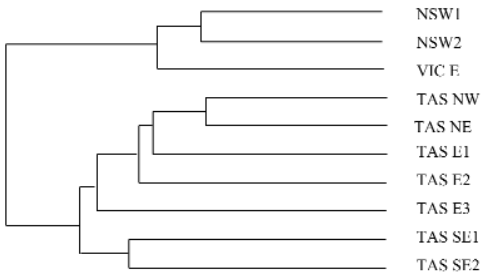


Figure 2. Representation of genetic differences between ten selected samples of blacklip abalone, H. rubra, showing the high level of differentiation between mainland (NSW 1, NSW 2 and Vic E) and Tasmanian (TAS) samples, and homogeneity among Tasmanian samples (TAS NW – northwest coast of Tasmania; TAS E – east coast of Tasmania; TAS SE – southeast coast of Tasmania). The axis is a representation of genetic distance between the samples.

Greenlip abalone (Haliotis laevigata)

A pilot study was undertaken to assess the effectiveness of microsatellite DNA markers developed for blacklip abalone (H. rubra) for assessing population structure of greenlip abalone (H. laevigata). Genetic variation was examined using three microsatellite loci in samples of greenlip abalone from three sites along the southern coast of Western Australia and three Tasmanian sites from the Bass Strait islands. Four additional loci were tested and each proved to be monomorphic for a single allele; a further locus proved problematic during the study but subsequent development indicates that it would be useful for future studies.

Despite small sample sizes (30 individuals per sample compared with 100 for the blacklip study) there was strong evidence of genetic differences between the three Western Australian samples, and between these and the three Tasmanian samples. There was also a significant correlation between genetic differentiation and geographic distance between pairs of samples (Figure 3). No differentiation was observed between the three Tasmanian samples.

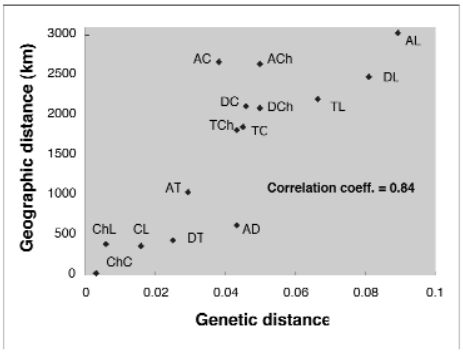


Figure 3. Relationship between estimated genetic distance and geographic distance between pairs of samples. Sample sites were Western Australia - Augusta (A), Dukes (D) and Twilight (T); Tasmania - Christmas Island (Ch), Councillor Island (C), Little Green Island (L). Data point for each sample pairs is indicated by two letters, e.g. AL represents distances between Augusta and Little Green Island. The correlation coefficient is a measure of the relationship between geographic distance and genetic distance (a value of 1.0 would indicate completed agreement).

Future research

A robust test has been developed for the clear separation of ten of the more common and commercially important Southern Hemisphere species of abalone. Differentiation of H. rubra and H. conicopora was not possible with this test. Very little DNA sequence variation was observed between these two purported species, such that their status as separate species is questioned. Additional known species both locally and from other countries (53 recognised species at present) of both commercial and non-commercial importance need to be added to the test. The test may then have to be modified to achieve full species separation, but such a comprehensive test would improve its value both nationally and internationally. In addition, further examination of the phylogenetics of the group is required to validate the recognition of species or sub-species status of such species as the local H. conicopora (which may really be a subspecies of H. rubra).

The preliminary results from the genetic diversity studies may have management implications (e.g. management zones for greenlip abalone in Western Australia), but equally importantly point to the need for further studies to refine our understanding of the genetic stock structure of our two main commercial species. These include improving the number of the molecular markers for multi-species investigations and applying these to an expanded sampling program in mainland fisheries. In addition, finer-scale sampling is required to further understand the genetic diversity within and between States and fishing zones. This will involve closer examination of genetic diversity at the individual reef scale through temporal larval settlement or recruitment samples and examination of known age cohorts. This will assist in understanding the genetic diversity results being observed in the abalone stocks. The use of molecular markers to assess the impact and success of stock enhancement programs should also be adopted.

Acknowledgments

This FRDC Project (1999/164) was administered through the Tasmanian Aquaculture and Fisheries Institute, and staff provided the majority of samples for the project. We gratefully acknowledge their support, the collaboration with Dr Neville Sweijd, formerly of the University of Cape Town, and the supply of samples from members of the Tasmanian Abalone Council, contacts at various State authorities and other research institutions both local and international.

Jason Froud - Industry Involvement in Enforcement and Compliance

Introduction

Commercial abalone fishing throughout Australia is characterised by relatively strong access rights and the recovery of the costs of management, research and compliance from industry. These factors have encouraged industry to pursue an increased role in management to the point where, in many Australian abalone fisheries, industry representatives seek to influence how enforcement services determine appropriate activity levels within a fishery. Compliance managers, for their part, often view such industry input with mixed feelings. On the one hand, commercial fishers frequently know as much, or more, about non-compliant behaviour in their fishery than the enforcement staff, and can provide valuable information to help optimise an enforcement program. On the other hand, in an environment of cost-recovery fishers may simply seek to reduce enforcement costs, perhaps to the detriment of sustainable resource management. Couple this last point with the potential for some commercial fishers involved in the management process to themselves be engaged in illegal fishing activity, and managers are indeed left in a conundrum determining what should be the 'right' level of fisher involvement in an enforcement program.

Many fisheries analysts agree that strong property rights should promote a higher level of industry compliance with fishery rules (Scott 2000). This theory is based on the premise that if fishers hold a guaranteed interest in the future of a fishery, they are more inclined to act with the future sustainability of the resource in mind. Western Australian commercial abalone fishers hold continuing access rights, are closely involved in the management process, and have recently formally requested that consideration be given to self-management and self-regulation in the Western Australian abalone fishery. Such a change would represent a considerable break from the traditional model of centralised public management, and thus needs to be carefully considered. Perhaps most importantly, and before such a concept is considered further, the management agency, industry members and the community need to consider the current role of industry in enforcement and compliance.

This paper seeks to explore the role industry presently plays in the compliance program for the Western Australian abalone fishery. Self-management/regulation is unlikely to be considered a viable alternative to current arrangements if industry is reluctant to usefully participate in the compliance program. However, if it can be demonstrated that commercial fishers are abiding by fishery rules, are actively involved in setting or amending rules as necessary for sustainable management, and actively report illegal activity, then an industry request to consider self-management/regulation may be viewed favourably by the community. Here we consider a number of options for industry to potentially expand and improve its involvement in the enforcement program, and thereby strengthen its claim for self-management.

The Western Australian Abalone Fishery

A Western Australian commercial abalone licence permits the collection of either Roei abalone, or greenlip and brownlip abalone. There are currently 42 managed fishery licences, held by 23 people. The GVP of the fishery in the 2000-2001 financial year was estimated to be in the order of $19 million, making it one of the smallest commercial abalone fisheries in Australia. In the 2000-2001 financial year around $1 million was recovered from industry for the costs associated with management, research and compliance. Of this amount, approximately 75% of the budget was spent on compliance, 15% was spent on research, and the remainder was spent on other management costs.

The fishery also supports a substantial recreational sector of (potentially) over 18,000 licenced fishers. Given the popularity of the fishery, a Perth metropolitan recreational fishing season is held each year commencing on the first Sunday in November, and running for the next 6 consecutive Sundays. On these days, abalone fishers are only permitted to take abalone between 7:00am and 8:30am. Elsewhere in the state fishing can occur all year round, but all recreational fishers are subject to daily bag limits and minimum size limits. In the 2000-2001 fishing season the recreational catch of greenlip and brownlip abalone was estimated to be approximately 5% of the commercial catch for the state.

In March 1999 the commercial fishery was divided into 8 management areas and an individual transferable catch quota system of management was introduced. Catch units are fully transferable in accordance with minimum unit holding requirements. Fishers must abide by a legal minimum size of 140mm for greenlip and brownlip abalone, and a range of sizes (depending on the area fished) for Roes abalone. However, industry has for some time agreed to voluntarily fish to a minimum size that is significantly larger than the legal minimum size. The legal minimum size is generally thought to be a size above which most abalone are sexually mature.

Industry involvement in the management of the abalone fishery has been significant. Indeed, many of the initiatives relating to the management of the fishery have been instigated and promoted by the commercial sector, including the development of catch 'quotas' and voluntary catch reductions. An Abalone Management Advisory Committee (AbMAC) established under the provisions of the Fish Resources Management Act 1994 exists to advise the state Minister responsible for fisheries on matters relating to the commercial abalone fishery. This committee also has a number of smaller sub-committees that are responsible for providing advice to the full committee on research, compliance and legislation, and budget issues.

Despite the MAC process working well in other Western Australian fisheries, such as the Western Rock Lobster fishery, abalone industry confidence in the AbMAC process is low, as is evident by the AbMAC recently being labelled by industry as 'little more than an expensive farce' (Rowe, 2001). Recently, the Industry Association asked the Minister to consider disbanding the AbMAC and recognise the existence of the Western Australian Abalone Industry Association as the consultative group for the day-to-day management of the abalone fishery. Further to this, industry has requested that consideration be given to allowing the commercial abalone fishery to enter into a system of self-management and self-enforcement.

Reporting Illegal Activity

Fishers and enforcement officers have traditionally been pitted in adversarial roles. When combined with the notion that fishermen are generally a consolidated group who look after each other in the face of environmental and bureaucratic adversity, this may stand in the path of individual fishers working with enforcement staff to reduce illegal activity amongst other licenced fishers in the commercial fishing sector.

Of course, in an environment of full cost recovery, it could be argued that industry may be less likely to report illegal activity (however serious) of other fishers, as any successful prosecution as a result of this information may foster an impression that illegal activity in the fishery is common. Industry members may believe that the management authority will then use this perception to justify increasing the compliance effort and therefore cost to the commercial fishing sector.

Despite this, it is clear that the fishing industry is best positioned to provide information about the illegal activity of other licenced fishers, and the activity of illegal, unlicensed operators (also called fish thieves or shamateurs). Industry members live in coastal towns, are involved in commercial fishing networks, and regularly operate in fishing areas where illegal fishers may also operate (Hernes and Sandersen, 1998).

A fisherman may hear that a known illegal operator is in town, they may see the person in an area and suspect that they are participating in illegal fishing, or they may, while diving, see large quantities of shucked abalone shell or 'scars' on the reef in an area where it is known that no legal abalone fishing has occurred for some time. Any such information may be useful to enforcement officers and should be reported.

McKinlay and Millington (1999) suggest six practical ways that fishers may be encouraged to report other fishers (whether they be licensed or non-licensed) to enforcement authorities.

1 Codes of conduct for ethical fisher behaviour

Fishers who hold access rights to a fishery are responsible for the maintenance of a public resource and should be subject to the same ethical standards as the public officials who are seen to more directly manage it. As such, fishers should be aware, through a code of conduct or some similar mechanism, of their ethical responsibilities as stewards of a resource.

2 Education on the legitimacy of regulations

Fishers often see some offences as less important than others. This is particularly the case with abalone, or quota fisheries in general, since many offences are technical in nature and these are perceived by industry as having little real value in protecting the abalone stocks. Fishers should be educated about the legitimacy of regulations, and that numerous breaches of even technical rules may have serious consequences on the fish stock.

3 Illegal activity 'hotlines'

Western Australia operates a 'Fishwatch' telephone hotline for reporting illegal fishing activity. However, rather than an illegal activity 'emergency' type service in which the caller can expect an immediate response from a fisheries officer, the 'Fishwatch' line is more akin to an information reporting service that may assist in a prosecution. The reporting of illegal activity by website is another method increasing in popularity, and allows the development of a comprehensive pro-forma that can be completed by the informant and submitted to the department electronically.

4 Rewards for information

In many law enforcement contexts, agencies offer rewards for the provision of information leading to the successful prosecution of offenders. Rewards are usually staggered to be commensurate with the severity of the offence and magnitude of the penalty. New South Wales and Tasmania have developed reward systems for fisheries related offences.

5 Foster good relations between fishers and fisheries officers

Effective communication between fisheries officers and fishers will encourage the reporting of illegal activity. Fishers should know who regional fisheries officers are, and be familiar enough to talk to them about the illegal activity of other fishers. The regulatory authority should work to minimise the administrative burden of fisheries compliance staff, and encourage communication with commercial fishers. However, relationships between compliance staff and fishers should also be maintained at an appropriate level so as not to encourage accusations of favouritism or corruption.

6 Effective administration and legislation

Fishers need to know that any information they provide will be acted upon promptly and effectively. The enforcement system must be capable of detecting and apprehending the reported offender, and legislation must be rigorous enough to impose meaningful sanctions on the offender. Importantly, the results of these actions must be communicated back to the person who provided the assisting information. A deficiency in any of these systems will quickly become evident if fishers report illegal activity and there are no immediate visible outcomes. This will serve to discourage future reporting of illegal activity.

Peer Reviews Committees

Legal action can be costly, lengthy, and similar offences sometimes result in inconsistent outcomes. The high value of illegal fisheries products has led to the development of high penalties for offences; this in turn has resulted in many defendants employing highly qualified defence lawyers that greatly increase the defendant's chances of successfully defending against prosecutions of a technical nature. Failure to successfully prosecute in these cases often causes concern among industry operators, and undermines the legitimacy of fishing regulations.

Peer review committees may be an effective alternative to judicial processes where legal prosecution is deemed as unwanted or impractical (McKinlay and Millington 2000, Burke 2000). Indeed, managers and industry members should be ideally placed to understand the nature and severity of fishery related offences, and therefore should be able to decide on appropriate penalties for those that are deemed to have committed these offences (Jentoft, 1989). The existence of peer review committees may be a deterrent in itself, as fishers would be very reluctant to have their dishonest behaviour 'paraded' before other fishers. Such an approach mirrors community policing initiatives where juveniles have the option to confront and make atonement to their victims as an alternative to judicial approaches to disciplinary action.

In Western Australia, there has generally been considerable reluctance from industry to participate in such groups. For example, when the suggestion was put to the Western Rock Lobster Fishery, industry members were unwilling to participate as they felt that doing so would create conflict within the fishing community. There was a belief that those involved in the committee may become targets for retribution within small fishing towns.

A number of mechanisms exist that may facilitate the involvement of industry in peer review committees. One involves the use of retired fishers on the committee. Although these people have retired from active fishing, they often maintain an interest in the fishery, and may be independent of current fisher organisations and management. However, these people may also have a negative impression of fisheries management and compliance, which could prove counter productive for all involved. Obviously, the recruitment and selection of industry and management representatives to a peer review committee would need considerable discussion and agreement from all stakeholders.

A second alternative to encouraging the use of peer review committees is to involve fishers that work in regions or areas other than that where the alleged offence has occurred. People who understand the fishery and the severity of the offence would hear the case, but they would, as a matter of course, not be personally connected with the person alleged to have committed the offence, or work in the area in which the offence was committed.

It is considered unlikely that either of these options would assist greatly in encouraging abalone industry members to be involved in peer review committees. Licence holders in Western Australia often hold units in a number of different areas around the state, and the fact that there are only 23 individuals holding licences means that many licence holders and lease divers know the majority of other industry members that have previously operated or are currently operating in the fishery.

In any case, the establishment of peer review or disciplinary committees must be done with caution and discretion. Such committees should not be seen as a replacement for normal legal proceedings, but may be applicable in situations where legal action is not considered appropriate.

Compliance working groups

Compliance working groups can help to encourage communication between management agencies and industry members. Ideally, they can assist in the communication of information to the management agency (from an industry perspective) about illegal activity, and advise on deficiencies in existing legislation. The Western Australian Abalone Compliance and Legislation Sub-Committee of the Abalone Management Advisory Committee has been tasked to provide advice to the AbMAC regarding matters arising that relate to the Abalone Management Plan, the Fish Resource Management Regulations, and the Fish Resources Management Act.

Discussions in abalone compliance and Legislation Sub-Committee meetings during recent times have primarily involved industry lobbying government to either amend or remove parts of the management plan that industry no longer believe are necessary for the management of the abalone fishery. In addition, a significant amount of time has been spent discussing the abalone fishery compliance budget. Industry is generally dissatisfied with the magnitude of the compliance budget, believing that it is excessively large. In addition, there is a perceived lack of accountability of government when expending and reporting on the compliance program.

Industry representatives in compliance working groups should be able to provide an industry perspective on a range of management and compliance issues. However, it should not be assumed that the members of an advisory committee are fully representative of the industry. In the case of the Western Australian Abalone Managed Fishery, some licence holders in the fishery are members of the advisory committee but, in practice, many of these people no longer fish the licence and instead choose to nominate a diver to fish the licence on their behalf (commonly referred to as lease divers). To appreciate the full practical impact of rule changes in a fishery, it is important to also canvas the opinions of those people who are actively involved in fishing. This could be achieved via a regular wide-ranging survey to ascertain the views of management, enforcement staff and stakeholder groups. Such surveys may also be an effective mechanism to enable industry members to anonymously provide information to management agencies about illegal activity.

Management Agency Responsibilities

Encouraging fishers to participate in enforcing fisheries law imparts certain responsibilities on management agencies. Governments need to ensure that supporting legislation and policy is provided so that fisher involvement in enforcement is encouraged and supported (Pomeroy and Berkes, 1997).

1 Responsiveness

Responding to industry reports about illegal activity in a timely fashion is critical if fishers are to be encouraged to continue to report illegal activity. The reports, be they received through official channels or delivered directly to a fisheries officer, should at least be recorded and any actions or results appropriately communicated directly to the fisherman who delivered the report.

Fishers are likely to know who is committing illegal activities, where they are committing them, and when. As a result, the management agency has a responsibility to consult with fishers regarding priorities for patrolling activities, without disclosing the actual location or timing of patrols. It should be remembered that even though a fisher reports illegal activity in a certain area, the management agency should not discount the possibility that the same fisher may himself (or herself) be involved in illegal activity. The report may merely be an attempt to divert enforcement activities to another area.

2 Confidentiality

Fishers should be able to report illegal activity in an environment that is safe and free from recrimination. This can be achieved through the establishment of strictly confidential reporting avenues. Most government agencies that rely on the receipt of information that would otherwise be unobtainable except under circumstances of confidentiality have the ability to suppress the source of such information.

For abalone fisheries, illegal unlicensed operations are increasingly of an organised nature and the illegal infrastructures being created are significant. In order to protect this infrastructure, it is possible that illegal abalone operators may take retributive action against individuals who report their illegal behaviour (Hauck et al, 1999). Strict confidentiality of illegal fishing reports in abalone fisheries is therefore critical to ensure the safety and continued involvement of those people providing the reports.

In Tasmania, an illegal fishing telephone hotline has been established. Informants are provided with a reference number that can be used by the caller to collect a reward if the information provided leads to a successful prosecution. The reward system is therefore totally anonymous. In Western Australia, a similar phone-in service has been in place for a number of years, and includes the potential to issue a reference number. However, a reward system has not yet been established in Western Australia for information leading to a prosecution.

3 Judicial Process

Industry members must believe that if they commit an offence, there is a reasonable chance that they will be caught and successfully prosecuted. Subsidiary legislation should not be unnecessarily complex and difficult to prove in court. The resulting sanction from a successful prosecution should reflect the previous record of the offender in an effort to prevent the repeated violation of fishery laws.

To be effective, sanctions should not only punish the offender, they should also be significant enough to deter other individuals who are currently engaging in, or planning to engage in, illegal activities. In Western Australia, a list of recreational and commercial fishermen who have been successfully prosecuted for fisheries offences is published in the quarterly Western Fisheries magazine. The name of the offender, the offence, and the penalty for each case is included in the article.

Conclusion

The communication of appropriate information relating to fisheries enforcement should flow from industry to the management authority and visa versa. Better communication should help to build an environment of cooperation and involvement, and will serve to mitigate conflict between industry and the management authority.

Industry should also be actively involved in creating and reviewing rules in a fishery. Fishers are familiar with the fishing process, and should be able to provide a practical perspective of those rules that work well, and those that do not. Ultimately, the sustainability of the resource should be their concern, and rules should be established that are fair, reasonable and enforceable.

In quota-managed fisheries, a key concern for all involved is that a fisherman in a particular area does not exceed their allocated catch for an area. In order to achieve this, industry should recognise that, in many cases, compliance in quota-managed fisheries can only be achieved through the establishment of technical offences. Although these offences may seem petty and unnecessary, where they do not exist, legislation loopholes could be created that would allow unscrupulous operators to exploit the system and potentially avoid prosecution for fishing over quota or taking animals illegally.

Encouraging fishers to report illegal fishing activity, the establishment of peer review committees as an alternative to current judicial processes, and the effective operation of compliance working groups are three methods that fishery stakeholders may employ to facilitate communication between management and the commercial fishing industry. Development of these processes provides a practical way for fishers to demonstrate a responsible attitude toward compliance with, and enforcement of, fishery rules, and this can only help serve to promote the concept of industry self management and regulation. However, these mechanisms will only be effective if management agencies can ensure that appropriate administrative and legislative structures exist to encourage and support fisher involvement in enforcement.

Acknowledgments

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David Doolette - Decompression safety

Abstract

Decompression sickness is caused by formation of bubbles in the body during and following ascent from a dive and is a significant health risk for occupational divers. The incidence of decompression sickness in occupational groups is approximately 3 per 1000 dives. The risk of decompression sickness cannot be eliminated, but is minimised by controlling the depth and duration of the dive and the ascent rate to minimise bubble formation. It is not widely appreciated that many factors other than depth and time also influence the risk of decompression sickness and decompression schedules can fail when used in manner for which they were not tested. This presentation examines some of the human and environmental factors (e.g. repetitive diving, reverse profiles, exercise, and temperature) that do and do not influence the risk of decompression sickness.

Introduction

Decompression sickness (DCS) results from the formation of bubbles from excess dissolved gas in the blood and other body tissue during and following ascent (decompression) from an underwater compressed gas dive. No dive is ever free from risk of DCS, but the risk can be kept small if the divers follow appropriate decompression schedules which control the depth and duration of a dive and the consequent rate of decompression. Approximately half the incidents of DCS occur within the limits of decompression schedules and there are several reasons for this.

1 Decompression schedules are based on rudimentary models of the complex physiological processes that cause DCS and cannot predict the risk of DCS in all circumstances.
2 DCS can result from incorrect execution of decompression procedures.
3 Divers have different susceptibilities to DCS and an individual's susceptibility can vary day to day.
4 Many human and environmental factors can cause large change in the normal risk of DCS.
5 Decompression schedules are only reliable under the conditions for which they have been developed and tested and can fail if used for a different type of diving operation.

Decompression theory

Ambient pressure increases with descent underwater and inert gases move into solution in the blood and other tissues, approaching equilibrium with the inert gas partial pressure in the breathing gas. Similarly, gases move out of the tissues during and after ascent. Bubbles form in blood and other body tissues where ambient pressure is reduced below total tissue dissolved gas pressure, and these bubbles can DCS. Bubbles form after the majority of dives and even if they do not cause DCS, they trap gas in the body and are only very slowly eliminated. As a result, the risk of DCS persists long after a dive and subsequent activities influence this risk, most notably repetitive dives. Even with correctly executed decompression, the risk of DCS is considerably greater for repetitive dives compared to the same bottom time spent during a single dive.

Most decompression schedules are based on models that predict the dissolved gas pressure in various parts of the body and rules that relate decompression rate to the dissolved gas pressure. These schedules do not directly consider bubble formation. Some of the tabulated decompression schedules (as opposed to diver carried decompression computers) do account for slow elimination of gas with decompression (eg. DCIEM standard air tables) and produce appropriately conservative repetitive diving procedures. Other tabulated decompression schedules (eg. US Navy 1957 air tables) do not account for slow gas elimination but still apply relatively conservative repetitive diving procedures. Many diver carried decompression computers do not make such allowances.

Decompression procedures

Irrespective of which decompression schedules are used it is important that the prescribed procedures are followed. For example, free-swimming divers are extremely poor at controlling their ascent rate, but the ascent rate is an important component of decompression. Recent human and animal experiments have compared dives conducted according to well known decompression schedules and found that slow ascent rate produced up to 200 times less bubbles in the blood.

Reverse dive profiles (repetitive dives deeper than preceding dives) provide a contrasting example. Many diving manuals written since the 1970s have prohibited reverse dive profiles, but there is no evidence that there is an increased risk of DCS and many decompression schedules have been tested using reverse dive profiles. A recent workshop on this subject concluded that there is no reason to prohibit reverse dive profiles for no-stop air or nitrox dives less than 40msw and depth difference less than 12msw. The workshop did not consider dives outside these limits where reverse dive profiles may be less safe.

Susceptibility to DCS

Some divers are more susceptible to DCS than others. In decompression trials where groups of subjects are exposed to the identical dive, some get DCS and others do not. There are many factors that may cause this. For instance divers over 40 and particularly over 50 are at increased risk. On the other hand physical fitness does not seem to influence risk. Obesity may not increase risk of DCS in young divers but probably does in older divers.

As important as the difference between individuals is that any individual diver's susceptibility to DCS can vary day to day. In decompression trials a diver can be exposed to the identical dive on different days and get DCS one day and not the next. Furthermore a diver's susceptibility might vary with successive days of continued diving (multi-day diving). The incidence of DCS in caisson and tunnel workers is higher on the first day working at a new pressure than on subsequent days working at that same pressure, this apparent acquired resistance to DCS is lost after a 10-day break from compressed air work. The same evidence does not exist for divers, and divers' work practice is very different from caisson workers (eg. divers do not necessarily dive to the same depth on consecutive days), but the number of bubbles detected in the blood of recreational divers does decline with multi-day diving. This suggests that the risk of DCS may be high on the first day of diving operations after a long break.

Change in the normal risk of DCS

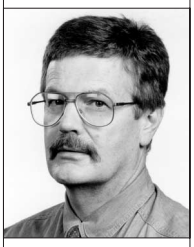
Changes in diving environment, diving practice, or even non-diving activities can alter the risk of DCS. Diving in cold water is widely believed to increase the risk of DCS but this very little evidence in support of this belief. On the other hand, the risk of DCS associated with surface decompression using oxygen is much greater for diving in warm water or using hot water heated suits than in cold water. In a recent US Navy surface decompression diving operation in 10°C water there were no incidents of DCS during 34 dives conducted using wetsuits but there were 5 incidents of DCS in the next 14 dives conducted using hot-water heated suits. Decompression times had to be extended by 30 minutes before an acceptable risk of DCS was achieved. It is not known if hot water heated suits increase the risk of DCS for in water decompression and such suits are effective for combating hypothermia.

Inappropriate decompression schedule selection

Decompression schedules are developed from simple models of what are in reality very complex physiological processes. The risk of DCS is predicted from the depth and duration of diving and does not account for other changes, for example the temperature changes in the previous example. To overcome this limitation a variety of decompression schedules that have been developed for use in a variety of different circumstances. Decompression schedules should be selected for use based on proven success in diving conditions similar to those for which they will be used. It must be recognised that changes in diving procedures can render previously useful decompression procedures unsafe.

Conclusions

In the past only the military and off-shore commercial diving industries have made the investment to develop decompression schedules, and it has only been economically viable for these industries to conduct the extensive test programs previously required. Other diving communities have used primarily military decompression schedules because they are widely available. However, these schedules can fail if diving practice is substantialy different from that for which the tables were developed. New techniques have been developed that would allow measurement of the risk of DCS for abalone diving and develop specific decompression schedules from normal working dives without the need to conduct expensive testing programs.



Chris Acott - Clinical lessons learnt in 12 years of treating divers.

Hearing loss, decompression sickness (DCS), dysbaric osteonecrosis (DON), various other bone problems are the main health issues for abalone divers. Each of these will be dealt with briefly.

Hearing loss and tinnitus ('ringing in the ears') are related to noise exposure and repeated episodes of ear barotrauma from equalisation problems. Regular audiograms are recommended to define the extent of the problem and avoidance of activities that may increase the damage (i.e gun/rifle shooting). There is no cure for tinnitus.

DCS in abalone divers should be viewed as an occupational hazard or disease and not seen as a result of bad diving practice, although in some recreational divers I have treated it has been a result of stupidity.

The symptoms of DCS are numerous. Any unusual complaint following a dive should be regarded with suspicion. Al Behnke (a USN Diving doctor) said:

'The major symptoms and signs of decompression sickness are pain (bends), aspyhxia (chokes) and paralysis. Minor effects are rash and fatigue. The parts of the body chiefly involved are the extremities (bends), cardiorespiratory system (chokes) and the spinal cord'.

However, today we would add brain involvement (stroke like symptoms and personality change) as well as immune manifestations of a rash and extreme fatigue and lassitude.

The best description of DCS I have seen is from 'Banjo' Patterson:

'Came up on deck like a dead man, paralysed body and brain; Suffered while blood was returning, infinite tortures of pain.'

Continuing to dive with DCS symptoms will make treatment harder, results poorer and may predispose the diver to DON. Ten to 20% of divers treated at the RAH have continued to dive while symptomatic. Ignorance, denial and the '5 minute neuro examination' (in recreational divers) are the main reasons for this. Denial can be organic (i.e part of the disease), or psychological (particularly in the recreational diving industry) – the diving instructor or divemaster just 'don't want to know'. Diving according to the tables or dive computer doesn't exclude the risk of developing DCS.

Some of the common predisposing factors to DCS (particularly in recreational divers) are:

1 a rapid ascent;
2 poor buoyancy control with associated multiple ascents;
3 mask flooding causing panic and hence a rapid ascent; and
4 flying within 24 hours of diving.

Abalone divers can minimise the occurrence of these events by:

1 using compressed air cylinders instead of compressors;
2 a bail out bottle on every dive; and
3 a full face mask with communication to the surface.

Diving with a dry suit will avoid hypothermia (being cold). Hypothermic conditions predispose divers to DCS.

Frequently asked questions following treatment are:

1 Why me – I dived within the tables?
2 Why me – I am the only one in the group and we all did the same profile?
3 When can I dive again?

A return to diving depends on:

1 What was the response to treatment (are there any residual problems after 6 weeks)?
2 Did the diver deserve 'to be bent'?
3 Was there any evidence of inner ear or pulmonary barotrauma?

Although divers maybe in a group none will do the same profile. The patient maybe the only one honest enough to be admitting to symptoms. Divers have a 'tendency to be flexible with the truth'.

DCS involves the body's immune system, hence some symptoms are similar to that of a 'cold' and some people are prone to 'colds' and others not.

The diving tables are a mathematical model trying to explain a physiological function - they are not without risk.

DON has been associated with divers since 1931. It had been described earlier in compressed air workers (caisson and tunnellers) in 1911 and was called 'Arthritis Deformans'. All abalone divers will know a colleague who has this condition. Regular long bone X Ray surveys should be done, these surveys are still the best way of detecting the disease. If you have persistent joint pain (shoulder or hip) you should see a doctor and have some X rays done. Hip replacement maybe required if the joint surface is involved. These hip replacements may only last about 10 years.

DON is associated with other medical conditions so it is important to have a regular medical to exclude any of these problems (trauma to the shoulder or hip joint, steroid medication, connective tissue disorders, alcoholism and high alcohol intake, pancreatitis, syphilitics and people with high blood lipid [fat] levels).

Other problems around the shoulder can be avoided by having a comfortable harness which avoids 'drag' and shoulder stress. Cervical spine (neck) problems are associated with the head up position in the water. These neck problems will cause frequent headaches while diving. Continuing to dive will only make the problem worse.

Lower back problems are associated with weight belts and twisting while gearing up. Other ways of weighting need to be investigated.

Although some of these problems maybe laughed at – it's your body, brain and spinal cord. The money maybe good now but you'll need it later to afford medication, medical help, and in some cases special adjustments to your houses (i.e. ramps). However, if you become demented then you'll not be worried about these things. So look after yourselves – your future is in your hands nobody else's.

First Aid

As soon as you think you have a problem:

1 100% normobaric oxygen;
2 Flat posture;
3 Go to the nearest hospital;
4 Contact knowledgeable medical help

DES 1800 088 200 or your local recompression facility.

Do not:

1 Reenter the water and try in water recompression – you may end up worse;
2 Attempt using oxygen underwater at a depth of 9msw.

Oxygen is the most abused gas in diving. Paul Bert first suggested it for treatment in 1878 BUT at normobaric pressure NOT hyperbaric pressures because of the fear of an acute oxygen toxicity reaction (convulsion). Oxygen was first used to shorten decompression and wasn't used in treatment until the late 1930s. The 'Oxygen Treatment Tables' were designed in 1965.

Oxygen is a toxic gas. Acute oxygen toxic reactions are seen at pressures greater than 1.2 Bar. Convulsions (similar to an epileptic fit) at 1.3 Bar or greater. The symptoms of Oxygen toxicity can be summarised by:

V visual disturbances, vertigo;
E excitability;
N nausea, numbness;
T twitching, tinnitus;
I irritability, irrational behaviour
D dizziness, depression

P palour, palpitations;
L lassitude;
U unusual sensations;
S sweatiness; syncope;

C confusion, CONVULSIONS.

A person breathing oxygen under pressure can exhibit anyone of these symptoms and should be taken off oxygen immediately. However, a convulsion can occur without any warning.

Retention of carbon dioxide (a CO2 retainer) will cause oxygen toxicity problems to be seen sooner. Older divers are known to be CO2 retainers so if you want to use oxygen in the water for your decompression stops or ascent you must have your CO2 response curves done and don't use oxygen below 4-5 msw depth.

Derek Craig - Occupational Health and Safety and Diving Codes

'A South Australian Regulatory Authority Perspective'

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Background

This paper was prepared at the request of the Abalone Industry Association of South Australia. The sole purpose of the paper and the associated presentation, delivered to the National Abalone Convention – Adelaide 19-21 August 2001, is to encourage discussion amongst delegates as to the merit of developing a National Abalone Industry - Diving Code of Practice.

1 Occupational Health and Safety Legislation

Introduction

In South Australia The Occupational Health Safety and Welfare Act 1986 (the Act) became operative on 16 April 1987, similar legislation exists in all other states. The intent of the legislation is to regulate the conduct of employers with a goal of ensuring the health and safety of all persons in the workplace. Section 3 of the Act states the objects of the legislation as follows:-

- To secure the health, safety and welfare of persons at work.
- To eliminate at their source risks to the health, safety and welfare of persons at work.
- To protect the public against risks to health or safety arising out of activities at work.
- To involve employees and employers in issues affecting occupational health and safety.
- To encourage registered associations to take a constructive role in promoting occupational health and safety.

As an employer, (licence holder) considering the application of the Act, it is important to realise that these goals are not to minimise or reduce risks to health in the workplace. The objects are to 'secure the safety and welfare of persons at work' and to 'eliminate risks to health and safety'. In order to achieve these objects, the legislation uses criminal penalties for breaches of its provisions.

Whilst people involved in health and safety have over the past decade been seeking to understand and comply with the scheme of the Act, it is only in relatively recent times that the Courts have had the opportunity to consider the enforcement provisions and to outline the roles and responsibilities of employers and employees in complying with the obligations under the Act.

The aim of this paper is to:

- Identify the legislative provisions that are central to the objects of the Act.
- Consider the external influences that shape the legislation.
- Examine a case study where in South Australian these influences shaped legislation for Tuna Farm Diving.
- Consider how the development of a National Industry Code of Practice for Abalone Diving might serve to control unwarranted Government intervention in Abalone Diving.

1.1 Legislative provisions

Duty of Care

The central provision outlining the duty placed on employers in Section 19 'the duty to take care not to endanger any person through any act or omission' of the Act. Section 21 of the Act outlines the general duty on workers. Section 22 to 25 cast the net over all other persons and bodies that may be involved in the creation and maintenance of the work environment such as occupiers, building designers and building owners, manufacturers and owners of plant (including diving equipment). The intention is to place an obligation on all to maintain the health, safety and welfare of persons in the work environment.

The duty of care concept has been further developed in the OHS&W Act to define specific legislative duties and responsibilities that apply to specific people in specific situations including:

- employers (individuals, partnerships and companies);
- employees;
- contractors (principal and subcontractors);
- designers and manufacturers of plant, equipment or substances;
- suppliers (re-sellers) of plant, equipment or substances;
- installers of equipment at a workplace;
- building owners and designers; and
- occupiers and persons in control of a workplace.

Through this duty of care all have a shared responsibility for health and safety in the workplace. Sometimes this sharing of responsibility, especially where contracts are involved, can make it difficult to identify exactly who has what responsibility.

This paper will concentrate on Section 19 because the primary duty for health and safety in the workplace rests with the employer. It should be noted that Occupational Health and Safety legislation places the broadest possible definition on the term employer. While contracts and share fishing arrangements may serve to confuse this issue, Courts in at least two jurisdictions have held that share fishing constitutes a 'contract of service'. That is to say that in some states, under OH&S legislation share fisherman may be viewed as employees.

- Denton – v – Tenney (1995) 181 LSJS 377.
- Praap – v – Thorogood (1992) 14 QLD Lower Reps 41.

Section 19 provides that the employer shall in respect of 'each employee employed by the employer ensure so far as is reasonably practicable' that the employee is safe from injury and risks to health. Section 19 outlines what should be provided, being:

- A safe working environment.
- Safe systems of work.
- Plant and substances in a safe condition.
- Adequate facilities for the welfare of employees in the workplace.
- The provision of information, instruction, training and supervision.

Section 19 then sets out some steps that must be taken by the employer in meeting its obligations by requiring:-

- Monitoring of the health and welfare of employees.
- Requiring that records and information are kept concerning work-related injuries.
- Requiring that information be provided to employees in relation to health and safety.
- Ensuring that any employee whom is undertaking hazardous work receives proper information, instruction and training.

- Ensuring that any inexperienced employee engaged in work of a hazardous nature receives appropriate instruction and training.
- Ensuring that any employee who could be placed a risk by a change in the workplace is given proper instruction, information and training before any change occurs and further, that person receives supervision following such changes.
- That managers and supervisors are provided with appropriate information, instruction and training to ensure that each employee under that person's control is kept safe from injury and risks to health.
- Monitor working conditions.
- Ensure that all ancillary facilities by way of accommodation, eating, recreational and other facilities are maintained in a safe and health condition.

The penalty for failing to meet the primary obligations in Section 19 being the provision of a safe working environment, systems of work, plant and substances and information, instruction and training is a fine no greater than $100,000 for a first offence and not greater than $200,000 for a second offence.

In understanding these provisions, it is important to realise that the duty placed on employers is not to the workforce in general but to each employee. A system of work that benefits the majority but may place a few at risk will not meet the requirements of the legislation.

The legislation also covers those employees who act in a foolish or thoughtless fashion. The obligation is to ensure health and safety of each individual without qualification. Systems must therefore be implemented that protect not only those who act responsibly but those who act outside of the standard operating procedures.

In carrying out the obligation imposed by Section 19, the requirement is to 'ensure so far as is reasonably practicable' that a safe working environment is created and maintained. The words 'reasonably practicable' are often focused upon when assessing the duty that is cast upon employers. These words do not mean that an employer is required only to do that which is reasonable given the constraints of the work environment, such as its structure, budgetary concerns and the like. The obligation is not the obligation that the civil law considers when assessing whether a person or corporation has been negligent. In the decision of Stevenson – v – Adelaide Tooling (1.70/1996), Senior Judge Jennings of the Industrial Relations Court of South Australia endorsed the interpretation of the words 'reasonably practicable' as put forward by counsel for the prosecution which were:-

'As is reasonably practicable' directs the inquiry not to whether there has been negligence on the part of the defendant (employer) but rather towards the issue of whether it was in fact practicable for the company, through its servants or agents to have taken steps to ensure that an employee was safe from injury or risk to health.'

The impact of this reasoning cannot be understated. The employer is required to ensure the health and safety of employees. To do so it must take all steps that are reasonably practicable to implement systems for health and safety.

By way of contrast, Section 21 of the Act places a duty on employees to take reasonable care:-

- To protect that person's own health and safety at work.
- To avoid affecting the health and safety of any other person at work.

The duty cast on employees is not at the same level as that cast on employers. The duty on employees is more akin to the duty cast on individuals in the community under the law of negligence. That is, the duty to take reasonable care in day to day activities having regard to the negative impact those activities may have on others.

Where an employee breaches the obligation placed on them, then the employee can face a fine not exceeding $10,000.

1.2 Regulations:

Under the OHS&W Act are 'Regulations' in South Australia these are known as the OHS&W Regulations, 1995.

These legislative documents are specific in nature and set out requirements for employers in relation to particular hazards or work activities. For example in South Australia the Regulations on Diving specify that :

'Construction Diving Work' must be performed in accordance with AS2299.
And
Tuna Farm Diving must be performed to a standard equal to or better than that provided by the Approved Code of Practice for Tuna Farm Diving.

For all other forms of diving the general duty of care provisions of the Act still apply.

1.3 Guidelines Called up Under OHS&W Regulations

Where any guidelines such as Worksafe Codes of Practice or Australian Standards are called up (appear in the general text) under the OHS&W Regulations in South Australia, the referenced sections then become mandatory.

That is, the requirements of the guideline become legislation and you must implement them.

1.4 Approved Codes of Practice and OHS Guidelines

Health and Safety Acts and Regulations (statute legislation) do not cover all the possible health and safety hazards that may be present in a workplace.

Nor do they always specify the action that should be taken to control the risk associated with identified hazards.

Often it is necessary to implement hazard controls based on State or Federal Codes of Practice (COP), Australian Standards (AS), International Standards (ISO), general industry standards, or the like.

These types of documents are used in legal proceedings to develop what is known as a 'common standard of practice'.

It is an employers' duty to identify which OHS documents and guidelines apply to their workplace activities, understand the requirements and meet the common standards of practice through the provision of safe plant, equipment and systems of work.

2. Tuna Farm Diving (A Case Study)

A 67% reduction in the tuna catch quota in South Australia in the early 1990s prompted fishermen in the Port Lincoln area to develop tuna farming. During summer, tuna are caught in the Great Australian Bight and herded into cages, which are then towed to Port Lincoln. The fish are then transferred to stationary pens and fed pilchards before being hand harvested for the Japanese sashimi market.

About 45 divers are employed full time, increasing to 70 during the catching season. They inspect, maintain, and repair cages and pontoons, remove dead fish and occasionally sharks from the enclosures, and monitor the herding, feeding, and hand harvesting of the tuna. Fishermen with little knowledge of occupational diving developed the initial farming procedures. Divers were recruited locally and they were usually recreationally trained. Diving equipment and practice were not of an occupational standard.

By 1995, WorkCover Corporation (South Australia) had received 39 diving related claims from this industry, A$600 000 had been paid in compensation, and 17 divers had been treated for decompression illness (DCI) at the Royal Adelaide Hospital. Many of these divers did not recover completely and compensation for this period has since escalated to A$1,600 000. This is not surprising as even promptly treated DCI has a high risk of major sequelae. In response, the Department for Industrial Affairs (subsequently renamed Department for Administrative and Information Services) and WorkCover Corporation, with the cooperation of the Tuna Boat Owners Association, implemented strategies to raise the standard of diving to that recommended for occupation diving. After introduction of these measures, the occurrence of treated DCI decreased.

Up to this part there had been no specific legislation covering Tuna Farm Diving. However much of the Government Intervention strategy had been based on the requirements of Australian Standard AS2299-1992-Occupational Diving.

Following the death of an untrained diver in a Tuna Farm in 1996 the South Australian State Government introduced the Approved Code for Tuna Farm Diving. (based on AS2299-1992 and introduction March 1997).

In response to the accident itself the Crown laid at total of 11 charges at 35 counts alleging breaches of the Occupational Health Safety and Welfare Act. The Company at its Responsible Officer entered guilty pleas to 7 counts and fines in excess of $80,000.

With the cooperation and support of the Tuna Boat Owners Association, The Regulatory Authority has conducted annual audits of Tuna Farm Diving Operations. Despite a considerable increase in Tuna Farm activity claims costs for diving remain low and satisfactory levels of compliance with the Diving Code are observed.

Associated initiatives:

1 The Hyperbaric Medicine Unite at the Royal Adelaide Hospital undertook a 2-year study (1997-98) of Tuna Farm Diver's Health.

2 A private training provider established an Occupational Diver Training School in Port Lincoln. Accredited under the Australian Diver Association Scheme (ADAS) the school now operates under the auspices of the Australian Fisheries Academy and delivers specialised training to a broad cross section of the fishing industry.

Risks and Opportunities

3. The Case for a self imposed Industry Code of Practice for Abalone Diving.

1 Diving (any diving) is viewed by the Courts as 'hazardous work'

Given that the severity of the hazard or risk is one of the major considerations in determining what is 'Reasonably practical' this places an even higher 'duty of care on all who are involved in diving'.

2 The National Institute of Occupational Health and Safety Worksafe Australia have observed a high incidence of fatality in Commercial Fishermen in Australia.

In a 3 year study (1982-1984) there were 47 traumatic fatalities amongst person engaged in fishery. This included 5 diving fatalities (Pearl or Abalone)

This represents an incidence rate of 143/100,000 persons years 18 times higher than the incidence of fatality for the entire workforce.

Despite these figures OH&S Authorities have done little to regulate this industry sector. Unless the Commercial Fishing Industry affectively manages OH&S State Governments, who are increasingly finding themselves the target of third party actions, may be forced to impose legislative controls.

3 There is anecdotal evidence of wide spread non-compliance with Occupational Health and Safety requirements (general) in some sectors of the Commercial Abalone Industry.

- Failure to report Notifiable Accidents/Incidents
- Failure to comply with plant registrations, such as pressure vessels, (AS1210).

4 The National Fishing Industry Council is yet to harvest abalone may have for reaching and unintended consequences. Such as:

'Share fisherman' being deemed employees under certain legislation while being viewed as self employed fishers. Eg SA OH&S Act and SA Workers Compensation Act.

Where a Share Fishing Agreement exists the diver and or licence holder may not be afford the protection from common law normally provided to employers under Workers Compensation Legislation.

5 In the absence of formally recognised industry diving standards the event of an accident or common law action the Courts may refer to AS2299.1-1999.

Occupational diving operations part 1. Standard Operational Practice.

Current Industry Practices would not compare favourably with this Standard.

6 Under present arrangements individual state Associations (Abalone Diver) may solely accountable for Industry Codes based on the lowest common denominator rather than Industry Best Practice.

7 To date none of the State Governments have signed off on the Abalone Industries current codes/practices.

This leaves the Industry as a whole solely responsible for both and boat at the worst of its diving practices.

Opportunity

1 By developing a self imposed Industry Diving Code of Practice based on Industry Best Practice, The abalone Industry would demonstrate it was self-regulating.

   This would be reinforced were the Code used to perform industry self-audits of diving operations.

   An abalone Industry Diving Code(s) could be developed at either state or federal level.

   Once a national code is developed Standards Australia could be approached (by the industry) and asked to include it under the AS/NZS2299 series of Industry Sector Diving Codes. This would increase the status of the document from Code to Standard.

2 Provides a mechanism by which divers previous training and/or experience can be formally recognised.

3 Once satisfied with the Code industry Associations may wish to approach State Regulatory Authorities requesting that their Code be given legislative status. By asking Government to endorse Industry best practice in this way the Industry as a whole would be limiting its liability by placing responsibility for OH&S where it belongs, with each individual licence holder or diver.

4 Workplace Services – Policy Division is prepared to provide assistance to the SA Abalone Divers Association should the Industry choose to explore such an option.

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- T.R.Druscoll G Ansari E.A.Ruck Traumatic work-related fatalities in commercial fisherman in Australia (Worksafe Australia) Occupational and Environmental Medicine 1994:51:1:000-000.
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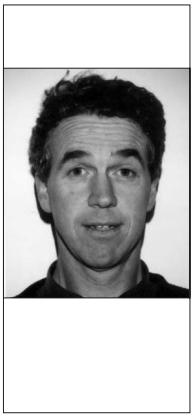
  National Medical Safety Council of Australia 1986.



Julian Morison - The Economic Indicators for the South Australian Abalone Fishery

Summary Results

Aim of the Study

- To present a set of economic performance indicators for the fishery
- To develop a consistent time series of economic information to aid management of the fishery

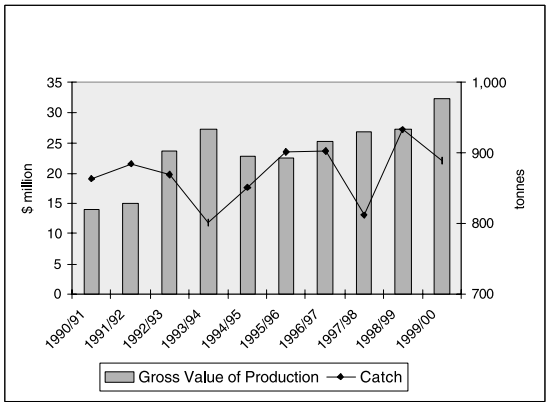
Economic Indicators Include:

- gross value of production
- cost of management
- financial performance
- economic impact (local and state)
- economic rent

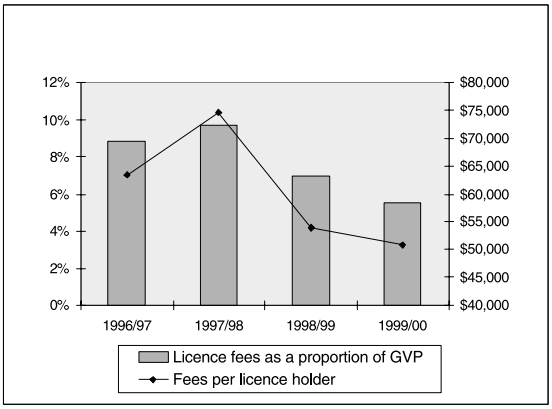
Summary of Methodology

- Survey of licence holders in the abalone fishery in 1998
- Economic models – regional and state
- Updating the economic indicators for the 1998/99 and 1999/00 reports
- Planned survey for the 2000/01 report

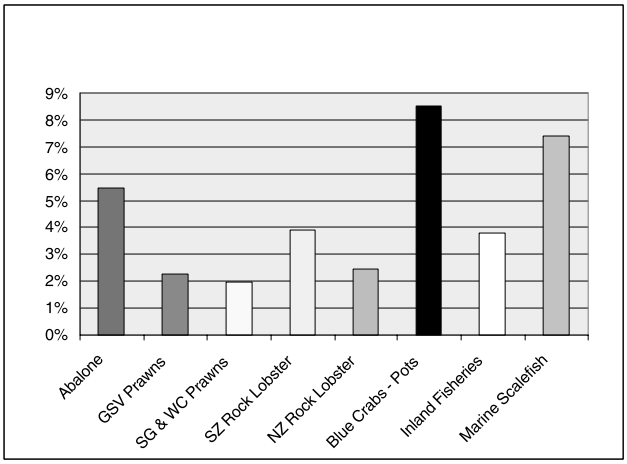
SA Abalone Fishery, Catch and GVP 1990/91 to 1999/00



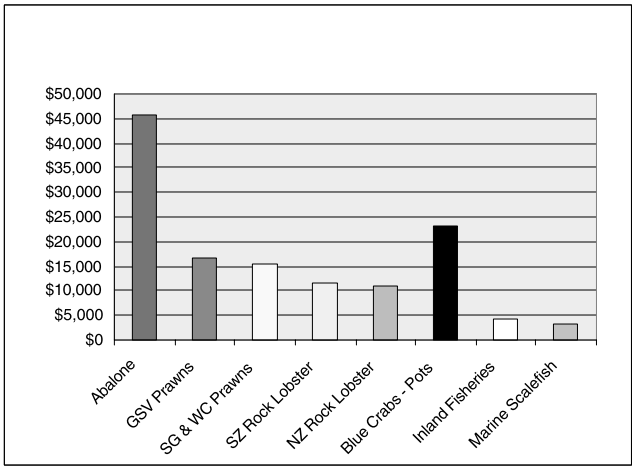
SA Abalone Fishery, Licence Fees, 1996/97 to 1999/00



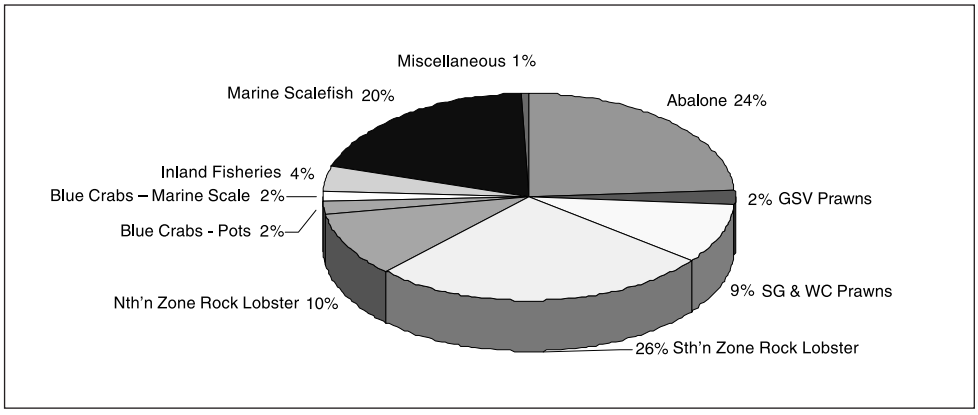
SA Fisheries, Licence Fees as a Proportion of GVP, 1999/00



SA Fisheries, Fees per Licence Holder, 2000/01



SA Fisheries, Contribution to Aggregate Licence Fees, 1999/00



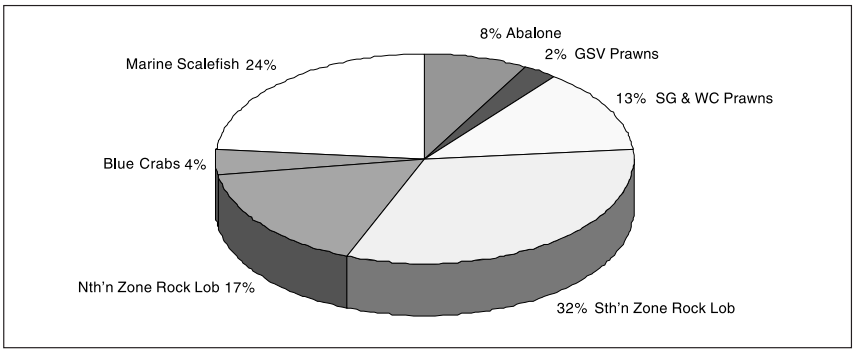
Financial Performance in SA Fisheries, 1999/00 ($'000, av. per boat)

	Abalone	GSV Prawns	SG & WC Prawns	SZ Rock Lob	NZ Rock Lob	Blue Crabs Pot Sector	Blue Crabs MS Sector	Marine Scalefish[a]
Gross Income	925.5	763.6	860.4	287.0	384.6	398.7	27.8	45.5
Cash Costs	390.4	397.0	506.2	181.5	271.5	315.7	34.3	44.6
Operating Surplus	535.2	366.6	354.2	105.6	113.0	82.9	-6.5	0.9
Depreciation	18.7	49.7	77.1	27.9	52.3	25.2	4.5	8.4
EBIT [b]	528.8	318.7	299.9	87.1	83.4	59.5	-10.0	-5.7
Capital								
Gear & Equip	121.7	148.2	1,091.2	245.0	459.2	222.6	27.5	66.9
Licence Value	5,083.8	3,273.3	2,358.5	1,666.9	1,463.5	563.2	35.0	40.4
Total Capital	5,205.5	3,421.5	3,449.7	1,911.9	1,922.7	785.8	62.5	107.2
Rate of Return	10.2%	9.3%	8.7%	4.6%	4.3%	7.6%	-15.9%	-5.3%

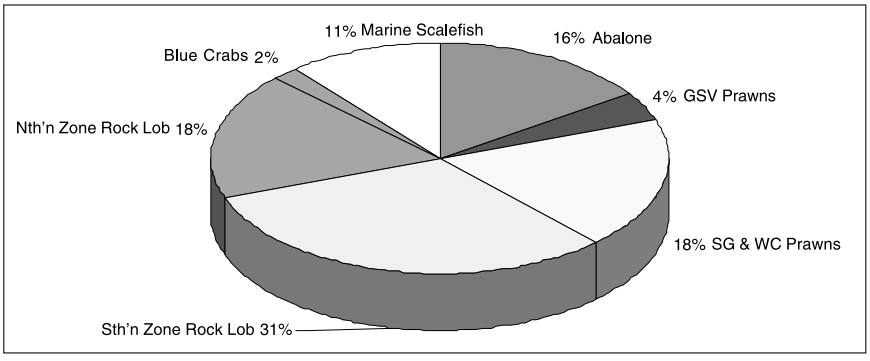
Economic Impact of the SA Abalone Fishery, 1999/00

Sector	Turnover ($m)		Employment (No. of jobs)		Household Income ($m)		Value Added ($m)	
	Local [b]	SA	Local	SA	Local	SA	Local	SA
Fishing (direct)	32.4	32.4	128[c]	128	9.4	9.4	28.2	28.2
All other sectors [d] (indirect)	15.2	28.0	150	219	3.8	6.3	7.8	14.2
Total	47.6	60.4	278	347	13.1	15.6	36.0	42.5

Contribution to Total Employment Impact of SA Fisheries, 1999/00



Contribution to Total Value Added Impact of SA Fisheries, 1999/00



Average Annual Investment Expenditures by Licence Holders

	Existing Businesses/ Assets (eg motels, farms, shares, real estate) ($'000)	New Enterprises (eg aquaculture, horticulture, tourism) ($'000)	Total ($'000)
Average Annual Expenditure per Licence Holder	95	210	305
Aggregate Annual Expenditure for the Abalone Fishery	3,325	7,350	10,675

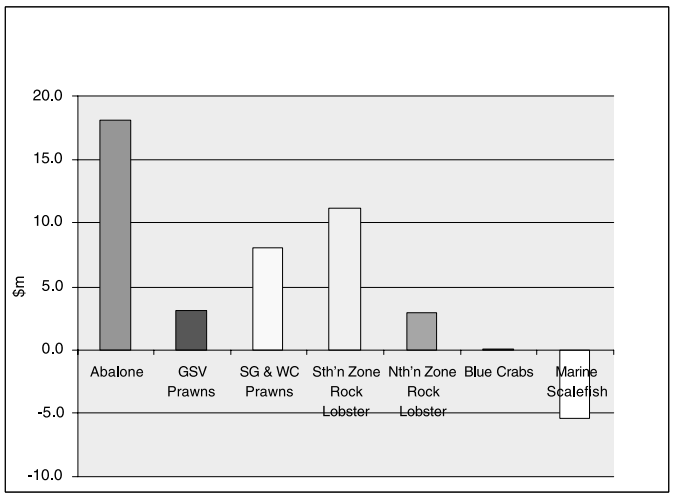
Regional Impact of Investment Expenditures by Licence Holders

Sector	Investment/ Turnover ($m)	Employment (No. of jobs)	Household income ($m)	Value added ($m)
Investment Sectors [a] (direct)	7.3	38	1.3	2.2
All other sectors [b] (indirect)	5.9	56	1.3	3.2
Total	13.2	94	2.6	5.4

Economic Rent in all SA Fisheries, 1999/00

	Abalone	GSV Prawns	SG & WC Prawns	Sth'n Zone Rock Lob	Nth'n Zone Rock Lob	Blue Crabs	Marine Scalefish	All Fisheries
Gross Income	32.4	7.6	36.1	51.2	29.9	2.1	19.9	179.2
Less Labour	9.4	3.0	12.4	19.6	10.5	1.0	7.9	63.7
Less Materials & Services	3.9	0.9	7.9	11.1	8.9	0.8	10.8	44.3
Less Depreciation	0.7	0.5	3.2	5.0	4.1	0.2	3.7	17.2
Less Opportunity Cost of Capital (@10%)	0.4	0.1	4.6	4.4	3.6	0.1	2.9	16.1
Economic Rent	18.1	3.0	8.0	11.2	2.9	0.1	-5.4	37.8

Economic Rent in SA Fisheries, 1999/00



Financial Performance Indicators

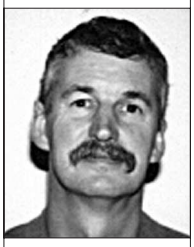
- Income
  - 1998/99 to 1999/00 increase of 19% ($776,000 to $925,000)
- Costs
  - Labour (68%), licence fees (12%), repairs and maintenance (5%), fuel (4%), interest charges (3%)

Financial Performance Indicators

- Cash Income and Profit
  - Average cash operating surplus approx. $535,000 (1999/00), increase of 25% from 1998/99
  - Average earnings before tax approx. $517,000, increase of 26% from the previous season
- Return on Investment
  - Rate of return to boat capital is approx. 430% (1999/00)
  - Rate of return to total capital is approx. 10% (1999/00)

Regional Economic Impact

- Business turnover impacts (1999/00)
  - Direct = over $32m
  - Eyre Region flow on effects = $15m
  - State flow on effects = $28m
- Employment (1999/00)
  - Direct = 128 jobs (full and part-time)
  - Eyre Region flow on effects = 150 jobs
  - State flow on effects = 220 jobs
- Household Income
  - Direct = $9.4m
  - Eyre Regional flow on effects = $3.8m
  - State flow on effects = $6.3m
- Value added effects
  - Direct = $28m
  - Eyre Regional flow on effects = $14m
  - State flow on effects = $8m



John Bolton - Native Title and Commercial Fishing Activities

Discussion Paper

This discussion paper is prepared for members of the South Australian Fishing Industry Council and the Seafood Council of South Australia.and other South Australian commercial fishers represented by Boltons. It is a discussion paper only and contains no decided or final view of the members of their advisers. No person or body should place reliance on its contents and as the discussion paper it is a brief presentation, Clients and members should take further advice on their specific interests and not rely on the contents of this document.

Contents

1 Summary

Contemporary Commercial Fishing Licences are validly issued by government and carry the rights set out in them in conjunction with the Fisheries Acts and Regulations.

Native title rights are not granted by governments but have existed since before settlement. They are rights which may now be 'recognised' by the Courts.

Native title rights may include rights to fish. They will probably not be exclusive rights and probably not commercial. The law is not yet decided.

Where native title rights to fish exist they will be able to be exercised and protected.

Indigenous fishing interests are being pursued by their alleged rights holders and are properly seriously considered by government.

There are a number of options for commercial fishers.

It is recommended that the Industry in South Australia:

- Remain involved in the native title process
- Consider what position should be taken to the process
- Consider further development of policy and a negotiation strategy.

2 The Nature of Commercial Fishing Rights

The general rule of law is that there is a public right to fish in tidal waters including the foreshore. This public right can be removed by the Parliament by proper legislation.

There is an important distinction between the right to fish which is in the public and can be regulated by the government and ownership of the fish which is not in anyone.

The public right to fish can be regulated in such a way that in practical terms it is removed and members of the public given private statutory rights to take fish in limited quantities pursuant to commercial and/or non-commercial licences. This is usually achieved by imposing a general prohibition on exploitation of a particular fish followed by a grant of licences for the taking of limited quantities. The only compensation to the public for this loss of the right of fishing may consist of licence fees being paid to the Crown.

The right to fish pursuant to such a licence has been compared to common law rights in land but the High Court of Australia has said,

> In truth, however, it is an entitlement of a new kind created as part of a system for preserving a limited public natural resource in a society which is coming to recognise that, in so far as such resources are concerned, to fail to protect may destroy and to preserve the right of everyone to take what he or she will may eventually deprive that right of all content.' Harper v Minister for Sea Fisheries (1989) 168 CLR 314 at 325.

The object of the current South Australian Fisheries Act is:

> To provide for the conservation, enhancement and management of fisheries, the regulation of fishing and protection of certain fish; to provide for the protection of marine animals and the aquatic habitat; to provide for the control of exotic fish and the disease in fish, and the regulation of fish farming and fish processing; and for other purposes.

Apart from some early attempts at oyster farming regulation the first South Australian Act for the protection of and the preservation of fish was assented to in 1878. From that day to this it seems there has been no claim by the Crown to ownership of the resource but the Crown has exercised it prerogative to regulate its exploitation.

In 1975 the High Court made a decision that the Commonwealth of Australia had sovereignty over off shore waters and the seabed up to the low water mark. This decision eventually led to an agreement between the States and the Commonwealth as to which legislature should control fisheries and the arrangement and it has been held that the State may make laws which may exceed its territorial waters depending upon the relationship to the state of the matters being legislated for. (Port McDonnell Professional Fishermans Association Inc. and another v The State of South Australia (1989) 168CLR 340)

It is also been held by the High Court in Harper v Minister for Sea Fisheries and Others (1989) 168CLR 314 that the rights conferred on abalone licence holders in that case were supported by sufficient Crown consent in right of the Commonwealth and the State.

The High Court has also held that a South Australian abalone permit-authority gives rise to valuable rights which are capable of being held in such a way as to constitute partnership property and to enable value to be placed upon it. In the South Australian case of Pennington v McGovern 136 LSJS 57 (1987) an abalone licence was held to be no mere personal inalienable right but a proprietary right in the sense that is is capable of being transferred.

Those who possess commercial fishing licences and rights do so by the authority of the Crown to regulate public fishing rights and they are probably the statutory holders of the remains of what used to be the common law public right to fish – but more – Commercial Licences have been authorised by the Crown through statute and regulation and by agreement been the Commonwealth and the States and have been recognised by the Courts as amounting to valuable property rights.

Aquaculture Leases

The Commonwealth Native Title Act contains a list of various landholdings including leases which are deemed to have extinguished Native Title. Sea based aquaculture leases in South Australia are not particularly mentioned.

Land based aquaculture and grazing and land based aquaculture development, land based fish farming and land based oyster culture are known as 'scheduled interests' (section 249C) and are 'previous exclusive possession acts' (section 23B) if they were validly granted before 23 December 1996. They extinguish native title.

For those land based leases granted since 23 December 1996 there will need to have been consideration given by the State as to whether or not the granting of the lease may have affected Native Title and if the Crown considered that such an act did affect Native Title then the processes under the Native Title Act would have needed to have been followed.

The South Australian Government has passed a series of acts to deal with Native Title and to validate its past acts and to validate those interests mentioned above with the exception of land based aquaculture and grazing under a miscellaneous lease (section 26F Native Title South Australia Act 1994).

The effect of the above legislation is that it is not possible to give a broad opinion as to whether a particular seabased aquaculture lease will have extinguished Native Title or whether Native Title will be able to co-exist.

The writer has not yet been provided with copies of individual leases upon which to give an opinion. Such opinion would rely upon an examination of the rights passed under the lease, their exclusiveness, how those rights may be exercised and whether or not they would necessarily extinguish Native Title and also an examination of the tenure of the land/waters prior to the issue of the particular lease together with an examination of the law at the time of the issuing of that lease and currently.

3 The Nature of Native Title

Native Title describes the rights and interests of Aboriginal People in land and waters according to their traditional laws and customs. Native Title is not granted by governments but may exist in places where Indigenous People continue to follow their traditional laws and customs and have maintained a relevant link with their country. Native Title rights may include the possession, us and occupation of traditional country and may be a right of access or the right for Native Title holders to participate in decisions about how others use their traditional land and waters. (see National Native Title Tribunal Brochure, Short Guide to Native Title).

Section 4 of The Native Title (South Australia) Act 1994 provides:-

1 The expression Native Title means the communal group or individual rights and interests of Aboriginal Peoples in relation to land and/or waters where –

   a the rights and interests are possessed under the traditional laws acknowledged and the traditional customs observed, by the Aboriginal Peoples; and
   b the Aboriginal Peoples, by those laws and customs, have a connection with the land or waters; and
   c the rights and interests are recognised by the common law; and
   d the rights and interests have not been extinguished or have revived.

2 without limiting sub-section (1) 'rights and interests' in that sub-section includes hunting, gathering, or fishing, rights and interests…….

Section 39 of the same Act provides that:-

1 The existing ownership of natural resources by the Crown is confirmed.
2 All existing rights of the Crown to use, control and regulate the flow of water are confirmed.
3 All existing fishing access rights under the law of the State prevail over any other public or private fishing rights.

4 Existing public access to and enjoyment of the following places is confirmed:
- waterways;
- beds and banks of foreshores of waterways;
- coastal waters;
- beaches;
  - stock routes;
- areas that were public places at 31 December 1993.

5 Nothing in this section –
- extinguishes Native Title; or
- affects land or an interest in land held by Aboriginal Peoples under a law that confers benefits only on Aboriginal Peoples.

Indigenous People must apply to the Federal Court for a recognition or a determination by the Court of their Native Title. It is important to note that the Court is not granting Native Title but recognising its continuation and current existence. This is a distinctly different process to the Land Rights Legislation in the Northern Territory where land grants are made irrespective of but often complimentary to the existence of Native Title. The Anangu Pitjanjatjara and the Maralinga Tjaratja lands in South Australia are also examples of land grants by the State outside of the Native Title process.

Applications for determination of Native Title have had their processes changed and so many of the original applications have had to be amended and re-assessed.

The current process is that Native Title applications are filed in the Federal Court and then are usually referred to the National Native Title Tribunal for mediation before the Court will conduct a trial.

There is currently only one trial in process in South Australia which is in the far north of the State over a single pastoral run and it is viewed as a test case by the parties for South Australian Native Title especially with respect to pastoral leases. There is a further case in South Australia which we understand is currently being prepared for the trial process. This is also an internal lands case and does not touch on the coastline nor areas which may affect fishers.

There are about 30 applications for determination of Native Title by Aboriginal People in the State of South Australia whose applications have been amalgamated and reduced in number over a period of time and that process appears to be continuing.

There are fourteen (14) Native Title claims which may affect commercial fishers:

Barkandji number SC97010
Mirning WC95/013
Maralinga Tjarutja SC96001.
Barngarla SC96/004
First Peoples of the River Murray and Mallee Region SC98/003
Ngarrindjeri and Others SC98/004
Kaurna being NNTT number S000/1.
YalataSC96/002
Wirangu #1 SC97005
Wirangu #2 SC97/006
Nauo-Barngarla SC97/008
Nukunu SC96/005
Kuyani #2 SC95/004
Narrung – not yet lodged.

Extracts from the Claimant applications summaries are annexed.

In some of the applications for determination of Native Title it can be seen that, on paper at least, the application is for substantial control and exclusive use of sea resources which must be taken to include fishing to the exclusion of others.

These 'statements of claim' were written at a time when Native Title law was developing, as it still is, and the actual rights achievable by Native Title applicants was and remains uncertain. The applications should be seen as stating the highest achievable outcomes and perhaps a desirable outcome for the applicants rather than an achievable outcome.

It seems to be the case that in Australia a number of Aboriginal interest groups are pursuing commercial fishing rights in association with Native Title or as a negotiated outcome.

The most recent Australian legal authority is that which was handed down by the Federal Court of Australia in what is known as the Croker Island case in which commercial fishing rights were not found to exist as part of Native Title. The Court which made that decision consisted of three Judges, one of which would have liked to have found an exclusive fishery in the Native Title applicants. The matter is currently being heard on appeal in the High Court of Australia which will be the final legal authority in Australia on the matters raised.

4. The Croker Island Case
Commonwealth of Australia Yarmirr [1999] FCA 1668 (3 December 1999)

On appeal all three Judges agreed that a finding of exclusive possession of sea or tidal waters or the right to control access to expanses of the sea or tidal waters would fracture the principles of the freedom of the seas in tidal waters which has been consistent from ancient times with the rights of innocent passage and to navigation.

A single Judge would have decided that where Native Title was recognised and included a native title fishery, which would at common law have historically excluded the public right to fish, then the native title fishery should be recognised by the common law as having a paramountcy over the public right to fish (Supra - Merkel J paragraph 592).

His Honour Merkel J went on to mention and approve of overseas legal cases that provided for a priority for conservation measures, Indian sustenance fishing, then sport fishing and commercial fishing.

His Honour went on to state (paragraph 736) that the fisheries legislation and licences granted in the Northern Territory did not appear to operate to extinguish any Native Title rights or interest to an exclusive or commercial fishery in any particular part of the claimed area.

The majority of the Court, Justices Beaumont and Von Dousa, upheld the decision of the Judge who first heard the case and found that he was right in saying there was no exclusive right of possession or occupation to the sea areas. They also said that there were obvious difficulties in the Native Title applicants trying to prove title to the resources of the kind in question given their diversity of character and location and the relatively large area of sea. They concluded by saying that any right of the public to fish for commercial purposes and any traditional right were at least regulated and possibly or partially extinguished by statute or executive act or both, apart from the provision of section 211 of the Commonwealth Native Title Act which preserves certain Native Title rights and interests if there are laws requiring licences and permits for the purpose of satisfying personal, domestic or non-commercial communal needs.

The matter is now on appeal to the High Court where it has been submitted that the fishery sought by the applicants is a territorial fishery not governed by a preference to a particular fish. It has been suggested by a commentator on that case that the High Court seemed reluctant to conclude that Native Title may include a right to control access to an area of the sea and that in future Native Title applicants should concentrate on providing information to Courts on any particular species which may have been historically taken and particular resources which might have been exploited rather than more general claims (as we are finding in those registered in South Australia).

Conclusions from Croker Island

The writer suggests that a likely outcome of the Croker Island appeal is that the High Court will find that Native Title rights do in that case include a right to fish but that such a right is not an exclusive right, nor a commercial right, and that it is subject to the regulatory laws.

This will leave interesting questions of how those rights should interact and where, for reasons of say conservation the catch has to be reduced from where and which right that reduction will be made. It also raises questions of the holders of the Aboriginal rights realistically requiring some input into the management of the fisheries in which they have those rights.

The Australian Seafood Industry Council appears to have made submissions with respect to amendments to the Native Title Act and the Native Title Amendment Bill in June 1997 and September 1997. It is not clear to the writer what consultation took place on a State by State level prior to those submissions being made and in May 1998 Mr Bill Nagel, the Chief Executive Officer of the Australian Seafood Industry Council appears to have made a presentation to the University of NSW symposium on Native Title.

5 Exploration of Indigenous Fisheries Strategy

The Aboriginal Legal Rights Movement is the prescribed Aboriginal body in South Australia which effectively controls Native Title strategies and the funding to Aboriginal persons making application for Native Title in South Australia. The writer understands that South Australian Fishing Industry has been informed by ALRM that 'fishing is on the agenda' but they are not ready to come to it yet.

A document which has become available is the New South Wales Fisheries Corporate Plan relevant to indigenous peoples which has the following points of reference.

1 Indigenous peoples interests in fisheries, including customary marine tenure and traditional fishing practices;
2 The extent of indigenous peoples involvement in management of fisheries and the marine environment;
3 Impediments to indigenous peoples participation in commercial fisheries and marine culture operations;
4 The impact of commercial fishing on fishing for traditional purposes; and
5 Cultural awareness and improved relations between indigenous peoples and other stakeholder groups.

The information paper issued by NSW Fisheries indicates that it was made clear to them that Aboriginal fishing interests cross-cut the areas of recreational fishing, commercial fishing, aquaculture, research and conservation. We are not aware of any similar South Australian fisheries plan.

The mission statement of the NSW Fisheries Corporate Plan relevant to indigenous people is

> *To work in partnership with indigenous peoples, the community, industries and agencies to ensure the conservation and appropriate utilisation of aquatic resources for present and future generations.*

Objectives:

To appropriately share the fisheries resources amongst all user groups in accordance with the principles of social justice.

6 Native Title Questions for Fishers – Answers

The questions which obviously arise are:

1 Did Native Title exist with respect to fisheries in South Australia prior to settlement? What was it?

2 Has any such Native Title survived to the present day by continuous practice in a relevant way?

3 Has there been any act of government which has extinguished Native Title?

4 If Native Title did exist and has survived and has not been extinguished, what is it? What are the rights?

5 What are the rights said to exist in commercial fishers under their current licences?

6 Do the rights of commercial fishers and Native Title rights co-exist or does one co-exist?

7 If they co-exist which one take priority?

8 If there is no priority how are the interests to be managed?

Answers to the Questions?

There is some degree of crystal ball gazing required as the Croker Island case is still before the High Court of Australia on appeal.

Even when that case is determined, there is still an element of guesswork on the particular facts which may be presented by Aboriginal parties in pursuit of their Native Title claims in South Australia. Therefore the advice that follows is to be subject to the warning that it will be affected heavily by the outcome of the High Court appeal and also depends upon evidence that may arise in the future.

It is probably still useful to theorise about outcomes.

1. Did Native Title exist with respect to fisheries in South Australia prior to settlement?

Answer: In the writer's view where fish resources were accessed by Aboriginal communities prior to settlement the Court will find that there were Native Title rights at that time included the right to fish. It is probable that the Native Title right will be limited to the specific species that were utilised and that it will be a non-exclusive fishery in respect to the coast and sea and that it will be for family or local community sustenance and not a commercial right.

In the rivers, lakes and Coorong where there was potentially more prospect for excluding others to particular areas, there is the potential that the Courts may find exclusive fisheries to specific species.

2. Has such Native Title survived to the present day?

Answer: For Native Title to have survived to the present day, it will be necessary for the particular Aboriginal Community to have survived and continued to have observed and accessed the resource since settlement to now. This is a question of fact and evidence.

If at some stage in the last 170 years or so the native title use of the resource has simply faded away in a traditional observation sense then it cannot be revived for the purpose of litigation.

In the writers opinion there will be areas where usage has continued, almost certainly in the Yalata area of the coast provided those persons did access the sea resources and to the extent that they used to and continue to access them. Another area might be the lakes and Coorong fishery where it is understood that Aboriginal Communities continue to exist.

3 Have there been any Acts of government which have extinguished Native Title?

Answer: Since the first fisheries Act in 1878 the South Australian government has exercised its perogative to regulate access to fish in the rivers and sea. In the writer's opinion that regime is a valid act of government and all rights issued to commercial fishers are valid rights.

The South Australian government fishing Act and regulations in this writer's opinion cannot be said to have extinguished native title because the Act does not clearly evince that is the intention.

On the other hand native title has been regulated to the extent of the current fishing regime bearing in mind the exclusion from regulatory licensing laws of native title holders by the Commonwealth Native Title Act of native title for non-commercial activity.

4 If Native Title did once exist and has survived and has not been extinguished what is it and what are the rights?

Answer: Native title rights Title will be those rights which can be shown in evidence by the Aboriginal parties to have continued to be exercised and will be limited to the exercise of particular rights in particular places for particular species.

A traditional use of a particular species from the shore may not require that the current exercise of that usage depend on the use of traditional methods.

Modern equipment such as boats and motors will almost certainly not be excluded from use by the Native Title holder to exercise their traditional rights.

It seems unlikely that any Native Title right will amount to a commercial right. The only rights removed from the government regulation control by the Native Title Act Commonwealth Section 211 are rights for the purpose of satisfying personal, domestic or non-commercial communal needs.

If a Native Title Community is able to show that they have commercial fishing rights at Native Title then those rights will be subject to the regulation of the fisheries act and regulations and will arguably have been extinguished to the extent that those rights conflict with the legislation and regulations.

If the writer is wrong about that then the Native Title rights will have been rendered unexercisable as commercial rights in so far as they conflict with the fisheries legislation and regulations but may revive upon repeal of the laws.

5 What are the rights said to exist in commercial fishers under their current licences?

Answer: The writer has been provided with a number of blank licences without particular licence holder details and has commenced to read in detail, each of them.

The licences give the rights explicit in them together, probably, with the implicit rights necessary to exercise the explicit rights.

For the reasons given before it seems that the licence itself is a valuable right amounting to a property right capable of being sold subject to the legislation. It does not follow that the licence holder has any property right in the catch.

The common law position is that no person holds property in fish until such time as it is caught lawfully. This certainly applies to recreational and commercial fishers and the State. There is a strong probability that it will also apply to native title holders.

It seems that commercial licences, at this time, only provide a right to hunt for the fish and that the valuable property right known as 'fishing licence' gains its value out of the expectation that the chance to catch fish will be realised. The more convenient argument for commercial fishers is that a fishing licence carries with it a real right to an as yet uncaught amount of fish which right cannot be removed capriciously by the State and that a mere exercise of effort can realise. Unfortunately on the current state of the law such an argument fractures the basis of the common law approach to wild catch and would need to be altered by legislation.

6 Do the rights of commercial fishers and Native Title rights co-exist?
Answer:

a as each of the rights, commercial fishing and native title, are probably mere rights to hunt for the catch and
b they do not give ownership to the entire as yet uncaught species hunted and
c there is no clear intention expressed in the Fisheries Act or regulations that Native Title is intended to be extinguished

then, in the writer's view commercial fishing licences do not necessarily extinguish Native Title rights to fish.

The general rule laid down by the Courts in Native Title matters is that Native Title is a fragile right and it will be extinguished to the extent that a valid act of government affects it. However, the Commonwealth has specifically provided that where there is a law which might prohibit or restrict Native Title holders from exercising a right such as hunting, fishing, gathering then they are not so prohibited at least for the purpose of satisfying their personal, domestic or non-commercial communal needs for the exercise or enjoyment of their Native Title rights and interests.

Not all Aboriginal People have Native Title rights and a recognition that a person is of Aboriginal descent does not provide them with the opportunity to disregard fishing laws. There have been a number of instances where persons of Aboriginal descent have attempted to do so. The Court has recognised that the exercise of the Native Title right would be a defence to the breach of the fishing laws with respect to a non-commercial activity but only where the person can prove that they are properly recognised as Native Title holders and exercising rights pursuant to the Native Title in a non-commercial way.

The recent Queensland case where there was a theft of fish from commercial fishermen by people claiming Native Title rights was a criminal case decided under criminal law and the persons charged with theft escaped conviction because they mistakenly claimed a right to retrieve the fish and - even though they were mistaken about that right - they could not be convicted of a crime whilst they held the belief that they were acting properly. Those particular people alleged to be thieves should not be able to use that defence a second time!

7 If commercial rights and Native Title rights co-exist, which takes priority?

Answer: There is no Australian authority to turn to. One of the Judges in the full Court of the Federal Court turned to the Canadian authority where it seems the priority of interests is firstly to conserve the fishery, secondly to preserve the right of Native Title holders to sustenance from the fishery and thirdly commercial fisheries.

That means that if there are to be reductions in quotas, they come from the commercial or recreational area before Native Title rights to sustenance fishing would be reduced.

8 How are the interests to be managed?

Further issues arise and questions may need to be to answered.

1 Identification of areas where Native Title exists; and
2 Identification of areas where Native Title does not exist; and
3 The establishment of an industry position with respect to areas where there is no Native Title; and
4 Establishment of a set of industry negotiation principles and preferred options for areas where Native Title does exist.

7 Exploring the Options

Once an application has been made to the Federal Court for a determination of native title the Court will usually refer the matter to the National Native Title Tribunal (NNTT) for mediation.

The NNTT will then conduct a separate mediation for each application. Each of which frequently takes place over a period of months or more and may take the form of an opening multi-party mediation and then there may be a number of bi-lateral meetings.

Opening position statements can assist the parties to reach an agreed outcome by placing clearly before the other parties which issues can be negotiated and which issues are non-negotiable and will be taken to litigation.

Frequently parties will make statements of their good intentions to mediate in good faith and to make statements of support of other parties positions.

It is recommended that the fishing industry consider such matters and give instructions on what may be contained in such an opening statement on behalf of the industry.

The following points may be considered for discussion and for possible inclusion

1 Acknowledgment that Aboriginal People were the first people to inhabit South Australia.
2 Acknowledgment that the arrival of non-Aboriginal people brought massive change to the original inhabitants.
3 Statement that fishers acknowledge and grieve for the loss caused to Aboriginal People.
4 Acknowledgment that native title holders may have a valuable contribution to make to the conservation of fishing resources
5 Acknowledgment of the right of Aboriginal People in South Australia to acknowledge and abide by their traditional laws according to their traditional laws and customs and subject to the law.
6 Acknowledgment that traditional owners of land who may have Native Title will have a recognised interest in resources to which they have Native Title rights.
7 Assertion that Native Title is fragile and subject to valid rights granted by government.
8 Assertion that commercial fishers have valid fishing rights and that those rights will be defended.

9 Statement that commercial Aboriginal entry into commercial fishing will be welcomed – or not resisted?

10 Assertion that to the extent that Native Title fishing rights may be affected by commercial fishers the commercial rights prevail.

or

Assertion that to the extent that Native Title fishing rights may be affected by commercial fishers that the native title right to non-commercial fishing will prevail.

or

Assertion that to the extent that Native Title fishing rights may be affected by commercial fishers that the parties should negotiate how those rights may both be best satisfied.

11 Assertion that we seek further information of the indigenous peoples interests in fisheries to the extent that it has continued to be practised and acknowledge that such continuity of Native Title rights is a legitimate right which should be taken into account in the management of fisheries.

12 Assert that once Native Title rights have been lost by the passage of time and non-adherence to traditional laws then such rights cannot be re-invented or recovered.

13 Continue an involvement in the Native Title applications which may affect fishers to ensure that any agreed outcomes are acceptable to fishers.

14 Consider supporting Aboriginal involvement in fishery management.

15 Consider supporting Aboriginal native title community sustenance fishing (but not commercial native title fishing) as a priority over commercial fishing in cases where catch reduction is required.

16 Consider requesting Aboriginal support for Commercial Transferable Fishing Quota in return.

Guy Leyland - Resource Sharing

In examining the matter of resource sharing I intend covering the following areas, some in depth and others briefly:

- The regulatory framework the industry operates within
- Changing society aspirations as reflected in legislative objectives- the 1905 Act and the 1994 Act
- Decision making under regimes of conflicting objectives and under clarity of objective
- Examination of the nature of resource sharing - what is it?
- What industry needs to do to survive and prosper in a climate of conflicting society aspirations
- The ways - practical experience from Western Australia
- Survival don't end - the price of success is eternal vigilance

Regulatory Framework

The regulatory framework within which the fishing industry operates is primarily fisheries legislation. This legislation:

- Enables allocation of fishing rights
- Enables renewal of those rights; usually subject to conditions
- Enables declaration of management plans for fisheries
- Prescribes what is contained in a management plan
- Enables Minister's to dissolve or revoke management plans and all rights that the plan allocates
- Prescribes penalties, powers of fisheries inspectors etc.

Generally fisheries legislation is not mealy-mouthed. It is gutsy, highly interventionist and gives the bureaucracy considerable discretionary powers. So much so it is often said that it provides for the bureaucracy to exercise 'Command and Control' capability over commercial fisheries. The rights defined by this legislation are generally fairly weak in that these rights can be swept away by discretionary powers of the Minister or bureaucracy.

For what purposes are the powers in fisheries legislation exercised for? To find out the objectives, the legislation needs to be examined and to a lesser extent the Second Reading speech.

Changing Society Aspirations As Reflected In Legislative Objectives

In Western Australia the legislation enabling commercial fishing was and is contained under two Acts of Parliament:

- Fisheries Act 1905
- Fish Resources Management Act 1994

The 1905 Act

'An Act for the regulation of the fishing industry and fish farming, and for the conservation and management of fisheries and aquatic animal and plant life, and for purposes connected therewith'

These objectives reflect the society aspirations up to the late 1980s early 1990s. These aspirations can be characterised by the desire of government for the economic development of the state through the commercial exploitation of fisheries resources. It did this through rewarding risk takers and pioneers by allocating exclusive rights to fish. It is worth noting that in the objectives for this legislation there is no mention of recreational fishers or ecotourists or greens.

In summary the objectives for the legislation represents the expansionary phase of the fishing industry, develop and exploit marine resources for the public benefit. This Act was revoked in 1995 to allow the 1994 Act to be proclaimed and therefore come into effect.

1994 Act

'The objects of this Act are to conserve, develop and share the fish resources of the State for the benefit of present and future generations'

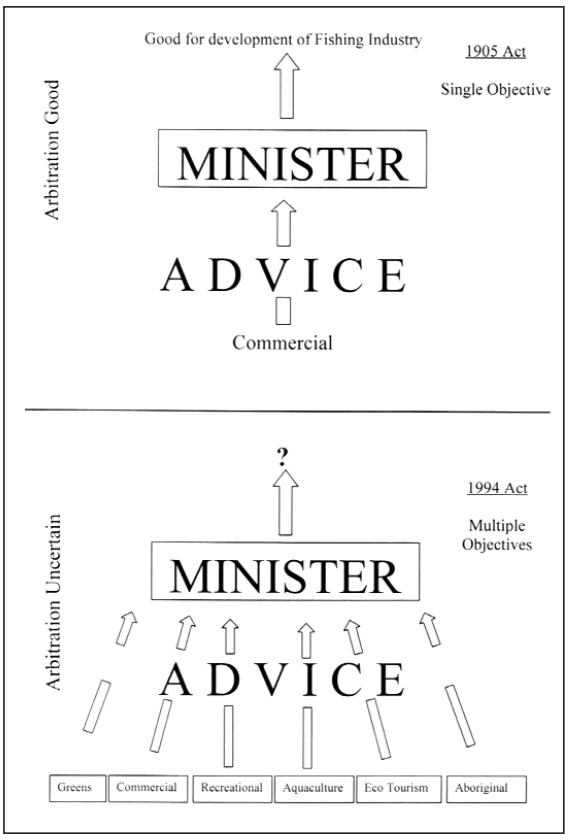
In particular, this Act has the following objects -

1 To conserve fish and protect their environment
2 To ensure that the exploitation of fish resources is carried out in a sustainable manner
3 To enable the management of fishing, aquaculture and associated industries and aquatic ecotourism
4 To foster the development of commercial and recreational fishing and aquaculture
5 To achieve the optimum economic, social and other benefits from the use of fish resources
6 To enable the allocation of fish resources between users of those resources
7 To provide for the control of foreign interests in fishing, aquaculture and associated industries'

These objectives reflect the wide scope of modern fisheries management. They represent a dispersal of focus away from commercial fisheries management towards an array of other activities. That is society aspirations for use of marine resources has broadened considerably from a single focus on commercial development of fisheries to multiple objectives for use of these stocks. Note that these objectives can conflict. Without a clear policy framework ensuring consistency of administrative action, combined with weak statutory fishing rights, the fishing industry is particularly vulnerable to the vagaries of political fashion and expediency. Under this legislative regime a recurring theme emerges from the fisheries administrators of the requirement to balance the use of marine resources amongst competing users based on the prevailing community standards as interpreted by the administrators. This is sometimes code for reallocating marine resources from the commercial sector to other sectors in response to political pressure and is conflict with what is understood about the benefits that derive to society from rights-based fisheries management.

It is worth noting that the National Scoping Paper prepared on behalf of all the state fisheries jurisdictions in regard to National Competition Policy raised the issue as to whether the generality of fisheries objectives are such that they provide insufficient focus to be operationally useful.

Decision Making Under Regimes Of Clarity Of Objective And Multiple Objectives



The above compares the pressures the decision maker is under in regard to arbitration on matters requiring decisions under the 1905 Act and under the 1994 Act

The 1905 Act was essentially single purpose. It was not that important that the Act prescribed weak rights because generally the decision maker's criteria in reaching a decision was based on what was good for the development of the commercial fishing industry. Therefore the outcome of arbitration under this regime generally produced favourable results for the fishing industry.

The 1994 Act is multi-purpose. Under this regime the perspectives or matters the decision maker needs to consider are highly variable (including community consensus and academic and economic analysis) and in some circumstances may conflict. Therefore outcomes from arbitration under this regime for the industry can be uncertain. With weak rights prescribed in legislation the decision maker is not greatly constrained in reallocation decisions or what is more commonly known as resource-sharing decisions.

Resource Sharing - What Is It?

'Resource sharing is a non-biological issue. It is not a matter of preserving biological sustainability, but of achieving an allocation of the resource across user groups that is in the best interests of society and maximises the value of the sustainable harvest to society.'

What allocations are in the best interests of society? That depends upon your perspective.

- If you are a keen recreational fisher it may mean having access to fish stocks that are relatively plentiful
- If a native title claimant you are entitled against the whole world to occupation, possession and use of land and waters of your claimed area
- If you are green it may mean setting aside substantial coastal areas for non extractive uses
- If you are a commercial fisher it's about preserving access to the resource on which your economic activity depends

Any analysis of these aspirations by society groups shows that these aspirations are legitimate and, given the objectives of fisheries legislation, are required to be considered by the decision maker.

Another definition of resource sharing is that it is about 'Competition and conflict over access to resources and share of those resources'. Remember nations fight each other over securing access to natural resources; therefore resource-sharing conflicts are not unique to the fishing industry.

What is the system in which resource allocation decisions are made on marine resources? The system is the legal and administrative framework determined and defined by legislation, policy and the courts.

Who is the arbitrator in regard to decisions on access to and resource share on marine resources? The Minister for Fisheries or by delegated authority the bureaucracy.

Resource sharing matters are ultimately political decisions by the state in the public interest. It is the relevant Minister who decides on who will get what and in what proportion in regard to allocations on marine resources. That is what is the optimum benefit to society of allocations. That is what politicians are, in part, elected to do and are accountable for. A relevant question to pose given the object of community benefit is how can the lack in legislation of well defined rights combined with the lack of effective adjustment mechanisms to easily allow for changes to allocations be in the public interest?

In saying this it is also important to note that Ministers and the bureaucracy do not have unfettered powers in regard to arbitrary reallocations. They are constrained by statute and common law (procedural fairness and natural justice) particularly in regard to reallocations that have a non-proportional effect on user groups. That is reallocations that represent blatant expropriation or confiscation of rights may be challenged in the courts. However case law, particularly at a state level, is largely untested but Courts tend to take a dim view of obvious injustice and generally find a means of remedy or delay while political balancing factors come into play.

Industry Survival And Prosperity

Given the political environment, the conflicting fisheries legislative objectives and the stronger assertion of rights by other user groups, how can the fishing industry position itself to ensure that in resource-sharing debates it is not disadvantaged?

There are a number of ways or initiatives the industry can take to shore up its position. It is important to note that there is not one panacea that will protect the industry, and it requires at a minimum industry cohesion, dedication, and resourcing and continual attention. In short it requires resourced plans and the capability to carry out these plans.

What are the ways? The following 5 are identified:

- Gain community support for your activities or at least neutralise community opposition
- Similarly gain political support
- Gain a stronger 'right' in legislation and in law
- Put fear into the heart of the oppressor
- Put in place mechanisms that allow conflicts to be managed and controlled to avoid conflicts escalating to the level of public issues requiring arbitrary government intervention. That is avoid high risk win/lose situations

It is important that the arguments put in the context of these ways are consistent, logical and designed to protect community interest. That is they are not seen to be self serving or blatantly self interested.

From the Western Australian experience I will go through each of the ways to show what we have done and the results achieved.

Practical Experiences – Western Australia

Community Support

The best example is the Marine Stewardship Council (MSC) accreditation of the Western Rock Lobster Fishery as a well-managed and environmentally benign fishery. The fishery is now associated with the panda bear which has local, national and international brand recognition. Whilst the MSC accreditation is primarily designed to provide competitive edge in export markets (and therefore has a strong profit enhancing goal), there is also an important domestic, political and community message. This is that a highly credible 3rd party is saying that the fishery is good.

For years both the industry and the regulator have been saying that the fishery is well managed. The problem with this approach is that both the industry and government are perceived to have self-interest in making this claim. Anyone who witnessed the debacle in WA over the Regional Forest Agreement will understand how quickly support can evaporate. Despite the Commonwealth, State and The forest industry saying that the regional agreement provided for sustainable forest management the Western Australian community just did not believe them. The debate became highly politicised and, with a State election looming the politicians deserted the industry.

The MSC greatly enhanced the rock lobster industry's position in negotiations over marine reserve zonings in waters of the proposed Jurien Marine Park.

Other fisheries in WA are privately considering MSC accreditation. The message is to get your act together, expose yourself to scrutiny, have pride in your achievements and gain credible 3rd party approval for your activities.

Political Support

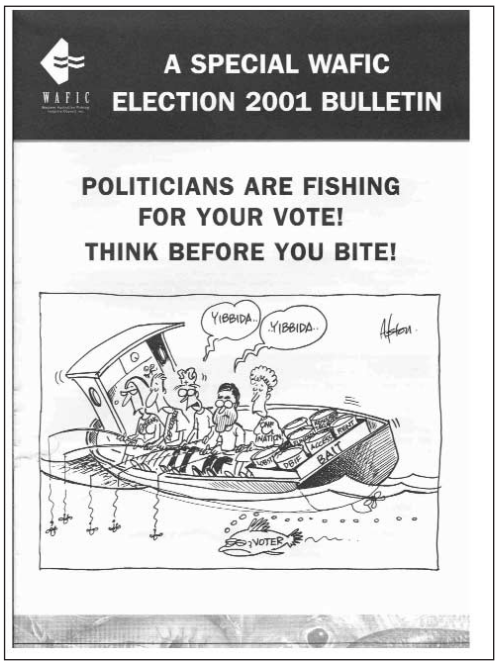
Examples include:

Lunches for members of Parliament which showcase the high quality of fish produced by the fishing industry whilst providing soft sell messages through the launch of:

- results of economic research showing the value of the fishing industry in dollars and employment to the Western Australian community, regional areas and by implication coastal electorates
- results of surveys showing the desire of the WA community in accessing fish, that is either through retail outlets or through recreational fishing

Provide regular briefings to all political parties, that is be apolitical.

Election questionnaire - we achieved considerable bi-partisan support for the industry from the major (and some minor) parties by requesting response to policy issues of importance to the industry in an election climate - these included commitments in regard to no resource rent, stronger property rights and transferability of fishing rights in smaller fisheries. See below.



Stronger rights

Plan, seize the opportunities that arise and make and close deals.

The best example was our successful negotiations with the government over amendments to marine reserve legislation including new legislation that gave a statutory right for compensation to rights holders in the event that they are disadvantaged by park zonings. These negotiations had been planned for and the groundwork laid over a period of at least 6 years. When the opportunity arose to close we made the deal immediately.

Securing the major international Fish Rights Conference for WA. This conference was held in Fremantle in November 99 and has provided intellectual impetus to the considerable benefits that derive to society through stronger rights based fisheries regimes. That is all society benefits through generating growth and employment and increased profits and therefore increased tax revenue that allow government to fund social welfare programmes.

Intolerance of Blatant Injustice

Whilst intervention by government to reallocate fish resources from the commercial to recreational sector has been at the margins in WA on the several occasions that it occurred blatantly industry demanded of WAFIC strong and sustained action to redress the injustice.

WAFIC's intervention was successful in that substantial compensation was paid in one case and in another the fisheries management planing process was put back on track.

WA industry (including the big players) demonstrated to the government that the industry would not tolerate injustice against its smaller members. It did this through self-interest in that it wished government to understand that blatant reallocation decisions (expropriation of rights) without compensation or appropriate redress would come at a political cost and industry would not tolerate this practice spreading. That is industry understood the benefit in taking collective action to minimise the spread of a trend by government towards confiscation of fishing rights as a means of reallocation.

Dispute Resolution Process

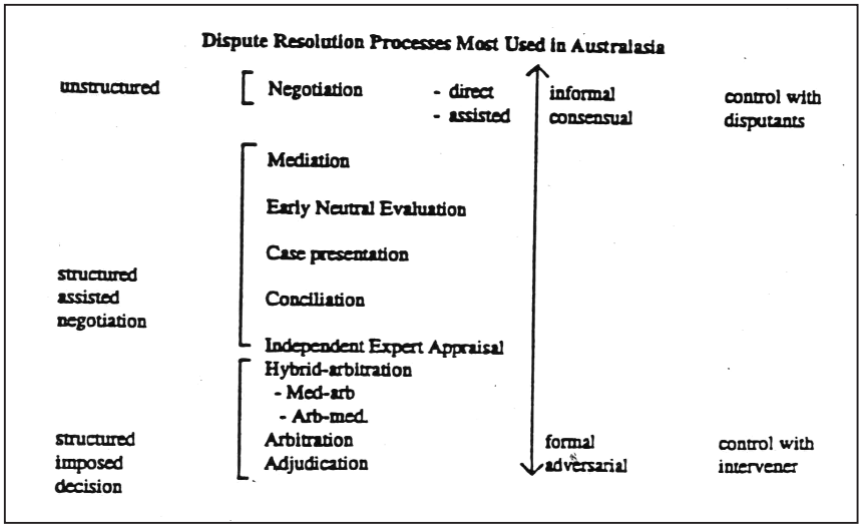
The 1994 Act gave recreational fishing sector the expectation that they would be listened to and their aspirations acted upon. As mentioned above initially the government tried to do this in a dishonourable way. The government closed areas to commercial fishing overnight without compensation. There was a strong reaction from the industry and government realised that if it continued down this path it would cause the politisation and radicalisation of the fishing industry. There are a number of coastal marginal seats that the industry could influence. Still government was faced with political pressure to respond to the recreational sector.

Government came up with what it called the 'Resource Sharing Initiative'. This entailed $8m spread over 4 years. It entailed a hit list approach to voluntary buyouts on selected fisheries. But there was no clear objective in regard to the outcome. The effect of the buyouts were as expected. The older fishermen who did not fish hard sold and the younger keen fishermen did not. As a policy instrument for reallocating fish resources from the commercial fishers to the recreational sector it did not really achieve this outcome.

What we feared is that at the end of the day we could be left with very unhappy and dissatisfied recreational fishers who would continue to lobby government to expropriate fishing rights. On this basis WAFIC refused to participate in the process. What we wanted was to use the money to restructure these inshore commercial fisheries into smaller, viable rights based fisheries with incentives for fishers to invest, value add and innovate. We also wanted to exercise control over disputes that might arise between sectors in these fisheries.

We came up with a model with dealing with disputes through mediation rather than arbitration. Mediation is also known as alternative dispute resolution. It is an alternative to litigation and is used widely in commercial disputes, family law and on occasion's disputes between nations.

The slide below shows the dispute resolution processes used in Australia and, in particular, the wide gulf between arbitrated dispute resolution and negotiated or mediated dispute resolution.



We put this model to the recreational fishing lobby and low and behold they supported it. They were also unhappy with the arbitrary nature of decision-making. That is they also felt excluded from decision making that purported to be for their benefit. What is mediation?

Definitions

[Mediation is] the process by which the participants together with the assistance of a neutral person or persons, systematically isolate disputed issues in order to develop options, consider alternatives and reach a consensual agreement that will accommodate their needs

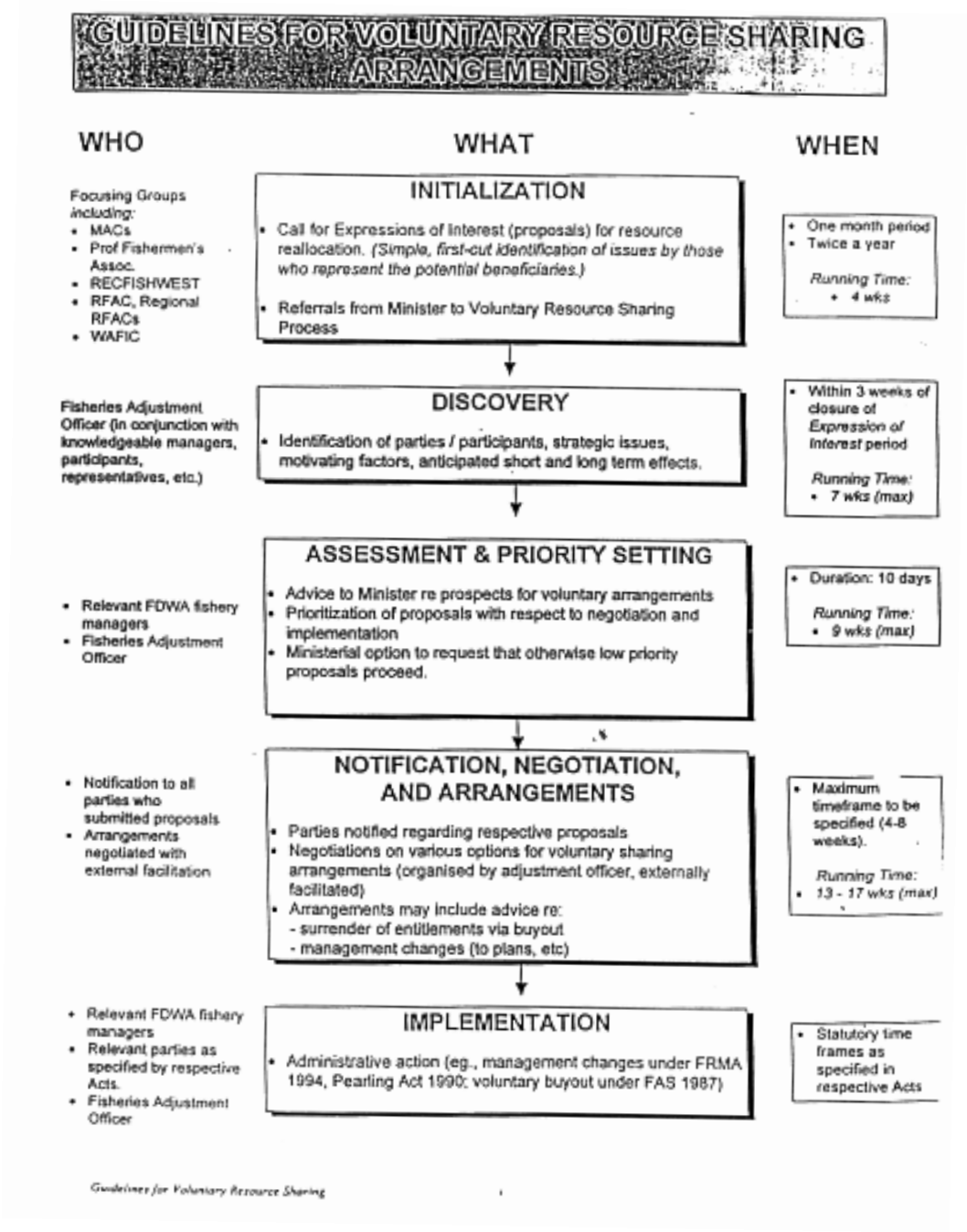
(Folberg and Taylor 1984:7).

Mediation is a decision making process in which the parties are assisted by a third party, the mediator; the mediator attempts to improve the process of decision-making and to assist the parties reach an outcome to which each of them can assent

(Boulle 1996:3).

It is about consensual agreements between disputing parties. It is about putting the control of the resolution of disputes into the hands of those parties in dispute. Control has moved from the arbitrator to those directly affected by the dispute. Features of the mediation process include:

- Structured approach
- Parties sign agreements to enter mediation and those agreements require:
    - Confidentiality
    - No speaking to the press
    - Good faith
    - Without prejudice
- All parties represented
- Mediator neutral but can be removed by any party if perceived to be biased.



Government has adopted this model in regard to addressing resource-sharing disputes. Six fisheries have or are going through mediation. The results so far: several fisheries have successfully reached agreements with the recreational sector that resolved disputes in a way that would not have been possible under an arbitration decision-making process.

The real value of the mediation approach is that it can resolve disputes effectively and allow all parties to realise most of their aspirations and it retards arbitrary action by government. However,
in the absence of secure fishing rights, even under a mediated approach, there remains the risk of politically-driven intervention in the process.

Conclusion - Eternal Vigilance

In conclusion the lessons and ways industries need to survive and prosper are clear

- You need plans (short, medium and long term)
- You need to resource your plans
- You need to be realistic in regard to your plans
- You need to employ professionals who will carry out you plans
- You need to get involved
- You need to care because if you don't care nobody else will

In the context of the above you need to work out how your plans also allow for achievement of objectives by other groups.

Unfortunately many in industry believe that simply making aggressive, threatening and unrealistic demands on Ministers will achieve their objectives. I hope I have demonstrated that this approach is unlikely to achieve desired outcomes.

Lastly I wish to leave you with a message from Sun Tzu from the book 'The Art of War' that summarises the choices before industry.

'Generally speaking, the toe to toe battle is the last resort of the skilled warrior who Sun Tzu says should be prepared, but should nevertheless avoid confrontation with a strong opponent.

Rather than trying to overwhelm opponents directly, master Sun recommends wearing them down by flight, fostering disharmony within their ranks, manipulating their feelings and using their anger and pride against them.

When you know both yourself and others you are never in danger, when you know yourself but not others you have half a chance of winning, and when you know neither yourself nor others you are in danger in every battle.'

Peter Clifford - Fisheries Management Systems

A fisherman will adopt technological improvements if they benefit his business in a cost effective manner. He is a risk taker, epitomises the entrepreneurial spirit and has by necessity adopted many significant technologies over the last decade. These include, GPS, charting software, satellite communications, multibeam data, net telemetry, net technologies, hydrophones, weather models, sea temperature and current maps, to name a few.

The industry, at the administrative level, has adopted VMS (Vessel Monitoring Systems) over this same time period to manage the increased ability of each fisher to search out and acquire catch, and is now at a point where it can technologically advance towards more superior FMS's (Fisheries Management Systems).

A FMS can be diagrammatically described as per Figure 1 in which there are a number of complementary systems, which interact to provide total value that greatly exceeds the value of the sum of the parts.

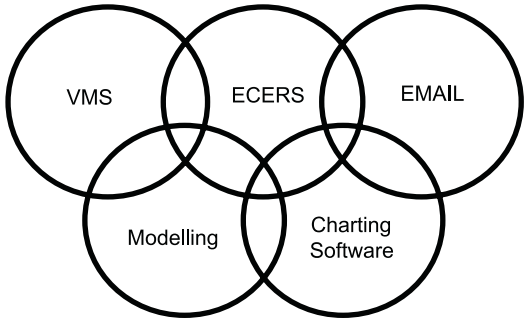


Figure 1: Fisheries Management System

Given these five major system components, they can be used as a platform to provide significant value-add to fisherman as well as research. This value-add is being promoted by TerraVision with its following products (detailed in Figure 2):

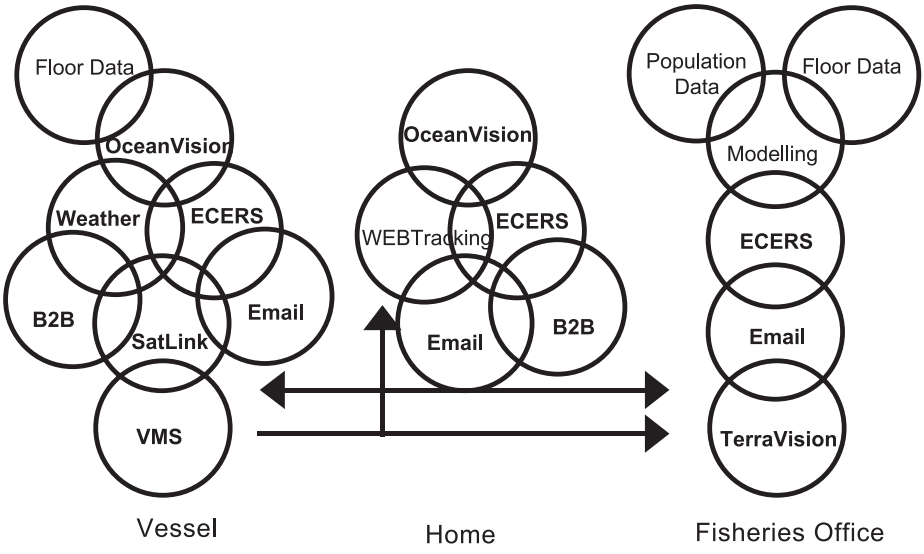


Figure 2: FMS Value Added Functionality

ECERS

Electronic Catch and Effort Reporting Systems (ECERS) are fundamental to the advancement of Fisheries Management Systems and this conference is an excellent forum to appraise its potential in FMS development.

Electronic Catch and Effort Reporting Systems (ECERS) are a means of acquiring data in near real-time and then delivering that data to those with a need-to-know, including the fishing boat owner, the researcher and the fisheries administrator. When this data is correlated against the VMS positional data, it is possible via new modelling technologies to produce current spatial models of the fishery. Benefits of ECERS and Modelling are discussed later in this paper.

The offline nature of the fisheries environment and the need for a consistent interface onboard the vessel, at the wharf, at the fisherman's home and at the office, implies that in most cases an email, rather than a WEB solution, should be used. Thus email will be the necessary component for ECERS electronic delivery because it can pervade all aspects of fishery operations. There is especially a need for the delivery protocol of ECERS data to the fishery administrator to be optimised for the communications environment, which in the case of Inmarsat-C is reasonably expensive. Thus newer WEB database technologies (such as XML) will be a major stumbling block to the uptake of ECERS in the Inmarsat-C environment.

Because it is the fisherman who sends the ECERS reports, learns and uses the email environment, and maintains the VMS system onboard, his immediate needs should be served with value-add functionality. TerraVision has approached this by providing him with tools to:

1 view his ECERS data spatially overlayed on his navigation maps;
2 distributing his ECERS data to office or home;
3 automatically collating incoming ECERS data from several vessels at home;
4 accessing the GPS of the Inmarsat device through his plotter; and
5 and providing the owner with the option to utilise the VMS environment to track his boat by 3rd party tracking systems, thus providing a 'tell someone who cares' level of redundancy in the safety environment;

And the email system built on top of the Inmarsat VMS platform can, cost effectively:

6 Provide him with a useful communications environment;
7 Enable him to use B2B tools to sell (or not sell) his catch and thus optimise his effort;
8 Enable him to receive high-resolution weather information in a cost effective manner.

TerraVision provides a comprehensive FMS utilising the following configuration:

- VMS: TerraVision VMS System;
  - WEBVision WEB tracking system
- ECERS: SatLink Electronic Catch and Effort Reporting System
- EMAIL: SatLink Email system via Inmarsat-C;
  - Standard ISP Internet access from land;
  - SatLink Weather system
- Modelling: OceanFARM modelling software
- Charting Software: OceanVision Electronic Chart Navigation Software

The QFS ECERS system

The ECERS system developed by TerraVision and the QFS is well documented publicly and a user manual can be downloaded from the VMS web page operated by the QFS at: http://bne001w.webcentral.com.au/~wb094

It is based on Microsoft Windows technology and submits its data report via e-mail. An OLEDB database is maintained on board the vessel which can be accessed externally using Microsoft Access, whilst on the land side the system uses Oracle, Ingres or Access databases to collate the incoming information (Ingress at the QFS headquarters, Oracle in research and Access at the fishermans home).

The e-logbook can use as many data entry/management forms as supplied with the application and can be a mixture of fisheries, VMS requirements, boarding information, special notifications, non fishing and B2B.

The software is an end to end solution, supporting the vessel client end and also the fishing administrator server end. An ECERS server is also available for fishing companies so that they can be copied ('CC' in email) with the same data sent to the fishing administrator's server. The server software includes the ability to onforward the catch report to other organisations or research groups if necessary. The distribution of ECERS data is according to business rules, which can be set up in much the same way that VMS data is onsent to remote systems. The server software which automatically processes incoming email and stores the data in the database also verifies reported lat/ long positions against the TerraVision VMS positions. The server also has automated archiving and backup facilities.

The use of Microsoft Outlook to provide the email platform is advantageous in that it supports Public Key Encryption and thus allows catch reports to be submitted encrypted and with a digital ID signature. Also the Fisheries Administration server is configured to acknowledge each report sent by the client. The acknowledgement is stored in the vessel's ECERS database tables against each report.

Fisheries forms can be designed by TerraVision to suit a fishery. The information is stored in the mode required by the form, whether it be by shot, daily or trip reports and can be retrieved by clicking on the appropriate day of the calendar contained on the ECERS interface. Different shots can be filled in separate forms under the same day and a total table is automatically produced.

Version control of ECERS forms are managed by each form maintaining its own database table structure, and thus when a new version of a form is loaded, a table structure is created to suit that version. This enables old data to be viewed with forms supporting the old table structures, whilst newer forms are used for reporting.

An email platform for Inmarsat-C which supports Microsoft Outlook is available via the Satlink Email system and uses Xantic as a gateway. Also TerraVision supplies an electronic navigation and charting product called OceanVision which allows the catch data to be entered and plotted spatially on hydrographic charts.

OceanFARM – Fisheries Activity Research Model

OceanFARM provides an environment in which the researcher can utilise the VMS data and ECERS data to develop a spatial model. The benefits of a spatial model are to:

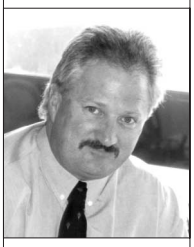
- Validation of incoming ECERS Data
- Real-time current model of Fishery
- Provide a tool to understand fishery dynamics
- Provide a tool to create temporal models of the fishery (hence forecasting)

The data environment which is used by the modelling system is called a FARM, which contains header information, vessel tracks, catch, catch probability, vessel characteristics, spatial model of population and variance and pointers to spatial data files such as sea surface temperature and habitat models.

OceanFARM provides the database interface to the VMS and ECERS data, both for historic and real time data. It also provides a processing tool template which researchers can use, or alternatively they can develop their own processing environment, all within the OceanFARM system. OceanFARM is an open architecture.

Thus the system collates a FARM data structure as input, which is then manipulated by the tools to provide a FARM data structure output and which can then be used with viewing and plotting systems contained in the system.

I am sure that a healthy debate about the merits of spatial modelling will ensue over the coming years, but our experience has been that where a fishery will organise itself to utilise the spatial data, it can reduce effort and thus increase profit to the fisherman whilst improving the environmental implications of the fishing activity and also ensure sustainability.



Brian Hemming - National Docketing Systems

National Fisheries Compliance Committee Report To the Abalone Industry

National Fisheries Compliance Committee (NFCC)

- Sub Committee to SCFA
- Participants
- Role of NFCC
- Strategic Direction for Australian Fisheries Compliance
- Optimal Level of Compliance - 'is that which holds the level of non-compliance at an acceptable level, which can be maintained at a reasonable cost for enforcement services while not compromising the integrity and sustainability of the resource'

Mission

'To achieve optimal levels of compliance with fisheries laws by maximising voluntary compliance and creating an effective deterrent against illegal activity'

Initiatives in abalone crime prevention

- National Docketing System
- Multi-jurisdictional Operations (incl. NZ)
- Joint Operations
- National Abalone Compliance Workshop
- Information exchange
- Airport Interdiction
- Involvement of non-fisheries agencies in abalone crime (State police, ATO, NCA, ACS, FedPol, Immigration and AQIS)

National Docketing System

The recognition of the weaknesses associated with jurisdictional boundaries led to the establishment of the National Docketing System.

A number of enforcement operations have been conducted to target this type of crime.

Operation ENDEAVOUR

A multi-jurisdictional operation targeting the illicit trade of abalone in Sydney prior to the Olympics.

Operation BENCHMARK

This operation was a Multi-jurisdictional operation into the illicit abalone trade.

BENCHMARK concentrated on Gold Coast premises to introduce new Queensland abalone regulations and educate traders.

Operation ORION

The co-operation of Officers from Fisheries Victoria, Victoria Police and Tasmania Police resulted in the apprehension of one of Australia's highest profile abalone thieves.

This offender was prosecuted and received a substantial term of imprisonment and record fines in Tasmania in 2000.

Operation ASCOT

This was a joint South Australia and Victoria operation targeting Melbourne based abalone thieves working both the Victorian and South Australian coast line.

Three offenders were apprehended with 350 Kilograms of abalone meats and are being prosecuted in the South Australian courts.

Operation CHURCHILL

CHURCHILL was an investigation into the activities of an illegal abalone processor by Fisheries Victoria with assistance from the Victoria Police and the Australian Customs Service.

31,004 abalone were seized with a commercial value of $300,000.

All equipment was seized.

The offender was convicted and jailed.

Assets confiscation was pursued and a Pecuniary Penalty Order of $978,275 was imposed. Two houses were forfeited.

One of the keys to the successful outcomes of all of these operations was the co-operation of the agencies involved

These included:

- State Fisheries
- State and Federal Police
- Australian Customs Service
- Australian Taxation Office
- National Crime Authority
- Department of Immigration

Product identification

- A major challenge to effective enforcement is the identification of product.
- Ongoing research into DNA identification currently being undertaken by CSIRO with FRDC funding is supported by NFCC.
- Mandatory labelling of all processed abalone is necessary.

Product reputation

Leakage through the domestic trade to tourists pose major risks to the reputation of legitimate product and perpetuates abalone theft.

NFCC has responded by implementing an interdiction model at Sydney International Airport.

Airport Interdiction

- Joint approach by AQIS, ACS and NSW Fisheries endorsed by NFCC.
- Model implemented at Sydney airport.
- Model to be expanded to all jurisdictions.

Licensed Sector Monitoring

- Quota fraud is a serious crime.
- There will be no leniency for persons connected in any way with this activity.
- The integrity of quota management can be seriously undermined.
- We want to maintain a level playing field for all participants.
- Information about quota fraud will be acted on swiftly in strict confidence.

Performance measurement

NFCC members recognise the need to measure performance and support the FRDC project to establish a robust methodology which may establish the level of the illegal take of abalone.

Effective compliance is underpinned by deterrence.

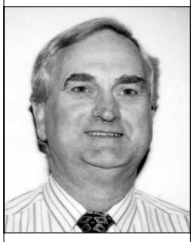
Significant penalties are now available under all jurisdictions.

These measures are supported by initiatives such as control orders, assets forfeiture and pecuniary penalty orders.

We are continually demonstrating that abalone compliance does not stop at the border.

Co operative Actions Workshop

- Timely provision of information to assist investigations into ALL illegal activities
- Introduction of labelling of all processed abalone
- Provision of documentation with all transactions
- Support for prohibited export concept



David Tonkin - Can the Australian abalone industry look forward to sustainable markets?

I have been in the Victorian abalone industry now about 30 years associated with processing and markets and currently I am the Executive Officer for the Victorian Abalone Processors' Association.

There is extensive abalone industry experience here at this convention and it would take me many lifetimes to accumulate such a level of knowledge and so what I am about to say represents only a small window in the overall picture but, never-the-less I believe my comments are relevant to some of the influences impacting on our overall business, especially our markets.

Hopefully these comments will stimulate and add to the debate on just where our industry is headed as we *Chart our Future.*

Australia produces approximately 48% of the world's wild abalone catch and we are achieving this level of sustainable production through efficiently managing our primary sector, the main tool being well set, and managed, quota arrangements.

This production output should put our industry in a dominant market position but, it's sad to say, this is not the case.

This dominant position should enable us to be price setters in the market, but it's sad to say, this is not the case, we are price takers and have been for the past 20 years or so.

Where then is the problem – we have a sustainable well-managed efficient harvesting sector, we are a dominant world supplier of a scarce resource and yet we are weak in the market.

Well the answer is that due to the structure and fragmentation of our post harvest sector we don't effectively manage the crucial secondary side of our business and in my view this situation throws into question the longer-term sustainability of our markets.

Our main markets are the same as they have been for many years, Japan, Hong Kong, Taiwan and Singapore but in recent years China has been opening as a new player. This is not to say that Australian abalone has not been entering the China market for some years - it has - but traditionally through Hong Kong connections, but it is now opening in its own right rather than through a third party.

So where do we stand now in our traditional markets. Let's consider two of the historical major markets – Japan and Taiwan.

Australia's share of imports into the Japanese market has held fairly steady over 10 years 1991/2000. In 1991 we held a 76% share of all imports and in 2000 we were maintaining a 73% share. A modest 3% reduction.

However, in real terms our exports to Japan have actually fallen by 40% over this period as the overall market has taken a 35% dive. Our share of the overall market has remained reasonably constant but it is now of a significantly reduced base.

In Taiwan it could be said that Australia is excelling itself as our share of imports into that market have risen from a 40% share in 1991 to a 76% share in 2000.

Well that's not really the case – the overall market has fallen by almost 60% over the same period so, like Japan, we are now getting a bigger share but of a greatly reduced cake.

In both these markets overall demand has reduced significantly. Why is this happening?

The answer will generate a number of responses and I would like to highlight just three issues, issues over which we, as an industry, can have considerable influence and if we care to make the effort could impact significantly on our long-term future.

The first issue is that of our markets themselves. We are constantly being faced with ever changing market conditions and we are not moving with nor adapting to these changes. We are not addressing the changing preferences of our markets nor are we researching the expectations of our customers – and by customers I mean the end consumer not the importer, the trader or the distributor.

As I said earlier, I came into the abalone industry some 30 years ago and at that time all abalone was being exported either frozen or canned. What are we doing today, almost the same thing, canned and frozen? It's true we have a few variations - the main one being live product but still old habits seem to die-hard. Over past years some new post harvest entrants have come into the sector as live packers but many have also entered as canners and we have also seen some existing packers install canning lines. The industry is maintaining the status quo rather than attempting to introduce new and innovative abalone product or packaging.

In the 3 years ending 2000 canned exports have moved from 62% to 76% of total Australian exports, live has reduced from 22 to 15% and all others from 16 to 9%. This is a relatively small window but it is indicative of our seemingly blinkered approach to abalone processing and the marketing that follows.

In all our markets we are competing with other food items that are being supported with a staggering level of promotion. The vast majority of this advertising is directed to the younger generations who are growing up not knowing or understanding the traditional value of abalone. In traditional Asian culture abalone is the prominent 'sea treasure' and is seen to represent health. Talk to younger Asians today and see how much they know and understand of this culture and compare it with what they know and understand about McDonalds, Kentucky Fried Chicken or Pizza Hut. I suspect knowledge of the former will be minimal or non-existent while on the later they will be able to produce chapter and verse.

We are constantly being faced with changing markets and we are not keeping up with them, nor as far as I can tell are we even researching these changes and so we are constantly falling behind.

Abalone has become an item that is largely served at banquets during festivals or weddings or when someone is out to make a big impression. It is a product that is more and more being consumed by the older generation rather than being an accepted 'special' food appreciated by a wide cross section of the population. Gone are the days when abalone was consumed in the home for the unique benefits it was seen to provide.

Our abalone has moved from a combination of retail and food service to an almost entirely food service distribution. We have become market specific rather than addressing the broadest possible market base and in doing so we have lost opportunities presented by a large and growing market sector – a sector called retail.

How did this shift come about? You have to go back twenty years or so to a period when we didn't sell abalone it was allocated. It has often been said of those days that we had to beat off the buyers with sticks and while this may have been good for the industry at the time we are now paying the price. During those years we took our eyes off the ball and have now lost the play. We are now very definitely sellers but in a very narrow and specific market. Because of this very narrow customer base our selling efforts are directed to an ever-reducing number of importer, traders and distributors.

The statement - abalone is too expensive as a retail item - may very well be true under current packaging and selling arrangements but this statement begs the question 'in what form and in what packaging would abalone become interesting to the retail market?'

Our current presentations are primarily directed to food service so it's not relevant to translate these presentations into an alternate market that has differing needs and expectations. Do any of us know what other opportunities are out there, have we surveyed the market, and most importantly - are we interested in making real changes that will contribute growth to our undervalued industry?

Some post harvest operators will say they have tried moving into a wider market sector and I know some who have attempted such a change. Some years ago I was involved in development of a retail pack that, in retrospect, was probably well ahead of its time but although significant capital was injected into the project and the final product and package accepted by a small part of the market, it was financially unsuccessful and the project was discontinued.

I only mention this as an example that product development is not easy, it is fraught with difficulties, not the least of which changing the mind set of the market can be seen as a major hurdle.

I'm not here today to canvass ideas about development of abalone product and packaging for the retail sector, what I am saying is that our markets are shrinking and we are doing very little, as an industry, to correct that shrinkage.

Should we stop looking into value adding developments because some ideas have not worked? Should we stop looking at expanding our markets into new consumer sectors or even new geographical areas? The answer to these questions should an emphatic no.

We should not be continually forced by profit constraints to take the easy option by staying with what we know as this strategy is destructive as it does not lead to product or market development.

However, to make changes will require time and effort but most importantly it will require significant funds to carry out research and development and most of all promotion and the post harvest sector does not have these funds available.

Post harvester operators are working on a gross margin over beach price of less than 20%, some even into single digits, and have been for many years so it's no wonder that there is little interest in attempting to fund development, the barrel is empty.

Yes it's true there have been some developments, pouch packs for example, but by and large developments in the sense of true value adding for a wider sector market are pretty thin on the ground.

Look at our record in the utilisation of what we call waste product – shell and viscera.

It's true some of this material contributes to the bottom line in the form of saleable product, abalone sauce is being produced in Victoria by a couple of operators, viscera is sold as fish bait and some shell goes into the market for medicinal purposes but not with-standing these initiatives a high proportion of shell and viscera finds its way into land fill at a substantial cost rather than providing a cash return. This is a lost opportunity.

Compare our record to other primary sector industries – meat and chicken, for example – we come a dismal last in utilising all our landed weight. The meat and chicken industries have found uses for all the non-human consumption parts of their intake.

In our industry the general rule of thirds – meat, shell and viscera - probably leads to around 50% of landed weight being discarded as waste. You can play around the edges with the percentages but sufficient to say that our industry discards a significant portion of landed weight as waste and this level of waste, whatever it is, could provide additions to our bottom line.

Why isn't it a significant contributor? I would suggest lack of R&D funding.

All this is to say that our markets are narrow and in some decline and we need to take action if we want to improve and provide expansion for the future.

Should we consider a single buying arrangement for abalone or a single marketing board? I'm not promoting these arrangements as being the answer to our marketing problems, I only add them to any debate that might follow this convention as the industry goes about *Charting our Future*.

The second issue is the number of licenced fish receivers or processors in our industry and the impediments we face as a result of this number.

Free and open entry into the post harvest sector certainly achieves its aim - that of providing increased and vigorous competition - but it is competition that is restricting growth and keeping our industry constantly on the back foot. Full optimisation of the resource is not achieved with the open entry regime we operate under and it significantly restricts improvement in returns to all stakeholders including the owners of the resource – the wider community.

Australia's wild catch today is around 5800mt live weight and to handle this catch we have 63 licenced processors. Pretty simple mathematics shows that this averages out to around 93mt per licenced processor. We know that some processors handle considerably more than 93mt so it stands to reason that a good number will be handling considerably less.

Add to the wild catch the output from farmed product, a quantity that is predicted to increase over coming years as more farms generate saleable product and the supply scale tilts further against us.

Add to the number of licenced receivers third party traders who also operate in this industry, and I'm one of them, and our marketing difficulties really compound.

This all goes to show that our post harvest sector is heavily overcapitalised. On balance probably 15 licenced operators could handle the entire catch and still the sector would be on the upper side of over-capitalisation. I'm not advocating that 15 is the magic number, all I trying to demonstrate is the imbalance in this sector and by default the cost that it adds to our final price. Our selling prices are carrying the cost of this over-capitalisation and it is a significant cost burden.

As I have said, sellers are offering product to a reduced and reducing customer base. Those of you who are in contact with the markets will know just how many importers have withdrawn from abalone trading for one reason or another, bankruptcy, cash flow, whatever, and I'm sure you will agree, the list is long.

As our customer base narrows I hear more and more stories of buyers from all the markets being offered abalone at prices below that which could be viewed as the 'market price'. I'm sure marketers here can attest to this scenario – we'll all have stories of being shown an offer from company X that is significantly cheaper than our current offer. Confronted with this situation what do we do? Do we hold out for our price? Yes, as long as there are not abalone suppliers knocking on the door chasing payment for raw material, in other words we have good cash flow support, or do we capitulate and meet or better the competitors offer in order to make a sale and improve our own cash position.

This scenario is common and leads to market price pressures that are detrimental to us all.

Too many sellers are dealing with to few buyers.

As a result the market is quite adept at playing one processor off against another and we provide them with the where-with-all to make their task a little easier. We keep them up-to-date with beach price movements and the state of stock holdings, not our own of course but other sellers. In this regard we are like politicians (heaven forbid) we point score when and where we can.

Does our industry have any sense of orderly marketing? In answer to this question I am reminded of a comment made to me only last week by a Japanese buyer. During our conversation he said to me '...that according to his long experience some people raise abalone prices like sky-rocket, then down like dive-bombing and continue this circle repeatedly.' Orderly marketing? – we are not even close.

Our buyers have and continue to do all they can to fragment our marketing efforts as this strategy is to their long-term advantage and our long-term disadvantage. Because of the large number of sellers offering into a limited market base, we are powerless to reverse this situation.

On the other side is the manipulation we regularly experience by some, certainly not the majority, but some fishers who play-off one receiver against another in order to extract an additional benefit, monetary or some other kind.

Due mainly to the need of some fish receivers to protect supply they are coerced into meeting these approaches but in the long term this action creates added industry problems.

The Australian abalone industry is fisher driven, that is, abalone is landed at the behest of the fisher rather than tailoring our fishing efforts to meet market demands, even as we know them today, and so become, as we should be, market driven.

As an industry we are doing ourselves no favours by having needs of fishers driving our business.

These issues result from the fact that there are just too many licenced operators in this industry, and I use this term licenced operator in its widest context, and this is one major factor why our industry has not developed to its optimum and will not develop under the current open entry provisions.

In my view the number of licences needs to be capped while industry determines a mechanism for reducing and reorganising the post harvest sector. This may be a buyback scheme, amalgamations or some other initiative, but we need to address this issue if we expect growth in the industry.

Until we are prepared to address this issue and convince our fisheries managers of the need to restrict processor numbers our lot will not improve and this includes returns to the community for the exclusive right to utilise their resource.

We have an extraordinary marketing tool at our disposal but we are unable to use it effectively to our advantage due in some part to the number of licenced fish receivers.

Now to my last point - illegal activities.

As an industry we are constantly faced with illegally caught and processed abalone entering both the domestic and international markets. Illegal product has been prevalent for many years and although there have been apprehensions and prosecutions it is still running at a significantly unacceptable level. It's fair to say that all in the industry as well as fishery managers would share this view.

Illegal activities impact directly on all of us on two fronts – on the one hand they deplete our natural resource, including the taking of undersize fish, thus denying legitimate stakeholders a return and on the other hand processed product enters our markets as a serious price competitor, not to mention the potential health problems that could impact on our business through poorly processed illegal product.

Illegal product also feeds a large proportion of the tourist market right here on our doorstep. Rather than restricting this trade current Commonwealth regulations allow it and our regulators, certainly from my point of view, seem slow to correct the situation.

This reference is to the allowance available to departing tourists to carry out up to 10kg of abalone without supporting documentation. It's interesting to note that this allowance exceeds the individual possession limit in each producing state by a considerable margin.

Take a tourist who has purchased 10kg of abalone, without supporting documentation, and is taking it home to Hong Kong. In Victoria, if this tourist was stopped by fisheries officers on the way to Melbourne Airport he could have the fish seized and charges could be laid. However, if he is not stopped and arrives at the airport unhindered then he is legal. A strange situation and one we don't need.

This matter has been discussed with AQIS and while I might sympathise with the difficulties in having the export orders amended it is a thorn in our side and one that has and will continue to cause us significant pain until it is corrected.

Take data from exercises undertaken jointly by fisheries, customs and AQIS at a number of airports around the country, the amounts of abalone detected up to 10kg per passenger are considerable but more to the point the amounts detected that are over the 10kg limit run into the hundreds of tonnes.

As an exercise take 1998/9 when there were 1.5m visitors to this country from Asian ports. For arguments sake let's assume that just 5% of these visitors carried out the maximum allowable undocumented quantity – 10kg – on their return journey. This would be around 75,000 individuals with 10kg each or 750mt finished product. Wet weight – perhaps around 2200 mt. Play around with the numbers all you like but it is one avenue for substantial tonnage of illegal product to be exported 'legally'.

We need to maintain pressure on fisheries managers to have this major threat to our industry greatly reduced. As licenced industry participants we must not undertake any activities that pose a threat to the resource and also we must be willing to report factual details of illegal activities we witness to our fishery managers.

Is the Australian abalone industry facing a crisis? Well maybe crisis is too strong a word right now but we are in a situation where our current markets and their long-term viability are reducing and that trend will continue unless we, as an industry, not individually, not as a single state, as an industry, take positive corrective action.

The opening of the China market may soak up some excess supply but I do not believe it will be a panacea for our poor marketing strategy. It may give us short-term breathing space but that is all.

Are our markets sustainable? – in my view not without concerted industry effort to address our market position together with its changing needs and expectations, to address with fishery managers the current unrestricted access to the post harvest sector and to do what we can to assist in the fight to reduce illegal fishing and processing.

If we are serious about *Charting our Future* then we have a number of challenges in front of us and resolving them will not be easy as there are many parochial views that will have to be tempered. However, unless we are prepared, as an industry, to seriously address a wide range of issues then, in my view, the sustainability of our markets will be at risk.

Eileen Gosling - AQIS, Abalone Interdiction Airports

Agency Roles

Australian Quarantine and Inspection Service (AQIS)

- To ensure that export product is fit for human consumption and accurately described.
  - Legal processing through registered export establishments.
  - Export Control Act 1982, Export Control (Processed Foods) Orders.

Australian Customs Service (ACS)

- To provide export clearance after ensuring export requirements have been met.
  - Customs Act 1901.

State/Territory Regulatory Agencies

- To regulate and enforce State/Territory fisheries legislation with a focus on resource management - taking, possession and movement.
  - relevant State legislation.

Export Control Legislation

Export Control Act 1982

- The application of the Act is dependent on defining 'prescribed goods'
  - meat, fish, dairy, grains etc.
- Order 7 Goods that are 'not prescribed' eg. Trade samples.
  - Liquid Goods - 10kg;
  - Dried fish (other than abalone) - 2kg;
  - Goods of any other kind - 10kg eg. fresh abalone.

Export Control (Processed Food) Orders

- Focuses on processing standards/food safety requirements of non-red meat products for the purpose of commercial export.

  Order 7.1 This Order does not exclude the operation of a provision of a law of a State or Territory with respect to fisheries that relates to the enforcement of a provision of that law concerning the taking of fish.

  Order 7.2 Processed food must not be prepared from materials which have been received, taken or processed in contravention of any law of the Commonwealth, a State or Territory.

Note:- does not address issues of possession or movement

Is the detection and seizure of abalone at airports

- food safety/ labelling issue? - AQIS
- resource management issue? - State/Territory Fisheries

Abalone seizures - Sydney Airport

DATE	NATIONALITY	GOODS	
4/7/2000	Australian	147 kg frozen	
11/12/2000	Dual	30 kg dried	DPP
14/1/2001	Australian	70 kg frozen	
24/1/2001	Chinese	120 kg frozen	
5/2/2001	Australian	30 kg frozen	
6/3/2001	Chinese	4 kg dried	RTO
10/4/2001	Chinese	16.6 kg frozen	
10/4/2001	Australian	160 kg dried	RTO

DPP - Brief of evidence with the DPP
RTO - Returned to Owner

Export Control Legislation

- Legitimate need for trade samples to facilitate development of export markets.
- Non-prescribed limits not required to be regulated.
  - resource/ cost implications.
- Fish Exports Program fully cost recovered.
  - AQIS activities for abalone interdiction subsidised by fees applied to 'whole of industry'.

Concerns with current model

- ECA controls legal, commercial exports.
- Penalties for non-compliance are against Australian based persons.
  - Prosecution under ECA of overseas tourists/couriers unlikely.
- Short timeframe for seizure ie. ability to seize depends on availability/proximity of AQIS inspector.
- AQIS has no equipment to detect goods, only ACS.
- After seizure AQIS can only hold goods for 60 days.
- Cost to AQIS to hold goods in commercial storage.
- Legislation only allows disposal of goods by the Commonwealth on conviction under court order or return goods to 'owner'.
- Ownership of seized product can rarely be established.

State/Territory Legislation

- Focussed on enforcement in relation to fisheries resource management.
- Broader powers covering possession and powers of seizure (including equipment).
- More stringent limits eg. pieces, weight.
- Compliance resources more focussed and substantial in relation to abalone than in AQIS.
- State/Territory courts more likely to convict than Federal courts due to impact/importance of abalone breaches within its jurisdiction.

Options for future management

- Authorise ACS officers under the Export Control Act and State legislation.
  - can seize and prosecute under most appropriate legislation.
  - problems with training of staff under multiple legislation; which legislation applies when?
- Extend current interdiction model to other States and Territories.
  - AQIS concerns still valid and resource/cost implications compounded.
- Raise abalone as a 'Prohibited Export' under the Customs Act.
  - ACS detect, seize, hold, prosecute or refer to State/Territories.
  - legitimate export consignments will have appropriate documentation.
- NFCC/SECC in-principle endorsement.
- State and Federal Ministerial endorsement required for change to Customs legislation.

Max Slee - Trade Practices Act

Essence of Trade Practices Act

- Don't collude with others for an anti-competitive outcome
- Don't use your market position to bully competitors or customers
- Don't lie to or mislead your customers

Restrictive Trade Practices

- $10 million each offence by company
- $0.5 million each offence by individual (directors/employees)

Consumer Protection

- $1.1 million company
- $220,000 individuals

Restrictive Trade Practices

- Anticompetitive Agreements
- Primary Boycotts
- Price Fixing Agreements
- Third Line Forcing
- Misuse of Market Power
- Exclusive Dealing
- Resale Price Maintenance
- Anticompetitive Mergers

Anti-competitive Agreements

Contracts/arrangements that have purpose or effect of substantially lessening competition.

Inghams and Steggles each fined $1/4 million in 1995 for rigging SA chicken meat market.

Primary Boycotts

Competitors cannot take JOINT action to refuse supply, or force another business not to deal with, a third business (eg a discounter).

In 1999 rural diesel mechanic TRIED to agree with only local competitor to share market by overquoting to farmer. Penalty: public apologies, 65 hours free labour, $3700 legals.

Price Fixing

Fixing prices by collusion (incl rebates or credits) is prohibited regardless of effect on competition.

In 1991 two Adelaide petrol resellers were fined $9,450 after meeting in a hotel with other 18 resellers and agreeing to raise prices for a short period. The others reneged.

Misuse of Market Power

Cannot take advantage of substantial market power to eliminate/damage a competitor or prevent entry.

In 2001 Rural Press Ltd was fined $400,000 for threatening to introduce a free Riverland newspaper when a small Waikerie newspaper attempted expansion into Mannum, which Rural Press perceived as exclusive territory to its Murray Bridge newspaper.

Exclusive Dealing

There is no RIGHT to be supplied, but distributor/wholesaler generally cannot refuse to deal with retailer if it substantially lessens competition.

In 1982 Mercury outboard marine engines was held NOT to have engaged in exclusive dealing when it cancelled the franchise of one of its dealers.

Resale Price Maintenance

Suppliers cannot cut or threaten to cut supply because a business is discounting or is selling below RRP.

In 2000 Hugo Boss fined $1/2 million, and managing director $75,000, for specifying minimum prices for certain lines of mens suits.

Third Line Forcing

Suppliers cannot make your acquisition of goods conditional upon your having to deal with a third business.

An example is a where a car dealer, as a condition of sale, specifies the finance company that the purchaser must use.

Misleading/Deceptive Conduct

- Two-price advertising (Cue Clothing)
- Composition/history (Vales, Pt Adel Wool)
- Performance/use/benefits (AMP)
- Bait advertising (insufficient stocks)
- Origin (John West)
- Silence/omission where duty to disclose
- Prediction/opinions known to be false or reckless indifferent
- Gratuitous advice - no defence if valued (eg bank)
- Defence of reasonable mistake
- Defence of reasonable reliance on others
- Defence of accident beyond control and due diligence taken

Australian Competition and Consumer Commission

- Commenced 6 Nov 1995
- Merger of TPC and PSA
- Chairman - Professor Allan Fels
- National - all Capitals + Townsville and Tamworth
- ANZ House 14th Fl, 13 Grenfell St.

ACCC vs Private Litigation

TPA is self-enforcing and so 90% of litigation is private action under restrictive trade practice and consumer protection provisions.

ACCC monitors these and may intervene at times.

ACCC work flows from:

Marketplace (consumers/competitors)

ACCC initiatives

Government directions/references

Specific ACCC Priorities

ACCC intervenes where there is:

- Blatant disregard of the law
- Significant public detriment
- Deterrent or educative effect
- Significant new market issues

Current ACCC Market Priorities Include

Telecommunications (Optus/Telstra)

News Media (mergers/authorisations)

Energy (generation/trans/dist)

Transport (rail/ports/dereg airlines)

Professions (legal/health sectors)

Petrol

ACCC Enforcement Strategies

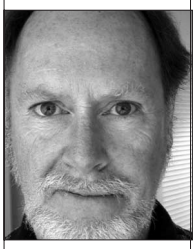
- S.155 Examinations
- Informal undertakings
- s.87B enforceable undertakings
- Litigation/ Consent Orders
- Prosecutions

Minimising Risk

- Commitment by senior management
- Systems which provide clear lines of responsibility and rapid response to problems
- TPA Compliance education for staff

Achieving Long-term Industry Compliance

- Innovative solutions which deal with market problems before they become entrenched.
- Integrated strategies (education+compliance+training+publicity+redress+compensation)



Mike Heasman - Post Larval Reseeding Program

Progress report on current research to enhance the black lip abalone (Haliotis rubra) fishery in NSW using hatchery produced seed . FRDC Project 98/219

M.P. Heasman1, R.C. Chick2, N.M. Savva1, D.G. Worthington2, C.P. Brand1, and P.T. Gibson1.

1 Port Stephens Fisheries Centre, NSW Fisheries
2 Cronulla Fisheries Centre, NSW Fisheries

Background and justification

Annual abalone catches in NSW peaked at over 1200 t during 1971-1972, and remained above 600 t during the early 1980s. Despite increasingly strict management, both catches and catch rates declined until a total allowable catch (TAC) was introduced in 1989. The commercial component of the TAC has been progressively reduced to 305 tonnes to help ensure the sustainability of the NSW abalone resource.

There are substantial areas of potentially productive reef in NSW that are devoid of abalone presumably due to many factors, including disease, poor recruitment, illegal fishing and over fishing. Natural re-colonisation by abalone of depleted reef is restricted by limited dispersal of abalone larvae from spawning adults. Exacerbating this problem is urchin domination of many reef areas that effectively prevents re-colonisation by abalone. Some remedial techniques have been developed in co-operation with industry to aid re-colonisation of depleted areas of reef in NSW, but these are very labour-intensive and only result in slow rates of re-colonisation over small areas. Supplementary stocking of depleted reef with hatchery produced seed provides a significantly more powerful technique to enhance depleted populations of abalone over a large scale.

Summary of results and discussion

All objectives and milestones of this project have been met. Successful year round conditioning and spawning of captive black-lip abalone brood-stock has been achieved for the first time in Australia. Considerable research has been completed on the factors affecting settlement, growth and survival of larvae and juveniles during and subsequent to deployment. Results of laboratory research demonstrated a major and progressive decline in optimum growth temperature from about 22ºC for early post-larvae to about 14ºC in juveniles and sub-adults above 30mm. Results also exposed an apparent dramatic decline in tolerance of black-lip abalone to adverse rearing conditions with progressive age and size.

Investigation of pre-deployment factors influencing settlement success of larvae have concentrated on pre-treatment with the chemical GABA, water flow, refrigerated storage, temperature shock and settlement substrate. Research on deployment methods for larvae has concentrated on factors affecting the competency of larvae to settle with regard to a deployment pump method (Preece et al. 1997) and in the use of 'tents' to increase survival of out-planted larvae.

New and novel seeding methods for deploying 7 to 10 day old post-larvae as an alternative to pump deployment of competent larvae have been developed. This research was pursued as a means of avoiding very high (above 95%) mortality rates shown by Preece et al.(1997) to be sustained by larvae within the first week of being deployed into natural boulder zone habitats. Methods developed involve pre-seeding of larvae at very high densities onto intermediate carrier substrates comprising coralline algae coated pebbles. The critically important ability of post-larvae to rapidly and efficiently disperse from the pebbles when scattered into boulder zone habitats has been demonstrated in laboratory experiments.

Greatly intensified nursery production and early weaning of juveniles onto artificial diets, has enabled an estimated 16 fold increase in production per area of nursery over most conventional commercial systems. This improved technology that has scope for a further 4 fold increase in production efficiency, will substantially reduce costs of producing juvenile abalone both for seeding of depleted reefs and for farming.

Over the past two years more than 18 million hatchery produced larvae and 650 000 mainly button size juveniles in the range 5 to 15mm have been experimentally seeded onto reef areas comprising natural boulder and fissured rock habitats within small bays. Much of the releases of juvenile abalone have focused on the development of sampling strategies, juvenile dispersal from deployment devices into the surrounding habitat and temporal patterns of survival and growth. More than 25 sites between Port Stephens in the north and Eden in the south of NSW have been seeded.

A simple benefit and cost model based on reported age specific survival data of wild abalone was developed to compare cost and benefits of 4 alternative age classes of seed. Predictions based on this model identify 6 to 9 month old button size juveniles as offering best prospects for cost effective seeding.

The most optimistic prediction of the model is based on the assumption that button size seeded juveniles survive as well as their wild counterparts, about 1 in 30 of which reach legal size. In this unlikely event, returns of up to $15 million could be expected based on an augmented sustainable fisheries yield of an additional one million abalone per annum. Such an operation would require a total estimated investment of $3-5million comprising capital infrastructure investment of $1-2million (specialised hatchery and nursery including land purchase) and cumulative annual operating costs of around $500 000 over 4 to 6 years (time to first additional harvest).

The worst case scenario for this and all other models is that no released seed survive to legal size. An intermediate more conservative forecast, based on a more plausible assumption of 10% wild survival rate, is that gross additional earnings of $1.5 million per annum would be generated by the same level of investment.

This preliminary model and associated predictions, though crude, are helping to narrow the focus of continuing research, namely development of methods to:

1 maximise post release survival of naive hatchery produced button size juveniles, particularly during the first critical weeks and months following their release

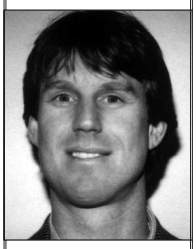
2 urther reduce cost of mass producing and deploying button size seed.

Some encouraging recapture rates in the range 1-4% after a period of approximately 1 year have been obtained to date with button size seed but such rates still remain well short of equivalent natural survival rates estimated to be in the range 20 to 30%.

Subject to continuing and increased financial support from the NSW abalone fishery shareholders and the FRDC, a follow-up three year research project will be undertaken to determine whether costs of production and rates of survival of hatchery seed can be increased to levels that will make enhancement a viable economic proposition.

On a cautionary note, a complex array of environmental and socio-economic issues will also need to be addressed at considerable additional cost prior to implementation of large-scale commercial enhancement operations. Such issues include development of enabling policy and legislation on fisheries enhancement and ranching, compliance issues and equitable allocation of potential benefits and costs. The decision to commit additional funds to the objectives of this research project must be weighed against these uncertainties.

Preece, P. A. Shepherd, S. A. Clarke, S. M. Keesing, J. K. 1997 Abalone stock enhancement by larval seeding: effect of larval density on settlement and survival Molluscan Research 18:265-273



Kim Friedman - Western Australian R&D Activities

Digital Video in–water assessment

- Stock assessment
- Stock manipulation – stunted, release units
- Special projects – ESD, Recreational Fishery

Protocols for the camera

- Industry owned
- Fisheries Research acts as booking manager and data analyser

Filming

- Utilises industry access to sites and skills
- Filming on different area and time scales
- Population structure – lengths and pre-recruits
- Densities and changes in density
- Others – scar replacement, growth bands
- With tagging – growth, mortality, movement

Research Tasks

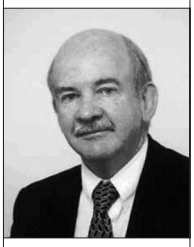
- Retrieve data from video - including shot of GPS
- Establish database
- Report to divers and licence owners
- One advantage of video in addition to accuracy and speed is repeatability

Advantage of DV

- Access (space and time)
- Accuracy
- Speed
- Data abalone and habitat (pests, weed, fish etc)
- Data permanence (transference, can be reanalysed)
- Reporting – communication options

Question ?

- Would like to know if we have support from other State and Industry representatives to develop
- Camera
- Sampling and
- Data management strategies



Gary Morgan - Abalone R&D Management

The Options

Current Situation

- No national approach to R&D prioritisation
- R&D needs review completed
- Clear linkage to State sustainability objectives
- No linkage to industry development strategies
- Informal communication and co-ordination

Advantages and Disadvantages

- Projects identified as high priority by States not assured of FRDC funding
- Focus on stock assessment/biology
- Perception of funds leakage to other sectors, including abalone aquaculture
- Funding shortfalls (currently 60% of possible funding through FRDC process)

Improving the System

- Is change needed? Disadvantages outweigh advantages of current system
- Strategic issues – linking R&D to both clearly defined State objectives AND to national industry development needs
- Operational issues – improving efficiency through better co-ordination and communication

The Options

- National Steering Committee (Govt/Industry)
- Abalone sub-program
- Annual workshop/conference
- Multi-lateral co-ordination between states (e.g. rock lobster tri-state)
- Some combination of above

Objectives – What Are We Trying To Achieve?

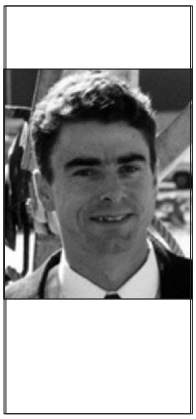
- R&D priority setting for sustainability and allocation issues remains with States
- Priority industry development issues identified
- Clear focus on delivery of R&D outputs and outcomes linked to strategic framework
- Improved success rate of R&D applications
- Assessing additional R&D funds
- Better communication and co-ordination
- Benefits outweigh costs

Assessment Of Options

- Consultation with industry and Government and researchers
- Sub-program structure delivers both strategic and operational objectives objectives BUT is most expensive
- National Steering Committee with annual workshop also an option

Conclusions

- There is a need for a national approach to abalone R&D
- Sub-Program structure appears to be the best way of achieving strategic and operational objectives
- Clear performance indicators need to be established so benefits and costs can be monitored
- National industry development strategy needs to be developed



Michael Arbuckle - Keynote Address: Where are we going – the New Zealand Experience

Introduction

You have asked that I speak on the topic of where are we going – the New Zealand Experience. In telling that story I will be reviewing where we have come from, starting briefly with the establishment of the Quota Management System and the death of government planning as a fishery management solution. I will then spend some time discussing the development of fisheries management by right-holders in the Southern Scallop Fishery and the resurgence of planning as part of the tool-box of fisheries management. Finally, I will briefly conclude on the topic of management integration in the marine environment - a matter that features strongly on the Convention agenda.

The Quota Management System vs Planning

The history of fishing in New Zealand leading to the introduction of the Quota Management System (QMS) is a history that is common worldwide. In the 1960s, 1970s and early 1980s New Zealand experienced a rapid expansion of fishing effort under subsidisation and largely open access licencing arrangements. The Government's initial response to the over-fishing and overcapitalisation that resulted was to legislate a requirement to establish Fisheries Management Plans (FMP's) in 1983. Under that legislation the Ministry of Agriculture and Fisheries was required to develop a regulatory environment for fisheries management through a public consultation process.

By the mid-1980s little or no progress was made in developing FMP's. In 1986 the new Labour Government moved to legislate the introduction of a QMS across all of New Zealand's major fisheries, which followed on from the earlier prototypes established for deep-water stocks. Over the following years the QMS evolved to include the introduction of proportional quota, the settlement of Treaty of Waitangi claims, and the introduction of cost recovery. Draft FMP's were also developed but only a few were advertised for public comment and none were ever implemented. By the early 1990s the conflict between central planning and the harvesting rights established within the QMS were becoming obvious. Government could no longer simply regulate to resolve allocation conflicts between sectors without challenge.

A new approach for fisheries management was sought beginning with a report prepared by Pearce in 1991. Pearce proposed a greater role for resource users in the management of the marine resource:

> *Within the limits of official conservation prescriptions, those who hold the rights to fish should be encouraged to manage resources and their fishing operations, taking account of all the costs and benefits of their actions. This will involve making collective decisions about fishing patterns and fishing rules, projects of enhancement, exploratory fishing and research, financing these activities and administering their arrangements with the Government, among other things.*

The Government's response to the Pearce report was to establish a Ministerial Task Force to initiate the process of simplifying New Zealand's fisheries management framework. The improvements described by Pearce were ultimately carried through into the report submitted by the Fisheries Task Force. The Task Force Report provided the foundations for the legislative framework that was to come into effect in 1996.

Earlier initiatives, consistent with the Task Force Report, were also implemented that saw the introduction of a cost recovery regime in replacement of resource rentals in 1994 along with a commitment to introduce greater accountability into the delivery of fisheries management services. This latter commitment resulted in the establishment of the Ministry of Fisheries, the introduction of contestability into the provision of research and, more recently, the devolvement of responsibility for the delivery of QMS registries to an industry owned company (to be effected on 1 October this year).

In retrospect there is no doubt that the relative roles of government and quota owners in the management of fisheries were poorly specified at the outset when the QMS was first established in New Zealand. By the mid 1990s these roles had however became clear. Since that time the policy and operational objectives of the Ministry have focussed not on fisheries planning or fisheries management per se but rather on the task of developing and administering the management frameworks established. These frameworks include the QMS and, more recently, legislative provisions designed to enable management of customary fishing interests by Maori. An active policy and legislative reform programme is also underway in an effort to better define recreational fishing interests.

It was within this rights based environment that the Southern Scallop Fishery was introduced into a transitional form of the QMS in 1992 and, subsequently in 1994/95, included within the proportional QMS following the settlement of Treaty claims. The quota owners decided to establish the Challenger Scallop Enhancement Company (Challenger) in 1994 following the decision to change to proportional quota and in order to take over, from the Ministry, the role of implementing an enhancement programme for the fishery.

The importance of the enactment of the Fisheries Act 1996 for the management arrangements established in the Southern Scallop Fishery are described in a paper prepared for the International Institute of Fisheries, Economics and Trade last year as follows:

> *The enactment of Purpose [to 'provide for the utilisation of fisheries resources while ensuring sustainability'] and Principles for fisheries management in the 1996 Fisheries Act was particularly important for the Southern Scallop Fishery as it provides a flexible framework for the development and empowerment of self-governing management systems in the fishery. It enabled the establishment of a Memorandum of Understanding [between Challenger and the Ministry] and the movement away from prescriptive fisheries management based objectives. By anyone's standards these initiatives were particularly forward and outward thinking for a centrally funded and correspondingly incentivised bureaucracy. Within this process the clear and unambiguous definition of respective government and industry roles is a positive and innovative step towards keeping government out of the business of business while ensuring that it can deliver to its legislative mandates.*

Challenger

The Southern Scallop Fishery is located at the top of the South Island of New Zealand. It is a modest fishery in economic terms with a capital value of around NZ $35 million. The Challenger Scallop Enhancement Company was established in 1994 as a cost centre to provide services for the management of the Southern Scallop Fishery as well as a range of other local shellfish and fin-fish fisheries. Challenger's shares are fully subscribed by the Southern Scallop Fishery quota owners of which there are about 44.

Challenger develops and implements fisheries management policies and plans for the scallop fishery, the local dredge oyster fishery and 20 inshore fin-fish stocks. The Company supports a number of advisory groups, including a regional recreational fishery advisory group, to facilitate the development of these plans. The plans are developed and implemented by ten permanent staff and up to fifty people employed on a casual basis under a number of management programmes and cost centres administered within Challenger. Challenger is responsible for developing annual budgets and business plans for three fishery management companies encompassing the shellfish and inshore fin-fish stocks. Challenger's annual expenditure ranges between NZ $1.6-2 million.

At the Company's Annual General Meeting in July this year about 60 shareholders (quota owners), fishermen and processors attended. As was the case for the previous seven years, the attendees elected directors, unanimously approved the management proposals for the fishery (developed by the staff and board), and approved a proposed business plan and levy to fund the management activities. The levy was set at 18% of the landed value of the scallops. The business plan encompassed enhancement, research (including stock assessment research), biotoxin monitoring and compliance monitoring and enforcement activities. The fishery management proposals for the upcoming season included a sustainability catch limit, various daily landing limits (based on the amount of quota fished by each vessel), various area closures negotiated with the recreational sector, and a civil contract specifying damages that would be payable in the event of breach of rules.

The management proposals were sent to the Minister of Fisheries for his consideration. A senior policy analyst in the Ministry evaluated the proposals and determined that the proposed management regime for the upcoming season met the Minister's legal obligations under the Fisheries Act 1996. The Minister was advised and commercial fishing will begin as soon as Challenger decides that the scallops are in an appropriate condition for harvest. The management of the Southern Scallop Fishery is now entirely planned, funded and implemented by the quota owners in the scallop fishery. Government's role in that fishery is to administer the wider operation of the QMS and evaluate and monitor the management plan developed and implemented by Challenger.

People often ask whether the management of the fishery has improved under the Challenger regime. There are a range of performance indictors available that suggest the Southern Scallop Fishery is a high performing fishery. For example, an analysis of implicit discount rates, estimated by dividing one year lease prices by the asset price of quota, show these rates to decline over time to the point where they approximate the real interest rate. This result, at the very least, indicates that economic confidence in the fishery is high.

Other, more traditional, indicators such as stock abundance and catch are also positive. **Figure 1** is reproduced from a paper delivered at the International Institute of Fisheries Economics and Trade Conference and it shows the number of scallops that have been recruited into the commercial fishery (usually two year plus aged scallops) over the last seven years. Catches for the last season unfortunately only reached 338 tonnes, which was lower than anticipated due poor meat yields and high sorting ratios. Biomass survey data collected this year indicates that there are 160 million recruited scallops in the fishery (equalling the highest number previously on record) and 915 million pre-recruits (a similar number when compared to last year but six times larger than any prior year on record). Scallop size (i.e. shell size and meat-yield) is also favourable.

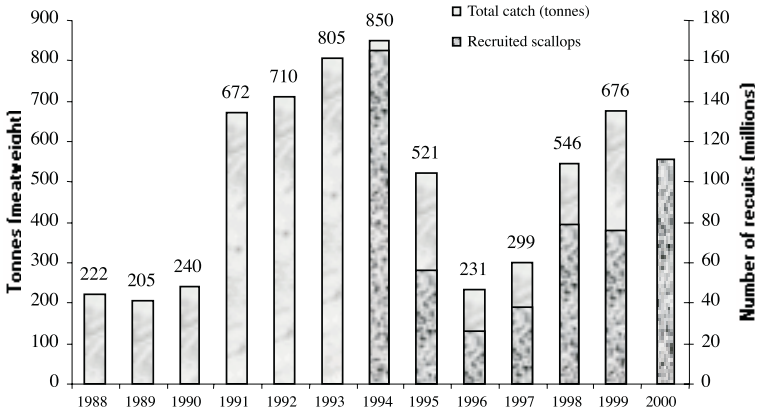


Figure 1

Fisheries Plans (again?)

A characteristic of the management approach now in effect in the Southern Scallop Fishery is that it is administered under civil law. The management rules are set out in a contract, which is voluntarily signed by all the commercial participants in the fishery. This approach provides maximum flexibility for self-governance by the commercial sector but has limited applicability across sectors. It does not, for example, provide a framework for establishing binding agreements between sectors. Nor is it applicable in fisheries where full agreement is difficult to obtain. It also has limited standing under fisheries law and therefore is vulnerable to changing policy even in the short term.

In 1999 the New Zealand Government re-introduced the concept of fisheries plans into fisheries legislation to provide an additional mechanism for use by stakeholders. The fisheries plan framework in the Fisheries Act 1996 is substantially different from the failed FMP initiative in that the plan development process is not statute driven. The new plan framework instead provides for the Minister to approve a plan proposed and developed by stakeholders. The role of government is not to develop the plans but rather to provide technical assistance to stakeholders and evaluate the plans once provided.

Importantly, the new plan framework gives explicit statutory effect to management arrangements developed and implemented by stakeholders. The Minister must consider an approved plan when making any other regulatory decisions under the Fisheries Act 1996. The new framework provides a mechanism for stakeholders to promote the establishment of agreed management rules to be effected through regulation. It potentially allows access agreements reached between sectors to be implemented. There are at least two plans being developed by paua industry groups in New Zealand for approval under these new plan provisions.

Management integration

The New Zealand government has recently embarked on a programme to develop an oceans policy. It is also in the throws of reviewing its marine reserve legislation and implementing a nation wide biodiversity strategy. Legislation governing the aquaculture industry, and how the development of that industry integrates with QMS fisheries, is also being reviewed.

The Ministry's strategic direction none-the-less remains the same. The Ministry's five-year goals continue to focus on the role of developing frameworks and managing processes to enable sustainable and efficient use of our fisheries resources. Those frameworks have proven to work in the past and they will continue to be a feature in the future in New Zealand.

David Fitzpatrick - Keynote Address: What is required to secure long term access to an abalone resource?

Does it matter:

- whether the licence holder is licensed to fish green lip, black lip or roe abalone?
- whether he can fish in Zone A, B or C or all Zones of a fishery?
- that the licence has a duration of 3 months, 2 years, 10 years or in perpetuity?
- that the licence will automatically be renewed when it expires or will not be renewed or may be renewed subject to the discretion of a Director of Fisheries?
- that the licence is not transferable or is transferable at the discretion of the Director or is freely transferable?
- that the licence can be held by an individual, partnership, company or trust?
- that the licence becomes an asset of the holders estate upon death?
- that the licence can be used as security for financial accommodation?
- whether financial institutions can register an interest over the licence?
- that the total allowable catch for an abalone fishery is determined solely by a Minister in his discretion or whether it is based on the best biological advice available?
- whether there is good knowledge and research of the available abalone stocks in a fishery?
- whether there is proper and effective enforcement to stop theft of abalone by illegal operators?
- whether there is a good co-management system in place to deal with management issues?
- whether there is a mechanism in place for the payment of compensation when a government decides to cancel a licence?
- whether there is a proper mechanism for payment of compensation when a government decides to introduce a Marine Park which will reduce the area and take of abalone?

The answer to each of these above questions is, yes. It does matter, the answer to these questions provides the characteristics of the rights given to a licence holder.

I will now briefly examine how the various State Governments have enacted legislation to regulate abalone fishing. The rights given to fishers are contained in such legislation:

Tasmania

The right to take and acquire abalone in Tasmanian State fishing waters for commercial purposes is conferred by a licence granted in a Deed of Agreement between the Director of Sea Fisheries and the Licensee, the terms and conditions of which are set out in Schedule 2 to the Tasmanian Fisheries Act 1959 ('the 1959 Act'). The main features of the Deed are:

- It confers upon the licensee full licence and authority to enter State fishing waters and to take and acquire from those waters a number of abalone quota units per annum for commercial purposes;
- The quantity of abalone that may be taken is 1/3,500 of the TAC;
- The Deed of Agreement guarantees that during the term of it and any subsequent term an abalone quota unit shall remain 1/3,500 of the TAC;
- The property in the abalone taken pursuant to the abalone quota unit belongs to the holder;
- The Deed states that the licence is property and the Deed can be assigned provided that the assignee is a fit and proper person to be a licensee;
- The licence may devalue to another person upon the death of the licensee;
- It may be held by a company;

- The Deed expires on 31 December 2003, however it can be renewed for furthers period of 10 years in perpetuity;
- In the Deed the Director acknowledges that any decision made to alter the total allowable catch of abalone will take account of the best biological advice available from the Tasmanian Department of Primary Industries and Fisheries on the conservation of abalone in State fishing waters with the intent that the maximum sustainable yield of the resource will be realised within those conservation constraints and that a reasonable level of consultation with the abalone industry will occur prior to making that decision;
- The Deed also sets out a scale of fees payable to Tasmanian Government as a sliding scale tied into the beach price. If the beach price increases, the Tasmanian Government receives substantial payments from the licensees.

There is also an abalone dive licence issued pursuant to the Fisheries Abalone Regulations 2000. There is a limit of 125 of these licences. This licence authorises the holder to have share of the total allowable catch of abalone which is equal to the number of quota units specified in the licence.

There is also a Management Plan in existence in relation to the abalone fishery.

Victoria

The Victorian Fisheries Act 1995 gives the licence holder a bundle of rights and entitlements namely:

- An abalone fishery licence authorises the licence holder to take fish for sale from the zones specified in the licence (Regulation 204);
- The licence is transferable subject to the provisions of the Act for a licence to be transferred, the Secretary must consider the transfer and be satisfied that the proposed transferee is a fit and proper person to hold the licence and satisfies any eligibility criteria. The Secretary can also consider any recommendations of the commercial fisheries licensing panel. In the event that any transfer is not allowed, then there is a right of appeal to the Licensing Appeals Tribunal (Regulation 233);
- The licence is renewable, however if the Secretary considers that the holders has ceased to satisfy any relevant eligibility criteria or be a fit and proper person to hold a licence, then the Secretary may refuse to renew the licence. There is however a right of appeal against this decision to the Licensing Appeals Tribunal (Section 57);
- The licence becomes an asset of the estate of a person upon death (Section 38(7));
- It can be held by a body corporate (Regulation 233);
- Financial Institutions can register a financial interest over the licence to secure money lent on the security of the licence (Section 59);
- If a licence is cancelled by a Court, then the licence holder or the holder of a registered financial interest in the licence has six month to transfer the licence (Section 60);
- In the event that the Secretary cancels the licence pursuant to a Ministerial Direction under Section 61, then the holder and the holder of a registered prescribed financial interest in the licence are entitled to compensation and provisions of the Land Acquisition and Compensation Act 1986 are applicable. It should be noted however that there is no compensation payable when areas are taken away for political purposes i.e. Marine Parks;
- There is also a right to nominate a diver to dive on behalf of the licence holder. It should be noted however that the licence holder is deemed to be responsible for any breaches of the Act by the diver unless the licence holder can prove that he did everything reasonably practical to ensure that the diver would comply with the law.

Victoria is currently preparing a Management Plan.

New South Wales

The New South Wales abalone fishery is regulated by the Fisheries Management Act 1994 ('the 1994 Act').

The New South Wales Act is based on recommendations of a property rights working group. The abalone fishery is referred to under the Act as a commercial share management fishery. The main features are:

- Licence holders who previously held a licence under the 1935 Fisheries Act were granted shares under the 1994 Act. The main features of the shares are:
    1. it entitles the shareholder to an equal percentage of the total allowable catch with other shareholders (Section 78);
    2. a shareholder can nominate a commercial fisher to take fish on behalf of the holder (Section 69);
    3. a shareholder can transfer, assign, transmit or mortgage the shares (Section 71);
    4. a shareholder may surrender his shares to the Minister and will receive 85% of the purchase price sold for the shares (Section 74);
    5. there is a minimum shareholding in the fishery of 70 shares and a maximum shareholding of 210 shares. The minimum shareholding relates to the minimum number of shares that must be held so as to be able to nominate another person to perform the diving on behalf of the shareholder;
    6. shares may be transferred in parcels of 10 (Management Plan clause 7);
- The total allowable catch is set by the TAC Committee which is an independent committee set up under the provisions of the Act (Section 29);
- Under certain circumstances there can be a forfeiture of shares. This relates to a number of serious offences against the Act (section 75 and regulation 35 of Management Plan);
- Shareholders are obliged to pay a community contribution which is to be phased in over the next couple of years to a maximum of 6% of the value of abalone taken;
- There is a share register set up under the Act whereby persons having an interest in the shares can note their interest in the share register;
- There is an Abalone Share Management Plan in existence.

South Australia

The South Australian abalone fishery is regulated pursuant to the Fisheries Act 1982, Regulations made under that Act and a Management Plan.

The main features of the rights associated with access to the fishery are:

- It is a limited entry fishery and split in zones;
- The Director may impose a condition on licences directed towards conserving, enhancing or managing a living resources to which the fishery relates or is related to any other matter prescribed by the scheme of management for the fishery (section 37). There must be consultation before this occurs and there is a right of appeal to the Administrative Appeals Court for a review of this decision by a person aggrieved (Section 58);

- A licence is not transferable unless the scheme of management prescribed for the fishery provides for same. In the case of abalone licence the scheme of management provides that licences are transferable. However, these may only be transferred with the consent of the Director (Section 38). A licence can be transferred to a natural person or a proprietary company. It appears also that the transferee must not already hold a licence in respect of an abalone fishery or any other fishery and furthermore that the transferee is not an associate of the person who holds such a licence. There is an extensive definition of who constitutes an associate. Again there is a right of appeal to the Administrative Appeals Court in relation to a decision not to transfer;
- Upon a licence holder dying the licence vests in his estate (Section 38(5));
- A Court may suspend or cancel a licence if the offence is prescribed offence. If there are two previous convictions for a prescribed offence the licence would be cancelled. For one previous conviction, the licence can be suspended. It should be noted however that a conviction for a prescribed offence committed more than 3 years before the offence whilst under consideration was committed will be disregarded;
- If the Minister is satisfied that the licence was obtained improperly or that the person being convicted of an offence against any other Act (including an Act in another State) being an offence relating to fishing or involving violent or threatening behaviour, he may suspend or cancel the licence. There does not appear to be a right of Appeal to the Administrative Appeals Court in relation to such a decision (Section 57);
- The Director must keep a register of all licences granted under the Act and must keep a notation on the register that a specified person nominated by the holder of the licence has an interest in the licence. This is to protect financial institutions and others that may have interest in licences. It should be noted that a person having an interest in a licence must consent to the transfer of the licence;
- The Governor may by proclamation constitute as a Marine Park any waters specified in the proclamation that the Governor considers to be national significance by reasons of the aquatic flora or fauna of those waters or the aquatic habitat (section 48). However, it should be noted that except as provided by the regulations or pursuant to a permit under section 48 of the Act a person must not engage in any fishing activity in an aquatic reserve or marine park. There does not appear to be any mechanism for compensation to fishers for being deprived of fishing grounds;
- The Regulations set up an abalone quota unit entitlement system whereby the units can be transferred during the year. However, there is no permanent transferability of the units;
- The Act prevents a foreign person from having a financial interest in a fishery (section 46(b)(iva)(A)). It should be noted that the National Competition Policy Review considers this to be a serious restriction on competition.

I note the South Australian Fisheries Act is currently going through a National Competition Policy Review. There are issues such as:

- one person one licence restriction;
- non transferability of licences;
- restrictions on what types of legal entities can hold a licence; and
- the restrictions on foreign ownership are being examined.

The National Competition Policy Review Issues paper refers to the use of property rights as the most efficient approach to fisheries regulations.

Western Australia

Fish Resources Management Act 1994. Under the Western Australian legislation:

- The former limited entry fisheries notice under the old Fisheries Act is carried over into the new legislation;
- The Minister may by instrument determine a plan of management for a fishery (Section 54);
- The licence is for a period of 1 years expiring on 31 March 2001;
- The licence must authorise fishing for either roei abalone or green lip, brown lip or green lip and brown lip abalone (Management Plan 9);
- A licence may specify the names of not more than two natural persons who may fish for abalone under the licence (Management Plan 10);
- The Management Plan establishes units which can be transferred during the licence period. There is no permanent transferability of units;
- The fisheries is divided into a number of areas specified in the schedule;
- In relation to renewal, the Secretary is, subject to various sections, to renew the licence;
- The Executive Director may by notice in writing given to the holder cancel, suspend for any period, or refuse to renew the authorisation:
    1 if the holder has been convicted of an offence against the Fisheries Act; or
    2 any other Fisheries Act throughout Australia; or
    3 if a condition of the authorisation has been contravened; or
    4 if the holder has failed to keep any record or submit any return as required to be kept or submitted; or
    5 the holder does not satisfy any guidelines under section 247 relating to foreign persons holding, controlling or having an interest in a licence (Section 143).

There is however a right of appeal against such a decision.

- The Registrar is to keep a register of licences (section 125);
- The Registrar is to make a notation on the Register that the person specified in the application has a security interest in the licence (section 128). The security holder is to be notified of certain events which may affect the security (section 130);
    1 In relation to transfer, the Executive Director must transfer unless:
    2 in the Executive Director's opinion the proposed transferee is not a fit and proper person to hold the authorisation; or
    3 does not satisfy guidelines in relation to foreign persons holding, controlling or having an interest in the licences or any other grounds specified in the relevant management plan or prescribed by regulations.
- In relation to Marine Parks there is legislation in Western Australia which sets up a scheme for compensation to be paid to fishers who can demonstrate that they have been affected by the introduction of a Marine Park.

Case Examples

Over the years the Victorian Scallop Fishers have found themselves in Court on a number of occasions in an effort to protect and preserve their licences and livelihoods. The first case was **John Manias and Ors v. Crabb and Ors (No. 7374 of 1991 Unreported decision of Marks J. of the Victorian Supreme Court)** where the issue was whether the Victorian Minister for Fisheries had power under the Fisheries Act to prohibit licence holders from dredging for scallops in Port Phillip Bay. The Minister relied upon a regulation in the Scallop Regulations to prohibit fishing in Port Phillip Bay during 1991. A declaration was sought from the Court by the Port Phillip Bay licence holders that this regulation was beyond the power of the governor in council to make such a regulation. The regulation was held by the Court to be void. Justice Marks of the Victorian Supreme Court said:

> *'Dredging for scallop requires a vessel conformed and fitted out for the purpose. An essential assumption of the Act is that a licence and payment of its fees provides some security and safeguard for investment by its holder in boats and equipment required to operate it.*
>
> *It would frustrate entirely any purpose of the Act if the law were to uphold the validity of delegated legislation which utterly frustrated and effectively confiscated the rights and property for which the Act provides.*
>
> *The evidence shows that the licence itself is valuable property for which high sums may be paid.'*

The second case I want to discuss is **Springall v. Kirner and Ors (1988) VR 159** where the Victorian Fisheries Minister attempted to prevent abalone divers from taking abalone in the waters adjoining Wilson's Promontory Marine Reserve. The Minister asserted that she was empowered by provisions in the Victorian National Parks Act to stop divers taking abalone. There was a conflict between provisions in the Fisheries Act which allowed the abalone diver to fish in the Marine Park and provisions in the National Parks Act which stopped him from fishing. The Court found that a diver's right to take abalone was one of considerable value. The Court referred to a principle of statutory construction that, unless it is unavoidable, an enactment should not be construed in a manner that would lead to the loss of a person's valuable rights without payment of compensation. On this basis, the Court granted an injunction against the Minister preventing her from enforcing the provisions of the National Parks Act against the abalone diver.

In **Harper v. Minister for Sea Fisheries and Ors (1989) 168 CLR 314** a Tasmanian abalone diver challenged a regulation made under the Tasmanian Sea Fisheries Act exacting a substantial licence fee payable each year for a commercial abalone licence and contended that it amounted to an excise and therefore was contrary to section 90 of The Australian Constitution. In the course of dealing with this contention, the High Court examined the provisions of the Tasmanian Fisheries Act. It held that a statutory right to exploit a limited natural resource [such as taking abalone or scallops] from the sea was a right akin to property. Brennan J. of High Court of Australia said:

> *'When a natural resource is limited so that it is liable to damage, exhaustion or destruction by uncontrolled exploitation by the public, a statute which prohibits the public from exercising a common law right to exploit the resource and confers statutory rights on licensees to exploit the resource to a limited extent confers on those licensees a privilege analogous to a profit a prende in or over the property of another.'*

A 'profit a prende' is a proprietary right to take the produce or part of the soil from the land of another person (eg. trees, minerals, clay or soil).

In the case of **Pennington v. McGovern (1987) 45 SASR 27**, the Supreme Court of South Australia had to determine whether an abalone licence issued under the South Australian Fisheries Act constituted property and, therefore, capable of being the subject of a trust. In arriving at its conclusion the Court held that the licence was proprietary in nature. Mr Justice King said:

> *'It is clear from the provisions of the Act and regulations to which I have referred that the licence in question is no mere personal, inalienable right. It is a transferable right, which is contemplated as having value. The limit of six licences renders it likely, as a matter of commonsense, that a licence will possess value'.*

The Judge confirmed:

> *'…. the provisions or the regulations to which I have referred as to the contemplated value and transferability of the licence and as to the right to hold it notwithstanding that its exercise is subject to the direction and instructions of another, are all, to my mind, indicia of rights or property and I have no difficulty in reaching the conclusion that the rights conferred by the licence are proprietary in character.'*

Kelly v. Kelly (1990) 64 ALJR 234, is a case which involved a question for determination by the High Court as to whether an abalone licence issued under the provisions of the South Australian Fisheries Act was capable of being partnership property under the South Australian Partnership Act. The High Court found that after analysing the South Australian Fisheries Act, the abalone licence could constitute partnership property. The High Court said:

> *'Whatever the position with the abalone permit, there can be no doubt that the abalone authority gave rise to valuable rights which were capable of being held for the partnership in such a way as to constitute partnership property: see Amber v. Bolton (1872) LR 14 Eq 427; O'Brien v. Komosaroff (1982) 150 CLR 310. Despite the fact that it could only be done indirectly and with the consent of the Director of Fisheries, it was plainly possible to make what was effectively the transfer of an authority for consideration, thus enabling a value to be placed upon it. This was so, notwithstanding that there were certain requirements in respect of an abalone authority which were personal to the holder, such as the requirement that he be medically fit to dive.'*

The next case I want to discuss is **Austell Pty Ltd v. Commissioner of State Taxation (1991) 4 WAR 235.**
This case involved the Supreme Court of Western Australia deciding whether a transfer of a rock lobster licence should be subject to stamp duty. It was argued that the fishing licence being a limited entry fishing licence was not property within the meaning of provisions of the Stamps Act. The Court rejected this argument and said:

> *'I must say I would have thought that if a person bought this particular licence, he had an interest that could be called property in the ordinary meaning of the word as used by a layman: see Pollock B in The Smelting Company of Australia Ltd v. The Commissioner of Inland Revenue (1896) 2 QB 179 at 184.'*

There are series of legal cases in Australia involving the Northern Prawn Fishery Management Plan. These are:

- Minister for Primary Industries and Energy and Ors v. Davey and Or. (1993) 47 FCR 151;
- Fritti v. The Minister for Primary Industries and Energy and Anor (1993) 47 FCR 151; and
- Bienke and Ors v. The Minister for Primary Industries and Energy and Anors 135 ALR 128

These are decisions of the Federal Court of Australia. The issue in these cases arose from amendments to the Northern Prawn Fishery Management Plan. Under the Plan units of fishing capacity could be issued to individual licenced boats. A certain number of units were required to fish in the Northern Prawn Fishery. Amendments were made to the Northern Prawn Fishery which cancelled units thereby reducing the total number of units of fishing capacity for the Northern Prawn Fishery. As a result of the cancellation of units, one of the Applicant's boat had insufficient units to allow it to fish in the Northern Prawn Fishery.

The Court held that a fishing boat licence granted under the Fisheries Act 1952 (the old Commonwealth Fisheries Act) does not create an interest based on antecedent proprietary rights recognised by the general law. The licence represents a new species of statutory entitlement, the nature and extent of which depends entirely on the terms of the legislation. The Federal Court held that the units of fishing capacity allocated under the Northern Prawn Fishery Management Plan conferred only a defeasible interest, subject to valid amendments to the Northern Prawn Fishery Plan under which they are issued. The making of such amendments is not to deal with property; it is the exercise of powers inherent at the time of its creation and integral to the property itself.

The next case I want to discuss is **Gordon Laidler and Associates v. Hocking (Supreme Court of New South Wales), Young J. unreported 6 March 1995).** This case involved a dispute between two joint venture parties. The issue was whether a fishing boat licence issued under the New South Wales Fisheries and Oyster Farms Act 1935 was property. The Judge held it was. This case contains a useful examination of the cases in Australia. The Judge highlighted the older view of a licence which was a permission to do something which would otherwise be illegal. If the licence was purely personal to the person to whom it is issued and could not be transferred, it was hard to categorise it as a proprietary right. The Court in referring to these cases stated that the classifications as to whether a licence was property tends to depend on whether the licence is transferable. Thus in **R V Toohey; Ex Parte Meneling Station Pty Ltd (1982) 158 CLR 327** the High Court had to consider whether a grazing licence issued under Northern Territory Legislation constituted a right of property. The licence was not assignable, nor was there any applicable market for the transfer of the licence. The Court held that such a licence was not property.

I will now look at the recent High Court case of **The Commmonwealth v. WMC Resources Limited (1998) HCA 8.** The facts in this case was that WMC Resources was the holder of an interest in an exploration permit issued under Federal legislation to permit and encourage exploration for petroleum in defined areas of the Australian continental shelf. Subsequently, the Commonwealth agreed with the Republic of Indonesia to establish a zone of co-operation in an area of the disputed sea bed boundaries between the Island of Timor and Australia known as the Timor Gap. Some of the areas of exploitation provided by the permit fell within the zone and by subsequent Federal law were extinguished in order that new permits might be granted within the zone by a joint authority constituted by Australia and Indonesia. In relation to the permit, in the end it was acknowledged by the Commonwealth that it was proprietary in nature. It was noted that the rights of the permit was susceptible of exercise during the currency of the permit, the permit could be transferred and the interest in the permit may be created or assigned subject to approval. The High Court acknowledged that these qualities of the permit and WMC's interest in it are indicative of the proprietary character of the rights possessed by the WMC.

From the cases I have discussed, the following is indicia of a statutory licence which is proprietary in nature:

1 Whether the licence is saleable or transferable (whether subject to approval or not); and
2 Whether an interest in the licence may be created or assigned.

Indicia of a statutory licence which is not proprietary include:

3 Where the licence can be terminated upon notice by the Minister; and
4 Whether the licence is personal in nature.

The mere fact that a licence is statutory, and the statute can be amended does not make it not proprietary (otherwise no statutory licence could be proprietary in nature). It is clear from discussing legal cases in Australia that one needs to examine the bundle of rights conferred by the statute to ascertain whether such a licence is property or not.

I will now discuss the recent Scallop case in Victoria. **Alesios v. The Honourable Stockdale and Ors (Supreme Court of Victoria, Unreported decision of Cummins J. 15 April 1988) and The Honourable Alan Robert Stockdale and Ors v. Alesios and Ors (1989) VSCA 128.**

In late 1996 the Victorian Parliament enacted legislation which had the following effect:

1 It cancelled scallop licences to take scallops in Port Phillip Bay in Victoria; and
2 It provided that a licence holder is entitled to be paid a sum of money which sum is to be determined by the Treasurer and the Minister for Fisheries.

There were no guidelines legislated as to how the Minister and the Treasurer would determine the sum to be paid. The Minister and Treasurer when carrying out their function determined that each scallop fisher should be paid the sum of $120,000 being in their view the value of the Port Phillip Bay scallop licence.

A group of scallop fishers issued legal proceedings against the Ministers claiming that the Ministers must determine and pay full and proper compensation to each individual licence holder for the cancellation of their Port Phillip Bay scallop licences. The case was heard in March 1998 before Mr. Justice Cummins of the Victorian Supreme Court. His Honour found that the Ministers got it wrong by not considering each licence holder individually and comprehending the consequential loss to each licence holder as a result of the cancellation of his or her Port Phillip Bay scallop licence.

On behalf of the scallop licence holders it was argued that these licences were property and therefore attracted the common law principle that a statute will not be construed to take away property without compensation unless the statute says so unequivocally. The Court held that the purpose of the common law principle of compensation is to protect the rights of subjects and the principle is to be scrupulously defended by the Courts and with vigilance. Such principle however will not avail licence holders unless the licence is property in nature. His Honour, after an analysis of the scallop licence held that the licence was property in nature and accordingly attracted the common law principle of full compensation upon cancellation.

The Court further held that Parliament intended that the payment to be made to each licence holder reflect his or her loss:

1 of the benefit of the pre announcement market value of the licence, scallop boat, scallop equipment and commonwealth permit and the post announcement market value of same; and
2 Parliament also intended there be compensation for loss of a licence holder's business of dredging for or taking and selling scallops pursuant to the scallop licence.

The matter went to the Court of Appeal where two of the Judges said that the common law rule did not apply in this case because on a proper reading of the statute it excluded its application. These Judges stated that the Common Law rule might be called in aid if the Treasurer and the Minister had made determinations of altogether arbitratory amounts such as $50.00 or even $5,000. The third Judge held that the question was not whether the statute expressly or by implication excluded a particular type of compensation, but rather what is the nature of the compensation which the statute contemplates.

The case is a most unusual one where the Courts had to deal with the property of a citizen being taken away by a state Government without payment of full and proper compensation. In the event that property were taken by the Commonwealth Government a fisher may be able to rely on section 51(xxxi) of the Australian Constitution which allows for the acquisition of property on just terms.

Ways of implementing property rights based fisheries:

There may well a number of ways of implementing property rights based fisheries. In my view in order to have strong property rights in a traditional limited entry licensed fishery at least the following rights, entitlements and matters should be present in legislation:

1 The entitlement of the licence must be clearly defined;

2 The licence should be automatically renewed when it expires;

3 The licence should be freely transferable to another person (subject only to eligibility criteria set out in legislation or a management plan);

4 The licence should be able to be used as security for financial accommodation. Furthermore, financial institutions should be able to register an interest over the licence and be protected under the provisions of an Act of Parliament;

5 The licence should become an asset of the holder's estate upon his death;

6 In the case of a fishery involving a total allowable catch, the Minister should determine it after receiving advice from the Management Advisory Committee in relation to that fishery;

7 The management tools for the fishery should be set out in a management plan which can be enforced, where necessary by regulation, or as licence conditions;

8 Full and proper compensation should be payable and a proper mechanism for payment of compensation should be set up where a licence holder can establish that there has been a reduction or diminution in the value of the licence (other than on biological grounds). An example of compensation could include any policy decision by a government to reduce or diminish fishing grounds or rights;

9 The above matters should be set out in an Act of Parliament and not in delegated legislation (ie. Regulation or management plan).

Marine Parks – The Victorian Experience

On 16 May 2001, the Victorian Labour Party introduced a Bill into the Lower House – National Parks (Marine National Parks and Marine Sanctuaries) Bill. The purpose of the Bill was to establish a series of Marine National Parks and Marine Sanctuaries in Victorian Coastal Waters. The Bill sought to amend the National Parks Act. In the Central Zone 15.5% of the fishing grounds were to be taken away from licence holders. The Bill prohibited a person from taking fish for sale in a Marine Park or Marine Sanctuary. Furthermore, the Bill provided that no compensation was to be paid for any loss and damage as a result of the alteration to rights conferred on licence holders under abalone licences. Access to the Supreme Court for any compensation was also prohibited.

Naturally, the Bill caused great excitement amongst professional and recreational fishers and various sectors of the community. Other sectors of the community applauded the Bill.

As part of the Parliamentary process the Bill was referred to the Scrutiny of Acts and Regulations Committee. The functions of this Committee is to consider any Bill introduced into a House of Parliament and to report to the Parliament as to whether the Bill trespasses unduly upon rights or freedoms, makes rights freedoms or obligations depended upon insufficiently defined administrative powers or makes rights freedoms or obligations depend upon non reviewable administrative decisions.

A submission was made on behalf of a sector of the Victorian Abalone Divers to the Scrutiny of Acts and Regulations Committee that the rights of an abalone access licence under the provisions of the Victorian Fisheries Act was a proprietary right and that the effect of the Bill was to take away part of the property (ie. areas of current access) without a mechanism for claims for compensation. Reference was made to the common law rule that a statute should not be construed to away the property of a subject without providing a legal right to compensation. The Committee noted that contained in the Minister's Second Reading Speech that there was a compensation package available consequent upon the establishment of Marine Parks and Sanctuaries by the Bill. Such measures included a package of $39 million of funding over 4 years. The money was to be used for a variety of matters associated with Marine Parks and an additional $14.1 million was to be allocated over 4 years to be used to boost fisheries enforcement.

The Committee made the following comments in relation to the Bill:

(i) The Committee accepted that a fishing licence permit or other authority constitutes a proprietary interest and is a right within the meaning of section 4D(a)(1) of the Parliamentary Committee's Act 1968 (4D(a)(1) relates to whether the Bill trespasses unduly upon rights or freedoms);

(ii) The Committee noted the Victorian Supreme Court decision in Springall and Kirner holding that an enactment should not be construed in a manner that would lead to loss of a person's valuable rights without payment of compensation, unless such a construction is unavoidable;

(iii) The Committee considered that the ex-grata compensation scheme for loss of proprietary rights in their broadest sense may constitute a diminution of rights and represent an undue trespass to rights and freedoms within the meaning of section 4(D)(a)(1) of the Parliamentary Committees; Act 1968;

(iv) The Committee is concerned that an absolute Ministerial discretion in respect to matters relating to compensation for loss of proprietary rights may also make rights dependent upon insufficiently defined administrative powers within the meaning of section 4(d)(a)(2) of the Parliamentary Committees' Act 1968;

(v) The Committee also considers that ex-grata payments as a form of compensation for loss of proprietary rights may constitute a non reviewable administrative decision within the meaning of section 4(D)(a)(3) of the Parliamentary Committees' Act 1968.

The Liberal Party relied on the Scrutiny of Acts and Regulations Committee's report to Parliament in opposing the Bill. The Liberal Party's view was that it wished to have Marine Parks but it could not allow the Bill to pass in it present form. After much debate and political grandstanding, the Bill was withdrawn by the Labour Party. As to the future of the Bill and Marine Parks generally, only time will tell.

The recent Victorian experience in relation to Marine Parks is but one illustration of the value of having licences recognised as property. To my knowledge, Western Australia is the only State in Australia in which there is a proper mechanism for payment of compensation in the event of Marine Parks. Of course it should be remembered that it is up to licence holders to prove that they will suffer loss and damage as a result of the introduction of Marine Parks. This may be more difficult than one expects.

In summary fishers need to have strong property rights to ensure long term access to an abalone resource.

Strong Property Rights from a Conservation and Economic Perspective

As been stated in the issues paper prepared by ACIL Consulting in relation to National Competition Policy Review of the Victorian Fisheries Act, individually or collectively owned property rights are the more efficient approach to fisheries management in the pursuit of commercial and sustainability objectives. Owners, either collectively or individually, would have incentives to employ the most efficient production methods and manage the sustainability of fish stocks in order to maximise the net present value of the fishery. Put another way, without property rights fishermen have little incentive to conserve the stocks of fish and be economic efficient in the exploitation of the resource.

Jeremy Prince - Keynote Address: Wild Stock Abalone Production; where are we going?

Abstract

The problem with sustainable and optimised management wild abalone resources is the mismatch between the scale of management (10s – 100s km^2) and the scale of abalone stocks (10s – 100s m^2). Despite regional management the 'tragedy of the commons' still occurs at the scale of individual beds which are serially depleted over time. Divers concentrate on the closest abalone beds with the largest abalone. On the best beds the entire breeding population is larger than legal minimum sizes. Divers know that beds should not be stripped of their breeding stock but each individual thinks; 'If I don't do it, the next diver will.' Modern, centralised, 'small' governments are ill-equipped to manage resources comprised of 10,000 – 100,000s of micro-stocks, each requiring surveys, assessments, TACs and size limits. Abalone beds require intelligent management at scales of 10 – 100m. This can only come with the motivated behaviour of divers. If there is to be a permanent future for wild stock production it depends on the diver evolving from competing marine hunter to co-operative marine gardener.

Introduction

In a seminal paper Hardin (1968) described the 'Tragedy of the Commons' by which 'each man is locked into a system that compels him to increase his herd without limit in a world that is limited.' At that time he was discussing the population control, but noted that it applied generally to the use of most renewable resources including fisheries. Where access is not controlled competition between users invariably leads to unsustainable pressures on a resource. The long term communal good is sacrificed to short term individual benefit. Hardin noted that 'freedom in a commons brings ruin to all.'

Since the late 1960s Australia and New Zealand have lead the world in promptly limiting access to our most valuable marine resources with the aim of preventing the Tragedy of the Commons diminishing society's marine wealth. By the mid-1960s, soon after the commercial abalone fishery commenced, most Australian states had imposed minimum size limits based on the size first maturity. Catches increased rapidly in the early fishery and by 1968 the annual catches were in excess of 8,000t. Most states limited entry during the late 1960s and early 1970s capping the number of commercial abalone divers in Australia to around 345. This limited further catch increases and, with no licence transferability, Australian catches gradually declined to less than 4,000t during the mid-1970s.

The introduction of licence transferability in most states during the mid-1970s promoted a further and rapid expansion of landings as new entrants tended to fish harder than the divers they replaced. Recorded annual catches steadily increased towards another peak in 1985, of approximately 8,200t. Once again diver concern at the level of catches prompted the authorities to act; in most cases introducing Individually Transferable Quota systems (ITQs) during the mid 1980s. Following the implementation of ITQs in Tasmania the industry lobbied the government, against the advice of the state fisheries agency, seeking and winning in one year a 30% Total Allowable Commercial Catch (TACC) reduction, such was their concern about unsustainable catch levels.

The TACCs are nominally reviewed annually and most states administer them within at least 2–3 separate zones each encompassing 100-1,000 km of coastline. Australia-wide TACCs stabilized around 5,000t during the early 1990s. Most states sanction the occasional fishing of 'stunted stocks', and are slowly introducing more and more zones. Formal stock assessments are now published in every state.

But do the stock assessments mean anything? Optimistic experienced divers think stocks are now stable but at much lower levels than suggested by quantitative assessments (less than 20% in Central Victoria, and around 10% in Tasmania). While the pessimists say things are not even stable but still eroding away from the inside. The lucky areas of Eastern and Western Victoria and Eastern South Australia probably have good 'stunty' grounds on which to base their optimism. But elsewhere the worms of overly concentrated effort of the poacher, recreational and commercial diver, and inshore eutrophication driven by run-off from agriculture and coastal development continues eating away at our underlying base of productivity

Global Trends

On the world stage Australian and New Zealand, with their prompt enforcement of size limits, limited entry and ITQ have much to be proud of in at least stabilising and maturing their abalone industries. From around 15,000t/annum in 1960 (FAO 1973-2000), world production of abalone peaked in 1968 at 27,600 t/annum, following the widespread adoption of SCUBA and neoprene wetsuits. Soon afterwards the large Californian and Mexican abalone fisheries, which had employed hard-hat divers since the late 19th century, collapsed (Tegner 1989; Guzmán del Próo 1992). In Japan, despite massive investment in ocean ranching and reseeding, catches have been slowly declining from 6.500t in 1970 to around 2,300t in 1998. By the late 1980s global production had declined to around 15,000 t/annum and at the end of the 1990s global production was sliding towards 10,000 t/annum. All around the world abalone resources, and similar resources, are proving difficult to sustain.

The Fisheries Ecology of Abalone

During the late 1970s and early 1980s as Australian abalone catches rose to around 8,000t/annum, there was widespread concern about the sustainability of the abalone fishery. The Commonwealth Fishing Industry Research Trust Account responded by supporting parallel, abalone state-based research programs in South Australia, New South Wales, Victoria and Tasmania. Together these programs concluded that a number of factors make abalone stocks extremely difficult to assess and especially susceptible to overfishing (Prince and Shepherd 1992).

Highly Aggregated Populations

Abalone are not dispersed through their environment, but form dense aggregations at fixed locations. At a scale of 100s to 1,000s of metres aggregations are clumped within reef complexes to form self-recruiting populations which are loosely linked within meta-populations (Shepherd and Brown 1993) that abalone divers call 'abalone beds'. Visually searching divers learn the locations of the abalone beds and the aggregations within them (Prince 1989). Once having learnt the location of aggregations, divers need spend little time searching for abalone, because they are able to quickly check whether or not abalone have re-aggregated, before deciding whether to re-dive a bed.

One consequence of this is that catches tend to remain proportional to the time spent diving. This means that catch rates remain extremely stable making them an extremely poor indicator of abalone abundance. This remains true regardless of the scale of reporting, or the standardisation procedures used to massage the data. In most government data bases the effort expended annually in each location would provide a far better index of abundance trends.

Restricted Movement and Dispersal

Larval and adult movements are generally limited to scales of 10s - 100s of metres (Prince et al. 1987, 1988; McShane et al. 1988; Brown 1991; Shepherd and Brown 1993). Consequently abalone fisheries are made up of many (1,000s - 10,000s) relatively independent 'units' of stock (Gulland 1969), or micro-stocks. If all these units had identical growth and breeding patterns, and divers fished them all evenly, this would not need to be a problem. In fact, a wide range of factors combine to make abalone resources particularly vulnerable to the serial depletion of the component micro-stocks.

Variable Patterns of Growth and Fecundity

To really complicate management, patterns of growth and fecundity vary greatly between and within meta-populations and maturity is determined principally by age, rather than size (Shepherd and Laws 1974; Prince 1989; McShane 1991, Nash 1992). Thus abalone of the same species commence breeding at around the same age over broad regions, but their size at maturity can vary by as much as 100mm on adjacent sheltered and exposed shorelines, and particularly north to south through a species' range.

At maturity cryptic juvenile abalone emerge out of the interstitial spaces within the reef and begin taking part in adult feeding and breeding aggregations (Prince 1989). Thus the entire breeding stock is vulnerable to divers depending only on size and catch restrictions. In productive fast growing areas, abalone mature and emerge at larger sizes than in slower growing areas. When legal minimum sizes are applied across an abalone fishery, the breeding stock in slow-growing areas is given a higher level of protection than in fast growing productive areas (McShane 1991). Moreover fishing pressure tends to concentrate on the faster growing areas, because that is often where legal sized abalone are most easily found. While protecting breeding stock in many areas, a high minimum size limit leads to local depletions in the fastest growing and most productive areas of the fishery (Sluczanowski 1984; Hilborn and Walters 1987).

Unfortunately, not only did the early researchers assume growth and fecundity would be relatively uniform over the abalone fishery, but original size limits were generally based on tagging studies conducted in relatively sheltered areas, where research divers were able to get the required time in the field. Thus, coincidentally most of the early size limits were set for relatively stunted stocks, and consequently left the most productive grounds particularly exposed to overfishing. Divers often talk of 'non-recovery bottom' that only sustained fishing for a few years before catches declined to almost nothing. These could be the most productive beds in the fishery but the entire breeding stock was considerably bigger than the minimum legal size limits and the fishery systematically stripped the breeding stock away. Conversely the most stable areas of the fishery are where size limits were conservative relative to the local size of maturity. It is no coincidence that these areas are marked by still possessing considerable stunted areas that cannot be fished commercially because the size of maturity is so low and few if any abalone reach legal size.

The Uncertain Status of Australia's Abalone Fisheries

Australian managers who used to rely qualitatively on regional trends in catch and catch rates to set TACCs, now rely increasingly on the 'baffle with bullshit' approach of conducting quantitative analyses that are deeply flawed by using data aggregated over inappropriately large areas. In reality the current status of the Australian abalone fisheries cannot be determined with any rigour because insufficient beds are being surveyed, and catch and effort cannot be collected at fine enough scales (Prince 1989; Prince and Shepherd 1992). The recent stability of TACCs in most states and the fact that quotas are filled each year is used to argue that the introduction of ITQs, and the subsequent industry initiated catch reductions of the mid-1980s, have permanently stabilised stocks and in some places TACCs are rising. However, clear and present dangers still work actively against the resource's long term sustainability.

- The normal legal fishing pattern of recreational and licensed commercial harvesters leads to the serial depletion of reefs even if TACCs are set at conservative levels for the broader fishery. (Just look at the east coast of Tasmania). This is because fishing pressure naturally concentrates on certain abalone beds (Prince 1989).
- The impact of illegal exploitation is particularly damaging to the long term sustainability of the resource because: the amount taken is uncontrolled, size limits are often disregarded, and fishing pressure is particularly concentrated due to the imperative to avoid detection.
- Declining water quality in inshore environments is an increasing threat to the resource. Burgeoning coastal development and agricultural inputs increase inshore nutrient loadings destabilising oxygen levels, introducing toxic agricultural chemicals, and fouling the coralline algal surfaces needed for settlement.

All these impacts lead to the ongoing loss of individual beds and to the steady 'trickling' erosion of the resource. These worms gnawing at the inside of our resource have not slept during the last decade of the last millennium. The question is, will we slay them in the new millennium, or sit back and watch our resource slide into memory?

Reef by Reef Management

Abalone need to be monitored, assessed and managed within the scale of reefs and abalone beds, that is to say within 1 x 1 km. Each abalone reef requires its own specifically tailored management plan with a total allowable catch, size limits and monitoring regime (Prince 1989; Shepherd and Brown 1993). The knowledge and techniques required to optimise assessment and management have been developed and are known.

Furthermore the resource is valuable enough to fund assessment and monitoring of the highest calibre. We all know that in aggregate it is one of Australia's most valuable fisheries earning on the beach around $250 million/annum. But what about the component micro-stocks, are they valuable enough to support individual surveys, assessments and management? With less than 4-5 person weeks per year a Renewable Resource Consulting Company like Bisopherics P/L could conduct surveys, (accurately) assess, and provide (reliable) management advice for a reef like George III Rock (Prince 1989) that would sustainably produce 2-4t/annum. The professional time would be worth about $10,000/annum (not counting the 2-4 days of commercial diving required to make the harvest) and the sustainable yield is worth $100,000-200,000/annum. So the economics stack up!

Yet as the fishery is currently managed, the reef by reef management needed to first stabilise, and then optimise production, will always be an impossible dream for the abalone fishery. Government agencies are incapable of collecting enough sufficiently fine scaled data, let alone with implementing regimes governing different behaviour for each square kilometre. Despite the aggregate value of the resource, no centralised, economically rational, 'small' government can monitor, quantitatively assess or manage the resource optimally. A democratic, liberal society with centralised priority setting will always favour spending scarce tax revenue on hospitals, welfare and government works, over spending it on monitoring and policing the harvest of abalone beds on behalf of wealthy abalone divers. Like death and taxes, that is certain!

So the public sector fisheries biologist charged with assessing spatially complex resources with minimal resources will always face an impossible task and be left wishing they had the resources to monitor more beds. No matter how much they rationalise the fact that they are doing the best they can with the available data, none of the existing stock assessments will ever be worth the paper they are written on!

The tragedy of the commons and a 'tyranny of scale' forces our society to manage this resource sub-optimally because the existing management framework is structurally unable to meet the challenge of spatially intricate renewable resources like abalone.

Optimising Australian Abalone Management

Only the informed and constructive behaviour of individual divers can provide meaningful information and action at the scale of aggregations and beds. To optimise the sustainable production of abalone the diver must also be more than a hunter, they must also be the resource surveyor, assessor and manager.

Managing Diver Behaviour

Most experienced abalone divers have observed population trends on the abalone beds they fish regularly and have well developed ideas on how abalone should be managed. Many of them want to change their behaviour to ensure sustainable management. I also believe that experienced, and informed divers diving the same beds repeatedly can intuitively manage sustainably without recourse to scientific surveys, and quantitative stock assessments. However, under current management arrangements, divers seldom behave like this because the 'tragedy of the commons' is still occurring at the scale of the stocks.

Rather than refraining from stripping all the legal size breeding stock from a reef, we divers think;

'If I don't do it, the next person will!'.

Turning Marine Hunters in Marine Gardeners

Hardin (1968) argued that the 'Tragedy of the Commons' does not have a technical solution' rather it is a social issue requiring society to change and develop new patterns of behaviour. Optimising wild stock abalone production requires harnessing the intelligent and constructive behaviour of divers. Abalone divers must evolve from being marine hunters competing amongst themselves and 'bringing ruin to all'. Divers need to evolve into marine gardeners co-operatively tending and harvesting abalone beds.

Territorial User Rights Fishery (TURF)

The relative success of Australian and New Zealand fisheries management has been built upon limiting access to resources and defining property rights that foster long term behaviour. If Australia's abalone fisheries were managed as Territorial Users Rights Fisheries (TURF) economic imperatives would favour harvesters who optimise long term harvests rather than short term catch rates (Kesteven 1988; Keen 1991; Young 1992).

A change to TURF management would grant exclusive harvest rights to smaller defined areas, specific aggregations and beds, rather than a defined weight of catch from extensive ill-defined areas. The individuals, or groups, owning access rights to each area would become responsible for optimising the long term production from their own areas. Their own motivation would lead them learn not just the location, but also the specific characteristics of each aggregation and bed and lead them to manage at the appropriate scale for abalone stocks.

The market would trade harvesting rights to specific areas or TURF Units, rather than a right to a weight. Fishers who are skillful at rehabilitation and at optimising long term production, will sell TURF units at a premium, and buy them cheaply from those who lack the same skills or inclination.

Loss of Existing Freedoms

A change to TURF management would further reduce the existing right of current stakeholders to move relatively freely around their fisheries. Existing stakeholders would be excluded from most areas they now have access to and would only have authorised to harvest abalone in some smaller sub-set areas. Many existing divers resist this notion because they value their existing freedom. But Hardin (1968) argued that the non-technical solution to the 'tragedy of the commons' required members of a community to voluntarily relinquish existing rights and freedoms.

The willingness of abalone divers to voluntarily relinquish existing rights of free movement relates to the perceived need for change. Most abalone divers acknowledge the long term gains that would be made by optimising the management of abalone beds with TURF. However those from fisheries with good stocks of abalone generally value their current freedom and lack of responsibility too much to support change. Divers that perceive long term stock problems in their own areas are generally supportive of TURF, for them existing rights are already being devalued by declining stock levels.

Self-organising Development

With TURF management will become innovative, experimental and adaptive because individuals assimilate new information and changes in the condition of resources more efficiently than centralised governments. Multiple experiences with many different stocks will present great opportunities to learn through adaptive management (Walters and Holling 1990).

Combating Diffuse External Threats

The issue of incremental resource degradation from diffuse external threats (i.e. inshore eutrophication and illegal harvesting) is also more likely to be confronted under TURF management. At the present time, rather than addressing threats to a particular bed, divers simply move away, placing greater pressure on a dwindling number of productive beds. With TURF abalone harvesters will be committed to ensuring long term productivity from specific areas of reef because they will not be able to relocate without first purchasing the rights to a new TURF unit. This will create an incentive for harvesters to address problems of illegal use and habitat destruction within their own areas. With a strong financial commitment to the integrity of the natural environment in specific areas abalone harvesters can be expected to evolve into environmental watchdogs guarding the ecological integrity of the inshore marine environment on behalf of the rest of the community.

Precedence

Territorial User Rights Fisheries have considerable precedence. In Europe and North America many stocks of intertidal bivalves are managed as private property and it has been found to maximise production and minimise the need for surveillance and enforcement (Beattie et al. 1982; Bourne 1986).

Japan's TURF Style of Management

Japanese Prefectures continue to manage their own fisheries on a basis of local corporate ownership of an area of fishing ground (Mottet 1980). Despite the ongoing slow decline of Japanese abalone catches in recent times, the relative stability of Japanese commercial catches over four hundreds suggests that local communities of Japanese fishers have had considerable success in managing their abalone stocks sustainably.

Widely practiced by traditional societies

Most marine resources were managed as territorial rights by the traditional societies of Oceania (Ruddle and Johannes 1983). The displacement of traditional TURF type management and the introduction of a law of the commons framework is encouraging the use of destructive fishing practices (poisons and dynamite). The power of villages, clans and chiefs to control their own fishing reefs is eroded while the governmental authorities which nominally take control, lack sufficient resources to monitor, manage or enforce (Johannes 1992, De Allessi 1997). A noteable exception to this trend is described by Johannes (1998) in Vanuatu where a local fisheries biologist began working directly with one community to developing village based management for their local trochus stocks. The success of this experiment and its rapid and spontaneous adoption by other villages, and application to a range of other species, demonstrate the power for self organisation that can be unleashed if individuals and small local groups are empowered.

Chile has managed all diver fisheries on a TURF basis since 1992.

Similarly a form of TURF management was implemented in 1992 for all Chilean dive and inshore fisheries. The most valuable species in the assemblage now being managed by local co-operatives, or Caletas, is the gastropod Concholepas concholepas also called loco, or sometimes Chilean abalone. The Chilean experience has also demonstrated the powerful self-organising nature of TURF management. Some Caleta's successfully claimed exclusive access to their own areas and then failed to improve management. But the few that had initial success have proved to be the most powerful influence on the system, providing working examples which other Caletas have aspired to, and copied.

The spirit of creative management which is spreading through relatively uneducated communities of tradition fishers is probably best characterised by the decision taken by many Caletas during the 1994/95 collapse in global abalone prices. In contrast to Australia and New Zealand which compelled divers to continue catching the same TACC for markets which were already over supplied with product. Many Caletas decided that with the low prices on offer, the product was best left in the water breeding for several more years until prices recovered. No wonder a recent international review of Chile's system acclaimed it as the world leader in managing benthic marine resources.

Where are we Going?

So where are we going? There are two trajectories we could follow. Most of us acknowledge the trajectory we are on and where it is leading us. If we do nothing we will follow Japan's path and experience a slow continuing decline in annual catches. It was the particularly pronounced sequential depletion that lead to the spectacular Californian and Mexican collapses. Relatively efficient management will save Australia from that fate. Instead catches will slowly fall over time until only the most remote beds with the smallest size of maturity are left. In time we will all forget that the the resource actually once had potential to be bigger. Just the way we are already forgetting how big the original biomass really was, and how many beds there originally were. Look out for puzzled stock assessment scientists telling you that the abalone beds must have been less productive than they originally estimated as they justify lowering TACCs. Eventually they will become so puzzled they will wonder how abalone beds ever bred up in the first place!

But there is another path. The good news is that, if we had done things right from the start our TACCs would now be 2-4 times bigger! That's right, done properly this resource is really much bigger and much more valuable than we currently think. Remember it was the best beds producing the biggest abalone that were stripped first. We now have all these empty spaces in our resource. What gardener would leave the best beds empty on a permanent basis?

This should be our long term goal. Not just to stabilise around current levels, but to recover the full productive potential of this resource. Why should the abalone resource be managed like a tuna or shark fishery, and not like a tree plantation or vineyard?

The need of this fishery is not for more quantitative stock assessments but for social change, and R&D priorities should reflect this. The relevant issues are no longer technical details of survey design, standardising CPUE, and developing models we need change, and to develop new forms of management. The R&D process in this fishery should be about facilitating change, not publishing more unbelievable stock assessments. The aim of research should be to promote the change needed for divers to evolve from marine hunter into marine gardener, and to provide the incentives needed to foster stock rehabilitation.

Flowing from this the issues for R&D in the abalone fishery at the beginning of the 21st century are:

Trialling forms of TURF management

There are local groups of divers in this fishery already unofficially trialling their own brands of micro-management. There are also areas where divers currently have no interest in these matters. As noted above this normally reflects relative levels of stock abundance in each area. For this reason alone those wishing to introduce change should be supported in their endeavours by setting up R&D projects providing management frameworks and scientific rigour. There experience, which currently remains informal and anecdotal, should be avidly collected and documented for the future benefit of the entire industry.

Developing agreed allocation processes Allocation

The impossibility of converting the existing ITQ allocations into an equitable allocation of areas of stock is factor commonly cited as an insurmountable barrier preventing existing management arrangements ever being changed. However one possible strategy for equitably converting ITQ allocations to TURF allocations was devised in 1990 by Dan and Danielle Pollock of the West Coast Abalone Harvesters of British Columbia.

The method they proposed and which I am currently trialling for Stewart Island (NZ) involves the following steps:

1 Grid the available coastline using an appropriately fine scale (1 km2).

2 Each diver assigns own value to each cell using a zero to ten scale.

3 The total perceived value of each cell is then estimated as the average value assigned by divers.

4 The total perceived value of the fishery is then be estimated by summing across all cells. This total perceived value is then comparable to the existing TACC, and a conversion rate can calculated between ITQ units and the units of perceived value.

5 A ballot is then used to allocate TURF units in proportion to each stakeholders Quota holding.

6 Once the balloted is completed stakeholders become free to begin trading TURF units and can rearrange their TURF holdings in line with their individual requirements.

The Pollock's system meets the necessary criteria of being equitable, open and above manipulation by individuals or groups (Hively 1995). But there are undoubtedly other ways of allocating areas so that a TURF management strategy can be implemented. The R&D process should aim to document and trial allocation methods so that the industry can become familiar with the concept and develop confidence that the equity of stakeholders will be preserved.

Allocation between commercial, recreational and traditional sectors

To completely implement TURF it will, in time, be necessary for the recreational and customary sectors to be allocated their own areas and to agree not to dive commercial TURFs. No-one would be under the illusion that education of the broader community about the need for this change, or the allocation of areas between sectors will be an easy task. For obvious reasons it is probably a task that is best undertaken outside the commercial sector who otherwise may be perceived as just narrowly driving their own self interest. This broader community process is properly another role that R&D could aim to facilitate, studying existing non-commercial use patterns, preparing material for public education and creating forums for broader community discussions.

Developing Protocols for TURF operators

In the same way agricultural advisers support the productivity of farmers with advise and protocols for efficient farm production, there will be a need to support prospective TURF owners. Accepted protocols will support the implementation of programs for surveying, rehabilitating and managing abalone beds. Many of these will be developed through the trials of TURF management suggested above, and the documentation of these trials will be the first step in developing these protocols. Based on the synthesis and study of these experiences agreed and acceptable protocols for TURF management should be developed and published.

Developing Tools for TURF Operators: handbooks and software

The application of accepted protocols of TURF management will be facilitated by the development of handbooks and software. Handbooks could lay out the protocols and provide the technical detail enabling initially unskilled operators to introduce 'best practice' TURF management. Likewise software could facilitate operators gathering, storing and analysing survey data on which bed by bed harvest strategies could be developed. The late Dr Philip Sluczanowksi and I designed software for this purpose back in 1992 (Prince and Sluczanowski. 1992).

Based on software developed and used by Prof. Carl Walters of UBC, we believed that the software would contain:

- maps detailing survey designs,
- spreadsheets for recording survey and catch data,
- routines for analysing mapping survey data,
- routines for fitting stock models, and
- high-end computer graphics to portray analysed stock trends.

We thought that the standardised software together with appropriate survey designs would be initiated with a couple of weeks work by trained personnel and then left with each individual TURF operator. The TURF operator would continue conducting surveys, entering data and gaming with the software's interpretation of stock dynamics to develop their own harvest strategies. Every few years the trained personnel would return to spend a few hours updating and checking the software's analysis of the beds.

We believed that in time the software belonging to each operator would become like the 'books of their business', the ultimate proof of the productive potential of their beds. With this value attached to the data being collected we thought that the current problems of collected fine scale spatial information from divers would end. We also thought that the software could be designed to produced standardised data downloads which, subject to confidentiality concerns, could be used to conduct meta-analyses of the differing experiences of management and so, over time, be used to refine and develop the protocols being implemented by individual TURF operators.

Conclusions

It is by no means certain that Australia and New Zealand will sustain abalone production through this new millennium. Global experience with these resources and underlying trends within our own resources suggest that this unlikely if current broad-scale management regimes continue.

Radical change is needed, existing rights and freedoms will need to be curtailed, if we are to reduce the scale of management to the scale of abalone aggregations and beds. But the potential rewards are clear, not only can we hope to sustain production, but after several decades of rehabilitation we could expect sustainable yields at least 2-4 times bigger than current TACCs.

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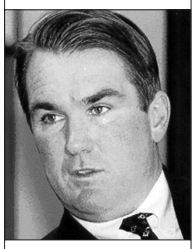

Paul McShane - Ecological Consequences of Abalone Fishing

Abstract

Abalone fisheries are demonstrably dependent on healthy functional ecosystems, particularly the subtidal reef habitat in the nearshore coastal zone. With current harvesting practices, it is unlikely that impacts of abalone fishing on subtidal ecosystems will be measurable. Of greater concern to participants in Australia's abalone industry are larger scale processes including coastal zone impacts (point source pollution, sedimentation, among others) and climate change. Such processes can affect habitat structure, e.g. canopy forming seaweeds, believed to be important in influencing the productivity of abalone fisheries. In seeking to maintain healthy coastal ecosystems, the abalone industry and the conservation movement share similar aims. However, at least some proponents of marine protected areas (MPAs) view commercial fishing as incompatible with 'marine protection'. Australian abalone fisheries should be able to defend their work practices as compatible with the primary aim of MPAs i.e. to maintain biodiversity. This has implications for continued access security of abalone fishers.

Introduction

The seascape in which Australian abalone fisheries operate has profoundly changed with the introduction of recent environmental legislation and policy. Although major new federal environmental legislation, the Environment Protection and Biodiversity Conservation Act (1999) (EPBC Act) applies to commonwealth fisheries, the EPBC Act can apply to state-managed fisheries such as abalone in the event of 'matters of national environmental significance'. However, the definition of such matters as they may be applicable to state managed fisheries remains unclear.

Recent changes to the Wildlife Protection (Regulation of Exports and Imports) Act (1982) include the need for third party Government Auditing that result from Environment Australia (EA) amending Schedule 4 of the Act. This change requires assessment against a set of guidelines (including sustainability and ecological impact) to allow continued export approvals. All export fisheries must be compliant against the EA guidelines by 2003. It is proposed that the Wildlife Protection Act and its provisions for sustainable fisheries and audit thereof will be subsumed into the EPBC Act further exemplifying the shift towards Ecological Sustainable Development (ESD) of fisheries. Thus, fisheries management is moving from management of target species e.g. abalone to management of coastal ecosystems (ESD).

Derivative environmental policy applicable to fisheries is the Oceans Policy released in 1998. Among other issues, the policy outlines a commitment to a National Representative System of Marine Protected Areas (NRSMPAs). The EPBC Act (Section 347) reinforces this commitment in the Oceans Policy by stating that 'reserves' should be managed in accord with the Australian IUCN (World Conservation Union, formerly known as the International Union for the Conservation of Nature) reserve management principles. Of most interest to the abalone fisheries of Australia is the potential application of 'no take' areas (category 1 and 2) (ANZEC 1999). This concern was most recently exemplified in the proposed network of MPAs in Victoria and the subsequent political action by the fishing industry.

This paper summarises the position of abalone fisheries in relation to the legislation and policy introduced above. In particular, it examines the ecological performance of abalone fisheries in relation to adverse community perceptions of the commercial fishing industry in general.

Public perception and commercial fishing

The public, in general, is poorly informed in relation to commercial fishing in Australia. Negative perceptions arise from catastrophic collapses of major fisheries overseas such as the Atlantic Cod fishery off Northern America (Lauck et al 1998). World fisheries are considered to be over exploited and this is supported by declining world catches of fish (Ludwig et al 1993). This and other issues such as the deaths of marine mammals supposedly attributable to commercial fishing tarnishes the reputation of the Australian fishing industry and resonates with the notion of marine protected areas. Yet Australian fisheries are for the most part, demonstrably well managed. In particular, Australian abalone fisheries are considered to be managed sustainably and collectively they supply more than half the world's wild catch of abalone (Prince and Shepherd 1992).

For a fishery that takes no by-catch and harvests abalone by directly prising the animal from its reef habitat, it may be expected that abalone fishing activity would be compliant with reasonable standards of ecological sustainability. It could be reasonably argued (see below) that the work practices of abalone fishing are compatible with protecting marine habitats and subtidal reef communities. However, the decision making process in relation to resource allocation in the coastal zone is as much about political and community perception as it is about science.

Abalone biology and ecological impact

Abalone are marine snails feeding on drift seaweed in their shallow subtidal reef habitat (Shepherd 1973). They tend to form aggregations in areas where drift seaweed accumulates (gutters, sides of boulders away from prevailing swell). Abalone divers, knowledgeable about the habitat preferences of abalone selectively target aggregations of abalone. In doing so, they can maintain high catch rates (above 100 kg whole weight per hour). In the NSW abalone fishery, the high level of fishing effort arising from a relatively large number of divers fishing in a relatively small area of coastline results in lower catch rates than similar fisheries in Victoria, Tasmania and South Australia (Prince and Shepherd 1992).

Abalone reproduce by releasing eggs and sperm into the water column. After fertilisation, a free-swimming larval phase of about two weeks duration precedes settlement on the reef surface. Settlement and recruitment to reef surfaces is most successful when the abalone larva is entrained near its parents (McShane et al. 1988, McShane and Smith 1991). The probability of an abalone larva settling remotely on suitable reef substrata in the typically exposed coastlines where abalone fisheries operate is considered to be very low (McShane et al. 1988). Productive abalone fisheries result from an overlap of juvenile (suitable for settlement and growth) and adult habitat. In Victoria, NSW, and Tasmania such areas include reefs dominated by 'crayweed' Phyllospora comosa, a canopy forming seaweed that provides for retention of larvae, maintenance of suitable settlement surfaces, and the drift seaweed preferred by adults. Annual catches of up to 100t per kilometre of reef can be obtained from such reef habitat (McShane 1995).

Where juvenile habitat and adult habitat do not overlap (e.g. exposed boulder habitat) recovery of abalone populations can be slow as replacement of harvested individuals would then be from migration from remote juvenile habitat. Such dislocation of adult and juvenile habitat is seen in some abalone fisheries in New Zealand (McShane 1993, 1997).

There have been relatively few studies of the ecological impact of abalone fishing. Given the information summarised above, it would be expected that the impact would be low and perhaps not measurable given the high spatial and temporal variability typical of subtidal reef communities. McShane and Naylor (1995) manipulated populations of Haliotis iris and found no significant effect on plants and animals associated with that species of abalone. They concluded that abalone behave more like benign filter feeders such as mussels than as active grazers on reef habitats. Thus, the effects of abalone fishing, unlike the harvesting of sea urchins, has so far revealed no detrimental or even measurable effects on habitat structure (e.g. canopy forming seaweeds). Furthermore, because of the relatively conservative fishing strategy of most abalone fisheries in Australia (McShane and Smith 1989), possible impacts (such as the relative cover of crustose coralline algae - the pink encrusting material found with abalone beds) are mitigated.

Marine Protected Areas and abalone fishing

The principle objective of MPAs expressed in the Oceans Policy is to maintain biodiversity. It is evident that abalone fishing as currently practiced in Australia would have no measurable impact on biodiversity. However, the policy and related legislation places the burden of proof on the fishing industry. It is all the more difficult to convince a sceptical public exposed to a media diet of sensationalistic coverage of catastrophic collapse of fisheries and unsavoury treatment of turtles, marine mammals, and seabirds, that commercial fishing of abalone is compatible with the maintenance of healthy coastal ecosystems.

At least two abalone fisheries (Tasmania and Victoria) have made submissions to Environment Australia addressing the principles of sustainable fishing following changes to Schedule 4 of the Wildlife Protection Act. Others should have little difficulty in complying with the requirements although problems with illegal fishing may threaten the sustainability of some abalone populations.

Challenges ahead include the provision of better public information on the environmentally-benign effects of abalone fishing, improvements to the spatial management of abalone stocks, and promoting good news stories of Australian fisheries management to the world.

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Lorraine Rosenberg - Environmental Management Systems

EMS

- What is it/ connection to what you have heard
- Why do it/ trends/ management
  - advantages
  - disadvantages
  - pressures from consumers/ Governments/ markets

Forms of EMS

- How do you choose the system for your fishery
- What do you choose and why
- Depends on the fishery/ market place/ competition/ recreational efforts/stakeholders
- May range from a Code of Conduct/ internal or external auditing
- Costs

ISO 14001

- Worldwide acceptance
- Generic standard
- Measure of the system not environmental performance
- Logo/ marketing tool
- Internally audited
- Doesn't address OH & S
- May build on ISO 9000

EMAS

- Highly recognised in Europe/ EU
- Highly prescriptive
- Legally regulated
- Measures environmental performance
- 3rd party accredited
- Public document
- Not to be used as a market tool

ISO

- worldwide/ no legal status
- provides a standard
- voluntary
- internal audit
- initial environmental status not required
- environmental statement not public
- self evaluation of environmental performance
- use logo for marketing
- evaluation and verification at discretion of the company
- comply to company policy

EMAS
- must comply to trade in EU
- controls and reduces pollution
- voluntary/ legally required
- external every three years
- initial environmental status required for continual improvement
- environmental statement public
- public evaluation of environmental performance/ penalties
- no logo for markets
- evaluation by deadlines/ public/ evaluated and quantified
- comply to verified audit

ISO Advantages
- worldwide and respected
- links to current management
- no initial environmental status required
- no penalty
- logo
- whole of enterprise
- self-evaluated

ISO Disadvantages
- no community involvement to build confidence
- not a measure of environmental performance
- lacks rigor to demonstrate impact reduction

EMAS Advantages
- ensures compliance to EU law
- involves the community and builds credibility
- public audit and 'good will'
- measures environmental performance

EMAS Disadvantages
- penalties
- deadlines for evaluations
- polluter pays
- stringent compliance
- continual improvements with cost: benefit implications
- for each individual company
- registration site specific

Conclusions
- addresses the new management process
- responds to public pressure
- leads to environmental protection
- meets environment legislation
- quality management = cost effectiveness
- maintain market share

Rick Fletcher - ESD Principles

Outline Of Talk

- Description of SCFA - ESD Reporting Framework
- How this fits with EMS – Applications to EA etc.
- Where to from here?
- Outcomes from applications to abalone

What is ESD?

NSESD (1992)

> *'using, conserving and enhancing the community's resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased'*

Incorporates the 5 major issues of interest: Cultured Species, Ecosystem, Social, Economic and Governance.

Issues and Needs

- Fisheries Legislative Requirements (all have ESD in their Acts in some form).
- Other Government Requirements e.g. WPA, (Schedule 4), EPBC, GBRMPA (some aspects of ESD). Various Agencies wanting Environment issues covered (Councils EPA etc).
- Market Leverage/Access Marine Stewardship Council - (varying aspects of ESD).
- Develop one reporting process that gathers the information to meets most of these needs.
- Urgent need to respond to the Schedule 4 requirements to enable exports past 2003.

Why Not Just Environment?

- Natural resource management needs more than just having minimum standards for affected populations.
- The activity MUST produce some social or economic benefit or it is vandalism.
- Depending upon societal values - acceptable impacts can be from 'not to be harvested' (e.g. dolphins) to 'fully exploit' (e.g. prawns).
- To effectively manage a fishery (and meet ESD Principles) requires integration of environmental, social and economic factors.

ESD Measurement and Reporting

Many previous attempts have failed

- One size does not fit all.
- Requires a process to systematically identify issues, develop operational objectives and then work out what indicators need to be measured.
- The objectives and acceptable range needs to be developed with all stakeholders.
- Level of information presented needs to be appropriate to the issue.

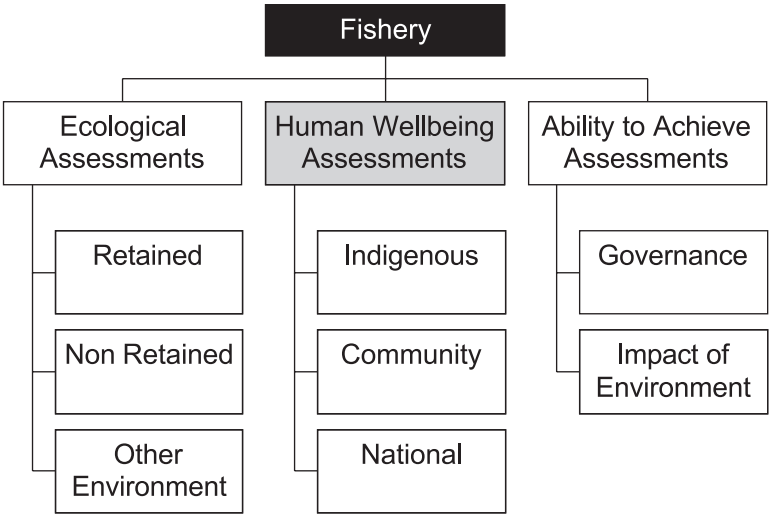
SCFA – FRDC Project

- Began in March 2000 (after Geelong Conference).
- Has a stakeholder reference group (ASIC, ACWA, RecFish, WWF, TRAFFIC, EA, FRDC, SCFA).
- Developed a draft ESD reporting framework tested through 8 case studies – different fisheries, different jurisdictions.
- Workshop to refine issues and methods.
- Has been applied to 3 abalone fisheries.
- Other subprogram projects - Green Chooser and the EMS initiative.

How does the SCFA Process Work? Part 1

- Identify specific issues for each industry
- Process based on the 8 main ESD components and adapting the generic component trees associated with these
- This should be done in consultation with all stakeholder groups

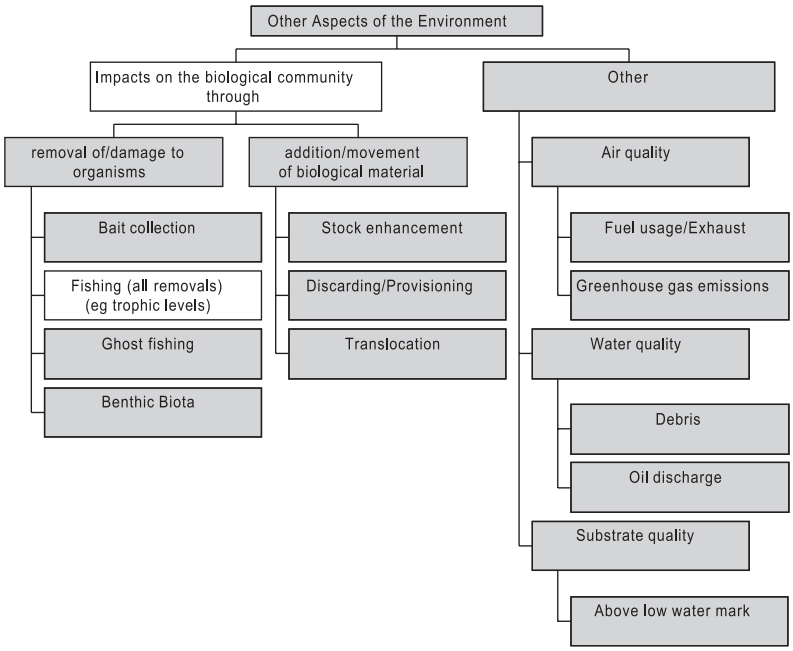
SCFA ESD Reporting Framework



Why use generic component trees?

- Likely issues relevant to fisheries were identified and developed into a generic tree for each of the 8 components
- These generic trees are used as the starting point for all assessments
- Enhances consistency of approach
- Minimises 'missing issues' at first pass

Indirect Environmental Issues



How does the process work? Part 2

- Often many issues are identified, not all require full assessment
- Conduct a Risk Assessment on each of the identified issues to determine appropriate level of response

Risk Assessment

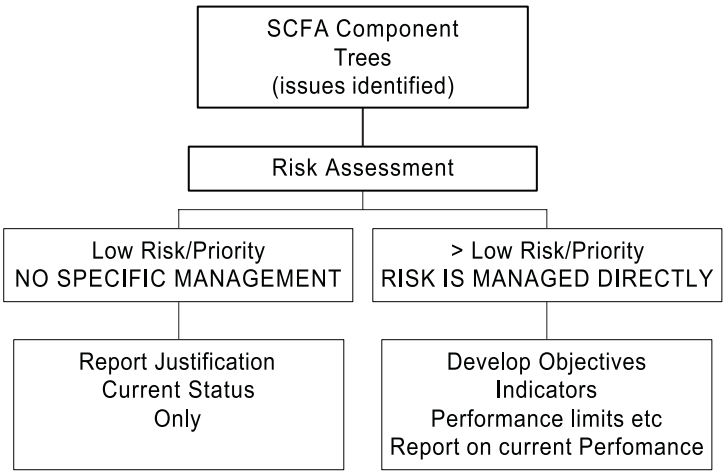
		Consequence					
		Negligible	Minor	Moderate	Severe	Major	Catastrophic
Likelihood		0	1	2	3	4	5
Remote	1						
Rare	2						
Unlikely	3						
Possible	4						
Occasional	5						
Likely	6						

5 Consequence Tables

- Major Retained/Non-Retained Species
- By-Product Species
- Protected Species
- Habitat
- Ecosystem

Qualitative descriptions of consequences from Negligible to Catastrophic

Risk Assessment



RISK ASSESSMENT INCLUDES NOT ONLY THE SCORE BUT FULL REPORT

Reporting Process Part 3

Complete Component Reports

- Component Reports have standard headings to ensure complete coverage of all elements needed to assess performance

Reporting Categories

- Operational Objectives (+Justification)
- Indicator
- Performance Measure (+Justification)
- Data Requirements
- Data Availability
- Evaluation
- Evaluation Reliability
- Management Response (Current, Future and if Trigger is reached)
- Summary of Actions and Conclusions
- External Drivers

Operational Objectives, Indicators and Performance Measures/Limits

- For this industry and this subcomponent, what do you wish to achieve?
- It is not how you achieve it or what you will need to achieve it.
- The operational objective, indicator and performance measure are a package. All three are needed before any one of them is useful.
- Needs appropriate level of justification for the limits/triggers chosen.

Reporting Categories

- Management Response.
  - Current
- What are the current management arrangements responding to this objective, particularly noting the level of information available and reliability of the evaluation?
  - Future
- Are there extra management arrangements proposed?
  - What is the response if performance limit is reached?
- This could include reviews, decision rules etc.

From These Reports:

- Can you justify that your management actions are appropriate given the level of risk and the current level of knowledge available?
- Is your current performance acceptable given the levels chosen?

This is specifically what EA wants to see!

General objective

To maintain the spawning stock of XXXX at or above an appropriate level that minimises the risk of recruitment overfishing.

Exploitation Rate/ Risk	Likely Indicators/Limits Required
Low	Catch or Effort Only Crude CPUE
Moderate	Reasonable CPUE, Possible some extra/occasional biological sampling
High	Good CPUE &/or Fishery Independent Surveys, probably Biological Samplingleading to estimates of biomass/exploitation rates

Ecosystem Table

Likely Impact	Habitat	Trophic Levels/ Ecosystem
Low/Negligible	Activity can occur across a large percentage of the area of the habitat	Stocks can be exploited to levels based only upon their own sustainability
Medium	Activity will require some level of restriction in spatial terms	Consideration may need to be given to the level of exploitation on other species
High	Activity will need to be constrained to relatively small specific areas	Exploitation rate should be set based on avoiding major changes to other species or community structure

How does the process work? Part 4

- Completing Applications to third parties (eg Parliament, EA etc) using information in Component Reports
- How does it fit in with an EMS

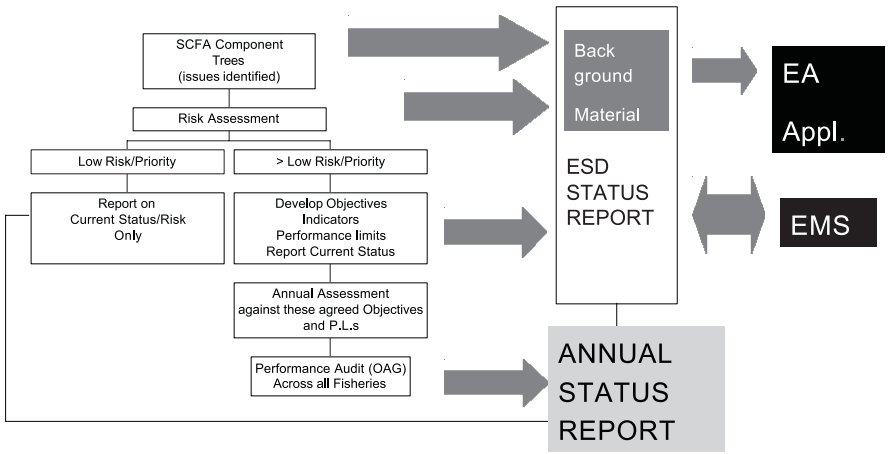
Meeting requirements of EA

- Just having the information in the ESD report is not sufficient as an application to EA
- What is also needed is a specific 'front end' that explicitly addresses each of the EA principles and objectives
- This front end is similar to a job application with the ESD report used as the CV for the fishery

Comparison to EMS

- The SCFA Framework allows REPORTING on performance for ALL issues for a fishery
- EMS is a method of achieving or improving the level of performance for a some/all of issues of an individual or a fishery
- Systems are complimentary

Overview of Reporting Process



Benefits of SCFA Structure

- Imposes discipline upon all stakeholders.
- By first setting the explicit objective, then the indicator and performance measures and finally working out what management is required to remain within the correct range is often a real 'sea-change'.
- Should produce good long term benefits for management by making explicit what has often been implicit – minimise 'random drift' in policy.
- Excellent way to show that good governance has been used.
- Once completed, next time should be easier.
- Having the completed SCFA- ESD reports makes finishing applications such as those needed for EA a relatively simple task.

Problems

- Complex issues.
- Process moving fast (bringing everyone along).
- Various external drivers affecting focus (eg EA and schedule 4).
- Different levels of ability to achieve.
- Paranoia (patch protection).
- Panic – Hoping for a magic wand.

Major new initiative

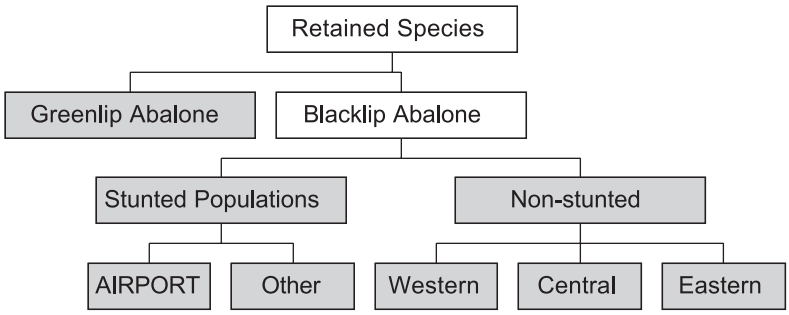
To get consistency of assessments by third parties and hence more certainty for industry we need to get general agreement on what is acceptable performance, ie what is low/high exploitation rates etc.

Turn the Qualitative Risk Assessment tables into a Quantitative Matrix.

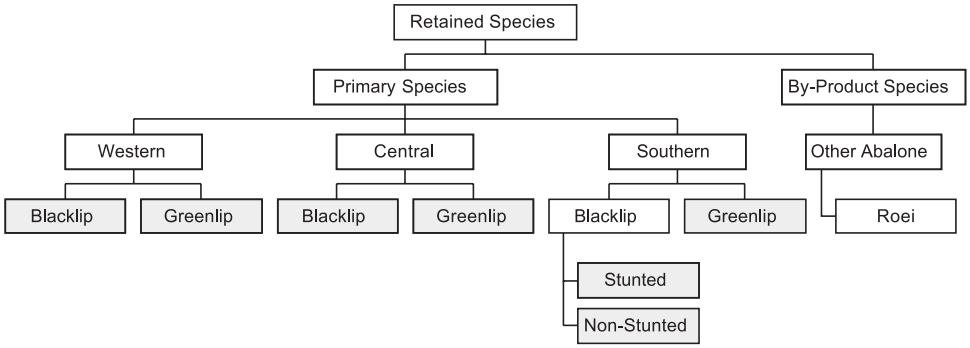
New ESD Projects

- FRDC - ESD Sub Program now operating.
- Website up soon fisheries-esd.com.
- LOGO IS 'CATCHING SUSTAINABILITY'
- Begin to develop standards for process and outcomes for all fisheries.
- Assess the framework's ability to integrate across fisheries.
- Begin to look at the social and economic aspects in more detail.

Victorian Abalone Tree



SA Retained Species Tree



Summary

- For each species in each zone that has its own TAC needs its own performance report.
- What is the appropriate level of biomass to leave?

Risks

All removals – commercial, recreational, illegal, indigenous

Biology of abalone

Levels and reliability of information

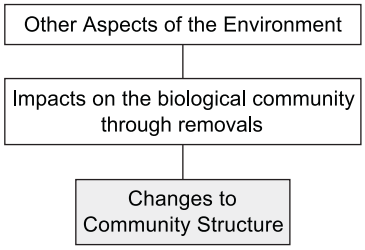
Effectiveness of management systems

Non-Retained

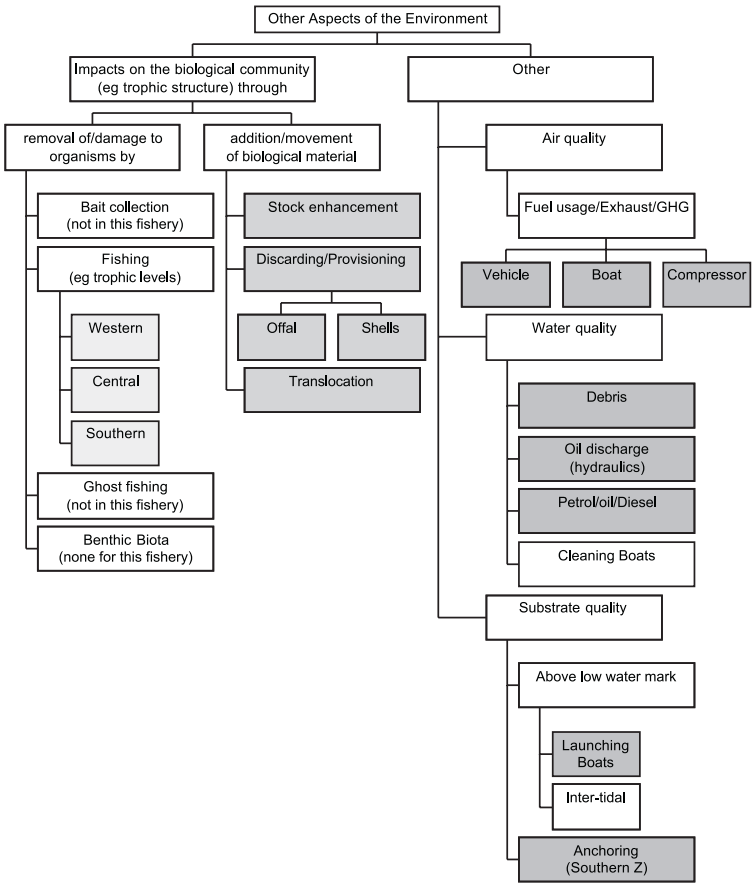
Vic abalone
SA abalone
no issues

WA – Piggy back Species
(low risk)

VIC Abalone Environmental issues



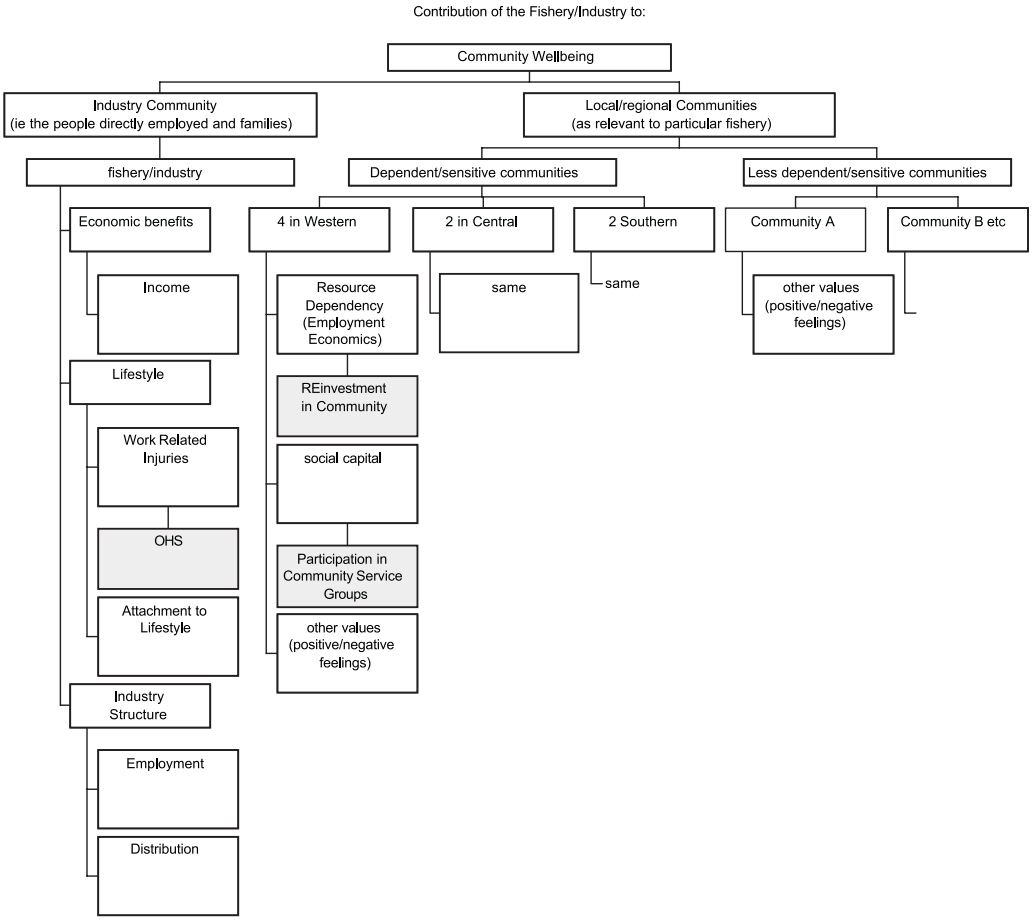
SA Abalone Environmental issues



Summary

- The risk of ecosystem impacts need to be assessed for all fisheries
- The need for monitoring will be dependent upon the potential level of interactions for abalone with other elements of the ecosystem
- Relatively important in NSW probably minor in WA
- Some new data may need to be collected.

SA Abalone



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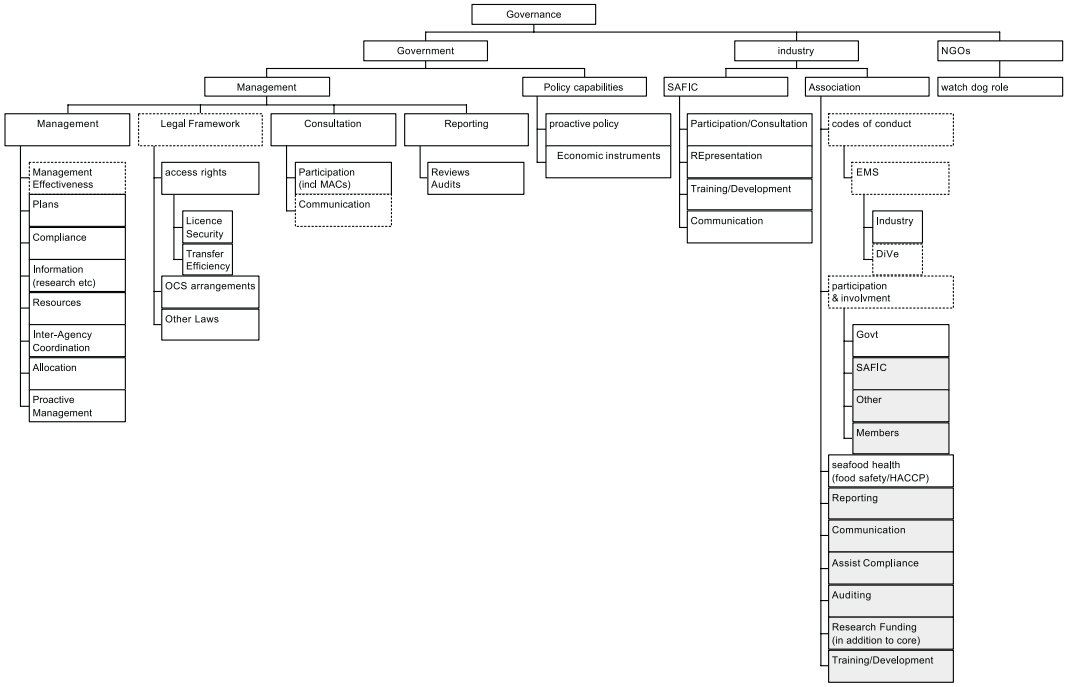

Summary

Most important issues here are:

- Compliance
- Allocation

Conclusions

- The SCFA framework should provide the information needed for any requirement.
- For most industries it will not be a trivial exercise.
- The degree to which it is taken up will depend on the relative speed of getting through the system(s) compared to using less comprehensive systems.
- Most agencies will concentrate on the Environmental aspects of ESD for the next few years.
- Full ESD reporting will take a few years to develop.
- Provides time to develop clearer understanding of what is needed in social and economic areas.

David Kay - Marine Protected Areas: EA

Overview

The recent legislative and policy developments in Australia

- Development of the National Representative System of Marine Protected Areas.
- The framework for Commonwealth assessment of environmental performance of fisheries.
- Protection of marine species.

Developments

Oceans Policy:

- accelerate the development of the national representative system of marine protected areas.
- remove the current blanket exemption of marine species from wildlife export controls to ensure exemptions are available only for marine species harvested in accordance with sustainable and ecologically-based management arrangements.

Environment Protection and Biodiversity Conservation Act 1999

- provisions for declaration and management of Commonwealth reserves.
- provision for strategic environmental impact assessments of all new management plans for Commonwealth fisheries.
- provisions for protecting cetaceans, threatened, migratory and listed marine species.

Australia's Oceans Policy - Dec 1998

National representative system of marine protected areas.

The Government will:

- accelerate the development of the national representative system of marine protected areas (NRSMPA).
- provide increased funding to accelerate declaration and management of marine protected areas in Commonwealth waters, including declaration of 5 new areas:
  - around Macquarie Island
  - around Lord Howe Island
  - in the Cartier and Hibernia Reef area
  - in the Tasmanian seamounts area; and
  - around Heard and McDonald Islands.

Commonwealth Marine Protected Areas

13 Commonwealth MPAs declared
5 new MPAs since 1998
1 proposed declaration still to be finalised.

Policy on permissibility of various activities in Commonwealth Marine Reserves

Activity	Strict Nature Reserve IUCN Ia EPBC (i)	Wilderness Area IUCN Ib EPBC (ii)	National Park IUCN II EPBC (iii)	Habitat/ Species Management Area IUCN IV EPBC (v)	Managed Resource Protected Area IUCN VI EPBC (vii)
Mining (exploration and development)	×	×	×	×	✓
Commercial fishing	×	×	×	✓	✓
Harvesting (live specimens)	×	×	×	✓	✓
Charter fishing	×	×	✓	✓	✓
Recreational fishing	×	×	✓	✓	✓
Research and monitoring	✓	✓	✓	✓	✓
Commercial tourism	✓	✓	✓	✓	✓
Commercial filming	✓	✓	✓	✓	✓

Where next ?

Fisheries assessment

Oceans Policy

Remove the current blanket exemption of marine species from wildlife export controls to ensure exemptions are available only for marine species harvested in accordance with sustainable and ecologically-based management arrangements.

Achieved through amendment of the Wildlife Protection (Regulations of Exports and Imports) Act 1984.

The Environment Protection and Biodiversity Conservation Act:

'undertake strategic environmental impact assessments of all new management plans for Commonwealth fisheries and, within a five year period, of all those fisheries that do not have a management plan'

Why do we need environment assessment in fisheries?

- The public are increasingly seeking assurances that natural resources are being sensitively and sustainably utilised and developed.
- Fisheries managers and industry are required to demonstrate environmental credibility by their legislation.
- People need to be confident they can invest in sustainable and competitive industries, which ESD will achieve.
- Environment legislation now also requires resource management to be carried out in an ecologically sustainable manner environmental drivers include regional marine planning, marine protected areas and the EPBC Act.

Strategic Assessment (S146 agreements)

- applies to Commonwealth managed fisheries;
- required before AFMA determines a new plan or takes a decision not to make a plan;
- two thirds of fisheries for which plans were in place when EPBC Act commenced must have S146 agreements in place by July 2003;
- agreement required for all such fisheries by July 2005;
- provides for endorsement of management arrangements and Section 33 declarations.

Wildlife export controls

- Assessment by December 2003 of ecological sustainability State/Territory fisheries with export
  - against guidelines for Ecologically Sustainable Management of Fisheries;
  - assessments to be for a fishery - not species.
- States may seek accreditation for process to develop assessments;
  - must meet benchmarks;
  - report and assessment against guidelines.

Guidelines for the Ecologically Sustainable Management of Fisheries

Issued by Commonwealth Environment Minister as part of benchmarks for assessing environmental performance of fisheries.

- core of strategic assessment terms of reference;
- core of wildlife trade assessment.

Guidelines for the Ecologically Sustainable Management of Fisheries

- Two major principles
- Objectives
  - performance measures
  - information requirements
  - assessment
  - management response

The management regime should:

- be documented, publicly available and transparent;
- be developed through a consultative process and ensure that a range of expertise and community interests are involved;
- contain objectives and performance criteria by which the effectiveness of the management arrangements are measured;
- be capable of controlling the level of harvest;
- contain the means of enforcing critical aspects of management;
- provide for periodic review of performance;
- be capable of assessing and monitoring, remedying or mitigating any adverse impacts on the wider marine ecosystem.

Principle 1

A fishery must be conducted in a manner that does not lead to over-fishing, or for those stocks that are over-fished, the fishery must be conducted such that there is a high degree of probability the stock(s) will recover.

Objective 1

The fishery shall be conducted at catch levels that maintain ecologically viable stock levels at an agreed point or range, with acceptable levels of probability.

Objective 2

Where the fished stock(s) are below a defined reference point, the fishery will be managed to promote recovery to ecologically viable stock levels within nominated timeframes.

Principle 2

Fishing operations should be managed to minimise their impact on the structure, productivity, function and biological diversity of the ecosystem.

Objective 1

The fishery is conducted in a manner that does not threaten bycatch species.

Objective 2

The fishery is conducted in a manner that avoids mortality of or injuries to endangered, threatened or protected species and avoids or minimises impacts on threatened ecological communities.

Objective 3

The fishery is conducted in a manner that minimises the impact of fishing operations on the ecosystem generally.

The Assessment Process

- Draft terms of reference for public comment
- Managers prepare an assessment on ecological sustainability of management arrangements against guidelines.
- Draft report out for public review and comment
- Management agency reviews assessment and comments, in consultation with EA, and incorporates any changes required.
- Final report, comments and how they have been addressed submitted to Minister with proposed management arrangements
- Advice provided to Minister by EA.

The Decision

- Minister considers final report and management arrangements and public comments; may request changes, including amendment to management arrangements
  - if satisfied with the outcome of the assessment the Minister must endorse the management arrangements
  - a section 33 declaration under EPBC can exempt fishers operating in accordance with accredited management arrangements from provisions of the Act including Pt 13 species protection.

Export-related decision

Where plan is assessed for purposes of export controls, Minister may decide on:

- exemption from export controls for 5 years, or
- export with permit
- prohibition of exports

Engaging in the assessment cycle

Opportunities for public input:

- on draft terms of reference for a fishery (Commonwealth)
- on the draft assessment reports
- public notices in national papers and in State
- nominate for register of interested parties maintained by EA

Colin Buxton - Marine Protected Areas and Abalone Fishing, A Tasmanian Perspective

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Abstract

The National Representative System of Marine Protected Areas (NRSMPA) is at the center of the Australian and New Zealand Environment and Conservation Council's (ANZECC) plan to secure the long term future of Australia's coastal ecosystems. The main focus of this plan is the conservation of biodiversity through a comprehensive, representative and adequate system of Marine Protected Areas (MPAs).

But MPAs may be proclaimed for a variety of other reasons. As harvest refugia, MPAs have also been advocated as having a range of potential benefits for fisheries. These include the protection of spawner stock; being a source of propagules and surplus adults; value as research areas; and possible insurance against stock collapse because of the failure of 'conventional' management.

Fishing industry's response to these arguments center on concerns that access to resources will be diminished and that remaining stocks will be pressurised as a result of shifting effort patterns.

This paper briefly examines these issues, with particular reference to work in progress on the Tasmanian abalone fisheries and a study of Tasmanian MPAs.

The National System of Marine Protected Areas

Australian governments are working together to establish a National Representative System of Marine Protected Areas (NRSMPA) which aims to establish a Comprehensive, Adequate and Representative network of MPAs that protect the biodiversity of our major ecological zones. These zones have been identified through the Interim Marine and Coastal Bioregionalisation (IMCRA) which recognises 60 distinct and different areas or bioregions (see David Kay's article in these proceedings). Tasmanian bioregions are illustrated in Figure 1.

Tasmanian commitment to NSRMPA process was announced with the recent proclamation of a Tasmanian Marine Protected Areas Strategy (Anon. 2001). The primary goal of this strategy is to establish and manage a comprehensive, adequate and representative system of marine protected areas, to contribute to the long-term ecological viability of marine and estuarine systems, to maintain ecological processes and systems, and to protect Tasmania's biological diversity.

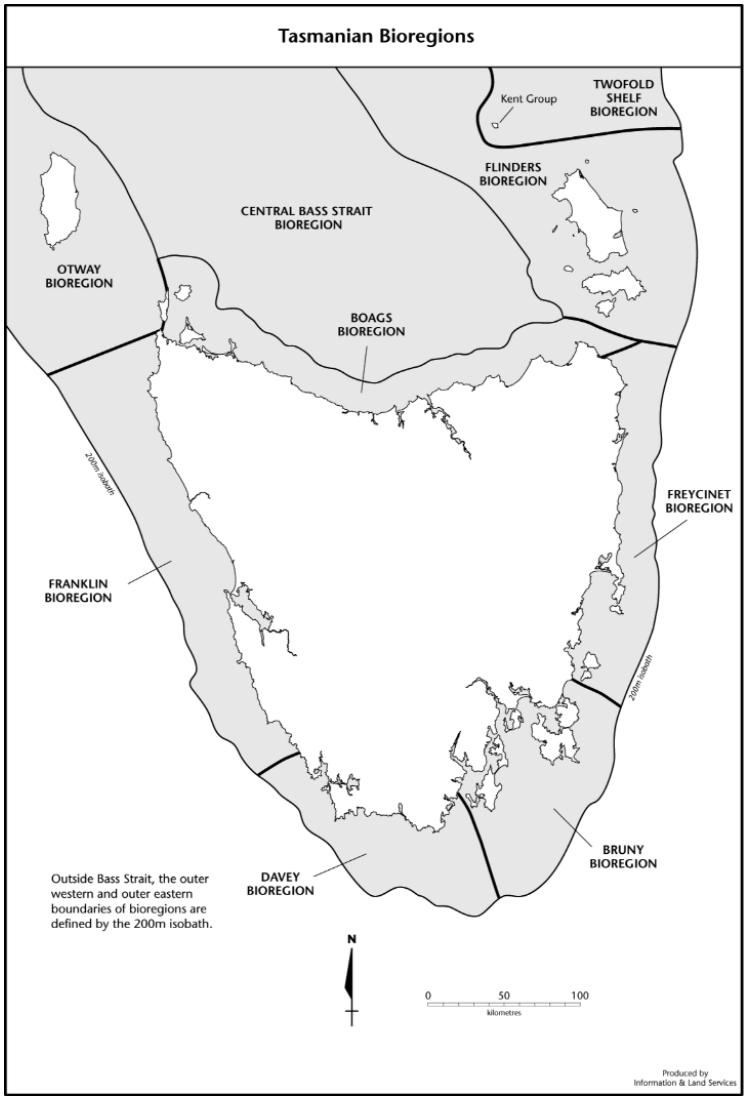

Figure 1. Tasmanian bioregions (Anon 2001).

Secondary goals of the Tasmanian strategy are aimed at particular management goals of the system, and are not hierarchical in nature or application. They include:

Ecological

- To protect threatened, rare, or endangered species, or ecological communities, and in particular, habitats considered critical for the survival of such species.
- To provide for special groups of organisms, eg. species with complex habitat requirements, mobile or migratory species, and species vulnerable to disturbance which may depend on reservation for their conservation.
- To protect areas of:

  (i) high species diversity;
  (ii) natural refugia for flora and fauna; and
  (iii) centres of endemism.
- To facilitate the restoration of degraded marine ecosystems.

Economic

- To protect and manage:

  (i) habitats of significance to the life-cycles of economically important species; and
  (ii) habitats, species and seascapes of importance to recreation and tourism.
- To provide a formal management framework for a broad spectrum of human activities, including recreation, tourism and the use or extraction of resources, that are compatible with the primary goal.

Social

- To protect and manage significant geological, archaeological, historical and cultural sites.
- To protect the natural aesthetic values of marine and estuarine areas.
- To cater for the management of marine areas and species in partnerships with indigenous communities.
- To achieve the support and cooperation of the community, and to facilitate the interpretation of marine and estuarine systems for the purposes of conservation, recreation and public education.

Scientific

- To provide for reference sites for scientific studies, including sites for baseline fisheries monitoring and long-term environmental monitoring.

The Australia and New Zealand Environment and Conservation Council (ANZECC) has adopted the International Union for the Conservation of Nature (IUCN) definition of MPAs in their efforts to develop a National Representative System of Marine Protected Areas as follows:

"An area of land or sea especially dedicated to the protection and maintenance of biological diversity, and of natural and associated cultural resources, and managed through legal or other effective means" (IUCN 1994)

More information can be obtained on ANZECC guidelines on the Internet at: http://www.rin.gov.au/marine/or2000/mpa/mpa.html

Several different categories may be recognised within the IUCN system of MPAs as summarised Table 1.

Table 1. IUCN classification of marine protected areas (from Anon. 2001)

Category IA Strict Nature Reserve: protected area managed mainly for science

Areas of land and/or sea possessing some outstanding or representative ecosystems, geological or physiological features and/or species, available primarily for scientific research and/or environmental monitoring.

Category IB Wilderness Area: protected area managed mainly for wilderness protection

Large area of unmodified or slightly modified land and/or sea, retaining its natural character and influence, without permanent or significant habitation, which is protected and managed so as to preserve its natural condition.

Category II National Park: protected area managed mainly for ecosystem protection and tourism

> Natural area of land and/or sea, designated to (a) protect the ecological integrity of one or more ecosystems for present and future generations, (b) exclude exploitation or occupation inimical to the purposes of designation of the area, and (c) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally and culturally compatible.

Category III Natural Monument: protected area managed mainly for conservation of specific natural features

> Area containing one or more specific natural or natural/cultural features which are of outstanding or unique value because of their inherent rarity, representative or aesthetic qualities, or cultural significance.

Category IV Habitat/Species Management Area: protected area managed mainly for conservation through management intervention

> Area of land and/or sea subject to active intervention by management purposes so as to ensure the maintenance of habitats and/or to meet the requirements of specific species.

Category V Protected Landscape/Seascape: protected area managed mainly for landscape/seascape conservation and recreation

> Area of land, with coast and sea as appropriate, where the interaction of people and nature over time has produced an area of distinctive character with significant aesthetic, ecological and/or cultural value, and often with high biological diversity. Safeguarding the integrity of this traditional interaction is vital to the protection, maintenance and evolution of such an area.

Category VI Managed Resource Protected Area: protected area managed mainly for the sustainable use of natural ecosystems

> Area containing predominantly unmodified natural systems, managed to ensure long-term protection and maintenance of biological diversity, while providing at the same time a sustainable flow of natural products and services to meet community needs.

This range of options provides a continuum of protection ranging from strict no-take areas to areas that allow managed exploitation. For example, Leigh Marine Reserve in New Zealand, Tsitsikamma National Park in South Africa and the Maria Island Marine Park in Tasmania are no-take reserves that provide total protection to all flora and fauna, but allow access for recreation, research and other non-extractive uses.

At the other end of the scale are the multiple-use parks such as the Great Barrier Reef Marine Park in Queensland and the Florida Keys National Marine Sanctuary in the United States. These areas provide for a range of activities within the protected area according to a management plan and, importantly, under the management of a single agency. Areas within the reserve are zoned for different uses and only some of the area within the MPA is set aside as no-take.

MPAs therefore cover a range of options from complete protection to various forms of extractive and non-extractive use. The important message in this is that the concept of MPA goes beyond no-take. In large multiple-use marine protected areas sustainable fishing can and does take place.

Tasmanian Marine Protected Areas

Tasmania has four MPAs declared for the protection of biodiversity although there are many other areas in which fishing does not occur including shark nursery areas, marine farming zones and fishery reserves. The Tasmanian Marine Protected areas are illustrated in Figure 2.

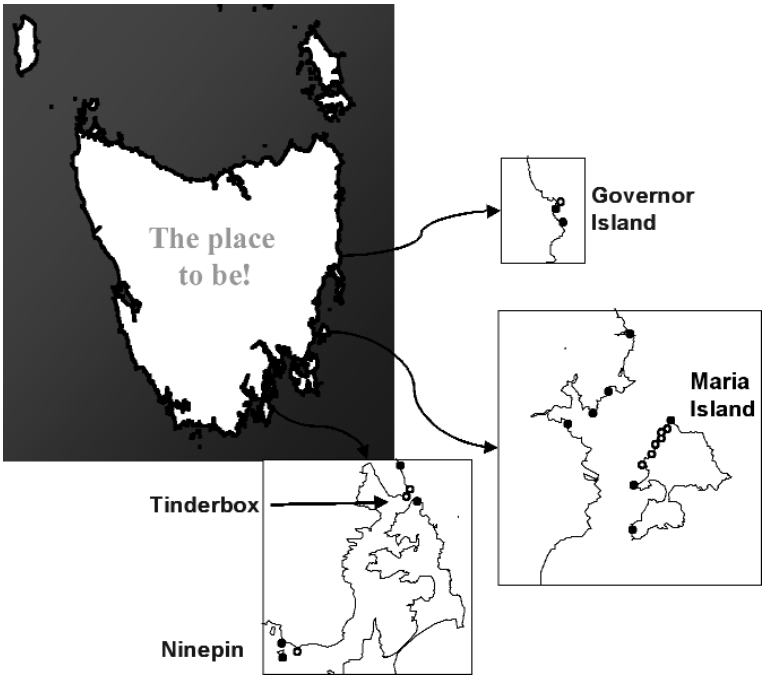

Figure 2. Tasmanian Marine Protected Areas.

Threats to marine ecosystems vs threats to fishing

MPA protection can be considered from two perspectives - ecosystem conservation and sustainable fishing. Often these are perceived to be conflicting positions when there is a potential to lose a fishing ground and when fishing is perceived as a threat to biodiversity.

Threats to the sustainability of marine ecosystems can be classified into 4 main areas:

- fishing
- habitat loss
- pollution
- introduced marine pests

Fishing

With few exceptions the threat of overfishing and the physical damage to the environment caused by the act of fishing has been a major cause of concern around the world. The literature is full of examples where stocks have been overfished, most recently the collapse of the Canadian groundfishery being a good example. In many cases the stocks do not recover as expected even after fishing has ceased. Physical alteration of the benthos may also cause significant damage, for example through trawling, and loss of gear can add to the problem through ghost fishing.

Abalone fisheries may be classed as low impact both in terms of an absence of gear damage and because bycatch is non-existent. However, abalone catches may be significant and several abalone fisheries have collapsed in the face of over-fishing.

Habitat Loss

The impact of a range of human activities including harbours, development, ocean outfalls, jetties and other development has led to significant loss of habitat, especially at a local scale in areas where coastal development is high.

Pollution

The impact of pollution on the environment is very varied and may be dramatic at small temporal and spatial scales, for example, oil spills or may be more widespread and longterm, for example, heavy metal concentrations in estuaries.

Introduced Species

The threat from introduced species is a relatively new and increasingly significant phenomenon in many areas. The Tasmanian abalone and lobster industries are concerned at the formation sea urchin barrens on the east coast that have arisen because of the extension of the range of the long-spined sea urchin, Centrostephanus longispinus.

Threats to fishing

On the other hand we may consider the major threats to fisheries to include:

- habitat degradation or modification from a range of human impacts;
- pollution from urban and industrial development;
- the threat posed by introduced species;
- over-fishing including recruitment overfishing (taking too many large fish before they have had a chance to breed), growth overfishing (taking too many small fish before they have had a chance to grow to a large size) and ecosystem overfishing (serial depletion of stocks that leads to a negative impact on the integrity of the ecosystem);
- effects of fishing such as bycatch, benthic modification and ghost fishing; and
- resource use and allocation conflict, including the act of reserve establishment itself.

Clearly there are a number of overlaps between the threats to the ecosystem and the threats to fishing. The key is to assess how MPAs may serve to both contribute to conservation objectives while at the same time offering a potential benefit to fisheries.

Potential MPA benefits

An examination of the literature reveals a range of potential benefits ascribed to area protection.

Conservation of biodiversity

The main focus of the NRSMPA is the argument that MPAs will ensure the overall protection of marine biodiversity through a network that affords protection to biodiversity, and includes representation of our main bioregions. This includes the protection of genetic, species, habitat and ecosystem diversity. It is worth noting, however, that in most cases the actual threat to biodiversity is implicit, rather than quantified by rigorous scientific examination.

Fishery enhancement

Another major potential benefit is fishery enhancement through the protection of spawner stock. This is described in more detail below.

Research

An often overlooked but significant benefit of MPAs is for scientific observation. They provide areas where biological populations can be studied in their natural state, often providing insights into commercial species that are not apparent in fished populations. Thus MPAs form an important baseline from which we can better understand fished populations.

Community values

There are many other benefits which are conveniently lumped as community values. These include the use of MPAs for:

- recreational purposes,
- the protection of places of historical significance (eg shipwrecks),
- the protection of places of cultural significance (eg sea country), and
- protection of important geomorphological features (eg stromatolites).

Clearly MPAs offer places where a range of educational benefits can be obtained, particularly for school and community groups.

How may MPAs benefit fisheries?

The benefits to fisheries are argued to arise out of the return to a more natural population age stucture (more large animals), which by virtue of the relationship between fish size and egg production, increases the population reproductive output. The MPA thus acts as source of eggs and larvae and a source of surplus larger fish that recruit to the fishery adjacent to the MPA.

From a fisheries perspective MPAs may also function as an insurance against stock collapse in the event that fisheries management fails in the face of conventional management. Under such a scenario it is argued that that stock will recover from the nucleus protected in the MPA.

The abalone fishery in Tasmania

The landed value of abalone in Tasmania has increased steadily over the past decade, and in 2000 exceeded $130 million (Tarbath et al. 2001). The Tasmanian fishery is the largest wild abalone fishery in the world, providing approximately 50% of the annual Australian harvest and 25% of the annual world harvest. The blacklip abalone (Haliotis rubra) is the primary commercial species accounting for 95% of the Tasmanian catch, with the remaining 5% being greenlip abalone (Haliotis laevigata).

Commercial exploitation of abalone in Tasmania began in the early 1960's and is limited by a range of management measures including size limits, total allowable catch, limited entry, and area restrictions (Tarbath et al. 2001). A minimum size-limit of 127 mm was first introduced in 1962 and in 1969 the number of divers participating in the industry was limited to 125. In 1985 individual transferable quotas (ITQ's) were introduced and a total allowable catch (TAC) was set at 3806 tonnes (Anon 2000a). In 2000 a zoning system was introduced with a TAC set for each zone. Since the introduction of each of these management measures, both the size limits and the TAC have been altered in response to changing perceptions of the state of the fishery in Tasmania (Anon 2000a). In 2001, management of the fishery is through individual TAC for four fishing zones: blacklip west – 1260 tonnes, blacklip north – 280 tonnes, blacklip east – 1120 tonnes & greenlip – 140 tonnes (Anon, 2000b). The size limit varies among zones, for blacklip ranging from 132mm to 140mm, and for greenlip from 140 to 155. A local cap in catch has been set for some of the more productive areas in south east Tasmania with trigger points for temporary closures in these areas (Anon, 2000b).

Tasmanian MPAs and the abalone fishery

As already stated the often identified benefit of MPA's for demersal fisheries is the potential for export of larvae, and emigration of mature individuals, from MPA's to surrounding areas (Alcala & Russ, 1990, Roberts & Polunin 1991). The realised benefit of MPA's for a particular species is intrinsically dependent on the life history of that species, specifically larval dispersal stages, adult movement, and adult behaviour, in addition to the size, number and location of MPA's. These aspects are examined below and represent our work in progress on an Fisheries Research & Development Corporation funded project entitled: The effects of MPA as a fisheries management tool (FRDC 1999/164).

Potential for export of abalone larvae from MPAs

Dispersal of invertebrate larvae is dependent on three distinct processes: near-shore hydrodynamics, the developmental period of the larvae, and the behaviour of the larvae during the dispersal period. In the context of shallow subtidal invertebrate species such as blacklip (Haliotis rubra) and greenlip (Haliotis laevigata) abalone, little is known of near-shore hydrodynamics in Tasmanian waters, and inferences are currently made from knowledge of larger scale oceanic circulation patterns at the shelf break. The reproductive and spawning synchrony at either broad or local scales of blacklip and greenlip is poorly understood, and although reproductively mature individuals can be found at most times of the year, the data available suggests spawning of populations in southern Tasmania is seasonal (late winter – spring; TAFI unpublished data). Eggs, both of blacklip and greenlip abalone are negatively buoyant on release, a strategy that is likely to limit dispersal and/or aid fertilization in dynamic environments. The relationship between timing and frequency of spawning of both blacklip and greenlip abalone in Tasmanian waters, and seasonal differences in near shore hydrodynamics, wind strength and direction, and tidal flows are likely to be an important determinant of dispersal of abalone larvae.

The developmental period of abalone larvae is generally considered to be between 4 – 15 days (McShane 1992), although this has not been quantified experimentally for either blacklip or greenlip abalone. Again, ontogenetic changes in buoyancy and larval behaviour are poorly understood for Tasmanian (and Australian) blacklip and greenlip abalone, but are assumed to be similar to patterns described for other haliotid larvae, in which negatively buoyant eggs hatch into photo-positive (or geo-negative) trochophore larvae at approximately 24 hours. The developing veliger larvae eventually become photo-negative (or geo-positive) and descend to the substratum after a further 3 to 14 days (McShane 1992). This generalised pelagic dispersal phase provides ample opportunity for long-distance dispersal, and is consistent with earlier estimates of gene flow from population genetic studies (Brown 1991). However, evidence of population subdivison at a scale of 50km in Victoria blacklip stocks has been inferred from recent genetic studies using higher resolution genetic markers such as AFLP's and micro-satellites (Huang et al. 2000). Conclusions of limited larval dispersal from this latter study are consistent with field experimental evidence of localised stock-recruitment patterns of blacklip in southern Tasmania (Prince et al. 1987), and Victoria (McShane et al. 1988).

Rapid settlement of larvae in the presence of con-specific mucous trails has been found for some northern hemisphere haliotids, with high substratum searching behaviour and settlement reported at 48 hours post-fertilisation in the warm water haliotid Haliotis diversicolor (Bryan and Qian 1998). This would give a potential dispersal period of larvae from this species of just 24 hours. Current knowledge of larval transport in Tasmanian abalone populations indicates MPA are likely to serve as source areas for only the reefs immediately surrounding the MPA. Further research of near shore hydrodynamics and larval ecology of Tasmanian abalone species however, is required to confirm that eggs and larvae produced within an MPA, are not transported significant distances from the natal reef.

Adult abalone movement

Movement and behaviour of adult blacklip and greenlip abalone are relatively well understood in comparison to behaviour and dispersal of larvae, and there is clearly limited potential for emigration of mature abalone from MPA's. Several studies of juvenile and adult blacklip and greenlip abalone in Tasmania and South Australia indicate movement occurs at the scale of metres over periods of several months (Figure 3). In southern Tasmania 45% of tagged adult blacklip abalone moved less than 50m over a 28 month period, and 70% moved less than 100m (Prince et al. 1988). Similarly, (Dixon et al. 1998) reported blacklip abalone movements at the scale of 10's of metres over a period of 7 months in Victoria. In a study of movement of juvenile blacklip abalone in southern Tasmania, 99.7% of more than 1500 juveniles recaptured after 28 days were within the same 4m2 quadrat in which they were tagged (Shepherd et al. 2000).

The consequence of these findings is that we may expect that abalone, because of their sedentary nature, would be afforded protection in a closed area. On the other hand, the net benefit of movement of adults out of an MPA would be relatively minor and restricted to narrow boundaries around the MPA. The larger the MPA the smaller this spillover effect would be in relative terms.

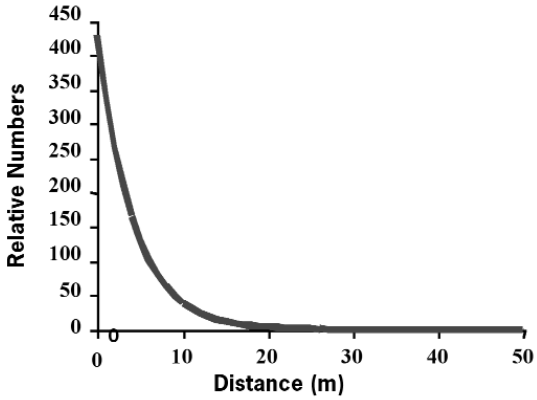

Figure 3. Total distance moved by tagged abalone from the south-east of Tasmania. The long term average distance moved was less than 50 metres.

Visual assessment of abalone populations on the East Coast of Tasmania

A comparison between MPA sites and adjacent fished sites has provided valuable insights into the effect of closure on populations of exploited species on the east coast of Tasmania (Edgar and Barrett 1999). At Maria Island abalone mean size increased significantly during the first five years of protection, from 128 to 136 mm, while the mean size outside the reserve declined from 125 to 118 mm (Figure 4). This increase in size within the Maria Island reserve has continued and was estimated to be 141 mm in Autumn 2000. At the reference locations mean size was not significantly different (122 mm). The increase in mean size within the reserve suggests that exploitation has altered the population structure of this species in eastern Tasmanian waters, leading to a reduction in mean size by approximately 15% (assuming the reserve is approaching an unfished state). This alteration appears to be relatively stable at present, as the mean size at reference sites shows no evidence of continuing decline or recovery.

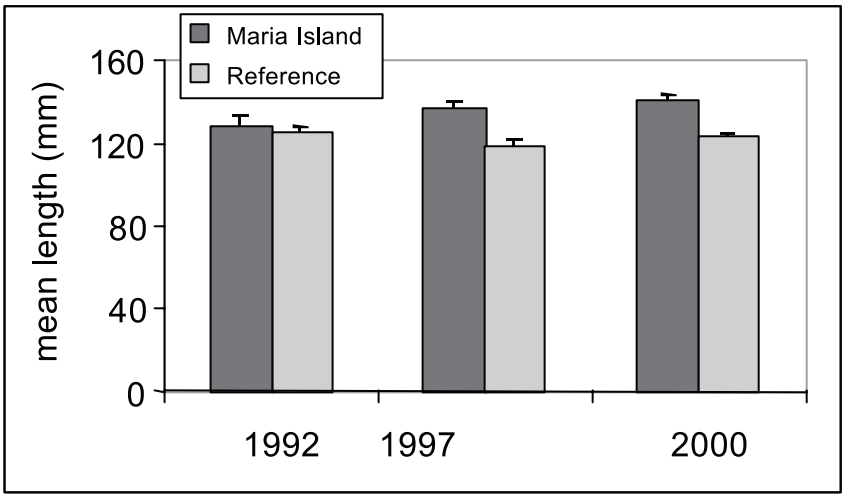

Figure 4. Mean length of abalone sampled using visual underwater assessment in the Maria Island MPA and adjacent reference sites.

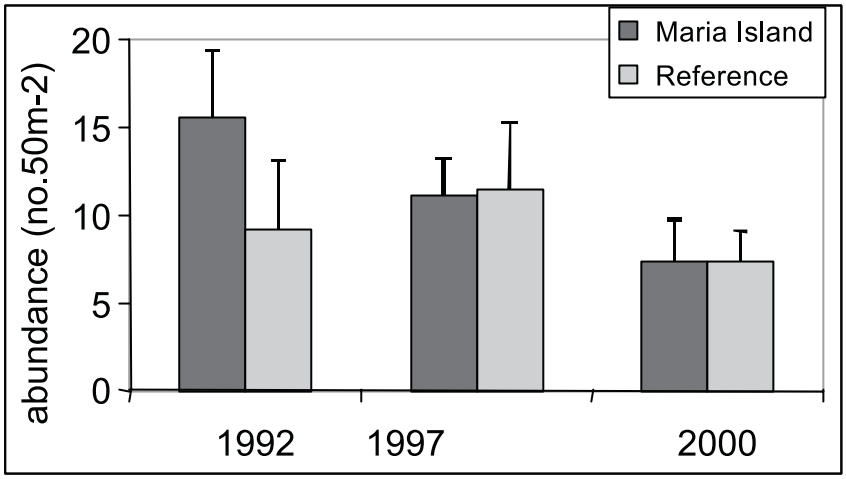

Figure 5. Mean abundance of abalone sampled using visual underwater assessment in the Maria Island MPA and adjacent reference sites.

Mean abalone abundance within the Maria Island reserve appears to have declined substantially over the eight year period between 1992 and 2000 (Figure 5). While this decline was not statistically significant when examined after five years of protection, due to a high level of variance in abundance estimates (Edgar and Barrett 1999) it now appears to be a significant trend. Abundance estimates at the reference locations show no significant change. There are a number of possible reasons for a decline in abalone numbers within the reserve, including intraspecific competition, increased predation and delayed emergence, and experimental manipulations will be needed to identify the main factors involved. Certainly protection from fishing within the reserve has lead to a significant increase in the abundance and mean size of abalone predators (Edgar and Barrett 1999), including wrasse and lobsters, species known to be important abalone predators (McShane 2000, Shepherd 2000). Lobster biomass has increased by at least an order of magnitude since protection. As lobsters have been documented to play a pivotal role in structuring invertebrate assemblages on reefs in South Africa (Barkai and Branch 1988) it is quite possible they could perform a similar role here when present at natural levels of abundance.

When the size distribution of abalone within the Maria Island reserve was examined after five years of protection, the density of small abalone within the reserve (less than 145 mm shell length), was found to have significantly decreased. The density of large abalone had significantly increased (Edgar and Barrett 1999). This trend appears to have continued, with the Autumn 2000 results showing a slight increase in numbers in the largest size categories, and an overall decrease in the smaller size categories (Figure 6).

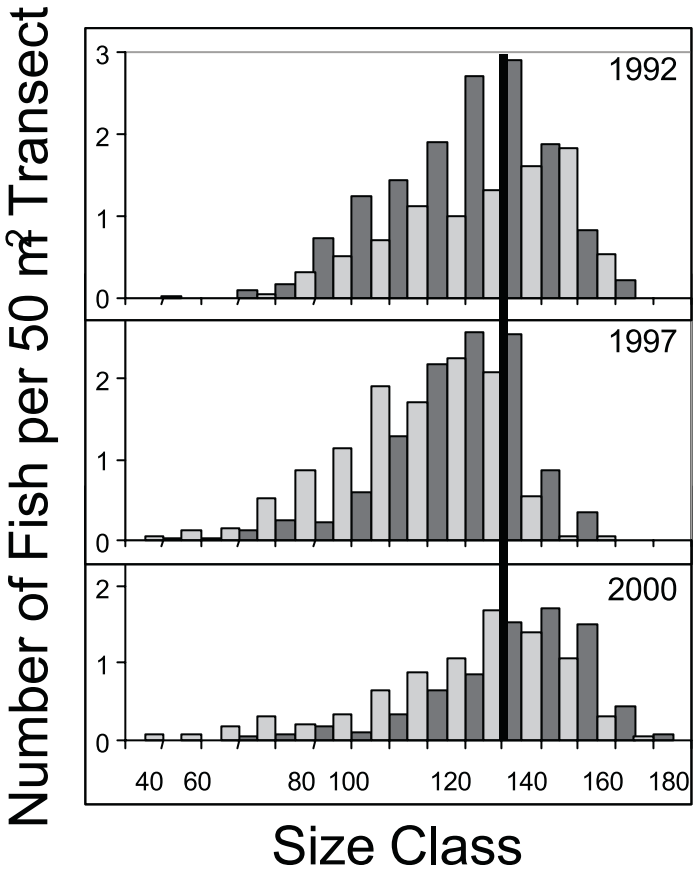

Figure 6. Length frequency distributions of abalone sampled using visual underwater assessment in the Maria Island MPA and in adjacent reference sites. The minimum legal size is 132mm.

The factors responsible for the decline in abalone abundance within the Maria Island reserve therefore appear to be acting predominantly on smaller abalone. If increased levels of predation are responsible for density reductions, this is the pattern that may be expected, with the vulnerable small size classes undergoing the most substantial decline. Alternatively a similar pattern may be produced if the presence of increased numbers of large individuals delays emergence, or if interspecific competition leads to greater survival of larger animals, particularly if the competition is for space.

With a mix of ongoing monitoring programs and experimental manipulations, the Tasmanian marine reserve system offers the opportunity to gain information necessary for the long-term management of fisheries such as the abalone fishery. This information will include the impacts of other fisheries on abalone, in addition to the effects of the abalone fishery on abalone stocks and coastal ecosystems. The eventual development of a network of reserves around the Tasmanian coastline will provide a range of reference locations, allowing these impacts to be assessed at a regional basis and managed accordingly.

Modelling the effect of fishing

There are three main ways of investigating the effects of MPAs on commercial fisheries: 1) experimental manipulations 2) comparisons of populations inside and outside of MPAs, and 3) modelling the effects mathematically. The first two approaches tend to be restricted to a relatively small geographical scale so if one wants to explore the wider implications of MPAs then we are, in practice, restricted to modelling the ecological processes involved.

We are developing a model designed to track the population dynamics of up to 70 geographically distinct abalone and rock lobster sub-populations. The geographical scale of these sub-populations could range from individual reefs (Shepherd & Brown, 1993) up to very large protected areas (this study). While this is a simulation model and not a stock assessment model, real data on growth, catches by area, and historical productivity are being used to initiate the simulations and make them as realistic as possible. Each population is described using a sex and size-structured model, which permits issues such as size-selective fishing and geographically different growth rates to be included in the simulations. Because most of our information about the Tasmanian abalone fishery is at the scale of statistical reporting blocks we are modelling the effect of closing whole blocks on the remaining fishery. We recognize that such closures would constitute very large MPAs but as a modelling exercise this is sufficient for the purpose of evaluating the influence of displaced effort.

Two aspects of abalone fishery dynamics that are especially difficult to model are firstly, how the fleet of divers may respond to the introduction of an MPA, and secondly, describing the relationship between spawning stock size and subsequent recruitment. Both required a number of alternative but plausible scenarios. For example, in Tasmania, one could examine the implications of distributing any displaced effort in proportion to the present distribution of effort among the different statistical blocks, or, alternatively, the implications of displacing effort into blocks immediate adjacent to the closed block.

Not surprisingly, because some blocks only contribute a very small fraction of the total statewide catch and others contribute significant proportions, the effect of closing a block varies greatly (Fig. 7). So, for example, closing a central northern block (one where the catch is insignificant) has no measurable effect on the statewide abalone fishery (though the favourite reefs of individual divers may be closed). On the other hand, closing a block of the same size in the southeast where up to 20% of the catch is taken has a significant and detectable effect on the rest of the fishery because of the large amount of displaced effort.

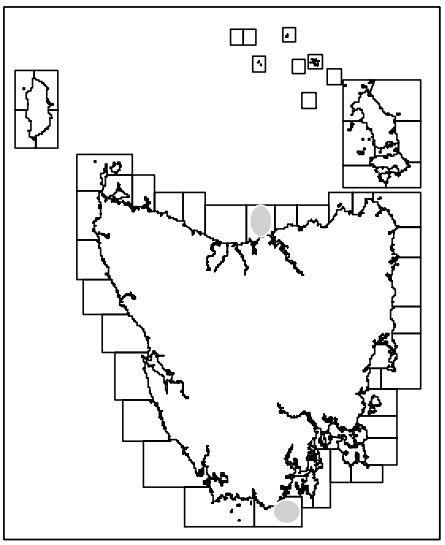

Figure 7. The amount of displaced effort and catch that would follow from closing any of the abalone statistical reporting blocks around Tasmania would vary greatly depending upon which area was closed.

Because closures displace catch and effort they are in effect equivalent to increasing the TAC in the area remaining outside the MPAs. Under the assumption that TAC is not reduced, such displacements can only have a negative or at best a neutral effect upon the remaining populations. Closing blocks were catch is insignificant has an almost undetectable effect on the statewide fishery in most cases. However, the impact of the introduction of large MPAs depends very much upon how the divers respond to exclusion (how effort is redistributed). Under the most severe scenario where we displace effort from highly productive blocks into adjoining blocks, those blocks very rapidly reach their production limits and the remaining catch must be sourced elsewhere to reach the TAC. In effect, we see a cycle of serial depletion of legal sized animals from successive fishing blocks.

Of course, this fishing scenario is strongly influenced by the establishment of an appropriate minimum legal size. If the legal size is correctly set to maintain reproduction even under extremely high fully-selected fishing mortality, then the stocks in the blocks should not be collapsed. But as described above the fishery within individual blocks has a production limit and can become completely dependent upon recruitment each year. Pushing any block to its production limits cannot be described as a risk-averse harvest strategy, especially if there are doubts about the appropriateness of the minimum legal size. It would appear that if a significant amount of catch is displaced from a large MPA, then to ensure sustainability a way must be found to reduce the TAC by an appropriate amount.

At present the assumption is that abalone are not good at dispersing their larvae successfully across long distances (see Shepherd & Brown, 1993 for a review). This implies that abalone populations must be relatively isolated and self-sufficient in terms of reproduction. When this is combined with the fact that individual abalone do not tend to move very far after they have settled on the bottom (see Fig. 3), then the benefits of large MPAs for wild abalone stocks would be minor.

It should be remembered that these results are derived from a model and not reality. They are also preliminary findings. Once more scenarios have been investigated our confidence in these findings should increase unless novel outcomes arise from the ongoing modelling.

Ecosystem effects

Abalone abundance and growth is influenced by interactions with other marine species. At a most basic level, predators and prey items influence abundance and growth. Higher densities of abalone lead to food and shelter limitation, which suppresses growth and raises mortality.

Concerns have been raised about the effect of other interactions such as rock lobster predation on sea urchins and the interaction between urchins, abalone and kelp. Put simply, there is concern that a reduction in rock lobster abundance leads to greater numbers of sea urchins which then graze down kelp and cause "urchin barrens". The interaction between this feedback loop and the role that abalone may play in the system is largely unknown. It is not inconceivable that the health of the abalone fishery may be in some way a consequence of the suppressed state of rock lobster biomass. What is known is that these urchin barrens are poor areas for recruitment of rock lobsters so the cycle positively reinforces itself.

These ecosystem effects are best studied in undisturbed population, in other words, ones that are not subject to fishing. If we need MPAs for no other reason, it is worth noting that they will be of value to our understanding of our fisheries and hopefully more security in the sustainable management of our fisheries.

Concluding remarks

The work presented in this presentation is ongoing and while the results are preliminary they do provide some insights into the interaction between MPAs and fisheries. In summary:

Large MPAs appear to offer little direct benefit in terms of yield and recruitment to the abalone fishery. This is mostly as a consequence of the movement dynamics of the species, which includes limited larval dispersal and limited adult movement.

Under certain circumstances MPAs may have significant effects on the fishery, particularly when effort is displaced into immediately adjacent areas. The consequence of this displaced effort in a quota-managed fishery is effectively to increase the exploitation rate in open areas (mathematically this is equivalent to increasing the TAC).

We suggest that large closures would not be sustainable unless there was a reduction in the TAC.

MPAs provide invaluable reference sites and sources of information in relation to the ecological effects of fishing and are considered to be an important tool in the management of abalone fisheries.

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National Strategies Workshop

Don Nicholls - from Western Australia – I listened to a lot of sessions here and I was very pleased to see the marketing session. I guess if I was to put the proposal that there was a means to increase production for between 5-10% that everybody would be interested, but anecdotally it sounds as though through handling processes and what have you there is potential for increased production to come out of existing harvest. I guess, in our experience in Western Australia, by concentrating on the post harvest sector, we've been able to facilitate new markets for a number of different species (not abalone at this point). So I'm just wondering if there's enough focus being put on the post harvest end of the industry here, and in fact it may be able to facilitate some new markets to address some of those shortcomings that were put yesterday.

When we got to the end of the third world lobster congress here, there were some good actions, and one of them was that there would be a national logo for some form of a confederation of associations, but to my knowledge, unless someone here knows otherwise, it didn't happen. Are there any views about what formal or informal structure that maybe nationally we could put together? Like a national abalone confederation or something – are there any thoughts so we can mobilise some of these ideas?

David Tonkin – there is a National Abalone Processors Group and that group is currently undertaking a project to develop just that – a logo which could be attributable to any other product on the basis that a participating processor signed off on an accepted set of production standards. We are proposing that that be developed and a promotion program goes with it.

What about the diving end of it? The wild catch. Remember, we're a group of associations at the moment – is there any move to have a national approach to that?

Bob – I'd very much like to speak to that. There are a couple of issues, which representatives from each association have been discussing. We had a short meeting just a little while ago, and I think it's fair to say although we're not at a stage, as the catching members (if you like) where we can come to a final decision about the sub-program. I think it's fair to say (I hope everybody agrees that was at the meeting) that it is an issue that is being progressed at the moment. We hope to be able to come to a decision on that fairly soon.

The issue that we didn't get to discuss is the one that has just been raised. I think it was absolutely magic the way that five State associations cooperated to get this convention up and running. It was not an easy job and there was no established forum in which to discuss the issues involved in just running the convention. I honestly believe that out of this convention should come an agreement – the word confederation has come up because I think it's simply a matter of these associations coming together so that they create a forum for the discussion of mutually beneficial topics, one of which will be the next convention. I'm certainly very very much in favour of establishing – I'm not talking about a high bound organisation – but certainly a forum where all the abalone producing associations can be represented and come together.

Robert Coffey – Diver – some of the questions you're posing Peter I think would be better handled at a workshop session, and to me this inaugural convention has really been about putting our toe into the water and it's about information dissemination. Perhaps the next convention could include some workshopping to address the very questions and points that have just been raised. In smaller groups people are going to be more prepared to speak.

Rob Royle – Tasmanian Abalone Council – Bob I'd just like to respond to you and thank you and Michael and everybody in South Australia for the effort you've made. I've certainly enjoyed it and I'd say that the thing that I got out of it is as a first conference of this type we got to meet each other, we got to identify the issues and I think that will be very important to continue on with, and maybe that's all we can do at this stage. But the meeting and identifying each other and putting faces to names was very important. Thank you.

Ian – Two issues – I wasn't able to attend the discussion yesterday in relation to dive health and safety, but afterwards some of the divers that I know talked to me about it and said that they thought there were conflicting opinions about what were the best procedures in terms of both health and safety as far as diving was concerned, and it may well be that perhaps the abalone industry....the issue of health and safety of divers has to be paramount. And just talking to some of the people yesterday and even this morning they thought that a lot more work could be done on that – so that's just a suggestion. And if I could add, from a West Australian perspective, I would also like to say congratulations to Michael, Bob and the South Australian Association on the conference they have put together – I believe it's been an enormous success and so many people have seen the conference through to the end. We all know, those of us who occasionally attend conferences, that by the time you get to the last session it can be a bit bare. In this case it's not – congratulations to Michael, Bob and the South Australian Association.

Brian – one area it strikes me that the abalone industry is very much behind the 8 ball is access rights, including transferability, resource rent taxes and a whole range of things like that. If this industry can't get its act together to actually get more liaison between states to avoid being picked off one by one, then really it deserves what it's getting.

The transferability and access rights in this industry state to state are far behind certainly the Commonwealth industries of all species and behind, in many cases, state fisheries in other areas other than abalone. It's really an area that needs to focus – whether it's done through a confederation or some other framework, or better liaison or something like that, it needs to do a lot better.

Are there any other follow-ons about the compliance issues/ non-compliance issues? More work we can do? Re-directions on the way we're going? No other comments?

It was raised with the labelling, that it should also apply to aqua cultural products so that if there is a disease problem it can be quickly identified where it came from.

One other heading was the 'aquas' people talked about making abalone – the word they used was – prohibited export, and I think that's what should be used here. Brian Jeffries mentioned that the royalties between states – there should be some kind of comparison.

Anyone want to pick up on this one, the public image of the industry?

It needs to be improved.

Public image needs to be improved … right. Any thoughts on how that can be done?

I don't know whether all of you have seen it, but the FRDC, about 3 years ago produced 'From the Antarctic to the Tropics – a snapshot of the fishing industry' – it's a 16 page colour document, which talks about the industry. We've just sent out a questionnaire to many people to see if they wanted a second edition, and we were overwhelmed by the positive response. The Director of Fisheries was first to respond to that questionnaire. So we're about to produce a second edition and launch that at Seafood Directions in Brisbane in November. The only issue with that is that it's about the fishing industry, but it probably provides a good model, and I don't think it would cost much to do up a wild catch abalone specific promotion document – four pages, whatever.

I might add that that's something which could form a working party and pull together, because it's not easy to get these statistics. We had some yesterday from Julian, and I think they were good, but we're looking at a national document. It's going to take some work to get the figures.

To give you an idea of the ABS figures – there are 340 people employed in aquaculture in South Australia. I think there's about 400 in southern blue fin tuna alone, aren't there?

Can I make a contribution about the image of the industry – I thought in Julian's presentation yesterday he made a very useful point in his table about the subsequent investment of abalone earnings in the rest of the economy, and I think a development of that and a widespread use of that could do a lot to counteract a public image that is that the abalone industry takes all this money out of the resource and spends it on whatever. His table was very interesting in showing that this money was very largely re-invested in the local economy. I think more could be made of that.

Gordon Anderson – a couple of points – one is I think there is still the capacity to document the early stages of the industry in the 60s. There are still people around who fished in those times. As one starts looking at the current status of the fishery, those historic periods become extremely important in terms of assessing the status of the stocks at the moment. So that's one issue which is take the opportunity while those people are still alive and can remember what things were like – they very early ones are no longer here.

The other thing that flows on from that is really some way of looking at the current status of the harvested stocks, the exported stocks, and the development of management objectives that move from the single species base to slightly more system based and really that then set the scene for moving the industry into a management scheme, I suppose, that promotes the increase in stocks to potentially much higher yields than are currently taken from the fishery.

Phillip Simpson – Tasmania – just following on from that – listening to the presentations of Michael Arbuckle and Jeremy Prince on some of these more innovative management options, like this territory user rights fishery concept. I know that in Tasmania we have quite a lot of bottom that was very productive which is now yielding precious little. Those sort of management tools could be run via a pilot study. I'd like to see FRDC sow some money into that area and continue some of these initiatives like this TURF concept and I think that could be applied to every state, because I don't think there would be a state represented here that wouldn't have bottom like that that they could not run a pilot study on.

Related to that – after the fish rights conference in Fremantle in 1999, we did write to the industry council and out to the Directors of Fisheries to see what extra work they wanted done on property rights options. There's a lot of international literature on it, and we weren't interested in just regurgitating that, but if there was a good project in identifying options for property rights, but we didn't really get a positive response to that, but a more targeted approach looking at other concepts for abalone, given that it is a little bit unique in that sense, might be an idea.

There should really be a national response to the marine park issue as well, because we've just gone through it in Victoria – it's not going to go away – and it's going to come back and hit every state hard.

At the risk of opening up an earlier question, I think that you've got to address inside 2 years some way of the whole industry responding to national issues, but I take what you said about that. Any other questions?

Kim – ...presented some information that the divers had developed some techniques of collecting data which was very useful for fisheries management and might have simplified some of the paperwork techniques. I would just want to put down there 'support the inclusion of industry divers in stock research through the use of innovative technologies'.

Terry – maybe just on the allocation of where we are when we look at the national abalone convention – perhaps out of this we take on a national abalone committee that is across the states right throughout Australia and take away from this that we meet once a year or once every six months, to discuss all the issues as they are in relation to the users of the resource on a pretty base line at I guess more of a grass roots level than from the top end and discuss some of these issues prior the next convention.

Thank you very much for your participation in that – no doubt these will be done up as notes as part of the proceedings of this conference. Once again I will thank you for your participation, and it gives me pleasure to invite the Hon. Rob Kerrin to close the conference. Please welcome the Minister.

Closing Ceremony - SA Deputy Premier, Hon Rob Kerin

Thanks Mike, to you Bob and other guests, ladies and gentlemen.

Thanks again for the invite to both last night and today, and I'd also like to congratulate everyone involved for putting this together. It is an inaugural national conference – and I think being national on this doesn't necessarily mean you have to have national licensing, but it is very important that there is a national approach to a lot of the issues. Particularly when you start talking R&D and some of those where what you can share will not only bring better knowledge, but also makes a lot better use of money that is actually spent.

No doubt, over the last couple of days, there has been a whole range of issues that can be helped with a national approach – right across pests and diseases, the marketing, what you do with diver safety (which is a very important part of this industry), but also the resource protection and management.

Australia is lucky to have the best abalone fishery in the world, but largely because of the management that has occurred. It's been conservative management and that's very important and that will no doubt need to continue into the future.

I'd like to congratulate this industry. The last few years in South Australia have been extremely good to work with the abalone industry in that there have been very few issues – they understand the resource better than anyone else – they understand the need for conservative management – they understand the need for R&D – the need for compliance and whatever – and they really are a joy to work with, particularly when you look at some of the other issues that you have as Minister for Fisheries.

I realise that marine protected areas have been on the agenda. It is an important issue. We saw what happened in Victoria. It's an issue that I'd just encourage everyone to be as involved in as they possibly can be, certainly here. Industry has shown good leadership. Industry have been actually sitting down with the Conservation Council here which is I think a very good move. In government you have to balance things – the Department of Environment and Primary Industries are working on this one to try and get the right sort of balance there, but it is very much an important issue.

It scares the living daylights out of a lot of people who don't understand what it's about – I often wish they were called 'marine planning areas' rather than 'marine protected', because I think that's spooks a lot of people to start with. There is a bit of feeling out there that once a marine protected area has got a line around it nothing can happen inside – it's important that we understand that it's not the case, but there may well be some 'no go zones' for certain activities and I think that with an industry like yours, that in some cases is not a bad idea. But you need to be in there - shoulder the wheel on that one, make sure you're heard, and certainly there is the issue of compensation for loss of resource, which we're looking at the West Australian model – but will try and get the best deal up on that that we possibly can.

I would say that it is important for industry to be right in there on this issue, make sure you are 'inside the tent' making sure your interests are well and truly protected into the future.

I would just quickly reiterate what I said last night about the regional impact of abalone in the other fisheries industries.

It was mentioned about the ABS figures and what Peter said is very correct. The figures that Planning SA put out about regional population figures are an indication of the way in which these figures are arrived at – they are very much 'desk top' stuff.

There were figures to be released here in January this year. I wouldn't allow them to be released at the time, they still haven't been released and we've actually got someone out doing some checking, because it showed Eyre Peninsula losing about 15-20% over the last 5 years of the population between 18 and 35. Now if you have a look at what's happened on Eyre Peninsula, and largely due to Brian's people with the tuna industry, but also a lot of oyster employment over there, what's actually happened is there's a lot more young people when you actually get there, but when we actually got the people who do these figures in, they were telling me that what they base it on pretty much is they look at the '86 census figures and the '91 – that creates a trend line – and then they do a small adjustment for '96, and there was no real 'go out and have a look at what the hell is going on' that was involved. We've had someone actually go and do a body of work, and what they've seen on Eyre Peninsula is that fishing and aquaculture over there is now up to 11% of the employment from a very low figure 5-7 years ago. Particularly on Eyre Peninsula, and in other areas of the state as well, the seafood industry is driving a revival of what was very much broad acre cropping country, and we all know what happens with broad acre cropping, when machines get bigger, less people are needed. That was driving the population down, but the seafood industry has well and truly been the revival of that area and not everyone loves the tuna farmers, but they have a hell of a lot to thank them for in Port Lincoln.

I hope everyone has benefited from the conference. These are good opportunities to have a couple of days away from home, to meet a lot of people you haven't met before, to share experiences, to share knowledge, to make friends, to talk about what you do, find out better ways of doing things – they really are a great experience and I would encourage you to look at doing it again in a couple of years.

I hope you have picked up a lot of knowledge, I hope that you that you take it away, and go away with good memories of South Australia.

To the speakers and sponsors – thank you very much for supporting the Abalone Industry Association of South Australia. They've done an enormous amount of work with this and they are to be greatly commended.

Michael, Bob, your committee – great stuff, very well done. Carolyn and Sally, everyone that's been involved in putting it together, you've done a great job.

There's one short story on abalone – I went to the west coast with a group of business people to show them what was going on, mainly with aquaculture over there, and we went to one of the abalone farms – a very high percentage of the abalone is exported. We went and had a look at one of the abalone farms and went in for afternoon tea – they were fascinated looking at those things because most of them had never seen an abalone before. The guy was preparing them for us to have a taste, and one of them said to the guy 'how do you get the best feed out of this stuff?' His reply was, 'you sell it and buy prawns!'

We need all the export dollars we can get, but that's a true story and a very honest answer from someone in the industry.

You have a terrific industry – I know you'll look after it – you've got a great future, it would be great if we could find ways in the future to actually increase the size of the wild catch. We hope that happens. Thank you very much for supporting the people who have put a lot of work into making this conference actually work. Thanks.

Len McCall – Thank you Michael – I'm not going to take a lot of your time – on behalf of the Victorian Abalone Industry, we would like to have the opportunity to have the next convention in Victoria, and I understand when I get home, there will be a letter on my desk from our Minister offering government support in principle, so it's really up to you people. If you're looking for someone to do it, Victoria would welcome the opportunity. We would dearly love to be able to put on something as magnificent as has been done here in South Australia and we thank the South Australian Abalone Industry for doing this and making the opportunity so that there will be another convention in 2 years time.

Thanks to the Minister for supporting and also closing the convention.

Action Agenda

1 Should we have another convention – Yes, every 2 years.
2 Marketing – the development of a national marketing strategy for a abalone was suggested in response to perceptions that Australia was price taker and not a price setter.
3 Developing quality procedures for handling abalone – post harvest.
4 The national abalone processors are developing a national logo to identify Australian abalone in overseas markets.
5 Developing a structure for managing abalone R&D – still being progressed.
6 A forum needs to be progressed for discussing national issues.
7 Dive health and safety – conflicting information – need to research and document what best practice is.
8 Access rights and transferability – state to state differences in costs and royalties are behind Commonwealth fisheries
9 Development of AQIS classification of abalone to "prohibited export" – particularly tourist trade.
10 Labeling of abalone product for point of origin – aquaculture.
11 Trade issues.
12 Public image – how , who etc needs to be done by a group – need to expand on the benefits for different sections of the abalone industry – need a statement on the industry not supporting non-compliance.
13 Snapshot of the abalone industry.
14 Need to talk to local communities, councils, regulators about what was discussed at convention etc – raise the positive profile.
15 Need more data on the flow on effects of the abalone industry into other sectors – being re-invested in local economies.
16 Document the early history of the fishery - important as a reference point
17 Development of fisheries management objectives that move away from single species to system based.
18 Micro management – development of management tools to assess this concept to rehabilitate previous productive bottom – needs case study research and development (needs to be extended to all states).
19 Size/frequency – including divers in collecting data for fisheries management – this is the measuring device presented by Harry Gorfine.
20 National abalone committee – meet every 6 months. Use this to facilitate this action list.
21 Accredited health protocol for abalone to be used in reseeding.

List of Delegates

Christopher Acott
Brad Adams
Darren Adams
Nathan Adams
Terry Adams
Flo Adams
Jodee Adams
Natalie Adams
Gary Allen
Lynne Allen
Gordon Anderson
Neil Andrew
Michael Arbuckle
Kenneth Bascomb
Roger Beattie
Nicki Beattie
Graeme Bevans
Garry Black
Craig Blount
John Bolton
Robert John Brice
Lois Janette Brice
John Brindle
Carol Brindle
Allan Buck
David Buckland
Donald Buckmaster
Margaret Buckmaster
Michael Buhlmann
Stephen Bull
Justin Burgess
Dean Burt
Colin Buxton
Deb Carrol
Steven Chamberlain
Rowan Chick
Christine Christian
Ean Clare
Kylie Clare
Peter Clauson
Robert Coffey
John Cornish
Norman Craig
Greg Croft
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Vanessa Daniel
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Marilyn Davis
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Christopher Deane
Carla Delarue
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David Doolette
Sandra Downes
Tony Downes
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Damon Edmunds
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Nicholas Elliott
Craig Ellison
Robyn Ellison
Vicki Esmonde - Morgan
David J. Fitzpatrick
Karen Fitzpatrick
Warrick Fletcher
Tonis Focas
David Andrew Forbes
William Graham Ford
Liz Ford
Brian Foureur
Stephen Fraser
Kaylene Fraser
Kim Friedman
Jason Froud
Peter Gaebler
Jeffrey Garnaut
Trevor Garnaut
Donna Garnaut
Maxine Garnaut
Andrew Geering
Martin Gilkes
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Jim Godden
Harry Gorfine
Eileen Gosling
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Wayne Haggar
Kendall Hammond
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Tobin Woolford
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