

# Seafood CRC Report – Project 2008-707 WERA Bursary

## Report for Trip to USA

### AIMS:

In applying for the Bursary to visit the USA I had several objectives in mind, these were:

- To visit and learn about selective breeding programs
- To visit oyster Hatcheries and Nurseries to compare them to Aussie operations
  - To seek out new grading and handling technology for oyster farming
  - To discover pack-out to market and cool chain processes
  - To discover export opportunities for Australian oysters

These aims to me were achievable with the many contacts we had been given and had made ourselves.

### *WERA Conference*

The WERA conference is a meeting held yearly in conjunction with the National Shellfish Conference and brings together the foremost researchers involved with oyster genetics and breeding from across America. France usually sends their top researchers to attend and this year Tony and I were invited to observe on behalf of the Australian oyster industry. I was impressed with the level of research being undertaken by the Americans although some areas of research struck me as lacking a commercial purpose or outcome. One example of this was a reference to a small study completed in conjunction with their breeding programme which asked both the public and oyster farmers what shell coloring most appealed to them, I believe the results came back that both parties preferred their shell coloring to be 'just right' not too dark and not too white, they also liked the patterns on the shells to be well defined. It was then mooted that this could be achieved and might be incorporated into the breeding programme. I wonder where the profit might be in such research, I was to learn that American research is not geared towards the bottom line and return to industry like it is in Australia.

An area where we might become involved which would be of benefit would be in their genomics area, a lot of the information discussed was very much over my head from what I could understand, they were mapping the oyster genome and finding which genes were responsible for which characteristics and then finding if they could be 'turned off' or 'on' to get desired results in the breeding programme. This may have application for our own breeding programmes in that we can identify recessive genes, mark them and breed away or turn them 'off' to enhance our selected lines.

When Tony gave a presentation on our breeding programmes we were met with a barrage of questions which were all aimed at how we could make such advances in such a short period of time. From what we could gather later in the trip, they run a much larger programme which is backed by a huge level of research and their gains were not nearly as great as ours. We gave them the simple answer; we chase fewer characteristics and then only ones which have a commercial significance. We were very diplomatic and didn't imply that we were cleverer in Australia, but offered collaboration and future discussions

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with the leaders of our breeding programmes. This was well received by the meeting who seemed very eager to find the secret to our success.

I would be very supportive of future work with the Americans, I would recommend however that we send our high level geneticists and breeding experts so they can understand all this is being said, I also recommend a high level of diplomacy, they are very friendly people though I feel they won't like being told they are focusing in the wrong areas, (who does?)

### **National Shellfish Association conference**

Running from Monday through to Thursday afternoon was the NSA conference, this was much like our Australasian Aquaculture Conference except that there's had very few industry speakers and only a half day session aimed specifically at industry. The rest of the days were filled with researchers giving reports on projects ranging from how the Nakor (the pearly lining inside the oyster shell) was created and then how it moved through the cells and was deposited by the mantle to continue oyster growth, through to how oil companies buying up oyster country so they could lay their pipelines across the sea bed was driving up the value of oyster land in the gulf of Mexico.

There was some interesting information and some relevant information but very little work being done to get more money into farmer's pockets. The tone of the research was mostly pro aquaculture with many projects being undertaken to prove oysters were not only having no negative effects but many positive effects on the habitats surrounding the sites tested. This information was then available for use where 'green groups' were targeting and blaming the industry for changes in the marine environment. This is a growing problem in the USA with areas suitable for wild catch and aquaculture having to co exist alongside housing developments and industry. Most of the outcomes could easily prove that both the industrial sites and especially the housing developments were creating the biggest impacts on the environments mainly through fresh water runoff and storm water drains.

The session aimed at industry was more geared towards mussel culture and the outcomes were finding that New Zealand methods were very much workable in the USA and had by far the most cost effective and user friendly equipment and practices. A session aimed at improving the performance of the 'Flupsy' was interesting with tech students finding more effective pumps and utilizing solar power to make the unit more cost effective.

A quick look at technology in the oyster industry quickened my interest, only to see that the grader they were hailing as a revolution was used 20 years ago in oyster grading in South Australia and 10 years before that in Tasmania. Imagine my disappointment! Something we may be able to utilize was a software programme being developed by the Alaskan shellfish industry which was costing out the many different methods of oyster farming and then giving a prediction as to how long a business might take to pay off the cost of the infrastructure given the amount they were producing. The project was as yet unfinished but would be interesting to follow up when it is completed.

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## Industry visits on the East Coast

Our first visit was to Bill Silksø operation which is a combination of deep sea oyster farm and a shellfish processing plant where he handles Oysters, Clams, Geoduckø Scallops & Razor clams, among other species. The premises were very large and the work area impressive with a cool room which could hold approximately 80 pallets.



Cool room facility at Bill Silkø shellfish processing operation. Bill explaining the setup.

There was a large 'wet storage' facility which pumped seawater through filters then into stacks of large bins which continually cascaded down through each bin, giving the shellfish a drink and being able to keep them onshore for weeks before packing and sending them out to market.



Wet storage for shellfish pre & post packaging for market.

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The actual processing was more repackaging and sizing that opening the shellfish; I guess the opening for sale happens further down the chain. The rules governing sales of any shellfish wild or farmed are very different in the US, shellfish can only be sold by the fisher / farmer to a licensed wholesaler, and they are not permitted to sell to the general public or a retail outlet. This was explained as a way to ensure traceability and compliance of harvest area protocols with direct relevance to water quality issues, so when the fisher / grower delivers his product to the wholesaler, the paperwork involved ensures that the product was harvested from an open area. I believe the wholesaler then became responsible for the product as he was in essence the policeman making the checks. As the wholesaler Bill's operation then sized the product, washed it, repacked it in their packaging and shipped it to market.



Bill, Tony & Joneen by the sorting table, unsorted oysters in the foreground & a worker repacking and washing in the background. 3 workers icing down a bin full of repacked oysters for transport to market in the far background.

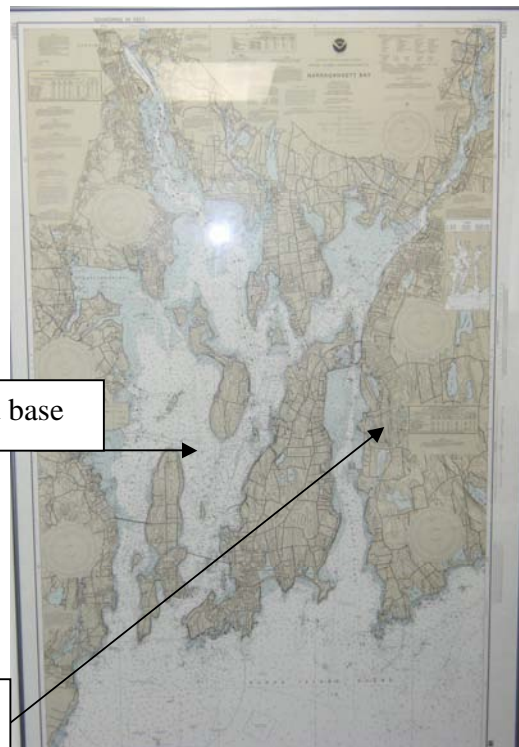
We then visited Bill's sub-tidal oyster operation which is located approximately 10km across the sound. They use a 30ft vessel fitted with star wheels and an overhead crane. It took about 2 hours to get across the sound with the ship only making about 6 knots.

Oyster Vessel



Land base

Sub-tidal oyster farm





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Bill farms 20ha of sub-tidal oysters (Virginia), he used to farm mussels also but had trouble with predators so discontinued that species.

We hooked up to the line and raised a stack of crates so we could check how things were going. These crates had been in the water for 7 months and the oysters were put in at 25mm.



Hooked up to the line and retrieving a stack



Bio fouling on a stack of crates.

The bio fouling was amazing, most of the overgrowth was *Tunicates* which were not a predator but just caused water flow issues. This was not a back corner of the lease but a normal part of the operation.

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Oysters in here somewhere!

We then got the lid off and inspected the oysters, once we had cleared some mud off them we got one opened and I was amazed at the condition! Fat oysters grown in that muck, this shows just how powerful the water is in these sounds, both for the bio fouling and the oysters.

After a slow cold trip back we were treated to a cook-up of shellfish and Australian wine, we experienced razor-clams for the first time which tasted both meaty and strangely like asparagus. These were only harvested from the wild fishery and while sharing a similar name were no relation to our razor fish we get back here, they are part the clam family with the razor part of the name being associated with the shape, similar shape to a straight edge razor.





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## Visiting Perry Raso' intertidal oyster farm

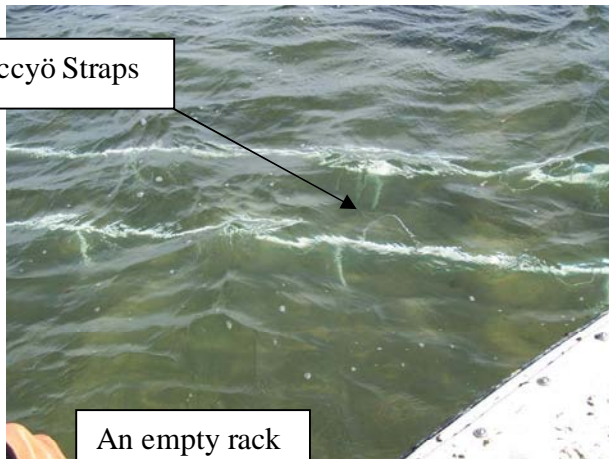
Perry Raso also farms in Rhode Island and uses a variation of our ðRack and Railö system which they call the ðRack and Bagö system. It is comprised of inch plastic water pipe made into a frame on which they strap down large öbagsö with oysters inside. The bags are made from plastic mesh and are about 3ft x 1 ½ ft shaped like a rectangle.



An oyster öbagö



Perry's farm



ðOccyö Straps

An empty rack

These bags are held down using ðoccyö straps which are tied to the rack permanently.



The ðRack & Bagö system

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I did not realise the extent of the population growth that I found in America, every waterway was all but surrounded by houses and holiday homes. This causes the industry trouble with the home owners complaining if the structures become exposed at low tide as they don't wish their million dollar views marred by aquaculture development.



Perry is fortunate that his growing area is a saltwater pond which doesn't get much tidal movement so his structures don't usually become exposed. This also saves him mortalities as this pond freezes over in winter and any oysters in the ice layer die.

His oysters were mostly *Virginica* which were taking 3 to 4 years to grow and he has diversified trying clams and also grows out Scallops for release into a re-population programme nearby.

He hand sorts his oysters and uses a 3m square raft moored on his lease as a work platform. He uses a Flupsy for his juvenile oysters and puts them into his grow-out system at about 25mm. this use of a flupsy for small oysters seems consistent across East and Western USA. Perry's system is the only inter-tidal operation I saw which compares remotely to ours and even then it was on a very small scale, I believe Perry will do well with his setup and hope other nearby farmers will take some notice and trial the Rack & Bag system.

The *Virginica* species seems to be a very slow growing oyster; these were market size and were 4 years old, a long time to wait on return of investment. I am not sure why they didn't farm Pacific oysters on the East coast; there must be a reason as the water seemed perfect for fast growth combined with good condition. It may be that the *Virginica* sell for \$8 US per dozen and the Pacific only bring \$3.50 US per dozen!



Market size *Virginica*



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## West Coast Shellfish Farming

### Oregon Oyster Farms Inc

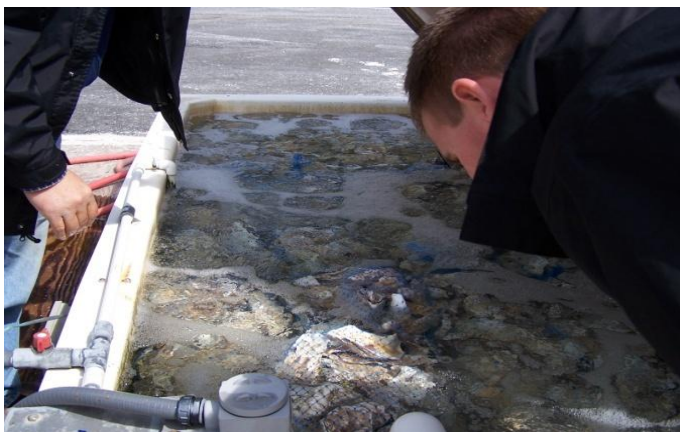
We were fortunate to be directed to Oregon Oyster Farms who use raft and bottom culture to grow Kumoø and giant Pacifics. The operation is run by Xin Liu who was a researcher into shellfish before becoming involved in aquaculture which gave him a great grounding and enabled him to buy the ailing business and turn it into a profitable operation.

There was no grading technology with all oysters being hand sorted for market, then packed into boxes with a plastic liner. Through his connections Liu has established markets in China and supply these with Pacificø ranging in size from 150mm (top shell) up to 300mm plus! He has identified different regions in China prefer different sizes and targets these very well. He was getting \$8US per dozen for the 300mm oysters with the freight being payed by the importer. These huge Pacificø were around 3 years old and looked very clean and well shaped even after having being grown on the bottom.

The Kumoø grown on culch and suspended on ropes under the rafts looked very ordinary with a lot of overgrowth and while they were not handled at all through grow-out it was labour intensive for a bloke to stand at a bench and chip them from the culch and one another. Once they were chipped and washed clean they looked presentable but very small with the market size being around 30mm top shell, these were selling for around \$8 US per dozen øfarm gateø.

Again we found the Pacificø sold domestically were shucked and sold in jars for around \$1.50 US per dozen, they were only opening the øcullsø which were not large enough for the China market or misshapen and ugly.

We found it was common practice for the oyster growers to buy øeyed larvaeø from the hatcheries and settle it themselves in purpose built tanks filled with bags of culch. This eyed larva gets sent through the MAIL and arrives in a post pack bag, holding around 5 million oysters. It didnø seem to be a big job as Liu explained they just sprinkle the eyed larvae into the tanks and wait until they settle on the culch then either put the culch on strings or scatter it across the sea bottom to be harvested years later. Too easy!



### Settling Tanks

Eyed Larvae is sprinkled into these tanks which are filled with bags of culch. The Larvae settle happily without any help.

### Raft culture system.

Oysters are settled onto culch; this is then tied onto strings and hung below the rafts

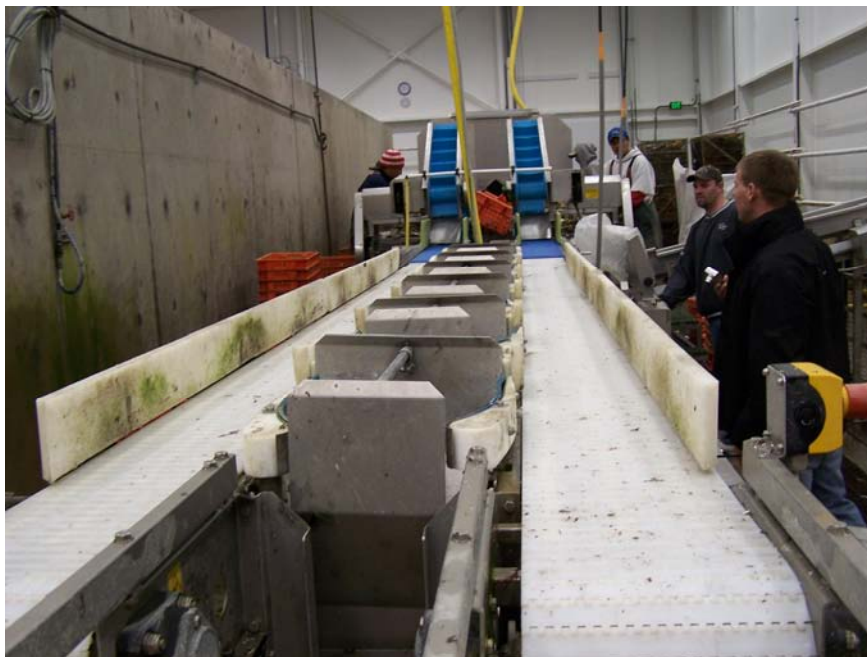


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### Taylor Shellfish

Taylorø is a massive operation employing over 200 people with around 50 working in their processing factory. It is located in right up in Washington State which is in the North West corner of America and nearly borders Canada. Taylorø farm Pacific Oysters, Clams, Mussels and Geoduckø and their farms are widespread across the state. Their processing operation is impressive to say the least. The shellfish are harvested and then trucked to the processing plant daily by a fleet of Taylorø own semi trailers and can be held in their wet storage facility for weeks if required.

They have a purpose built oyster ðpackingö room which contains an electronic grading machine that makes itø decisions based on each individual oysters weight. Oyster are emptied from plastic bulk bins into a freshwater tank and then elevated up through a medium pressure washer which removes the mud. They continue horizontally along an inspection belt and workers visually identify and remove mortalities, foreign species and ðuglyö oysters. They continue over a series of pressure sensors which measure the oysterø weight and are mechanically removed from the belt into crates based on a weight to size calculation previously defined by the operators. The grade looked good with sizes clearly definable though not as accurate as the imaging technology employed by Australian designed electronic graders.



The product was then hand packed into waxed cardboard boxes with plastic liners and stacked into airline transport containers for immediate dispatch



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There was an impressive Nitrogen freezing tunnel which very closely resembled the design used by Tasmanian Quality Foods in Tasmania. A large proportion was shipped frozen with a drive in freezer being a part of the plant, and able to hold 200 pallets of frozen product!





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### Blast freezer at Taylor's

Taylor's had an extremely good product traceability programme in place which saw a few oysters from every batch opened and photographed, with the photo then emailed to the buyer. This then provided a record for both parties to refer to if a complaint were received. They also use similar product tags to SA growers which give growing area, date of harvest information and species information.



### Shucking at Taylor's

Approximately 25% of all Oysters and predominantly the Pacific's are shucked on site and distributed as jars or tubs of oyster meat. They are packed out in brine and are sold through the supermarket chains to the general public or sent to restaurants to be used in marinara's and other seafood recipe's.

This seemed to be standard practice not just to utilize the ugly or mis-shapen oysters, which occur as a result of their bottom culture, but it seemed to be a part of the American culture. I believe it made eating oysters simple and easy which has been the trend with any produce bought by everyday Americans.

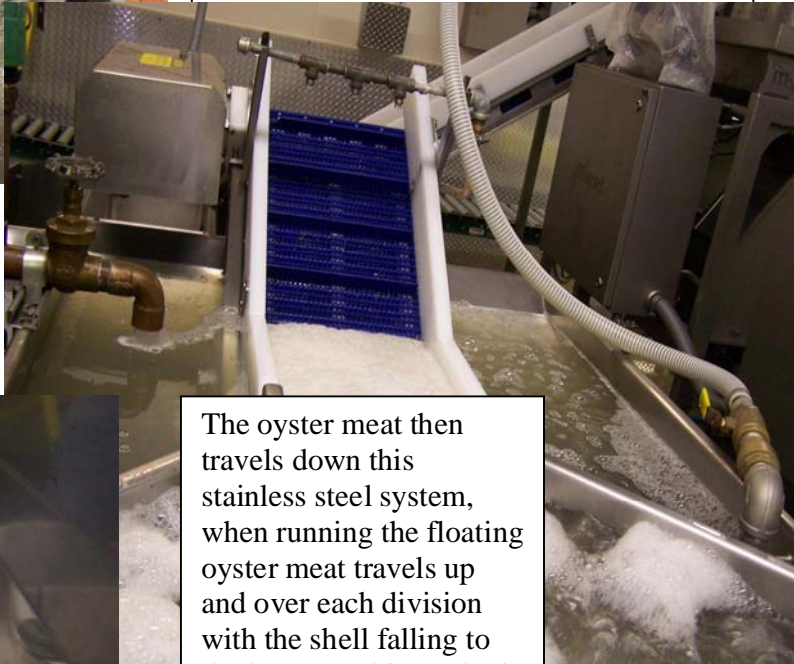
This is not the case with the Australian oyster eating culture with the shell attributing to the freshness and 'local' image which is so important to Australian oyster consumers. I believe we should continue to build on our way of presenting oysters, in the half shell, as the perceived and actual benefits to both consumers and farmers are many.

The American bottled oysters turn their product into even more of a commodity and with the average 'bottled oysters' only returning around \$1.50 per dozen to the grower, it is only cost effective when combined with the high loss low cost method of bottom culture. A method I feel could not be recreated in our waterways.

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Oyster shuckers are paid by the pound of oyster meat shucked with penaltyø for any damage to the meat or excess shell in the sample. The majority was Mexicans with a few Native American Indianø, the conditions were bloody cold and the pay per pound of meat was very low.



The oyster meat is put into a large holding tank which is aerated. Any shell falls to the bottom of the tank. The oyster meat then travels up the elevator and moves into another shell removal system.

The oyster meat then travels down this stainless steel system, when running the floating oyster meat travels up and over each division with the shell falling to the bottom. This method is based on the gold mining technology developed hundreds of years ago when it was the gold which sank and the soil and debris floated away.

The shell free oyster meat is collected at the bottom and is then hand packed and weighed into plastic tubs.





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**The final product!**

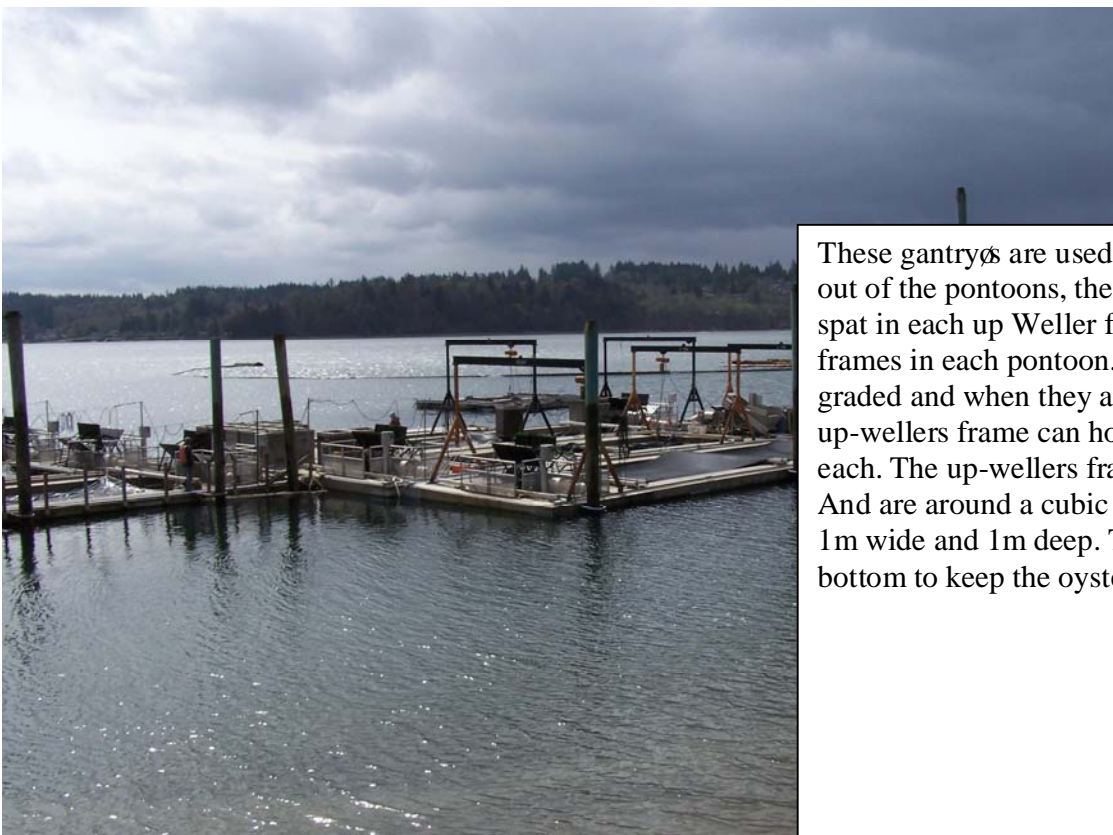


### **Taylor's Flupsey operation**

Just a quick drive from the Taylor base of operations is their Flupsey setup. Flupseys are used across America for the raising of juvenile oysters up to around the 25mm size. They are required as with no inter-tidal racking systems their single seed needs a way to grow to a reasonable size before they plant them out into the sea bed.

Flupsey loosely stands for Floating Up-weller and is usually of simple construction with oysters suspended in standard up-weller connected to a trough of water with the water being pumped out of the trough which pulls water in through the up-weller, suspending the oysters in the nutrient rich water.

Taylor's have taken this to a new level with their massive 30 foot flupseys strung together to form a floating flupsey workstation!



These gantries are used to lift the up Weller frames out of the pontoons, they hold around 250,000 5mm spat in each up Weller frame and there are 12 speller frames in each pontoon. As the oysters grow they are graded and when they are around the 20mm size the up-wellers frame can hold around 100,000 oysters each. The up-wellers frames are made from aluminum And are around a cubic meter in size, e.g., 1m long 1m wide and 1m deep. They have 1mm mesh on the bottom to keep the oysters from falling out.



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The pontoons are set up in rows so 1 gantry can service 3 pontoons



The paddle wheel pulls the water from the pontoon which forces water to rise through the up Weller frames and bring a continual supply of fresh food laden water to the oysters. In summer when the water is teeming with food these oysters have remarkable growth rates.

These were some slower growing seed which was being persevered with due to the current shortage of available spat. It also shows the aluminum frame of the up Weller.



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The flupsey systems employed by American growers is used in Tasmania in some areas for the rapid growth benefit however I can not see the SA oyster industry utilizing these systems as the cost of the infrastructure would far outweigh any benefits which may be gained from the faster growth in the short term. It is also my experience that pushing an oyster faster through the early stages of growth adversely affects the shape of the oyster. This is obviously not a problem for the Americans as their bottom culture adversely affects their shape anyway and they counter this by selling their ugly Pacificø as oyster meat.

### **Oyster farming @ Taylor's**

Once the seed has been through the flupsey system there are 2 options for it, it can be put into the sub-tidal farming system similar to what we have in Australia using lines and hanging baskets or it can be put into the bottom culture system which simply involves piling the oysters onto the barge and driving over their sub-tidal or inter-tidal farms and washing the oysters over the side, ensuring they fall evenly over the bottom. The Sub-tidal oysters are left for a few years and then dredged up while the inter-tidal oysters are left for a few years then on a low tide workers rake the oysters from the mud and put them into a big bulk bin which is picked up once the tide rises using an overhead gantry mounted on the barge.

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We were unable to see the inter-tidal oyster beds as the tide was too high during our visits.

The spat are grown at another of Taylor's facilities further up the coast, and also at another of their hatcheries in Hawaii. These hatcheries also produce the other species that Taylor's farm which means costs can be kept low and production can be geared to whatever the farms require.

### **Hatfield marine science center:**

We were fortunate to visit the Hatfield Marine Science center which is where the American oyster breeding programme is based. It is a very large facility which caters for marine science needs; it has an extremely good facility for running a breeding programme with its own breeding and nursery systems along with oyster sites up and down the river on which the center is located. I didn't understand everything that was discussed or shown to us but from what I could follow they were running a programme about 6 times the size of the Tasmanian / South Australian breeding programme. They were focusing on many and varied traits and again could not believe how we had made so much progress with our relatively small programme.

Tony and I explained our process in simplified layman's terms and recommended that they get in touch with the core people behind our programmes so both parties could move forward. Tony understood everything that was discussed so interested persons should get a copy of his report.

### **Summary**

I was very surprised by the lack of grading technology I found in the American oyster industry and was disappointed by the fact that there were very few inter-tidal farms utilizing the rack and rail or long line systems. For some reason I believed that the fact they had been farming oysters for many years would mean they were far ahead of our oyster farming systems.

I understand the benefits of their high loss low cost bottom farming methods and the ease and simplicity of the process and would presume that an industry built so long ago on a rich wild catch has made simple progressive steps that as the wild stocks ran low they simply moved to reseed the bottom, kept their dredge boats and as the oysters grew they continued to replant and harvest them. They moved ahead with the invention of the flupsey which allowed them to reseed the oyster beds with larger oysters which resulted in less mortality and continued to refine their process.

I have read that before the 2<sup>nd</sup> world war oysters were hugely popular in the half shell and that after the war people moved away from seafood and turned to more red meat. I struggle to see how their culture has moved to a meat in a jar product but guess that most things American have become fast and easy to prepare and oysters have followed the trend.



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I ate at a good number of restaurants, from high class to low and never once saw oysters on the menu in the half shell. When they were mentioned it was always after the clams and fish entrees and mostly they were in a marinara and generally mixed with clams and mussels. I understand I did not visit the super premium fine dining establishments and also missed out on investigating the oyster market in Las Vegas where I hear pacificø are served in the half shell so I will not assume to know the full story, however based on my personal experience I believe it would be a hard market to make money from.

I was enormously impressed by the size and diversity of Taylor shellfish and encourage anyone able to get there and take a look, I have not reported on their other species as it could take another 6 months to get it all into a report but will endeavor to spread the word at any opportunity I get. If anyone is interested they also produce Clams, Mussels and Geoducks and have some state of the art packing machines for the mussels especially, at their factory.

I did not get the opportunity to visit their clam farms as the tides were high but understand the clams are seeded into the sand at around 4mm and covered with mesh netting to keep the predators at bay. After 2 years they send in their cockle rakers at low tide who rake the clams into crates which are lifted onto barges at high tide and sent to the factory to be sized and packed for market. Mussel farming systems were similar to New Zealand with the mussels spawned into stocking like netting and suspended from rafts.

I believe the bursary should continue as the friends and contacts we have made would be a great start to building a continuing relationship with the American shellfish farmers. If possible it would be a great opportunity to present our systems and growing techniques at their next national shellfish conference but it would be hard not to come across as ðthe rich cousinsö and upset their industry by showing them how advanced we are.

It would also be of benefit if we could send an attendee who could sit in at the WERA conference and give them an idea of how we are making such advances in our breeding programmes in exchange for us participating in the areas of their research where we have an interest.

After seeing how many oysters are produced in America and the low price received for Pacific oysters I am now hesitant to pursue any export to the USA. When I realized their culture preferred ðpacificø in a jarö we were at an immediate disadvantage as they can produce so much meat for such little cost we could never compete. We could spend years developing a market and singing the praises of the freshness package of our half shell oysters but I believe it would take them no time at all to put in enough of our inter-tidal systems to flood whatever gains we could make with oysters exactly the same as we produce.

I propose there are alternative markets in our own country which are underdeveloped (mainly Western Australia) which are currently serviced by New Zealand half shell

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frozen product and we should spend the time and money growing our domestic sales and protecting ourselves from oyster imports attacking our own sales.

The USA growers pack out to market systems were varied with the East coast using onion bags and selling by the piece with the West coast using waxed cardboard boxes with liners and selling by the dozen.

All used refrigerated transport to get the product onto the air freight system and it was then widely recognized that a plane in the air was enough of a cooling system to not require that step to be refrigerated. The waxed boxes were suitable for the restaurants with them purchasing just enough each week to shuck and serve.

I was impressed with the wet storage systems used by the major operations and wholesalers and wonder if this could be used in Australia. It may be an option for the future to overcome logistics problems but I can not see how it could be utilized at the moment.

I would like to thank the members of the Seafood CRC for this opportunity and again hope this bursary can be made available to other industry members who are in our industry to not only stay but see us continue to build on the gains and hard work made so many of our dedicated members.

Thank you once again

Yours sincerely

Judd Evans  
General Manager  
**Kiwi's Oysters**  
**Smoky Bay**