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2005 Census of Aquaculture: National sales exceed \$1 billion

Results from the 2005 Census of Aquaculture, recently released by the U.S. Department of Agriculture (USDA), National Agricultural Statistics Service (NASS), reflect an increase in value of aquaculture products sold nationally. The 2005 census is the second survey to collect data about the aquaculture industry in the United States. The first census was conducted in 1998 in response to the need for an accurate measure of the aquaculture sector. Last year, 4,309 farms reported \$1,092 million in sales, moderately up from 4,028 farms reporting \$978 million in 1998.

State Production—On a statewide basis, Florida ranked 7th in national production with 359 farms reporting \$57 million in sales. This represents a 25% decrease in sales from 1998, when Florida was ranked third in the nation with sales reported at \$76 million by 449 farms. (However, Florida did remain third in the nation for the number of aquatic farms.) Mississippi dominated national sales with \$249 million reported, consisting primarily of catfish, followed by Arkansas at \$110 million, Alabama at \$102 million, Louisiana at \$101 million, Washington at \$93 million, and California at \$69 million.

Product Category—In addition to geographic area, census data is also summarized by products sold, by species and size category.

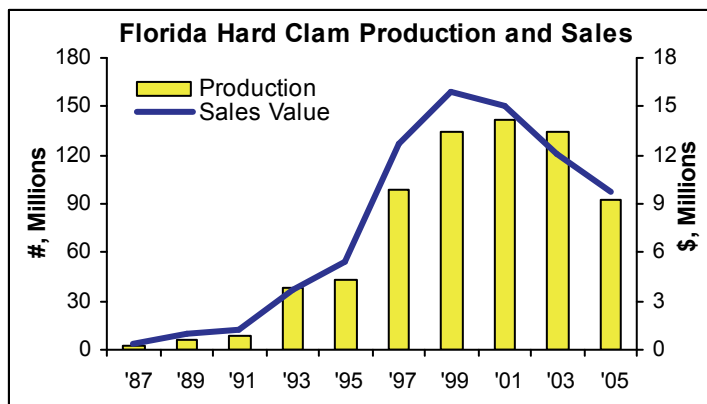
Product categories (and national sales) include food fish, consisting of catfish, trout, salmon and tilapia (\$672 million); mollusks, including clams, oysters and mussels (\$203 million); miscellaneous, primarily alligator sales (\$56 million); crustaceans, primarily crawfish and shrimp (\$53 million); ornamental fish (\$51 million); and, baitfish (\$38 million).

Mollusk Production—A closer look at the molluscan data reveals a dramatic increase in farms reporting, 980 as opposed to 535 in 1998, and sales value, up 128% from 1998. Most of this can be attributed to an almost three-fold increase in oyster production over the past 7 years, with Washington state's cultured Pacific oysters valued at \$38 million (137 farms) and Louisiana growers reporting for the first time Eastern oyster sales of \$28 million (135 farms). Other mollusks reported include manila clams (\$19.5 million, 108 farms mostly in Washington), abalone (\$9 million, 9 farms), softshell clams (\$5 million, 36 farms), and mussels (\$3 million, 31 farms).

Hard Clam Production—The balance of molluscan production is associated with hard clams with 14 states reporting sales. A total of 434 farms accounted for sales valued at \$60 million, compared to 320 farms in 1998 with \$38 million in sales. This represents a 63% increase in hard clam sales nationwide. **Page 2 →**

2005 Florida Aquaculture Survey: Hard clam production and sales continue to decline

While the national census is the primary source of aquaculture data for many states, the Florida Agricultural Statistics Service (FASS) has been conducting a statewide aquaculture survey every other year since 1987. Results from the 2005 Florida survey were also released last month. Note there are some discrepancies in the data reported through the national census and the state survey. Yet, both reports reflect a decline in sales and production for all aquaculture crops, including hard clams, produced in Florida last year. Affects of hurricanes in 2004 and 2005 were cited as the primary cause of crop losses. A summary of the 2005 Florida Aquaculture Survey, which may be of interest to the clam farming industry, can be found on Page 2 of this newsletter.



2005 National Census, continued from page 1

The state by state data reveals where hard clam production and sales have increased since 1998, or in the case of Florida decreased (by 20%). Results of the first census of aquaculture have allowed Florida clam growers over the past few years to claim they were "the leading producer of farm-raised clams in the nation." In 1998, Florida's reported production of 76 million by 206 farmers topped Virginia's production by 6 million clams. However, Florida's value of sales, reported at \$9.5 million, fell behind Virginia (\$11 million) and Connecticut (\$12 million). The following table summarizes hard clam production and sales in 2005 reported by the top 6 states.

State	# Farms	# Clams Sold (1,000)	Clam Sales (\$1,000)
Virginia	38	170,343	26,285
Florida	142	92,132	9,785
Connecticut	22	90,033	11,535
Massachusetts	75	14,328	Data withheld
South Carolina	21	11,645	1,372
New Jersey	49	11,378	Data withheld

The complete 2005 Census of Aquaculture report is available by contacting NASS at (800) 727-9540 or visiting their website: www.nass.usda.gov.

2005 Florida Survey, continued from page 1

- Total Florida aquaculture sales were valued at \$75 million, down from \$95.5 million in 2003, with ornamental fish (\$33 million) and aquatic plants (\$15 million) leading sales.
- Clams ranked third in the state for aquaculture sales (dock-side or farm gate) with \$9.8 million reported, compared to \$12.9 million in 2003 (a 24% decline in sales value).
- At an average price per clam sold of 10.8 cents (up from 9.0 cents in 2003), an estimated 92 million clams were produced and sold last year (down by 31% from 2003).
- 142 growers reported selling clams in 2005, out of 153 operations raising clams. 55 clam growers reported they were out of business in 2005, with many respondents commenting about losing clams planted in 2004.
- Survival rate to harvest was reported to average 43% in 2005, down from 54% reported in the past 3 survey years.
- Expected intentions to plant in 2006 were estimated at 500 million, but many growers commented they were having trouble getting seed. Planting in 2005 was estimated at 350 million, compared to 392 million in 2004.
- An additional 20 operations reported selling clam seed. The average cost per clam seed was 0.48 cent.

The complete 2005 Florida Aquaculture Report is available by contacting FASS at (407) 648-6013 in Orlando, or accessing their website: www.nass.usda.gov/fl.

Virginia's Hard Clam Aquaculture Industry Leads the Nation in Production and Sales

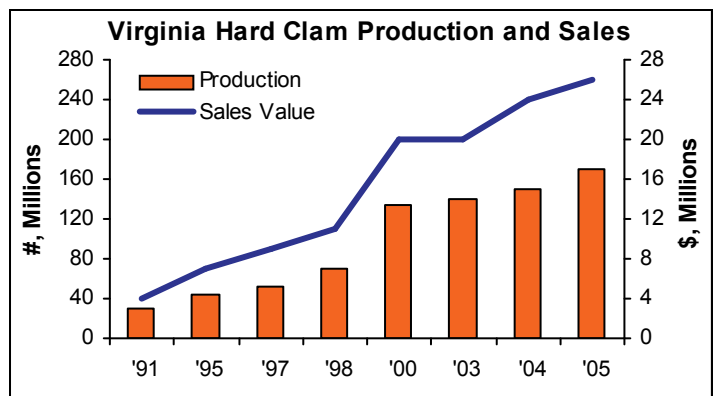
Hard clam farming has become a viable commercial form of aquaculture in Virginia only during the last 15 years (see graph of Virginia's production and sales during that time period). The first estimates of production in the state were reported in 1991 — 30 million clams and \$4 million in sales. By 1998, production had increased to over 70 million clams valued at \$11 million, with 25 farms reporting in the first national census of aquaculture. Today, the hard clam is considered to be the most valued single commodity produced among the Eastern Shore's diverse agricultural crops. Results of the 2005 aquaculture census (see table above) confirm that Virginia is also the leading producer of hard clams in the nation, both by production and by sales value. In addition, Virginia hatcheries sold 99 million clam seed valued at \$2 million last year.

To estimate the economic activity associated with clam farming, economists at the Virginia Institute of Marine Science conducted an economic impact study in 2004. This was similar to the 2001 study completed in Florida, which assessed the economic output of the clam industry to be \$34 million. Survey results in Virginia displayed the same type of multiplier effects. While initial clam sales by Virginia growers generated a direct impact on the local economy of \$30 million with 381 jobs, the total economic output was \$49 million with an added employment of 620 individuals.

There are several factors that have contributed to the growth of this industry over the past decade. According to one industry observer, these include a liberal leasing program with good growing locations, increased hatchery production,

and readily available market outlets (given their proximity to the Baltimore, Washington, Philadelphia and New York seafood dealers). With a minimal investment, it was possible for many people to enter into clam farming. Most were commercial watermen who already had "water knowledge" and much of the necessary skills and equipment. The presence of local seafood dealers eager to have a "new" supply of product accelerated this expansion, with some dealers becoming growers as well.

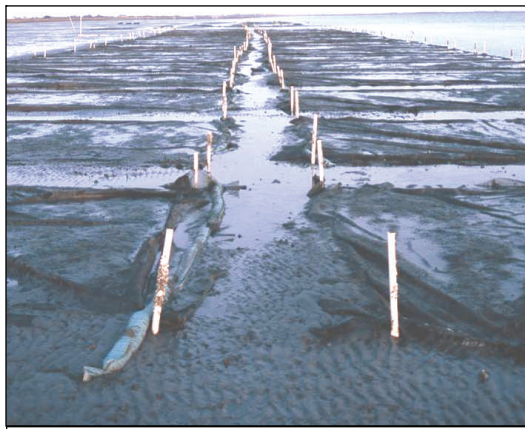
One of the biggest factors that has boosted the production of hard clams in Virginia and allowed for continuing prosperity, is the success of several firms, for example, Cherry-stone Aqua-Farms and J.C. Walker Brothers, and their incorporation of sound business strategies. Of the 5 to 6 firms who account for about 75% of the state's production, several use contract employees, called "clam cooperative growers" or "co



Virginia's Clam Industry (continued)

-opers," for high volume growout. This strategy was adapted from the poultry industry, the largest agriculture sector in Virginia, in which processing companies, like Perdue Farms and Tyson Foods, contract to 1,200 chicken farms.

The way contract growing works is that the larger company provides up-front services (seed, supplies, etc.), while the co-oper provides a growout site and the labor needed to tend the crop. When the crop is harvested, all of the product goes to the larger company, who re-coups some of the initial expenses, and then shares the profits. The larger company benefits by having more product available and grown in different sites to reduce the risk of catastrophic losses. The co-oper enjoys having no expenses until after the product is sold and does not have to worry about marketing. Having a greater supply of product available has allowed larger companies to expand their markets and remain competitive by stabilizing their pricing structure. Not only are production and profits increased through the use of co-ops, but so is employment, with the number of co-ops often greater than the number of individuals employed by the company. For example, Cherrystone Aqua-Farms employed 70 people in 2004, while 104 growers were contracted. Probably half of the Virginia clams marketed are produced by co-ops.



Bottom net culture used by Virginia growers

Bottom Plant Culture Method for Hard Clams

In Virginia, the growout culture method for hard clams is quite different than that used in Florida. Access to large intertidal areas along the coast allows growers in this state and other northeastern states to use a bottom plant method. At low tide, field-nursed seed (8-12 mm) are broadcasted in "beds" at densities of 50-100/ft² and covered with 1/4 to 1/2" plastic mesh netting, commonly called predator control screens or nets. The size of these beds varies in length (up to 150'), but the width is usually 14' or the width of a roll of netting. Since the nets are buoyant, various techniques (rebar, lead line) must be used to hold down the sides and ends. In Virginia, beds are usually 50' long and nets are held down with tubular gravel-filled bags. The average growout time is 2 years, but some beds are harvested after 14 months. This is typically done manually with hand rakes or, where legal,

with mechanical harvesters. The bottom plant method allows clams to dig deeper into the substrate, which may assist in their ability to tolerate harsher conditions experienced during the winter seasons. Survival rates can vary from 50 to 70%.

Sources of Information: 1) Mike Oesterling, VIMS, pers. comm.; 2) Murray and Kirkley, 2005, *Economic Activity Associated with Clam Aquaculture in VA-2004*, Virginia Sea Grant; 3) Petrocci, 2001/2, *Clam Farming Comes of Age*, Virginia Marine Resource Bulletin: 33(3); 4) Flimlin, 2000, *Nursery and Growout Methods for Aquacultured Shellfish*, NRAC Pub. 00-002.

CLAMMRS Water Monitoring Program is Back

During 2002-5 clam farmers in seven coastal counties could obtain "real-time" or archived information about water temperature, salinity and other parameters at or near their lease site by simply clicking onto a website. Water quality monitoring equipment was purchased and stations maintained through a USDA-funded project, nicknamed *CLAMMRS*, which concluded last year. Efforts to secure funding to continue operating these stations have been unsuccessful—until now! The USDA CSREES, UF/IFAS Shellfish



Aquaculture Extension Program, and FDACS Division of Aquaculture have recently entered into a cooperative partnership agreement with funding obtained from the USDA Risk Management Agency. Stations that will come online within the next couple of months include those located at the following lease areas: Dog Island and Gulf Jackson (Levy County), Horseshoe and Pine Island (Dixie County), Indian River (Indian River County), and Body F (Brevard County). More on *CLAMMRS* start-up dates soon.

Fresh from Florida features New Clam Logo

The Florida Agricultural Promotional Campaign (FAPC) is an identification and promotional program designed to boost the image of Florida's agriculture and aquaculture industries. The program's goal is to increase sales by helping consumers to easily identify Florida farm-raised products at retail stores. Coordinated by the Florida Department of Agriculture and Consumer Services (FDACS), the FAPC provides an opportunity for farmers to benefit from a multi-tiered advertising campaign. Those participating in the program can use a distinctive logo, depicting a sun over land and water, with either the *Fresh from Florida* or *From Florida* recognition. Many of Florida's farm-raised products have their own individual logo—for example, strawberries, ferns, watermelon, shrimp, alligator, orchids—and now, clams! High-resolution, print quality logos can be downloaded from the FDACS Bureau of Seafood and Aquaculture Marketing's website: www.fl-aquaculture.com, including vertical, horizontal, full color and black and white. Call (850) 488-0163 to learn more about joining this successful (and now clammy) promotional campaign.



Florida Shellfish Aquaculture Development Program supports applied research projects

Earlier this year it was announced that federal funding had been obtained through the efforts of the Cedar Key Aquaculture Association and Congresswoman Ginny Brown-Waite to initiate a new research program for Florida's clam farming industry — the Florida Shellfish Aquaculture Development Program to be administered by the UF/IFAS Shellfish Aquaculture Extension Program (see the February 2006 issue of *The Bivalve Bulletin*). Since then, a steering committee made up of clam growers, research and extension faculty, and state agency representatives met to identify research needs and set priorities. A proposal, developed by a team of researchers from the UF Department of Fisheries and Aquatics Sciences, UF Soil and Water Science Department, and Harbor Branch Oceanographic Institution, was submitted to the USDA for approval. Recently, the University of Florida received notification of funding and the following applied research projects will begin in 2007.

Clam Stock Improvement through Hybridization

Rationale: The need for a hardier clam strain has become evident over the past few years as clam farmers report below average survival or total losses during the summer months. In Florida, clams normally encounter high water temperatures and reduced phytoplankton levels. Typical water temperatures of 80-90°F are beyond the threshold for many algal species and can reduce clam pumping rates by 50% or more. At the same time, clam metabolism is higher and dissolved oxygen levels are reduced. Together, these stressors may contribute to the increasingly high mortalities seen in Florida.

Strain development through basic breeding takes many years and large financial and physical resources to accomplish. A quicker method to capitalize on genetic improvement is through other breeding techniques, such as hybridization. Hybridization is widely used in finfish aquaculture to improve growth, flesh quality, disease resistance or environmental tolerance. There has been limited commercial application of hybridization in shellfish aquaculture.

Background: The hard clam (*Mercenaria mercenaria*), or northern quahog, supports aquaculture operations in Florida and many other states along the east coast of the U.S., as well as fisheries, with a natural range from Canada to the Gulf of Mexico. The southern quahog (*Mercenaria campechiensis*) has supported commercial landings along the Atlantic and Gulf coasts of Florida and is commonly found from North Carolina to the Gulf of Mexico and Caribbean. The two clam species are normally separated by salinity and temperature tolerances. For example, the northern clam is more tolerant of low temperatures than the southern but less tolerant of high temperatures. Another important difference is shelf life. The southern quahog quickly gapes and will die in several days when removed from water. The longer shelf life of the northern clam is one reason it became an aquaculture candidate in the 1950-60s.

Studies have shown that the two clam species hybridize readily in the controlled conditions of a hatchery and offspring are fertile and viable. During the 1960-70s, a researcher at Florida State University's Marine Lab began to evaluate the potential of clam farming in Florida. Dr. Winston Menzel examined the use of hybrids, with the objective of producing faster growing clams for mariculture. His studies showed that hybrids do have superior commercial traits to either parent species, for example, as good or better growth as the faster growing southern quahog with shelf life as good as the northern parent. Unfortunately, little data was reported on the merit of hybrids for improved survival. Menzel concluded that more effective control of predators must be devised before clam culture could become a profitable venture. A rigorous examination of the use of clam hybridization for increasing survival and production in Florida waters is necessary.

Objectives: Triplicate families of northern hard clams, southern quahog clams, and their reciprocal hybrids will be produced in a hatchery. Spawning, larval and post-set rearing will follow standard protocols used in hard clam culture. Clam seed of each family will be field nursed and grown under commercial conditions. Production characteristics (growth and survival), will be compared between these families at several stocking densities and site locations using both the bag and bottom plant methods. The shelf life of these stocks in refrigerated storage will also be documented. Controlled laboratory experimental challenges will examine the combined effects of temperature and salinity on survivorship of these stocks using natural ranges found in Florida. The physiological mechanism by which hybridization may improve field survival will be determined.

Assessment of Soil Properties in Clam Lease Areas

Rationale: Accounting for variability in soil properties is crucial to understanding the interactions between soils and the plant/animal life supported by them. In aquaculture, clams spend a considerable portion of their life cycle buried in the soil. Soil physical and chemical properties likely have an effect on clam culture and vice versa. Understanding these relationships is crucial to maximizing harvests.

Objectives: As a first attempt at considering soil properties, soils inside and outside a high-use lease area and no-use lease area will be sampled and analyzed. Specifically, an initial land assessment using a soils-based approach will be conducted. In addition, a digital terrain model of the study areas will be created. Since it is likely that soil properties

vary considerable within leases, a grid-based sampling approach will be used for obtaining soil cores. Samples for bulk soil characteristics, for example, particle size distribution, bulk density, and organic matter content, will be analyzed to establish relationships between these characteristics and clam productivity.



RESEARCH UPDATE: National Market Assessment of Cultured Ark Clams

Background: Growth in Florida's hard clam industry has motivated growers/wholesalers to explore alternative bivalve species for market expansion. Two native clam species with commercial potential are the blood ark and ponderous ark. Wild stocks of these clams are currently harvested in North Carolina and Virginia in limited quantities for ethnic markets in the U.S. The development of a major fishery for these species has been limited by a variety of factors, including dispersed wild populations, minimum understanding of clam reproduction, and isolated markets. In the 1990s Virginia Institute of Marine Science investigated the aquaculture potential of ark clams and concluded that slow growth would be a constraint. More recently, UF researchers studied hatchery rearing techniques for seed production and monitored the production performance of arks in Florida waters. Rearing results will be provided in another newsletter issue. The marketability of cultured ark clams was also assessed.

Objectives: The overall objective of this study was to determine the market potential of blood ark and ponderous ark clams in the U.S. The study was conducted in three phases during 2003-5. The major focus of Phase I was to assess the market situation for the two ark clams, specifically to determine the trade's knowledge about them and attitudes toward handling them if adequate supplies were available. This was accomplished by mailing questionnaires to all certified shellfish wholesalers in the nation (over 2000). In Phase II, firms identified in Phase I as potential marketers of these clams were asked to evaluate basic product characteristics of live cultured samples, including appearance and organoleptic (taste, texture) qualities, and to estimate potential sales through their respective firms. Phase III determined the nutritional composition of each species and the shelf life under typical commercial refrigeration. Comparisons were also made to the cultured hard clam.

Results: Detailed results concerning Phase I and Phase II procedures and conclusions can be found in the Electronic Data Information Source (EDIS) publication FE478. Phase III results are summarized in EDIS publication FE568. Both papers are available at the website, <http://edis.ifas.ufl.edu>. The complete report can be found on the UF/IFAS Florida Agricultural Market Research Center's website, <http://www.agmarketing.ifas.ufl.edu>, first click on "Publications," then "Market Research Publications 2000+." The following is a summary of findings from this marketing study.

The survey responses revealed extremely limited trade awareness of the two ark clams; 92% of shellfish dealers were unfamiliar with them. Only 1% of responding firms reported selling these clams, and sales were very limited. However, nearly one-third of all respondents were willing to evaluate product samples of both species. Of these, a total of 82 firms agreed to examine and evaluate live cultured samples.

In the product evaluations, firms were asked to rank a number of basic characteristics using a zero-to-ten rating scale where 0 represented the "worst" and 10 represented the "best." For appearance, both ark clams received mediocre ratings (an average of 5). Respondents commented on the black "fuzzy" appearance of the shells. The attractiveness ratings for meat color fared worse, with average ratings of 4.2 for blood arks and 3.6 for ponderous arks. Many commented negatively on the bloody appearance of the meats. Taste ratings for both arks, whether eaten raw or cooked, averaged 5. Texture responses ranged from "slightly" or "much too tough." Only 10% of the firms made sales projections, but estimates were extremely variable.

In comparison with the hard clam, the two ark clams were slightly lower in calories and protein, but similar in total fats, cholesterol, and total carbohydrate. Greater differences were found in the iron and sodium values. Ark clams provided 2 to 3 times the daily percent values for iron than did hard clams, most likely due to the presence of hemoglobin in the meat tissues which also accounts for their characteristic reddish-orange coloration.

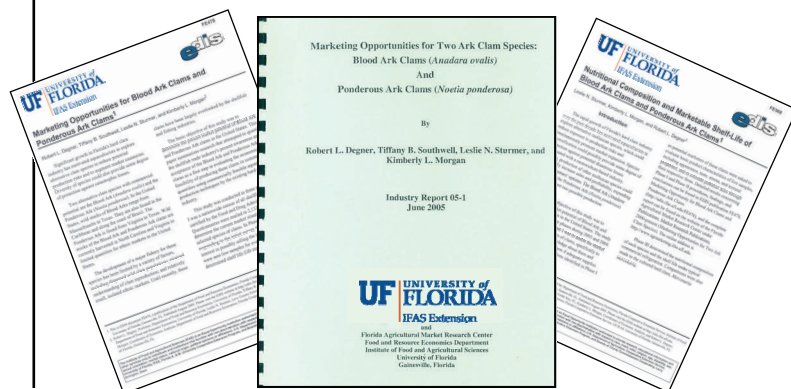
In this study, the blood ark clams showed similar responses to refrigerated storage as hard clams. Survival of blood arks, harvested in winter months, dropped below 90% after 13 days in a cooler but gaping was frequently observed. Survival of ponderous ark clams was 100% up to 22 days in refrigerated storage. The majority of ponderous arks remained tightly closed throughout the evaluation.

Summary: The current market for both the blood ark and ponderous ark is very limited in the U.S. There is a widespread lack of familiarity with these species, and very few dealers are currently selling them. The product evaluations and survey comments indicate that these two clams are perceived as being too different from clams currently available on the market. It is unlikely there will be a "mainstream" demand for ark clams in the U.S. Despite these findings, market development proponents should recognize the importance of ethnic markets in target locations on both the East and West coasts. Targeting seafood dealers in those areas with large Asian and Hispanic populations could result in profitable niche markets.

This research was conducted by the Florida Agricultural Market Research Center with funding from USDA CSREES. Contact Dr. Bob Degner, UF Food and Resource Economics Department, at (352) 392-1871, ext. 454 for more information.



Ponderous Ark, top
Blood Ark, bottom





CLAMunications



Sebastian Clambake Festival

November 5-7

Riverfront Park, Sebastian

The City of Sebastian will again showcase their commercial fisheries, clam industry, and natural history during a 3-day event. The clambake forges a common bond between the clamming families in the community and new residents. Clams are served just about anyway they can be with entertainment provided throughout the event. (The festival will most likely have occurred by the time you receive this newsletter. Regardless, it was great to announce the recurrence of this popular event after the devastating impact to the area from the 2004 hurricane season.)

Clam Industry Task Force Meeting

Friday, November 17, 10:30 AM – 1:00 PM

Hillsborough Community College, Brandon Campus
1014 Columbus Drive, Tampa

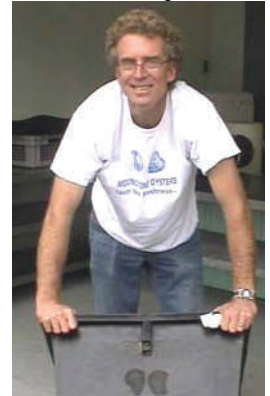
The next meeting of the Task Force is scheduled to coincide with the Florida Aquaculture Association's annual conference. The agenda will include updates on the USDA Aquaculture Block Grant and the state-funded Clam Disaster Assistance Program. Additional agenda items are to be submitted by task force members to the DACS Division of Aquaculture. Industry members are welcome to attend. If you cannot, stay informed through your regional representative.

Florida Aquaculture Association Annual Conference

Friday and Saturday, November 17-18

Hillsborough Community College, Tampa

Several renowned experts in their field will be giving presentations at the Florida Aquaculture Association's "Exploring Aquaculture Opportunities in Florida" Conference. Sessions will include an overview on effective recirculating systems, water quality management, future opportunities in offshore aquaculture, disaster preparedness, and more. A reception will be held at The Florida Aquarium, where their new AquariuMania display showcases Florida's tropical fish farming industry. The Shellfish Commodity Session will feature Bob Rheault, president of Moonstone Oysters, RI and the East Coast Shellfish Growers Association, who will speak about the industry's challenges from both a business and organizational perspective. A research and extension roundtable will allow for updates on ongoing shellfish projects. The full agenda and registration form are posted at <http://flaa.org>, or call (863) 293-



Bob Rheault
Moonstone Oysters, RI
Featured FAA speaker

Growers in Brevard, Dixie, Indian River and Levy Counties remember to sign-up or change your coverage for the pilot crop insurance program by November 30. Ask about their catastrophic coverage level (50/55) available for \$100.

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Shellfish Aquaculture

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