PUT MORE EMPHASIS ON THE PROCESS

The future of growing oysters in trays

There is no advancement to him who stands trembling because he cannot see the end from the beginning.
- E. J. Klemme

By Brian Kingzett

I believe that the future expansion of oyster culture in British Columbia is going to be based on deepwater (off-bottom) tray culture. The market is moving away from large shucked oysters, and the province simply does not have the intertidal areas available for expansion once conflicts and biophysical capability are factored in. Our wide range of deepwater sites, high productivity and tidal exchanges make BC ideally suited to this form of shellfish culture.

At first glance, tray culture makes a lot of sense; a piece of plastic worth $10 is capable of growing $30 worth of Pacific oysters in a single year. In fact, in British Columbia we have no less than four different types of specifically-designed trays to choose from. Oysters grown in trays feed continuously – only limited by quantity and quality of phytoplankton and the flow of seawater through the trays. As a result, oysters are capable of growing more than three times faster than on the beach and will have a sweeter taste and higher meat quality. In terms of site productivity, the raft as a single farm unit can produce more than 6000 dozen oysters per annual cycle. At a very reasonable deployment of 20 rafts per hectare, this can translate to annual productivity in excess of a quarter million dollars per hectare.

So why are we not seeing more growers investing and making significant returns from tray culture? Indeed, on the contrary, we have seen at least one spectacular failure of intensive tray culture and other growers who have invested in tray culture barely hanging on.

Trays represent a significant investment, yet many growers are falling short of demonstrating their profitability. The fault does not lie with the oysters, but arguably with the trays and the growers themselves – and by extension the tray producers and the industry as a whole.

No pain, No gain

The first common mistake now well understood by those who are succeeding with trays is a failure to understand the "no pain – no gain" principle as it applies to basic oyster biology (not growers themselves). The Pacific oyster did not evolve to grow in deepwater; it is a creature of the harsh intertidal environment.

Clockwise from top left: Tray-grown oysters less than one year, Stephanie Richards with Hi-Flow stack, hi-Flow oyster stack and raft, Stephanie Richards with Hi-Flow tray.

Oysters in trays can actually grow too fast, and as a result they have fragile shells and weak adductor muscles. Oysters will compete for access to seawater with each other by altering their shell shape by growing long and thin. Those that do not compete well do not produce adequate meats. Very quickly a tray of what should be ten dozen high-value oysters becomes a mess of misshapen, thin-shelled oysters with inconsistent meat quality and poor shelf life that the market simply does not want. Growers who insist on trying to market this kind of product damage the overall acceptance of tray-reared oysters.

Challenge your oysters

To produce marketable and desirable oysters, growers must challenge their oysters regularly by simulating some of the same forces that oysters would experience in their natural habitat. Oysters must be roughed up and redistributed as often as possible. This breaks off the fast growing shell margins which causes the oyster to develop thicker shell, more cup, grow straighter and result in an optimum (read: marketable) shell shape. Redistributing the oysters regularly within the trays results in more consistent meat quality. This is the reason that systems such as the Australian semi-submerged longline system that allows the oysters to continual-

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DarkSea tray stack in northern BC.

ly be moved with wave action produces such a pretty, high quality oyster.

Not to be underestimated is seawater flow through the trays (read: meat quality), and the effect that bio-fouling has on this. Trays must be kept clean so as not to restrict flow. In one study undertaken by our firm a single settlement of blue mussels onto trays at a critical period in the growing season, left alone for less than two months, was enough to put a group of oyster stock almost a full year behind the rest of the year-class. Emerging as a highly efficient fix for this problem is the poly-culture of a few green sea urchins within each tray (details for another day).

Slow, but steady

From an economic point of view, it is more important to grow a crop that may develop slower, but is more consistent in size and quality. Oyster handling becomes the key to success with trays, and the common denominator of growers who have become successful with tray culture is finding a way to handle their trays and shellstock efficiently. As a rule of thumb, oysters in trays must be handled at least every two months during the growing season, and some growers have attempted to reduce this considerably.

Putting pen to the back of napkin, a farm of 60 rafts capable of more than $750K per cycle (in theory) must be capable of handling a stack of trays in less than five minutes on average. This includes lifting more than 100 kg out of the water, disassembling the stack, handling all the oysters, cleaning or changing out trays and then loading and reassembling the stacks and returning them to the water. All this must happen without inducing high mortality. This does not take into account harvesting or responding to seasonal issues (such as biofouling). This is the calculation (and its associated costs) that is generally left out of business plans. Very few farms have demonstrated that they can handle large volumes of trays efficiently and most that have, developed their own approach to the problem.

Bigger picture

This leads to some bigger picture questions. Trays are only one component of a handling process that is not yet fully developed or standardized. Perhaps before we build any more trays, the industry should be concentrating on developing a process which achieves the desired product efficiently and then building or adapting trays to it. In BC, the industry has been concentrating more on developing trays and not giving enough attention to standardizing the process. For such a small industry we have four locally produced trays, each with its own pros and cons. A grower recently told me that he was about to start designing and building a "new tray." Given the high costs of design, building and operating plastic manufacturing moulds, is this what we need right now?

Tray options

Of the four BC-developed trays (Dark Sea, Hi-Flow, Thunderbird and Aqua-Mesh) each has its supporters and detractors and each can produce high quality oysters when used to its potential. Opinions vary on each: "Dark Sea" trays are best at producing smaller oysters and need to be handled regularly to produce good meats, but are well made, and have good ergonomic qualities for handling and hanging. Hi-Flow trays produce larger oysters and good meats when handled properly, but are tall and bulky, making for poor ergonomics (especially for shorter employees). Thunderbird trays combine good aspects of both Dark Sea and Hi-Flow trays but also bring forward problems of both. Aqua-Mesh trays do not attract much fouling (presumably because of the round wire), grow well and are heavy (which is good in the water) and equally difficult ergonomically. Additionally, trays that do not nest or collapse when not in use present significant shipping and storage issues. What would be otherwise low-profile oyster rafts suddenly become much more visible to the industry's detractors when piled five feet high with black trays.

Before manufacturers begin to debate the validity of these opinions, it is important that all the developers are recognized and commended for taking the financial risks in developing these designs independently. None of these designs to my knowledge has been extensively supported by the expensive necessary research and testing to fully make connections between biology and engineering beside the growers own good understanding.

Process the key

The collective experience of these designs may be what results in developing an efficient process, and the *process* is what is key. The next evolution in tray design should not be about the tray, but about the process development which may change the way trays are designed. The industry needs to take a hard look at the type of oysters that the market will demand in the future and then rebuild the whole process backwards. This may mean marrying French oyster handling technology with BC tumblers, building tray stacks that can be tilted and tumbled and washed without being disassembled, designing rafts to better facilitate cranes and most of all, rebuilding the process to be in tune with the biology and seasonality of oyster culture. In future, manufacturers need to be selling not just trays but a process of which the tray is simply a component. In addition to first supporting the growing and handling process, the future tray, whether brand new or modified, must be durable and affordable, facilitate worker ergonomics, assemble, disassemble and hang quickly, restrict fouling and ship and store in as little space as possible.

Collective intelligence from the industry's experience is needed to solve this problem, but it must be coupled with engineering and manufacturing expertise from other sectors. Unfortunately this is straight production research of the type that most other agricultural commodities addressed decades ago. For the research agencies currently supporting the aquaculture industry, this project may not be exotic enough to receive much funding as it does not protect the environment, use new high tech technologies or address social issues of aquaculture (other than critical financial success).

Brian Kingzett is a senior associate with the Blue Revolution Consulting Group; he has grown both beautiful and ugly oysters in all sorts of trays. (*brian@bluerevolution.ca*)

Aquatic farming – An organic inspector's view

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course, we have to define the carrying capacity of the bay and this will dictate how many fish and cages can be supported in a given area.

This could be a very difficult standard to define in the ocean and will cause some controversy. With fish, the maximum allowable biomass for each cove/bay must be discussed.

Again, it is possible to imagine the farming of several species of aquatic plants and animals taking place using organic methods. There are a wide variety of farm candidates and it must be said that it is important to see the development of indigenous species. In the marine environment, species such as halibut, cod, haddock and various marine plants could be farmed organically.

Shellfish present a slightly different situation and their importance as filter feeders that could (and are) used in various bio-monitoring projects should be discussed and indeed, used around marine cages.

Tank farming of marine species, along with the continuing development of freshwater farming must be encouraged, especially for mixed family farm operations. At this point most of the salmon development is in the hands of large corporate entities and as long as it costs so much for a small operator to have a marine environmental assessment carried out, this situation will continue. When we started aquatic farming in the late 70s, the total production of farmed salmon was approximately 150,000 tonnes. Today, with production now greater than one million tonnes, a handful of integrated corporate groups grow more than 60% of this production. This point alone can and will continue to preoccupy many individuals, various groups and people involved in the aquaculture industry.

When I first started exploring organic farming protocols (*World Aquaculture Society*, Volume 20(3), 1989) there was very little differentiation in the salmon marketplace. Just as we see in traditional agriculture, it is possible to witness the development of local production where the consumer pull is dictating changes in our farming methods.

It is my opinion that if aquatic farmers are to gain success in developing (and using) organic methods to grow their products, then the various levels of government must support the need for smaller, diversified and owner-operated family farms. Aquatic farming will continue to see significant growth and this development should be for the benefit of all rural communities and the consumer. The Canadian government needs to recognize the importance of aquatic farming.

I believe that the organic community and certifying boards should support the development of sound and appropriate technology for aquatic farming.

I also believe that future growth should be directed to smaller operators and that we need more farmers, not fewer.

Further, we need a food security policy in this country that is not being directed by a handful of lobby groups who – at the end of the day – are completely removed from the farming community.

In the development of sound aquatic standards it is critical that the continuous rigor of international organic standards be maintained and that the organic integrity of any new process (or methods) be assured.

I am hoping that the brave souls on the west coast who are working towards these standards will weather the challenges.

Controversy can be positive in this young and evolving industry and we need to have more conversations about the need for diversity and a long-term plan for all the aquatic sectors.

But confrontations, such as we are now seeing on the west coast will not serve the farmer or the consumer well.

We need the development of aquatic farming in rural Canada and it is time for a committed government agency to become more engaged in this process.

– Brian H. Ives
Nova Mariculture
Truro, NS

Brian Ives has been involved in aquatic farming for more than 25 years. He is a member of the Independent Organic Inspectors Association (IOIA) and has carried out more than 200 third party inspections and HACCP audits of land farms and processing facilities in the past four years. Email: bhives@ns.sympatico.ca