FAO CULTURED SPECIES SHEET

FLORIDA POMPANO (T. carolinus)

OFFERED BY Michael F. McMaster

March, 2014

The following data for this species will be entered according to the format provided.

IDENTITY

OWNER: Consultant is Michael F. McMaster, P.O. Box 1020, Oak Hill, Florida 32759 USA

AUTHOR: Michael F. McMaster, Fisheries Scientist

SOURCE OF INFORMATION: Author's personal research developed over 40 years of working with this species along with data provided from sources described on the attached Bibliography. Advanced technologies held by private companies will not be included.

IMAGE OF THE SPECIES: Attached photo in Appendix section, attachment #3 & #4.

SPECIES NAME: Family Carangidae, Genus Trachinotus, Species carolinus. The Florida pompano is a member of the Jack family (Carangidae). Other common names for this species are pompano, common pompano, Atlantic pompano, sunfish, pompaneau sole (French), and pompano Amarillo (Spanish).

BIOLOGICAL FEATURES: The following is largely extracted from Berry and Smith-Vaniz (1978) and is considered an accurate description. Body shape is generally fusiform. Dorsal fin rays VI+I, 22 to 27 (usually 23 to 25); anal fin rays II+I, 20 to 24 (usually 21 or 22); anterior to the first elongated dorsal fin exists six rudimentary fin rays that protrude slightly in juveniles and pronounced in adults; no teeth on tongue at any size; no enlargement of second to fourth ribs; no dark vertical bars on upper half of the body; anterior-most dorsal and anal rays notably elongated in adults and sub adults, not extending posteriorly to base of caudal fin; maximum total length (TL) and weight about 63.5 cm and 3.4 Kg. (7.5 lbs.); in the wild individuals over 1.8 Kg. (4.0 lbs.) are considered rare. The record pompano caught by angling in Florida weighed 4.7 Kg. (10 pounds 5 ounces). The body is short and deep (depth is 2.0 to 2.8 times its fork length (FL) in adults but this metric varies widely depending on race (location of catch). The body is

compressed, with upper and lower profiles similar and head profile sloping to a blunt snout; eyes small; upper jaw very narrow at end and extending to below mid-eye, lower jaw included; teeth in jaw small, conical and re-curved, disappearing completely by about 20 cm FL; gill rakers (including rudiments) 5 to 7 on upper limb of the outer gill arch, 8 to 14 on lower part of arch; anal-fin base shorter than second dorsal-fin base; pectoral fins short, contained 1.1 to 1.3 times in head length; scales small, cycloid (smooth), and partly embedded; lateral line slightly arched to below middle of second dorsal fin and straight thereafter; no scutes; vertebrae 10 + 14. A weight-length relationship was determined from a sample of 1,984 Florida pompano collected along the Gulf Coast of Florida between 2000 and 2002. This fish sample ranged in length from 79 – 481 mm (3.16 to 19.24 inches). This sample of Florida pompano predicts that a 12 inch (300 mm) pompano will weigh about 0.45 Kg (one pound).

PROFILE

Historical Background of Aquaculture: In Florida, the first reference known was work by Berry and Iverson, 1967 titled "Pompano: Biology, Fisheries and Farming Potential". Shortly after publication a considerable private industry interest evolved into many private research firms exploring the biological potential of controlled farming of this species. Tens of millions of dollars were invested between 1968 and roughly 1974 in an attempt to create the necessary methods and protocols for aquaculture farming of this species. The vast majority of these research funds were from private sources and not governmental participation. Out of some dozen private firms only one succeeded in developing a controlled and reliable methodology for the farming of the Florida pompano. This company was Oceanography Mariculture Industries, Inc. (OMI) and was located in Riviera Beach, Florida. In 1971, under the direction of the company's chief fisheries scientist, Michael F. McMaster, the company initiated a commercial level expansion. The location of the first pompano farm ever was constructed in the Dominican Republic. The planned objective for this first phase farm was 455,000 Kg. (one million pounds) per year. In the first two years of operation the farm staff out preformed the production plan in terms of hatchery production and provided year round supply of fry to the grow-out farm. Due to a number of operational factors the project was not able to sustain its business interest starting in 1974. The primary obstacle to continuation of the farming effort was the total lack of fuel oil supply in the Dominican Republic at that time. The farm was dependent on diesel driven water pumps to move natural seawater to the tanks. The fuel oil shortage was caused by the first Arab embargo of fuel to the western countries. The Dominican Republic, being a small country, was not able to provide fuel to the farm as it barely had enough to operate its

electrical infrastructure. Most likely if it were not for this problem the company would still be producing marketable farmed pompano today.

After the collapse of the OMI project, there was no commercial interest in pompano farming in the USA primarily because the breeding and hatchery technology was not widely known. Further to that, the Governments of Florida and other coastal states along with the Federal Government had no rules in place for managing the use of open water sea cage farming in coastal waters and as of this date (March 2014) they still do not. The next notable commercial effort to re-start the farming of the Florida pompano was done by a firm called Ocean Farming Systems, Inc. which started in 1976 and was a solely owned, private venture belonging to Michael F. McMaster (the original creator of the vertically integrated methods for the year round production of this species). Mr. McMaster has been in the continuous development of the science of pompano farming, mostly in research and development projects, from 1976 to present day. Between the years 1969 to 2006 there was only one technologist and company that continued the investigation and improvements in the art of farming this species. Starting in the middle 2000's a few new companies, flush with new capital in the millions of dollars, attempted to copy the technology first developed by OMI. As of March, 2014 there remains only one commercial operation that continues to farm Florida pompano from egg to market ready product and that is Mariculture Technologies International, Inc. The primary owner of this firm is Michael F. McMaster. All other private contenders have fallen by the way side primarily due to the lack of full understanding of the entire biological and business process needed. Second to the private investments there has been some public funds spent and utilized by Universities and by "not for profit organizations" used in an attempt to create the turn-key technology to farm Florida pompano but they remain today minor contributors to the advancement of profitable pompano farming.

The Florida Pompano is endemic to the Eastern near shore continental shelf of North, Central and South America. This species has been collected in summer months from as far North as Delaware (USA) to as far south as central Brazil (SA). Prior to the early 1970's there was no reported sighting of the Florida Pompano in the Bahamian shelf zone or any of the Caribbean Islands. It is assumed that neither the egg and larval stages of this species nor adults were able to traverse the Gulf Stream thus isolating them to the continental shelf boundaries. Post the middle 1970's there are now records demonstrating the presents of the Florida Pompano inhabiting the South shore of the Dominican Republic and the South shore of Puerto Rico. It is assumed that this presence was due to the escapement of Florida Pompano from the commercial pompano farm belonging to OMI which was established there in 1972. The OMI farm was located on the South coast of the Dominican Republic. The extensive range of this species would suggest that it is tolerant to varied habitats but it is primarily limited by water temperature and near shore food abundance.

The aquaculture techniques developed for this species has given rise to basic hybridization efforts. All companies, OMI, OFS, and MTI, Inc. have taken this species to a F-3 generation produced from farm breed pompano. The techniques exercised were simple in that the first effort was to select out of a month class the fastest growing specimens. This was done when the fish attained a fork length of 15 cm (6 inches) and set aside for individual culture. The earliest age of spawning pompano was six months and a weight of 350 grams (¾ pound). These finding strongly demonstrate that this fish, through selective cross breeding can result in an improved race that is better adapted to farming environments then the wild F-1 pompano. Further, it was noted that the variation in size per month class became narrower with selected cross bred fish. This equates into less runt or smaller fish that had to be discarded early in the process. The second metric focused on was the body confirmation. The market has always preferred a pompano that had greater body depth and not the longer fusiform shape. This is due to the presentation of rounder appearing fillets.

Artificial breeding techniques have been used for forty years with this species. The OMI Dominican Republic pompano farm had early on developed controlled spawning protocols for the year round production of eggs and fry. These methods have been continuously used by the Author with little modification. Essentially, it is the belief that for predictable spawning events to happen, which is needed in a commercial farm, the use of injectable HCG is required. The keys to success with this method are highly dependent on the experience of the brood stock staff. The timing of manual egg striping is nearly an art as much as a science. Other researchers in recent years have tried to induce ovulation in free swimming fish using the ovulation stimulator referred to as Salmon Gonadotropin releasing hormone analogue (sGnRHa) at a dose of 75 ug. Unfortunately, this can only be used in a research environment as the compound is not USA-FDA approved for use on fish destine for human consumption. Further, current research using this stimulator does not suggest a predictable time of spawn or the amount of quality eggs the technician can retrieve from the brood tank. Both of these parameter are essential to a properly managed pompano farm.

Main Producer Countries: The aquaculture of Florida Pompano remains, after 40 years of development, a non-commercial species. The only source of marketable pompano is from wild caught fisheries. There has been great optimism by a few that the pompano will soon develop into a widely established aquaculture species. But, at the present time it remains in development stage projects in the USA. There have been limited reports of some commercial activity in western Dominican Republic and in Panama). These efforts are said to be by private companies and real time information is hard to find. The limited expansion of the species for farming is surely due to the universal lack of technology needed to farm this species by the

wider industry. However, turn-key commercial pompano farming technology has been developed by Mariculture Technologies International, Inc.. Unlike many new potential species being considered for aquaculture, the Florida Pompano's advancement to commercialization is not precluded by lack of science and experience.

Habitat and Biology: As previously mentioned, the Florida Pompano has a very wide or elongated range from mid-Eastern USA to nearly Southern Brazil. This species is not found in any abundance in waters greater than 33 meters (100 feet) throughout its range. This species inhabits both near shore zones with ocean salinities to inshore bays and lagoons (estuaries) that have reduced salinities. The Florida Pompano has been found to survive for at least short periods of time in freshwater at the mouth of rivers for example. It is not known at this time what the normal tolerance to low salinity is in terms of affecting the fish's ability to grow and survive normally. Recent work by the author would suggest that the lower tolerance for normal growth and survival is 12 ppt. Other investigators have suggested lower than 12 ppt is acceptable to this species but the test designs were suspect and execution in the authors opinion did not control other important variables thus making the conclusions unreliable.

Temperature tolerance is most likely the major environmental influence on the natural range of this species. The lower intolerant temperature is 12 C. (53 F.) at which the fish will become inactive and if left at that temperature for more than a few hours mortality will soon ensue. The upper temperature tolerance is 33 C. (92 F.) and if left at that temperature for more than a few days mortalities will ensue. The optimum farming temperature is 24 C. to 28 C. (75 to 83 F.) with the considered best temperature for growth being 27 C. (80 F.).

The natural feeding habits for the Florida Pompano are that it is exclusively a benthic feeder. The primary diet is small shrimp, crabs, and bivalves. The author believes that the Florida Pompano's favorite natural diet is bivalves and crabs. This is due in part to this species having a specially adapted mouth that allows it to crush small prey (pharyngeal plates). Numerous reports from recreational and commercial fishermen would support these observations. The most common bait used by fishermen is small crabs (sand fleas/mole crabs), clam meats, and shrimp. There are no reports that pompano will bite on fish flesh of any type or form. The farming experience with feeding captive pompano demonstrates that this fish is not piscivorous at any time in its life stages. These feeding behaviors support this species as a good candidate for intensive farming. Even with mixed sizes of pompano in the same enclosure there will be no cannibalism. Current understandings of the captive diet requirements is that this fish has a high active metabolism due to its need to continuously swim and thus requires a higher energy diet to support good growth. Most reports on this subject indicate that a 40 to 50% protein, 7 to 10% fat, and 4% ash diet is best. Of course the sources of these nutrients are of utmost

importance due to digestibility and assimilation issues. The Florida Pompano has a relatively short gut compared to carnivores and herbivorous fishes. This morphometric characteristic suggests that this species has a rather fast through put time and also would suggest that the feed types be easily digestible. Therefore, studies have shown that low food volume per feeding and more frequent feedings through the day light period give rise to faster growth rates. At the present time in the USA there are no commercial fish food manufacturers that have a tested specific diet for the Florida Pompano.

Production Cycle Schematic Diagrams: A typical operational design for a Pompano Plant can be seen at Attachment #1 and Attachment #2.

Production Systems: Over the last forty years of commercial and experimental trails for the farming of the Florida Pompano there have been four types of industrial culturing designs tested. They are: (1) Low Salinity Earthen Pond Culture using subterranean seawater of various salinities, (2) Above Ground Tank Culture using both natural seawater and well seawater (subterranean) flow through systems using various salinities, (3) Re-Circulated Above Ground Tank Culture using various types of bio-filtration equipment to maintain acceptable water quality and using normal seawater salinities, (4) Floating Sea Cage Culture used generally in shallow near shore with natural seawater of normal salinity.

Further description of each of the four methods and their current state of the art is as follows:

1. Low Salinity Earthen Pond Culture was first attempted by Berry and Iverson (1967). This first method was the blocking off of natural estuarine tributaries to confine the wild caught pompano fry in a natural environment. The results were very poor. Later, Tatum & Trimble ((1978) attempted the polyculture of Penaeus species and wild caught pompano fry in seawater ponds adjacent to a natural bay and using natural water of uncontrolled varying salinities from that bay. The results of these experiments were very poor. Starting in 2004 and continuing to this date the firm Mariculture Technologies International, Inc. and Pompano Farms, LLC. have been extensively testing the Florida Pompanos suitability to low salinity earthen pond culture. For the first time the testing of this method exclusively used hatchery produced fry and not wild fry. The experiments have been positive and have been reported on extensively. Published documents on this subject can be reviewed at www.PompanoFarms.com.

   For the last described pond farming trials, all pompano fry were produced in the MTI, Inc. hatchery. From the hatchery the one gram fry are moved to a nursery where at they

reside until they attain 10 grams in average weight (40 to 60 days). All nursery feeds are small dry pellets (protein 54% and fat 16% manufactured by Inve Aquaculture). Diet supplementation with live brine shrimp (Artemia) can shorten this step by up to 20 days giving a nursery period of 40 days. The nursery is supplied with 19 ppt saltwater from a 400 foot deep well which maintains a year around temperature of 25 degree C (77 F.) All nursery tanks are polyethylene and are 2.44 meters (8 feet) in diameter and 3,000 liters (800 gallons) in water capacity. The fry stocking rate for these tanks is 2,000 fry per tank. Survival in this system is 99%.

Once the pompano fry attain an average weight of 10 grams they are move to either earthen ponds, tanks, or cages for on-growing. In the case of the earthen ponds, the size presently being used are 92 meters long (300 feet), 15 meters wide (50 feet), and 3 meters deep (10 feet). The net volume per pond is an average of 3.785 million liters (1.0 million gallons). Current trails use 5,000 pompano fry per pond which gives rise to a density of one pompano per 750 liters (200 gallons). This density is considered the highest one should use unless additional mechanical filtration is added and is considered high density for a basic pompano farm pond. Low density trials have used 1,000 fry per pond. At this low density the pompano are encouraged to prey on natural occurring benthic organisms as a major part of their food needs. The results of these trials have been very encouraging and have been reported on in technical and public media. To review these works see www.PompanoFarms.com. Pelletized commercial fish feeds for all grow-out sizes are supplied by PMI Nutrition International, LLC., trade name AquaMax. The feed is classified as a carnivore diet and contains 41% protein, 12% fat, 4% fiber. The diet is considered a fish meal based product.

As with all pond farming ventures one of the most cumbersome steps in the farming process is harvesting. However, pompano pond farming is not as difficult as it is with other pond farmed fish. Other species require the draining of the ponds in order to catch all large fish. The reasons for this are generally two fold, (1) all the fish can be caught (2) the pond bottoms can be dried and limed which is generally a disease prevention practice. The point of catching out all the big fish and not leaving any of them behind prevents the next crop of small fish from being eaten by bigger fish that may not have been caught out. In the case of the Florida Pompano there is no fear of cannibalism thus the ponds need not be drained in order to catch all big fish. Therefore, the preferred method of harvesting pompano from ponds is using selective sized gill nets (entanglement nets). The selected mess size for example can be set for .45 KG (1 pound) pompano and larger. This lets the smaller fish escape through the net to be caught at a later date when they attain the .45 KG (1 pound) size. Once most of the marketable pompano are assumed extracted from the pond the farm manager can put a

new crop of fry into the same pond without fear of fry loss due to cannibalism. In fact, entanglement nets can be towed through the production pond monthly in order to extract all marketable fish if need be.

In the United States, the market for pompano prefers them to be whole and fresh iced. Only wild caught pompano exceeding 2 pounds in size are used for fillet market. Due to the nature of the market demands the pompano farm must know what customers they are supplying on what days in order to keep fresh, low shelf life, product flowing to the markets. As of this time there is no value added processing of either wild or farmed pompano in the USA. It is unknown to the author what other markets in Central and South America require for their wild caught pompano.

Elements that determine pond productivity are water quality, water salinity, oxygen, temperature, food supply, avian predation, and jumping out of pond. With ten years of pond farming trials at the author's demonstration farm it has been concluded that production losses due to the above mentioned parameters do not cause losses in excess of 10%. Therefore, the pond is originally stocked with 10% more fry or 5,500 per pond.

The greatest risk to success is farm location and manmade chemicals. In selecting a satisfactory farm location there are a number of considerations that must be properly assessed. The most important considerations are geographic location which should be in tropical latitudes. The research farm that the author operates is in a temperate latitude and is challenged with winter temperatures from time to time going below the minimum tolerant temperature for the Florida Pompano. The off set for this risk is deeper ponds and adequate well water pumping. Public electrical interruption can be a serious risk in some locations as a high density pompano pond requires supplemental aeration (24/7) which generally is supplied from electric pumps. The off set to this risk is a backup generator and/or wind driven aerator pumps. Lastly, manmade chemicals are generally in the form of pesticides used for mosquito control in some locations. These chemicals can have a direct and an indirect effect on the success of a pompano pond business.

2. Above Ground Tank Culture for the commercial production of the Florida Pompano using natural seawater was first tested by OMI in the Dominican Republic in 1972 and the testing of saltwater well water was first tested at the same time. The use of natural seawater pumped into the tank farm from next to shore intakes was judged not to be the best approach after a few years of operation. The problem was unwanted intruders of all types including fowling organisms. At that project the tanks that were operated on well water did much better as the well water was free of contaminating and fouling organisms. The experience at the Dominican Republic project definitely proved that wild

natural seawater was not to be considered as a water source for a commercial tank farm.

The OMI pompano farm used round concrete above ground tanks that were 6 meters (20 feet) in diameter holding 7,570 liters (2,000 gallons) of water. The fish density was considered very high at 0.45 Kg (1 pound) per 3.75 liters (1 gallon) of seawater. This high density was not considered detrimental to this schooling species. This OMI project was short lived due to the lack of diesel fuel available at the time in the Dominican Republic which was caused by the first Arab oil shortage. Extensive description of this project can be review at www.MaricultureTechnology.com.

The author is not aware of any other commercial pompano farming project that used this method of farming. The author has used from time to time above ground circular tanks for brood stock holding and inventory purposes. These systems have been both well water supplied and Re-circulated systems.

3. Re-Circulated Above Ground Tank Culture or a process referred to as "RAS" has been a major focus of research attention for forty years. During the last ten years there has been a massive investment worldwide by both Governments and private companies attempting to prefect the best system for farming fish with little to no effluent discharge. It is to be assumed that the motivation for such expensive development is the belief that fish waste effluents are very bad for the environment. Second to that, RAS culture is said to be technically functional in any location on the planet as long as energy/electricity is available. There are other assumed benefits to RAS farming such as close control of feeding strategies, better disease management and easier harvesting to name a few. However, this approach to farming fish is very energy and capital intensive. Thus, the cost of operations can only be met if the target species being RAS farmed has a high enough market value that can provide profit after farming expenses. There are very few marine species that fit that requirement. The Florida Pompano is one that can generally meet the financial conditions of RAS culture. Recently, in North Florida, USA a large public food chain store was offering pompano fillets for $27.00 per .45 Kg. (1 pound). This valuation is the highest observed for Pompano and it is not to be assumed that this valuation can be applied directly to all market levels and locations.

   The author is not aware of a single commercial RAS Florida pompano farm anywhere in the world. There may be some research under taken using RAS and the Chinese pompano (blochii) and there have been some RAS research undertaken in Florida by Government laboratories using T. carolinus. At this date there are no ongoing

Government research projects using the Florida Pompano in RAS projects of which the author is aware . However, over the last forty years Florida Pompano have been successfully held in low densities in what now would be referred to as basic and somewhat primitive RAS designs. The RAS application has been primarily used for brood stock holding and hatchery support for many years. In general, the Florida Pompano should be an excellent candidate for commercial RAS farming as long as the economics of production costs and market value support the investment.

4. Floating Sea Cage Culture has been a widely used method of fish farming for decades and today is the preferred method for the farming of salmon for example. The efficacy of this method has therefore been well defined by the salmon farmers as the best mechanical and profitable form for farming that species. It is further assumed that other species should do well in this type cage environment and in support of that belief the Mediterranean Sea Bass is currently being farmed extensively in floating sea cages as well. However, the author is not aware of any published reports describing the Florida Pompanos adaptability to open water floating sea cages. It is the belief of the author that this species should do well in this farming environment as long as the floating cages are designed to meet their specific behavioral and environmental needs.

Diseases and Control Measures: Florida Pompano farming remains in its infancy as an industry and therefore farmers and fisheries scientists have had limited exposure to short and long term experiences with specific pompano disease issues. Therefore, exhaustive literature searches on diseases of the Florida Pompano (T. carolinus) yields little to no specific assistance on this subject. Extreme caution must be exercised these days as to what if any chemical treatments are used against any known pathogen due to the FDA Approved Chemical Guidelines used on animals destine for human consumption. For example, there have been many recent published reports by Government researcher in Florida working with the Florida Pompano that suggest the use of formalin dip at 250 ppm for new incoming fish as a prophylactic precaution. This suggested treatment in the USA would be illegal. Therefore, even though there are diseases that affect the Florida Pompano in ponds, tanks and cages most all historic remedies are not allowed anymore by the USA-FDA. This issue has created a serious concern for farmers. The best practice therefore is prevention.

Even with the most diligent “Bio-Security” protocols implemented on fish farms today, some potential diseases still challenge the farm. For the Florida Pompano the author is aware of two disease organisms that can cause havoc and losses to farming or holding facility. They are (1)

Cryptocaryon and (2) Oodinium (Amlyoodinium). Both organisms are considered parasitic dinoflagellates that have free swimming motile stages, primarily first infecting the gills, then spreads to the body if high concentrations are not controlled and fish deaths occur generally within three days of noticed onset. The only USA-FDA approved control chemical is copper sulfate and it is effective against both disease organisms. The recommended treatment dose is .2 to .3 ppm copper. In RAS systems it is recommended to have continuous level of .2 ppm copper for ongoing protection. The author has used this element for years on pompano with no apparent negative effect on the pompano. Symptoms of occurrence are the fish become lethargic, frequent the surface, get foggy eyes, and high mucus production which is first noticed by large persistent bubbles on the surface of the tank.

In the author's experience, there have been no other disease organism that has had epizootic outbreaks that cause the death of pond or tank cultured Florida Pompano. Private research on this subject cannot be included in this presentation but there are a few new approaches for the control of Cryptocaryon and Amlyoodinium that should provide help when made available to the market.

Production Statistics:

Florida Pompano aquaculture production is essentially zero. Minor amounts, less than five tons, have been produced by Mariculture Technologies International, Inc. at its demonstration farms.

Market and Trade:

In the USA there is a demand for aquacultured Florida Pompano but there is no supply. There is a commercial supply of wild caught Florida Pompano in the Southern USA Gulf States. The vast majority of wild caught Florida Pompano are marketed within the borders of the USA and it is therefore assumed that very little is exported. The market desires the Florida Pompano to be supplied whole with head on and eviscerated. Fish larger then one Kg (2 pounds) are generally filleted. Pompano smaller than one Kg (2 pounds) are generally served whole. Upscale restaurants prefer the fish to be fresh and never frozen. However, during peak harvest periods the fishery must flash freeze for later inventory. The author is not aware of any value added presentations of this fish.

Ex-vessel value to the commercial fisherman range between $4.00 to $5.00 per pound. The wholesale Pompano supplier generally asks $6.00 to $8.00 per 0.50 Kg. (one pound). The retail market generally ranges between $9.00 to $14.00 per 0.50 Kg. (one pound). The highest value

in 2014 seen for Florida Pompano fillets has been $27.00 per 0.50 Kg. (one pound) which was recorded at a Publics Grocery Store in North Florida, USA. See www.globefish.org for more detail on this subject.

In the USA there are no market regulations for farmed (aquacultured) Florida Pompano as it is considered private fish as opposed to wild caught fish. Therefore, the farm can sell any size of pompano the customer's request. However, for the wild caught fishery the State of Florida imposes a size restriction on catchable and marketable pompano. The legal size for both recreational and commercial catch is no less than 11 inch fork length (Fl) (27.94 cm) and no greater than 20 inches Fl. (50.80 cm.).

Status and Trends: As of this writing, the Florida Pompano remains a prospective species for commercial aquaculture. However, this species has been commercially farmed on a year round schedule and on a small developmental scale, for forty years. The major limiting factors in the USA for commercial development center on political issues rather than scientific issues. The two road blocks are: lack of government regulations for industrial use of near shore open waters for cage culture and the excessive cost of RAS production that limits profit opportunity in the USA. The challenge in the USA has been what would a profitable pompano fish farm look like? Recently, the author completed a technical/business paper titled "A Sustainable Eco-Pond Approach to Profitable Farming" which can be reviewed at www.PompanoFarms.com and is listed in the attached bibliography as well. Lastly, there may be a technical synergism that could give rise to a profitable pompano farm, in the USA, by implementing and combining some of the best components of both RAS and Eco-Ponds methods. Future research at the demonstration farm of Mariculture Technologies International, Inc. plans to explore this potential synergism.

Based on the current operating atmosphere in the USA, it would appear that the best course of action would be to take this species to other locations in the world that suit this species environmental requirement and better suits the business and economics of pompano aquaculture. The road block that the author has experienced with this approach is that countries around the world tend to be cautious about the introduction of non-indigenous species. If this consideration inhibits the expansion to Asia for example, the only locations that could fit the requirements are central and South America.

In a world that is clearly running short on what is referred to as high-end valued marine fish it is the author's belief that the market will pull the expansion of pompano farming. It is debatable as to what level of availability will slow this pull but it surely is in excess of twenty million pounds of fresh pompano production per year.

Future recommendations for the profitable farming of the Florida Pompano would be to define what countries have the required environmental needs for this species and can offer regulations that allow for the implementation of commercial pompano farming at least cost. Once that is established then sourcing the funds required to build the first modern pompano aquaculture business would initiate the creation of a new industry.

Main Issues: As regards to environmental impacts caused by a Florida Pompano fish farm and referring to the four methods used for farming, and ranked as least in possible impact, then the RAS methods would be classified as least impact. Second in least impact would be the low salinity and low density Eco-Pond method and third would be sea cage culture. The above ground tank culture using natural water is not a recommended method at this time. However, an above ground tank farm using low salinity well water would have a low impact. The specific design of each system or method would be specific to the site in which a farm is placed. Generally, the modern farm design and planning is one that creates little to no off site effluent that is enriched with significant organic waste. In the case of sea cages operators around the world, they have done a good job of site location that limits accumulation of organic waste which does not influence the quality of water contacting the farmed species. These operations have their detractors but in general there is an equitable trade off that is tolerated by the natural environment and adds to the need for more human seafood.

In the case of introduction of non-indigenous species there is always the possibility of escapement from any of the outlined farming methods. Then, the question is what would be the impact on the local environment and its indigenous species? There are severe cases like in the Florida Keys, Florida where the escapement of the indo-pacific lionfish has taken place. This fish is a ravenous predator on juvenile fishes and will cause lasting damage to the diversity of those reefs. In the case of the Florida Pompano, it is not considered a predator of fish as its diet does not include fish. The impact of Florida Pompano escapement is minimal compared to predatory carnivores fish species. The pompano would be new competition to other benthic feeders, but due to its feeding so low on the food chain and the relative abundance of benthic prey species, I suspect the natural species diversity would not be negatively impacted.

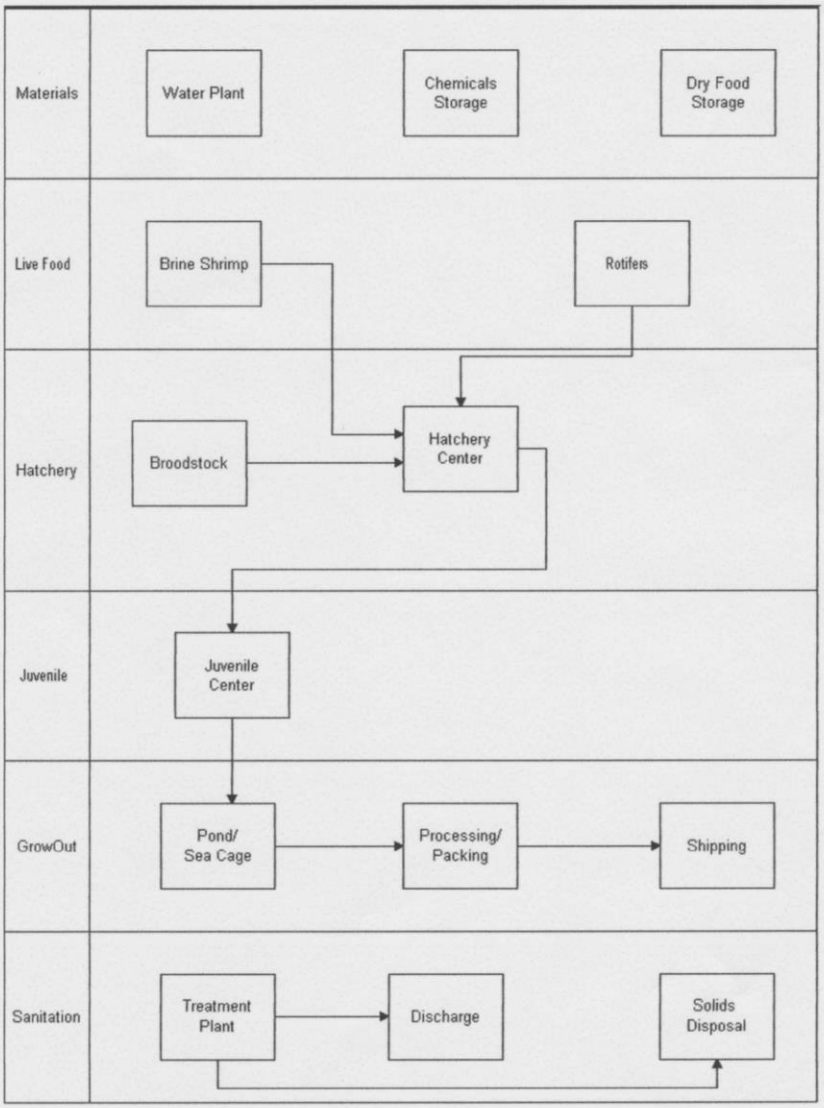
Responsible Aquaculture Practices: Please see the FAO Code of Conduct for guidance. This document is similar in intent to what Florida Department of Agriculture calls Best Management Practices. These documents help to focus the design specifications for the development of new fish farms, fish handling practices, and many other issues including current regulations/laws managing operation of a fish farm.

References:

Attached to the appendix of this document please find a Bibliography of published documents dealing with the life history and aquaculture developments starting in 1967.

Appendix 1

Pompano Plant
Process Diagram



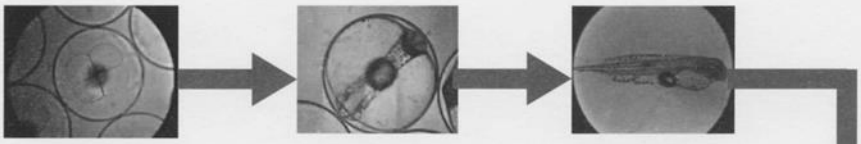
Farmed florida pompano

Seasoned travelers to the Florida Gold Coast
and gourmet diners throughout the world recognize Pompano
as a true delicacy … perhaps the finest eating fish there is.

What is Mariculture? Well it's "farming of the sea"
and our Pompano have been raised in captivity, right from the egg.
The process is brand new and absolutely fascinating.

The great thing about Mariculture is that these
Fish are quality controlled to give you that
Fresh, tasty flavor and firm, flaky texture.

They are grown under controlled conditions to insure quality.
We're certain … because we know where they come from
And what they had for dinner.

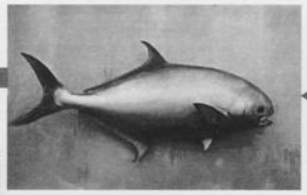


Developing eggs

Ready to hatch

Newly hatched

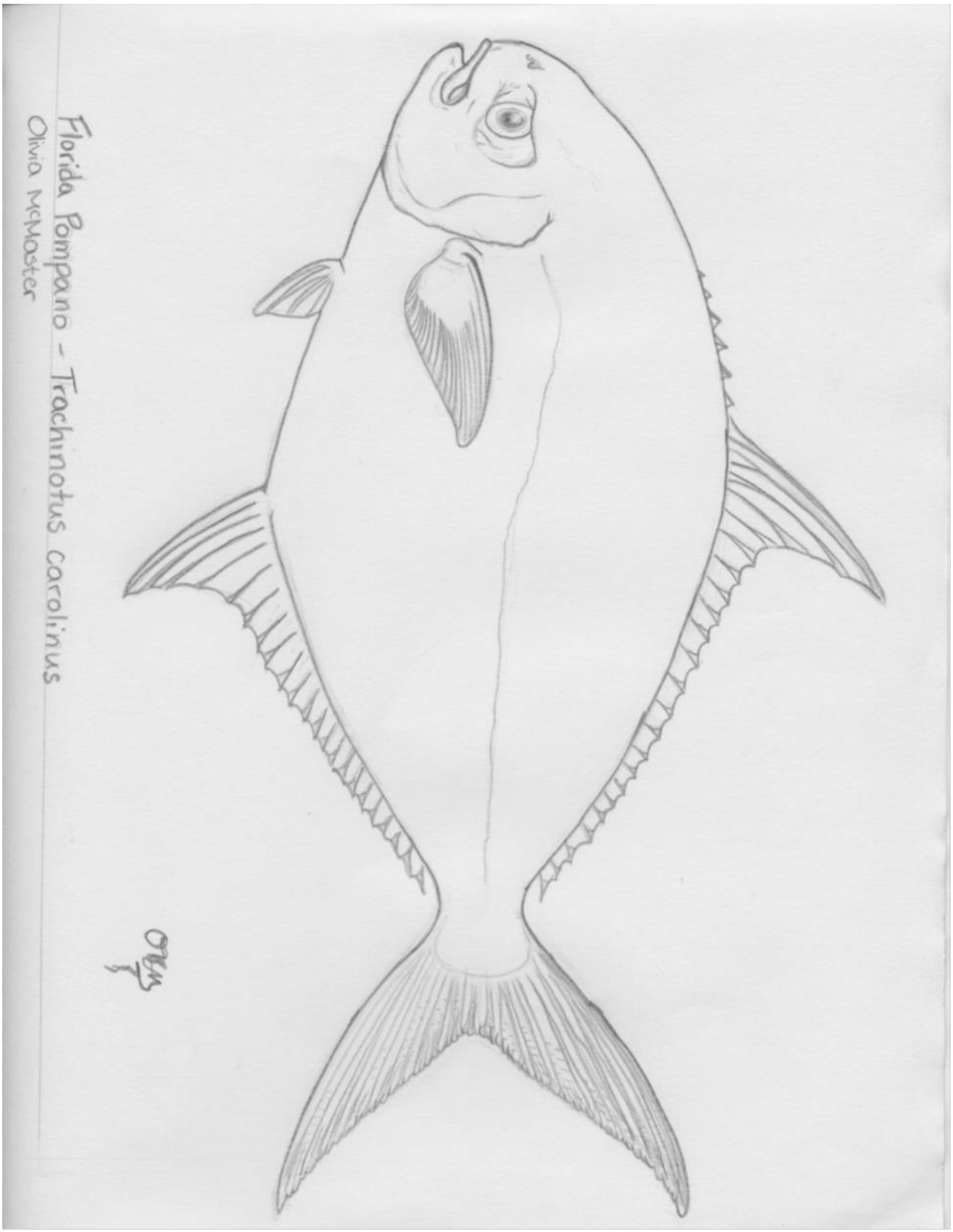
Juvenile pompano

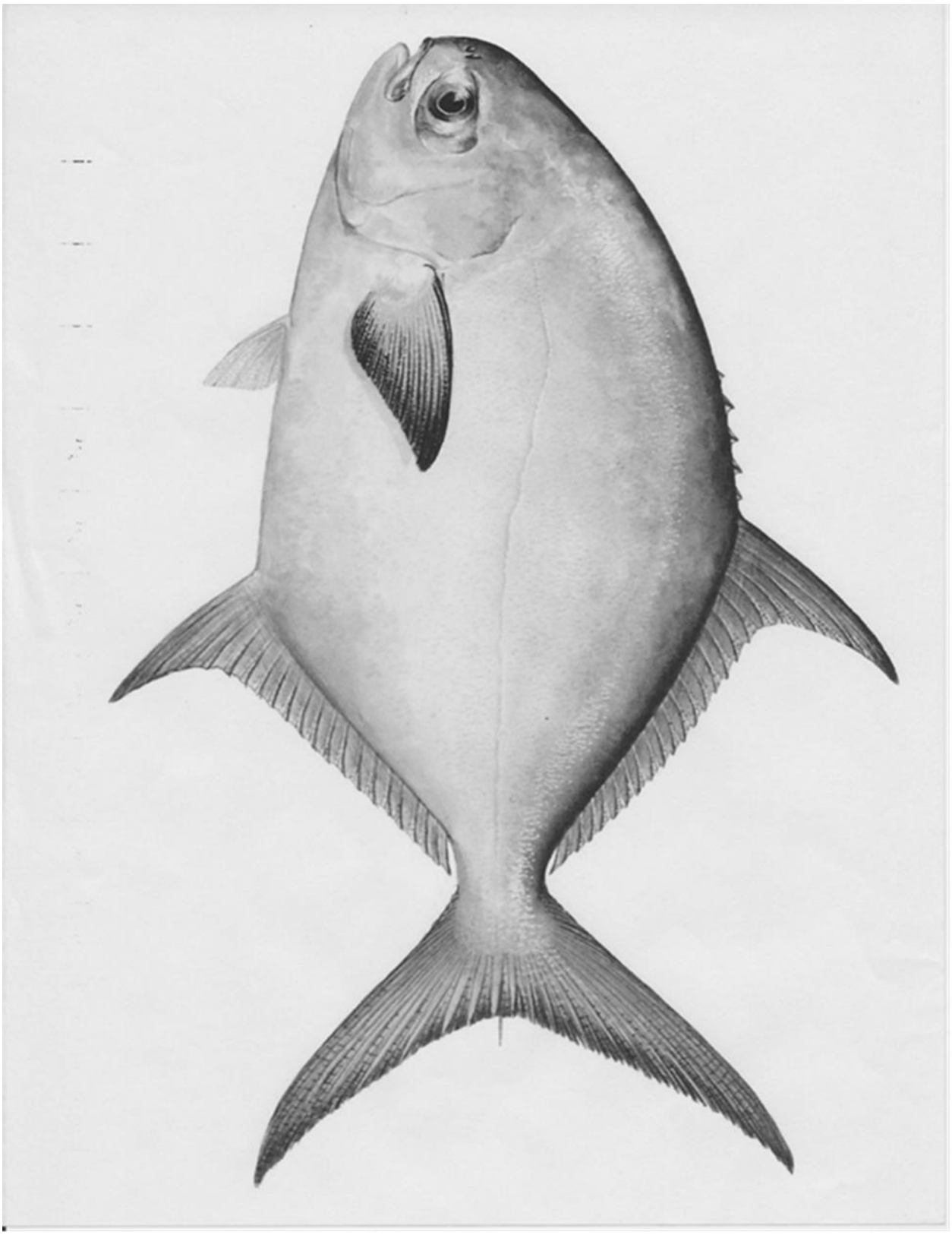


Ready for market

The process begins with the careful selection of breeding stock. Female pompano are induced to develop eggs and to spawn on demand. This controlled reproductive cycle is essential to steady-state farm production. Once spawned, eggs hatch in twenty-four hours. Newly hatched larvae quickly develop into juvenile fish. Pompano take almost a year to reach marketable size. The finished product is processed to consumer specifications.

www.PompanoFarms.com


Florida Pompano - Trachinotus carolinus
Olivia McMaster



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