

C-Quest Marine Aquarium Fish Hatchery

C-Quest is the leading marine aquarium fish hatchery for 1997.

By Joyce Wilkerson

C-Quest, which stands for "cultured quality using experience and scientific technology," is the largest ornamental marine fish hatchery in operation today. Although there were other hatcheries producing tank-raised marine aquarium fishes in 1994, several of these hatcheries closed in 1995 and 1996. If this hatchery closing rate continues, we may not have a commercial marine aquarium fish hatchery left by 1999. But, for the moment, C-Quest remains positive and prolific.

In 1994, marine aquarium fishes were being reared in at least five hatcheries: Aquaculture Development in Denmark, AquaLife in Walker's Cay in the Bahamas, C-Quest in Puerto Rico, Desert Fisheries in Utah, and Reef Propagations in suburban Chicago. As I write this, only two of these are operating: C-Quest and Reef Propagations. Reef Propagations is quite a small operation, operating in Joe Lichtenbert's basement. AquaLife's broodstock fishes are now kept in Florida, and some commercial breeding is expected to resume this year.

The economics for culturing ornamental marine fishes is dismal because wild-caught fish generally sell for less than it costs to culture a fish. Hatcheries are typically the undertakings of either millionaires or obsessed hobbyists. Most ornamental marine fish hatcheries operate for a few years, unravel a few of the numerous mysteries of how to culture marine fishes, and then close for lack of funding or profitability.

In January 1997 I visited C-Quest, with Scott Michael, to coax juvenile clownfishes into posing for some "great balls of clownfish" pictures -- as James Lawrence of Chapters Publishing put it -- for a book I am writing titled *Clownfish: A Guide to their Captive Breeding, Care and Natural History*. While at C-Quest, Scott also photographed C-Quest's more recent fish culturing achievements: gobies, dottybacks and comets. I was so awed at the fishes now being tank-raised at C-Quest that I returned a month later and spent a week as a volunteer working at the hatchery.

Dottybacks, which normally fight with each other, live in harmony if they are siblings. Photo by Scott Michael. Outdoor grow-out area at C-Quest. Each of 10 tarps houses 20 to 40 300-gallon grow-out tanks. Photo courtesy C-Quest. The use of flowerpots makes for convenient spawning sites for pairs of *Amphiprion percula*. Photo courtesy C-Quest.

Newly laid eggs on the back of a ceramic floor tile. The grid is 1 centimeter square.

Photo by Scott Michael.

Bill Addison "retired" and moved to Puerto Rico, where he built C-Quest. Here he is shown with Jackie Baez, who was trained at C-Quest and is highly skilled at raising ornamental marine fishes.

Photo by Scott Michael. I only drooled into one or two of the tanks that I cleaned and inventoried while working. Have you ever seen 2000 sibling neon dottybacks all getting along together in one tank? Or perfectly formed and colored marine fish babies half the size of a dime? I have. What a sight they are!

C-Quest is a productive hatchery located on the south side of Puerto Rico about two hours south of San Juan. It has an inventory of almost 250,000 tank-reared marine aquarium fishes.

If my assumptions are correct, C-Quest alone could supply about 10 percent of the marine aquarium fish demand in the U.S. Yet, the demand for tank-raised marine fishes continues to hover at less than 1 percent of the market. The vast majority of marine aquarium fishes are wild-caught fishes collected from reefs that are increasingly stressed due to cyanide, dynamite, construction run-off and other human activities.

Bill Addison owns and orchestrates C-Quest. He "retired," moved to Puerto Rico and built C-Quest. Three years ago, C-Quest started shipping clownfishes, and now they are shipping clownfishes, gobies and dottybacks.

There are 20 full-time employees operating C-Quest. Veronica Santiago manages the hatchery. Veronica spends part of the day at her desk handling sales and marketing details. From the waist up, she looks like a New York fashion-setter, but her footwear, big black galoshes, indicates she spends time in the production area.

Broodstock and Research

A 15,000-square-foot main building houses 1200 40-gallon glass aquariums. Some are subdivided into smaller

compartments, which act as broodstock, larval-rearing and research tanks. The main building also houses a library and lab.

Lab technicians maintain starter cultures of greenwater. Equipment is in place to diagnose fish diseases and perform complete water analyses. The lab technicians count rotifers in culture samples daily to measure rotifer productivity and density, and establish the day's harvesting volume and rotifer feedings. When rotifers are scarce, they are rationed out, so the rotifer population never drops below 150,000,000 rotifers. When there are too many rotifers, the excess is collected so rotifer density stays below about 400 rotifers per milliliter. Apparently, savvy larval-rearing technicians maintain secret stashes of rotifer cultures hidden among the numerous C-Quest tanks, just in case.

While I was at C-Quest I came across about 900 gallons of secreted rotifer cultures. That's quite a stash. Even on a paranoid day, I keep less than 30 gallons of rotifer cultures for my home clownfish-raising activities.

C-Quest has 550 pairs of prized broodstock. Clownfish broodstock have grottoes fashioned from rectangular ceramic floor tiles. Clownfish couples spawn on the rough side of their tiles. The egg-laden tiles are moved to larval-rearing tanks for egg hatching when the eggs are seven or eight days old, depending upon species.

Also included in broodstock tanks are gobies, dottybacks, jawfishes, cardinalfishes, royal grammas, basslets, comets, mandarins, damselfishes and angelfishes. Yellowheaded jawfish, royal grammas, blackcap basslets, comets, mandarins and orange-tail damsels have been tank-raised at C-Quest, although many are not commercially raised because they are difficult or because demand does not justify commercially raising them.

Research has been a significant and costly undertaking at C-Quest. However, research has recently been curtailed because ornamental marine fish culturing research is too expensive and time-consuming for the current demand for tank-raised fishes.

The details for spawning and rearing *Pseudochromis* were defined at C-Quest, and dozens of pairs of *Pseudochromis* males at C-Quest eagerly invite ladies into their handsome cinderblocks to spawn. When they spawn, their egg masses, which resemble small balls of frog eggs, are collected and incubated in jugs, where they hatch. C-Quest is searching for additional *Pseudochromis* species to grow into broodstock.

Bill Addison believes C-Quest can rear most, if not all, of the *Pseudochromis* genera. Apparently, there are at least two different types of *Pseudochromis* larvae, depending upon species, which makes one wonder if those who identified the various species might have classified them differently had they had the benefit of knowing the larval stages better.

A year ago C-Quest was producing commercial quantities of three goby and two dottyback species in addition to clownfishes. Now, five goby and seven dottyback species are routinely raised in large quantities.

Gobies are generally kept in pairs. However, some goby broodstock tanks contain two females and a single tired male. Pieces of PVC pipe, held in place with suction cups, are placed within a few inches of the bottom of goby broodstock tanks. The females lay their eggs inside the pieces of pipe and males tend the eggs.

Pseudochromis are kept in pairs. The requirements for raising *Pseudochromis* species were deciphered by C-Quest super-sleuths. Such achievements are not gained by chance -- they're gained through funding (courtesy of Bill Addison) and finesse. Part of the finesse includes concerted and focused efforts by Bill Addison, Todd Gardner and Jackie Baez.

Fishes Being Commercially Reared at C-Quest
 Cinnamon clownfish (*Amphiprion melanopus*)
 Clarkii clownfish (*A. clarkii*)
 False clownfish (*A. ocellaris*)
 Skunk clownfish (*A. akalopsis*)
 Tomato clownfish (*A. frenatus*)
 Pink clownfish (*A. perideraion*)
 Clown clownfish (*A. percula*)
 Red saddleback clownfish (*A. ephippium*)
 Barrier reef clownfish (*A. akindynos*)
 Orange clownfish (*A. sandaracinos*)
 Maroon clownfish (*Premnas biaculeatus*)
 Neon goby (*Gobiosoma oceanops*)
 Genie goby (*G. genie*)
 Citron goby (*G. citrinus*)
 Yellow goby (*G. okinawae*)
 Masked goby (*Coryphopterus personatus*)
 Springeri dottyback (*Pseudochromis springeri*)
 Neon dottyback (*P. aldabraensis*)
 Sunrise dottyback (*P. flavivertex*)
 Orchid dottyback (*P. fridmani*)
 Striped dottyback (*P. sankeyi*)
 Olive dottyback (*P. olivaceous*)
 Australian dottyback (*Ogilbyina novaehollandiae*)
 Within C-Quest's facilities, larval research specialists test various rearing techniques, including such parameters as first and second food preference, water quality and water stability, to determine what works for each species. They push barriers back a little at a time until they establish workable larval-rearing and fry-culturing techniques. Unfortunately, *Pseudochromis* larvae will not tolerate poor water quality, so raising them involves "vacuuming the bejesus out of their tanks," according to Jackie Baez. When ever I asked what I could do to help around the hatchery, someone stuck a tank siphoning wand post-haste in my hand.

Interestingly, dottybacks, which normally fight with each other, live in harmony if they are siblings. However, once they are separated for some time, they cannot be put back together safely. A retailer I know in Maine put sibling C-Quest neon dottybacks in a 20-gallon aquarium and they coexisted peacefully until they were sold. How long they can be separated and safely put back together still needs to be defined.

Larval Rearing

Clownfish larvae are moved on the day of hatching to larval-rearing tanks and incubated over airstones. The larvae hatch and are raised indoors for a month or so in 40-gallon larval-rearing aquariums. They receive rotifers as a first food. At about five days old they get newly hatched brine shrimp as a second food. Eventually, they are weaned onto crumbled dry food. At about a month old, they are booted outdoors to 300-gallon grow-out tanks where they receive dry food and occasional newly hatched brine shrimp treats.

Gobies lay their eggs on 3/4-inch-diameter pieces of PVC pipe that are taken outdoors to 300-gallon tanks, where water is squirted across them using a syringe. The agitation causes the eggs to hatch. Dottyback egg masses are collected and hatched over aeration in funnel-bottomed jugs and then released into 300-gallon outdoor tanks.

Grow-Out

Grow-out tanks are outdoors. Ten rows of black cloth awnings on metal frames stand like huge tunnels behind the hatchery building. The awnings provide shade from the tropical sun for 400 opaque plastic, 300-gallon round grow-out tanks. Inside the tanks are congregations of 1000 to 3000 juvenile fishes. There are clowns, gobies, dottybacks and occasional unique treasures, such as baby comets.

Comets are reared at C-Quest, but they are not for sale. The ones raised are being held as broodstock. The white juveniles with dappled fins and an iridescent blue tail spot are quite beautiful larvae. Rearing comet larvae is not a problem. Unfortunately, getting the adults to spawn is a problem. I'm hopeful that tank-raised comets will be more inclined to spawn in captivity than wild-caught comets.

Inside one masked goby grow-out tank, an albino stood out like a sore thumb. I'll bet that one's a C-Quest keeper. Also, a neon dottyback with an iridescent turquoise tail bar could be spotted among a tank containing 1500 or so normal-colored neon dottybacks. Unique fishes are often kept for broodstock.

Two strains of percula clowns have now been "set" at C-Quest. Strains are set by selectively breeding fishes with the desired feature until they produce only offspring with that feature. An "early" black percula strain develops wide black margins early on. And, a bright-red colored percula strain has been set. Hundreds of these special fishes were being grown out.

While vacuuming tanks at C-Quest, I occasionally found a fish of the "wrong" species inside grow-out tanks. For example, a tank of orchid dottyback juveniles held one or two neon dottybacks, or a tank of neon dottyback juveniles hosted a few striped dottybacks. Amazingly, the lucky renegade fishes had, as larvae, escaped through their own tank's standpipe screen. They had quite a ride through a fluidized bed sand filter, survived a rather large centrifugal pump, and ended up in a different grow-out tank.

C-Quest personnel have many stories of fish escapades. My favorite was the "escaped convict" account. A convict blenny once jumped from a broodstock tank and apparently somehow hobbled about 60 feet across a concrete floor, landed in the hatchery's drain, and was caught by a local fisherman in C-Quest's effluent pond a hundred yards away. The fisherman put it in a bucket and brought it back to the hatchery. Convict blenny broodstock tanks now have secure lids.

Available Species

Last year brought a milestone. C-Quest began offering more non-clownfish species than clownfish species. Tank-reared neon, genie, citron, masked and yellow gobies are routinely available. The available dottybacks are: sunrise, orchid, springeri, striped, neon, Australian and olive. If you need 5000 neon dottybacks, Veronica can arrange it.

Murphy's Laws

While this fruitful operation is set in a tropical island paradise, Murphy's Laws are universal, and C-Quest has not escaped their influences. Obtaining additional *Pseudochromis* broodstock is a current pressing problem. Personnel is another challenge, as is distribution.

Marine larval rearing is a specialty not taught at universities. Trained personnel cannot be obtained -- they have to be created. Few job applicants meet the single most desirable qualification: people who would rather raise fish than eat.

Many C-Quest employees have that inclination, including Jackie Baez. She was trained at C-Quest and is an ace at raising ornamental marine fishes. Todd Gardner, from New York, also meets the criteria. Todd lived in the C-Quest library for over a year -- no kidding. He slept on a cot in there. He has since moved into more spacious quarters, but on his days off Todd can still be found in the C-Quest nursery tending his wards. Bill Addison knows the requirements to rear many marine species that are not currently being reared for lack of a larval-rearing champion to assign to those species.

Marketing and distribution continue to be a problem. Somewhere between the hatchery, capable of producing 1,000,000 tank-reared fishes a year, and hobbyists, desirous of an environmental alternative to wild-caught fishes, the transfer of ownership fails to materialize. The wholesale supply is there, but that supply does not make it to most retailers. Unfortunately, the distribution network continues to offer wild-caught specimens that often die, even when healthier tank-raised fishes are just a phone call away. Can this possibly be good for the hobby?

With the current demand for tank-raised marine aquarium fishes, hatcheries cannot break even. That is why so many hatcheries have closed. Hatcheries have to offer their fishes at a cost comparable to, or within a few cents of, wild-caught fishes, regardless of the fact that tank-raised fish survival rates in the tanks of wholesalers, retailers and hobbyists are much higher than wild-caught fish survival rates. Due to better nutrition, the color of tank-raised fishes is excellent -- that previous impediment seems to be fading into history.

If my many years of discussing marine fishes with fellow hobbyists is an indication, the demand for tank-raised fishes is there at the hobbyist level. It is hobbyist dollars that fund fish collecting and fish culturing businesses. Consequently, hobbyists are not helpless to make changes in the industry, if they want to.

Retailers seem receptive to offering tank-raised fishes. In my area, wholesalers are the holdouts. These wholesalers prefer supporting their collector colleagues rather than buying from hatcheries. Hobbyists, perhaps unknowing of how many tank-raised species are now available, continue to vote with their dollars and buy wild-caught fishes even when tank-raised fishes can be had.

Is it time for marine aquarium hobbyists, whose dollars run the marine aquarium fish industry, to draw a line and support an environmentally friendly alternative? If your retailer cannot get tank-raised fishes for you, it's not because they don't exist.