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STATUS OF POMPANO FARMING METHODOLOGIES – 2013

INTRODUCTION: The founder of Mariculture Technologies Int'l, Inc. (Michael F. McMaster) first artificially spawned adult pompano (*Trachinotus carolinus*) and subsequently cultured the larvae through full metamorphous starting in 1972 (42 years ago). There remains no other fishery scientist that can claim such a long and experienced history with this species. Our group has over the years produced millions of eggs and fry of this species and no other group can make that claim. Unfortunately, this work was accomplished in the USA where even today there remains no Governmental path for expanding marine fish farming to open sea cage culture which has limited commercial expansion. There does exist a Governmental rule path for the farming of this species in low salinity earthen ponds and in indoor re-circulated water systems. The company currently operates a low salinity earthen pond demonstration farm in central eastern Florida. The balance of this document will focus on the current state of the scientific art as developed by MTI, Inc. and not the comparative economics of the various methods of marine farming.

FARM DESIGN AND OPERATION: Over the last forty two years of farming this species in a research and development and commercialization demonstration undertaking, the company has experienced an evolution of techniques, designs, and approaches that has resulted in a turn-key methodology for commercialization. Starting in the Dominican Republic in 1973, we produced millions of pompano eggs and fry in what at the time seemed to be the best farming approach. It was a concrete tank farm using natural water pumped in from the nearby sea. In hind sight, this was not the optimal method of farming this species from either a technical or economic viewpoint. Farm design and operation are best described in relationship to where the farm is to be located. Understanding the physical characteristic of the location is of first importance to a successful farm design. Our team has designed and managed the construction of two of the largest, vertically integrated marine fish farms in the western hemisphere and numerous smaller facilities. We are uniquely experienced at determining what approach and design will work best for a given location and market considerations.

BROODSTOCK CENTER DESIGN AND OPERATION:

Commercialization of a pompano farming industry requires a year round, weekly or monthly, supply of seed stock (fry). MTI, Inc. has accomplished this technical task numerous times over the last 42 years. Starting in the Dominican Republic farm in 1972, monthly fertilized egg production was sustained at ten million eggs per year from the initial facility. After a few years the technicians had produced F3 generation broodstock in-house. In subsequent years and in various R&D projects these results have been replicated numerous times. Spawn inducement has been refined over the years to where spawn success rate for adult conditioned fish is now 70%; meaning that for every ten adult fish exposed to the artificial inducement protocols, seven would spawn normally. In general, a pompano female will produce 100,000 fertilizable eggs per pound of total body weight. The inducement techniques perfected by our team is a manual striping method. For 42 years we only used HCG (Chorulon) because this is the only FDA approved hormone stimulant that can be used on fish destined for human consumption in the USA. The average fertilization rate is 90%.

The high success rate with our induced spawning techniques is based not only on our understanding of the ova development which give rise to the proper timing for the stripping of the eggs, but also includes proper feed ingredients in the broodstock diet specific for this species. Environmental design of the broodstock facility is also important. Physical variables such as tank size, water temperatures, lighting requirements and sanitation have all been highly developed and refined for this species.

The years of experience that has given rise to this unique ability to spawn this species with such great success now exist within two scientists who are stockholders of this corporation. I have represented to many observers that Mr. Thomas Kloth is the world's most experienced practitioner of our artificial spawning protocols for the Florida Pompano. Couple Mr. Kloth's aptitude and experience with that of the Founder and we have the most experienced Pompano broodstock managers anywhere.

HATCHERY CENTER AND OPERATION:

Commercialization of a pompano farming industry requires a year round, weekly or monthly, supply of pompano fry to be made available to the grow-out (farming) operation. The hatchery methods have been an ongoing evolution of technique improvements for 42 years. The methods for hatchery operation and development over the years have been the most secretive part of the company's intellectual property. Starting in 1972, the Founder, was the first scientist to complete the hatchery cycle which allowed for commercial expansion. The Dominican Republic pompano farm in 1972 was producing 35,000 fry per month which was in excess of the start-up farms need of 25,000 fry per month. Hatchery success at that time, as measured by fry produced from some number of

fertilize eggs, was 10%. Today, our hatchery operates on a 30% egg to fry success ratio. Further, the current overall success rate for hatchery output is 4 fry per liter of hatchery culture water for every 25 day cycle. The resultant size for harvested fry is 1 to 2 grams each. Most likely, the most important point to make about our hatchery methodology is that we have not used the classic "GREEN WATER" technique that most of the rest of the world uses for culturing marine fish larvae. For 42 years we have no need for a commercial phytoplankton culture facility to support our hatchery operations. This lack of need for large amounts of live phytoplankton reduces the operational cost of the hatchery by 25%. Some phytoplankton culture is needed however in support of the live rotifer production. The hatchery technique that has been refined over the years for pompano can be used for the production of any marine pelagic egg species with little modification. The company has over the years demonstrated in various projects that the physical construction of a marine fish hatchery need not be made of brick and mortar. We currently operate a successful pompano hatchery in a vinyl tent with earthen floors. However, construction types are related to geographic areas. Least expensive construction methods favor the tropical latitudes.

The evolution of live and artificial larval fish foods has in recent years moved the state of the art significantly. The general science for enhancing the nutritional value of the rotifer for example by supplementing a fatty acid mixture has improved the output and the condition of the overall population of hatchery fry. These diet developments have significantly reduced the incidence of malformations in all marine larval fish cultured.

There is variability between hatchery units so we speak in terms of averages when referring to output. We believe that variability in hatchery unit output is human or operator caused. It takes not only years of experience but also requires that the technicians have an unquestionable aptitude for hatchery work for optimal results.

FRY CENTER AND OPERATION:

This center is the segment of what we refer to as the first grow-out farm and is where the 1 to 2 gram fry harvested from the hatchery first go. Currently, it is our opinion that small fry of the 1 to 2 gram size should not be released directly to earthen ponds or large production tanks. Therefore, the fry reside in a tank farm for 6 to 8 weeks until they reach an average size of 10 grams. It is at this size we release them to, in the current demonstration farm, earthen ponds or RAS production tanks. If a farm is using floating sea cages, the release size should be larger.

The stage one farm is very basic. We use subterranean sea water from wells that has a constant temperature and salinity. In the current case our well is 19 ppt. and 77 degrees F. year round. Fry food types range from live adult brine shrimp that is concurrently being farmed at the

facility to high protein dry foods. Disease prevention is generally not a high priority issue when using well water and the proper dry food formulas. Unlike most other predator fish that are being farmed worldwide, the pompano has some very different dietary needs. Due to the protection of proprietary methods we are unable to explain the difference here.

At time of harvest from the fry center there is an average 3% reduction in population. This loss is due to mechanical damage to the fry or to what we refer to as misfits or malformation issues. Generally, the pompano fry is a very hardy species. They do like to jump so the design of the facility must take this into account. Also, they are a strong schooling species and thus can be placed into tanks at very high densities with apparently little ill effect. At the Dominican Republic farm, the pompano were raised at a density of one pound of pompano to one gallon of tank water using a flow through system. We believe that this species can successfully be farmed at this density but it requires a different environmental system than the one used in the Dominican Republic.

FARM GROW-OUT AND OPERATION:

Currently at the companies demonstration farm, we decided in 2001 to experiment with the concept of farming this high value fish in low intensity and low salinity earthen ponds while poly-culturing natural forage organism simultaneously in the grow-out ponds as a method of providing an offset against the expensive dry diets offered in the USA. The chronological progress of this experiment can be read at the website www.PompanFarms.com where at all the appropriate published papers on this subject reside. Essentially, we can say the project has been a great success. As mentioned earlier, here in the USA with its very high costs of operation, we were looking for a farming method that one, was allowed by Government rules and two, would demonstrate economic viability. In 2006 our team wrote a technical paper which was present at and published by the World Mariculture Society. In this paper, we suggested to the world that due to the horrendous drop in marine shrimp farming production, particularly in South America at that time, that the Florida Pompano is well suited for farming in shallow low salt earthen ponds and should be considered as an alternative to shrimp farming. Since 2006 we have had many visitors come to our pompano farm to discuss the application of our technology to their particular farm.

Regarding what food and at what cost of food should be used in the farm- out operation. We believe that this is the single most important question for the grow- out farm. The pompano, as previously mentioned, has very significant dietary requirements that are not understood by others who have been reporting on feed types and conversion factors for this species. Due to the sensitivity of this intellectual property we cannot give a complete explanation here.

At the demonstration farm we have been testing the pompano's response to small earthen ponds that are 300 feet long by 50 feet wide and 8 to 10 feet deep. When accounting for the side slopes there is roughly one million gallons of water within each pond. In each of these ponds, we have placed 5,000 pompano fry to observe growth rate and adaptability factor. The results have been pleasing. This species does very well in low salinity earthen ponds and can take advantage of the forage organisms used for supplemental feeding. At the present time our opinion as to how low of a salinity is acceptable to the pompano as in regards to physiological stress and its effect on growth rate; we would recommend staying above 12 ppt. This is not to say that they might perform normally in lower salinities, but we have not adequately looked at that question. Over the 12 years at this demonstration farm we have subjected pompano to salinities of zero for up to two weeks and have not recorded any ill effects. These tests were done to mimic what a hurricane might do to the ponds with twenty inches of rain in just a few days. Again, all of the results and observations on this subject can be read at the Pompano Farms website.

There are a few disease organisms that can cause problems in the grow-out ponds or tanks. Care must be taken at the farm as to what and who gets near the grow-out areas (bio-security protocols). The primary disease culprit is cryptocaryon type protozoans. The farm-out protocol has the addition of a certain element that is not a cure for protozoan infections but certainly retards their population expansion. The element is not copper as copper is harmful to the diverse biota in the ponds. The demonstration farm has not seen an outbreak of protozoan disease since this element has been used starting three years ago (2010).

COMMENTS ON PROCESSING AND MARKETING:

The Florida Pompano has continuously been the highest valued marine fish since 1948 here in the USA. All of our business plan work uses the ex-farm gate value of \$6.00 per pound. The estimated production costs for the farm-out is \$2.72 per pound here in the USA. We have seen retail prices of \$24.00 per pound in upscale grocery stores. Seafood restaurant have listed pompano dishes from \$18.95 to \$42.00 a plate in recent years.

Traditionally, here in the USA the Florida Pompano is preferred to be presented to the market as whole iced fish. We do not know of anyone that filets this fish at farm gate or wild catch. Wild catch is moved to market on ice only. Some wholesalers use IQF when supplies out pace sales. The pompano has a fat content similar to salmon and thus the market generally does not hold the product more than a month or two.

PREPARED BY: Michael F. McMaster

