RECIRC IN ACTION

INTERVIEW

Photos courtesy Michael Timmons.

Is RAS really the next step for aquaculture?

An interview with US recirc veteran Michael Timmons

Dr. Michael Timmons with two of the first tilapia raised at his Finger Lakes fish farm.

BY DAVID SCARRATT

It is just about 14 years since the magazine *Recirc Today* — now incorporated into *Hatchery International Magazine* - made its debut at the AES Conference in Roanoke, Virginia. Dr. Michael Timmons was then a member of the editorial advisory board that helped us establish the magazine. It was clear then and even more apparent now that a shift is underway in how fish and shellfish can be grown profitably in controlled conditions, and provide customers with high quality products. *Hatchery International* (HI) caught up with Dr Timmons recently in his Cornell laboratory to discuss some of the changes and trends in RAS technology.

HI: To begin, what is the difference between Recirculating Aquaculture Systems (RAS) and traditional aquaculture?

Timmons: The obvious answer is to read my book*, all 950 pages of it, *but besides that, it's pretty simple. RAS is about the ability to control the aquatic environment, whereas traditional aquaculture is dependent upon the vagaries of the natural environment, where there is minimal to no control.

HI. When did producers first get the idea of cleaning and re-using the water, and who were the pioneers?

MT: Well the instigator was probably the first fish culturalist/farmer who lost a bunch of fish in a natural system and said 'there's got to be a better way than that!' And we've been working on it ever since. Unfortunately, there's been a catch 22: If you institute a well engineered system and all the possible controls it's just too expensive, and an inexpensive system will probably kill fish more often than one would like. In neither case can you make any money.

HI: But have things changed?

MT: Yes. Things have got much better, and I seriously think that marketing factors — people want to buy safe, locally produced fish — are a very strong driving force. Also, the developed world, North America and Europe, depends heavily on imported fish (the USA imports 90% of its seafood), most of which comes from China, India and other Asian countries where standards of living and disposable income are increasing dramatically. More of the fish they produce will be consumed locally, and prices on the world market will go up for the importing countries. This will create huge opportunities for our domestic

A new outside recirc system. The large tank in the back is the low-head biofilter.

producers who can meet the most serious criterion — is this fish safe to eat? Do I feel good about putting this fish in my mouth?

HI: And of course, is this fish being produced in a humane and environmentally sustainable fashion?

MT: Exactly. But it's interesting. A recent study we have just concluded (to be published) found that the principal attribute that people would be prepared to pay more for, is a guarantee that the fish are free of antibiotics, hormones, and GMOs!

HI: So what are the operational benefits of RASs?

MT: The benefits are that you can create any water environment that you want, if you are willing to pay for it. And you can use it for all life-stages of the species you are interested in. The principal attribute of a RAS, of course, is that you reduce by up to 99%, the amount of water you need to raise a given amount of fish, and are able to create the environment the fish command for economic viability.

HI: What are the down-sides?

MT: The main down-sides are the capital costs, which are coming down. When you come to think about it, every large recirculation system is basically one of a kind, nothing is standardized. Want to buy an automobile? In the old days they were made individually until Henry Ford came along and said 'I can give you any car you want as long as it's black.' That's where we're at: there's no accepted design, so everyone has to build one from scratch.

HI: So if the main problem is the cost difference between producing fish in recirc- compared to natural systems, how do we bring that down?

MT: There are two costs: Capital costs are an ongoing constraint. Even with the best designs the cost of an on-land system will still be two or three times that of a net pen, and then there are production costs, which are considerably higher for fish produced in RASs than in a pond or pen. That [higher] operating cost has been dominated by the cost of pumping. However, within the past six months there has been a dramatic development. A major international company that has been involved in water quality, not aquaculture, but including swimming pools and the like, has decided to bring its resources to the manufacture of pumps specifically built for aquaculture. What does that mean? It means that the pumping cost for a low head system —1.2-1.5 meters or less— will be 5 or 6 times cheaper than with pumps currently used. And, of course there have been significant advances in low-head biofilter designs that lower the amount of pumping energy needed.

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A large, AKVA-designed sturgeon facility in the Middle East.

HI: Beside cost, what are the other problems?

MT: Traditionally recirculation systems have been overly complicated and consequently more subject to management error that lead to kills and loss of productivity. To get out of the quicksand the systems need to be easy to manage. Think about a car again. Time was when they were difficult to operate; now, anyone can get in and drive one. We need to approach that kind of simplicity. The system can be elegantly complex, but needs to be simple to operate. Think of a TV: turn it on by pushing a switch, change the channel, adjust the volume; complicated equipment but east to operate.

HI: You have been running the Recirculation Short Course for many years now. How has your teaching changed to reflect advances in recirculation systems?

MT: Well as you know I have been heavily involved in a commercial aquaculture enterprise all the time that I have been doing this job [with Cornell], and my goal has always been to give the producer the most competitive technology that is available. It doesn't matter whether I invented it, or whomever. What matters is that the producer gets the most cost-effective technology available. The Cornell course does not promote any specific technology. It aims to bring producers up to speed with the best technology available. In fact, this year we have expanded from four to five days in order to include a day of hydroponics, and one of aquaponics and business management, as well as the basic RAS program.

HI: What about having more than one species of fish in the tanks?

MT: For small-scale systems, mixed species can work. For large scale, I think the complexity of harvesting over-whelms the advantages. I don't see any commercial broiler farms that mix in ducks or turkeys.

HI: Given the capital and operational costs you have described, does RAS technology offer an alternative future for aquaculture?

MT: I have never been more upbeat about the current economic viability of producing seafood in recirculation systems. We (our RAS community) have known for a long time and demonstrated that it is technically feasible to produce any species we choose. The constraint has always been economic feasibility. The industry has been plagued by overly complicated and capital intensive systems that have not performed. This has begun to change in the last three or four years and there are economically viable systems.

In my own case, I am about to 'jump into the fire' again and invest the equity in my house in an RAS operation somewhere in the eastern United States (cannot disclose the location at this time). The key challenge here was to re-convince my wife that I was not going to lose our house!! The key part of my own argument (to myself and my wife) was that I have done this previously at a similar scale and I now have improved technology that reduces operating costs by a factor of 2 or 3, and that I will be operating [the new] farm at half the biomass densities of my previous farm (60 kg/m^3 vs. 120 kg/m^3). The lower operating costs are largely attributed to the total pump head being ~ 1.2 m. So, with the lower operating costs, lower risks due to a simpler system AND the markets desperately seeking locally produced and competitively priced products - I anticipate success for myself and our RAS community.

Michael Timmons is with the College of Agriculture and Life Sciences at Cornell University, Ithaca NY, with responsibilities for teaching, research and extension services. For more information contact him at: mbt3@cornell.edu.

* Recirculating Aquaculture, 2nd edition. MB Timmons, JM Ebeling, 975 pp Cayuga Aqua Ventures, 2007.