

Bio-floc shrimp system yields high density production, low FCR's, and superior survival rates using bottom diffused aeration and patented probiotics



Charles "Sandy" Harris photos
Installing 9000 feet of air diffusion tubing.

by Charles "Sandy" Harris

SINALOA, MEXICO – SEA PRO is a commercial shrimp production company doing business on the Gulf of California, on the west coast of Mexico.

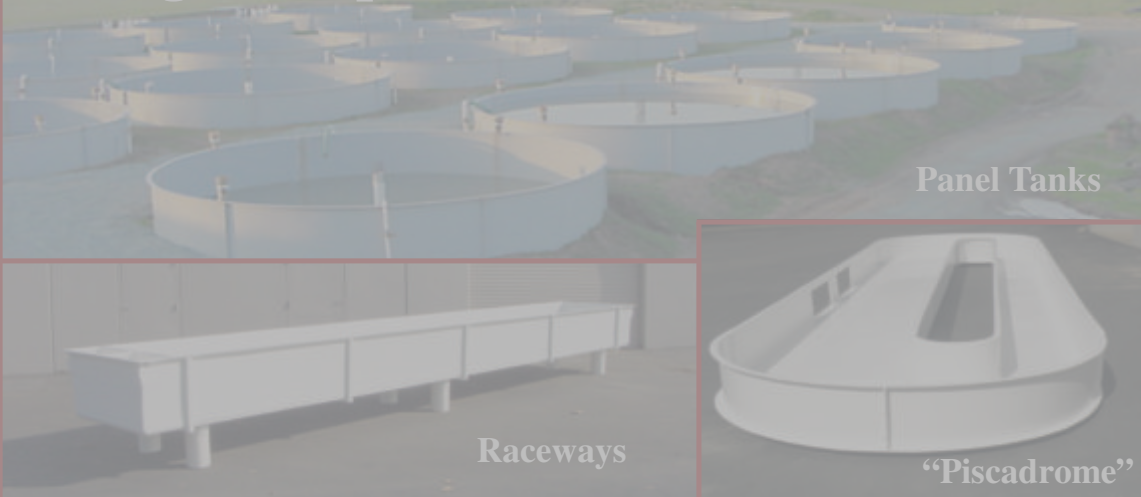
The Gulf of California coastline, north and south of the port of Toplobampo in Sinaloa state, supports more than 50,000 hectares of shrimp production ponds – principally in the states of Sonora and Sinaloa, but also south into the states of Nayarit, Colima, and Guerrero.

The majority of these Pacific west coast shrimp aquaculture farms employ traditional extensive or semi-intensive pond management production methods.

This includes heavy feeding of concentrated marine protein diets and diluting nutrient accumulation in the ponds via daily water exchange rates that normally average 10%-20% of pond volume during peak production.

With several years of commercial shrimp production experience, SEA PRO biologist Takeo Matsumoto began to evaluate options for improving routine shrimp farming

Fiberglass Aquaculture Tanks



Panel Tanks

Raceways

"Piscadrome"



FIBERGLASS inc.

"Quality Products at Competitive Cost"

www.dtfiberglass.com

Sacramento, California USA

Tel: 916 · 383-9012 Fax: 916 · 383-1851

- Huge Inventory
- Custom Design
- Favorable Shipping



MADE IN USA



Charles "Sandy" Harris photo
650 scfm positive displacement blowers.

management practices.

SEA PRO concluded that traditional aquaculture practices employed in the region are not sustainable, principally due to the biosecurity problem of dealing with shrimp diseases – particularly White Spot.

In addition, excessive agricultural and municipal runoff, plus nutrients discharged from concentrated aqua farming activity, is producing eutrophication in the estuarine environments that are the primary water supplies to many regional shrimp farms.

And another critical factor with respect to industrial sustainability has been the continued increased cost of marine proteins that are incorporated into balanced shrimp diets.

Excessive market demand and overexploitation of Mexico's commercial Pacific fishery for the Monterrey sardine (*Sardinops sagax*) has this important marine protein resource declining.

In 2010, sardine meal was around \$1,000 per ton – while the sustainability of current fishing pressure on the resource was being challenged by a consortium of six Mexican scientific institutions working to monitor Pacific and Gulf sardine fisheries.

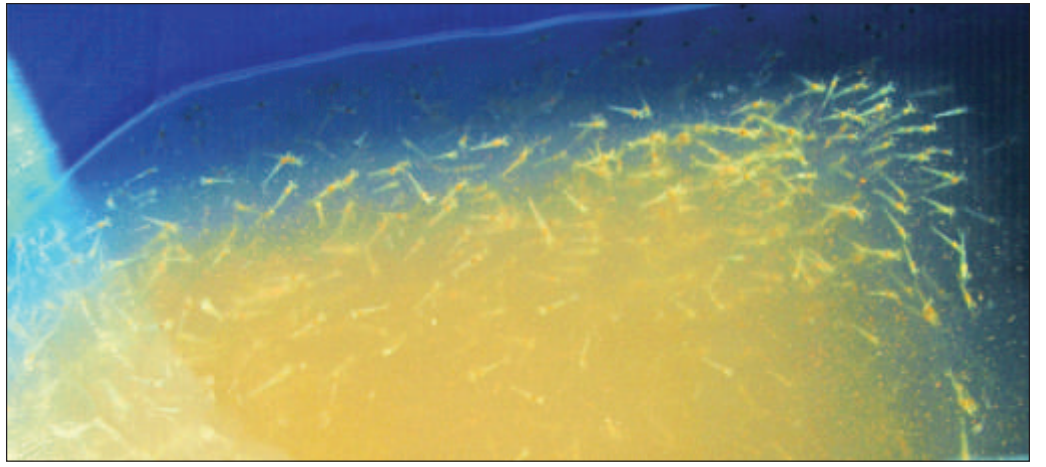
Prices for balanced shrimp diets containing moderate levels of marine fish protein increased to record highs.

With shrimp market prices naturally declining during the economic downturn, while aquaculture feed prices continued an upward trend, addressing the question of "sustainability" appeared to be a debate that could no longer be ignored.

In 2009, biologist Matsumoto decided that a change in shrimp aquaculture production practices was fundamental to future SEA PRO business.

Recycling the nutrients discharged into the environment by traditional aquaculture systems, he believed, offered a promising opportunity to make a change.

See MEXICAN SHRIMP, next page



Charles "Sandy" Harris photo

700,000 PL15 Pacific white shrimp were stocked June 6 in the 11,500m3 bio-floc production pond, stocking rate: 80/m2 or 60/m3.

If it has fins, our catalog can help you raise it.

Eagar Inc. offers a complete line of aquaculture products at economical prices. Call today for a FREE catalog.
1 (800) 423-6249

EAGAR INC

Aquarium, Zoo & Aquaculture Applications

Mermaids know...

Fybroc® has the world's most complete line of aquarium, zoo and aquaculture pumps...

Fybroc helps keep sealife alive!!

PRIMARY ADVANTAGES

- ✦ NO corrosion
- ✦ NO harmful leaching of minerals into the exhibit environment

FEATURES

- ✦ Capacities from 5 to 5,000 GPM
- ✦ Heads to 450 feet
- ✦ Horizontal/vertical configurations

TYPICAL AQUARIUM APPLICATIONS

- ✦ Filtration
- ✦ Recirculation
- ✦ Ozone systems
- ✦ Sea water in-take
- ✦ Foam fractionation
- ✦ Heat exchange

Ideally suited for both freshwater and seawater exhibits

ANNOUNCING a new name in pumping solutions!

MET-PRO
Global Pump Solutions

A Met-Pro Fluid Handling Technologies Business
Combining the Resources of Dean Pump, Fybroc & Sethco

700 Emlen Way, Telford, PA 18969
TOLL FREE 1-800-FYBROC 1
Fax 215-723-2197
info@mp-gps.com

www.mp-gps.com

Met-Pro GPS is leading the way!



We have more than 400 standard sizes and shapes, and specialize in custom fabrications.

See our price list at

www.aquaculturetanks.com

Email: DolphinFBG@aol.com

305-247-1748

Fax 305-247-8750 • Homestead, FL

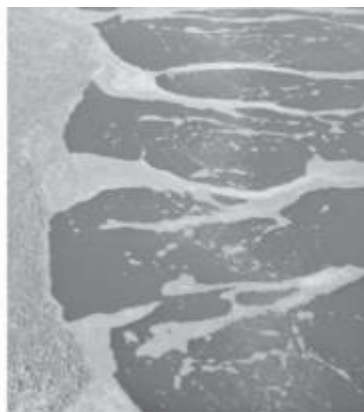


Charles "Sandy" Harris photos

Mexican shrimp Continued from previous page

So production management for *in vitro* bioremediation of aquaculture nutrient wastes was planned.

This was to be an effort to reduce the requirements for costly high protein shrimp feed formulations, and at the same time, achieve significantly improved feed conversion



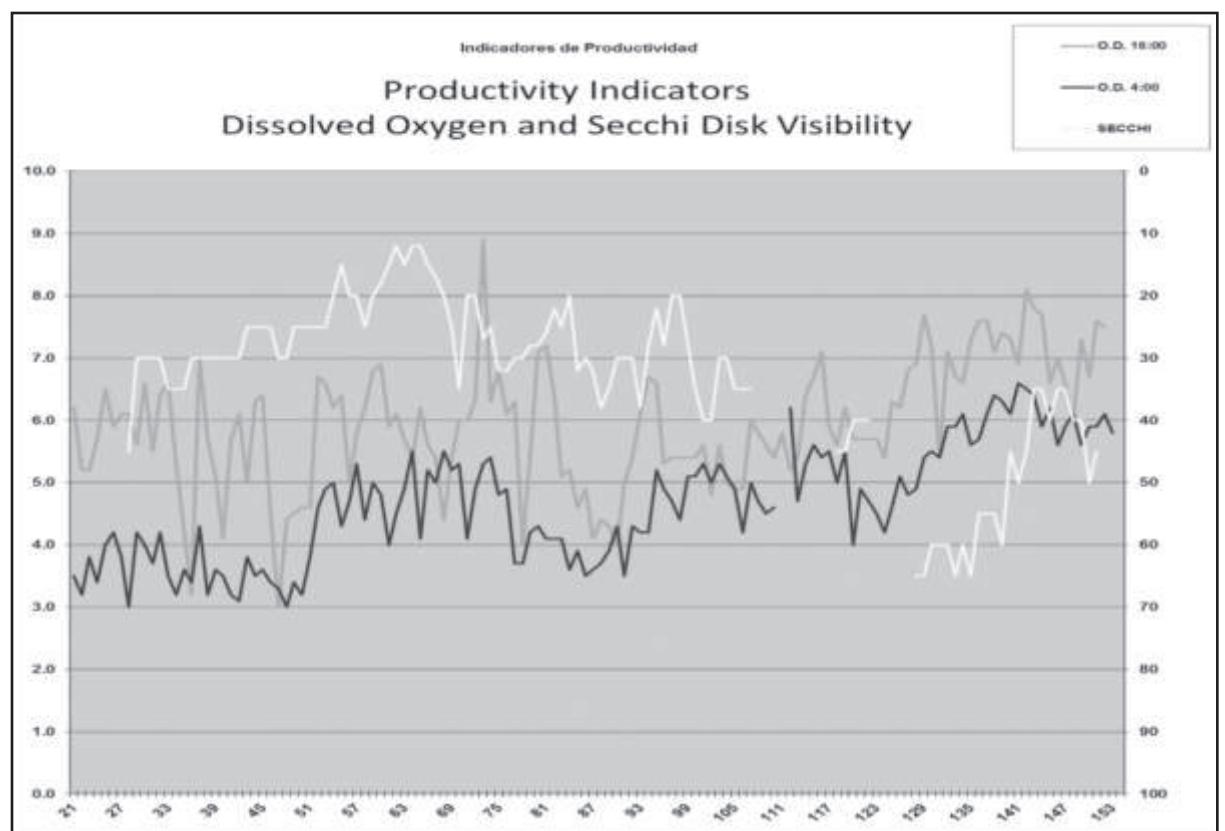
ratios to enhance economic productivity of the shrimp farming enterprise.

These factors provided sufficient motivation to build Mexico's first bio-floc shrimp production project.

In Mexico's northwestern coastal Gulf of California region, Construcción e Ingeniería Ambiental, SA de CV (CIASA) had been working to provide systems design engineering, procurement, and construction services for commercial aquaculture installations by specifying proprietary technologies that could competitively advance survival and production yields.

CIASA is the engineering/procurement/construction (EPC) contractor for a new 1,000-hectare aquafarm development along the Rio Fuerte in northern Sinaloa called "Project Paradise."

For several years, SEA PRO and CIASA had debated technology options but in 2009, finally joined forces to design and plan the first super-



Kgs feed consumed	13150
Kgs of shrimp harvested	9341
FCR	1.41: 1
Kgs of molasses applied	7869



Charles "Sandy" Harris photos

high-density closed bio-floc production system in northwest Mexico.

During early 2010, supplies and materials were procured and installations begun according to CIASA specifications. SEA PRO filled the pilot pond in May, 2010.

During the 2010 shrimp production cycle, the incidence of White Spot Virus Syndrome (WSSV) became prevalent in the region with an estimated 90 farms in Sonora experiencing significant losses as the disease reached into northern Sinaloa by early June, about the time SEA PRO was preparing to stock *L. vannamei* PL15 at super high densities not common to the regional industry.

By this time traditional producers were harvesting ponds at 8-10 grams to avoid losing the entire year 2010 harvest.

Prior to stocking, SEA PRO had elected to comply with consulting recommendations for applying routine biweekly treatments of LYMNOZYME® preblend probiotic formula provided for the bio-floc project by Keeton Industries of Wellington, CO.

LYMNOZYME® was selected as the preferred probiotic formulation to confront the possibility of a disease outbreak in the SEA PRO bio-floc trial since there were reports of improved biosecurity for shrimp farms in Ecuador, Brazil, and Vietnam.


50 gram granular packages were incubated for 48 hours in nutrient

See MEXICAN SHRIMP, next page


Maine's Aquaculture Business Incubators provide more than just water...

We offer:

- ✓ Extensive technical support with access to juveniles and seed
- ✓ Academic partnerships with the University of Maine
- ✓ Entrepreneurial training and business counseling
- ✓ RAS and flow-thru culture facilities from 50 - 1000 m²
- ✓ State-of-the-art culture systems
- ✓ Business support facilities and networking opportunities
- ✓ Assistance in grant writing and identifying funding opportunities
- ✓ plus exceptionally high quality sources of water!




Welpole Aquaculture Business Incubator
Darling Marine Center




Franklin Aquaculture Business Incubator
Center for Cooperative Aquaculture Research

FOR MORE INFORMATION, CONTACT:
CHRIS DAVIS, MAINE AQUACULTURE INNOVATION CENTER
5717 CORBETT HALL, RM 436, ORONO, ME. 04469-5717
207.581.2263 MAIC@MAINEAQUACULTURE.ORG

Fundamentals of Aquaculture James W. Avault, Jr., Ph.D. 

A STEP-BY-STEP GUIDE TO COMMERCIAL AQUACULTURE

If you are a fish farmer or thinking of becoming a fish farmer **THIS BOOK IS FOR YOU!**



This Book is:

- Practical Aquaculture covered from A to Z
- An easy-to-follow text at the college level
- A comprehensive guide for the beginning fish farmer
- A reference for someone established in aquaculture

Fundamentals of Aquaculture & companion Manual: Order both today for: \$79.00!

Fundamentals of Aquaculture \$69.95 Add \$6.00 for US shipping
Companion Manual alone: \$9.95 Add \$2.00 for US shipping

To order or for more information:
Call: 225-763-9656 – Fax: 225-766-0728
Email: AVApub@cox.net
Website: www.AVApub.com

AVA Publishing Company, Inc.
PO Box 84060
Baton Rouge, LA 70884-4060 USA

AND

NOW GET the NEW Companion Aquaculture Manual For Teaching and Extension:

Based on the Book *Fundamentals of Aquaculture*

This Manual:

- Provides teachers with a guide for using the book *Fundamentals of Aquaculture in the Classroom*
- Provides extension specialists with a guide when conducting short courses for fish farmers.

Mastercard & Visa Accepted
Please send checks in US Funds
Louisiana residents add 9% sales tax

Advanced Aquaculture Systems, Inc.

PERMA-BEADS™
REPLACE SAND IN ANY SAND FILTER!

Perma-Bead™ Media

- eliminate clogging, channeling and compaction in all sand filters
- never need replacing
- are easy to install
- need no plumbing changes
- reduce maintenance time
- provide superb water quality and water usage
- have been in continuous use for over 20 years in thousands of filters

Perma-Bead™ Water Filtration Systems

ARE CUSTOM DESIGNED FOR YOUR PROJECTS!



- Preassembled, compact, skid-mounted systems with automatic backwash, ultra violet sterilizers, variable speed pumps and many other available options.
- Minimize your install costs with our "Plug & Play" system.

Call for a quote today!

- FREE System Design
- FREE Technical Support

Advanced Aquaculture Systems, Inc.
4509 Hickory Creek Lane
Brandon, FL 33511
Toll Free: 800-994-7599
www.perma-bead.com
advacu@aol.com

Mexican shrimp —

Continued from previous page
concentrated seawater obtained from the SEA PRO production pond and applied every 15 days – from stocking up to two weeks prior to harvest.

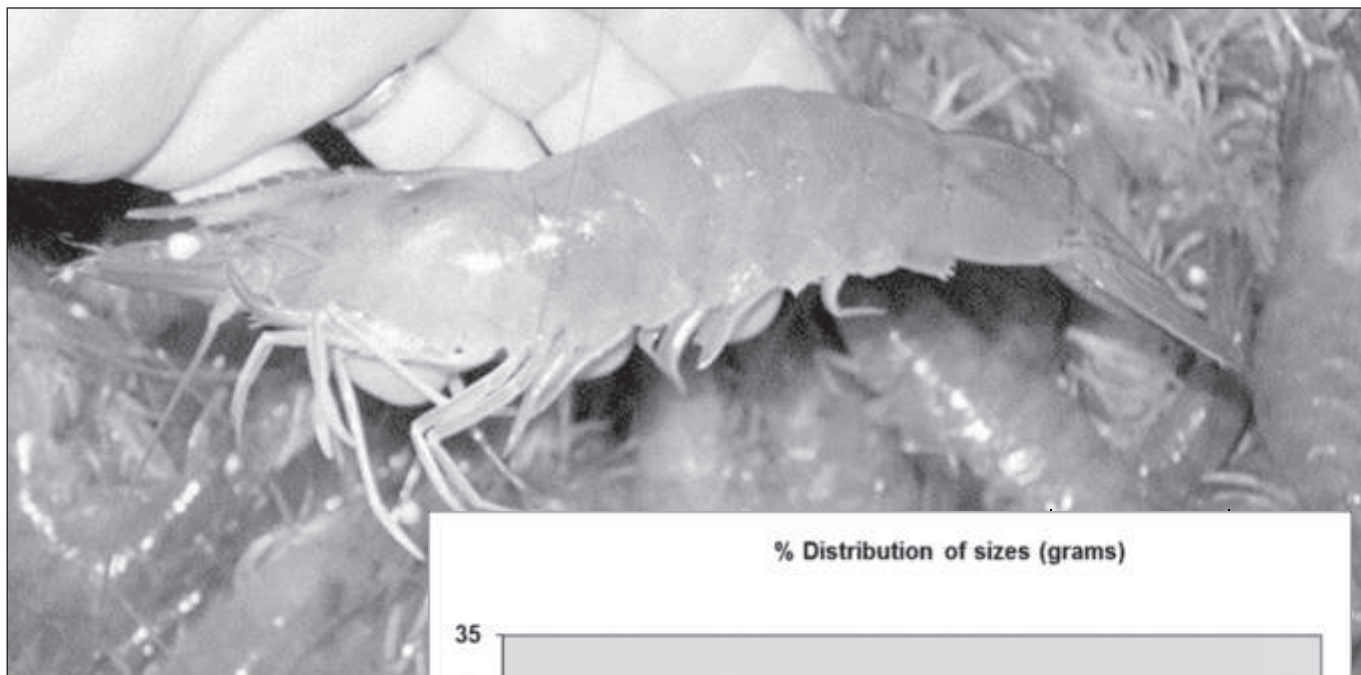
No bacterial disease problems or WSSV outbreaks were encountered.

Of the 700,000 PL's stocked in June, following the final harvest in November Matsumoto reported a total shrimp biomass harvested to be 9,341 kilograms made up of 601,800 organisms for an approximate survival rate in excess of 85%.

By late August and early September, daytime water temperatures averaged 33°-35°C. With feeding rates in excess of 160 kgs/ha/day and the shrimp biomass exceeding 7+ tons/hectare, significant bacterial bio-floc on the pond surface was generated daily.

With salinity maintained at a 26 ppt average, and ammonia nitrogen maintained by balancing carbon inputs via added sugar cane molasses at an average of 1.5 mg/l, feed protein levels were reduced from 32% to 26% to lower feed costs.

Due to heavy organic loading on a daily basis, and with ammonia nitrogen fluctuating in the closed system, SEA PRO elected to apply additional treatments of waste sludge reducer

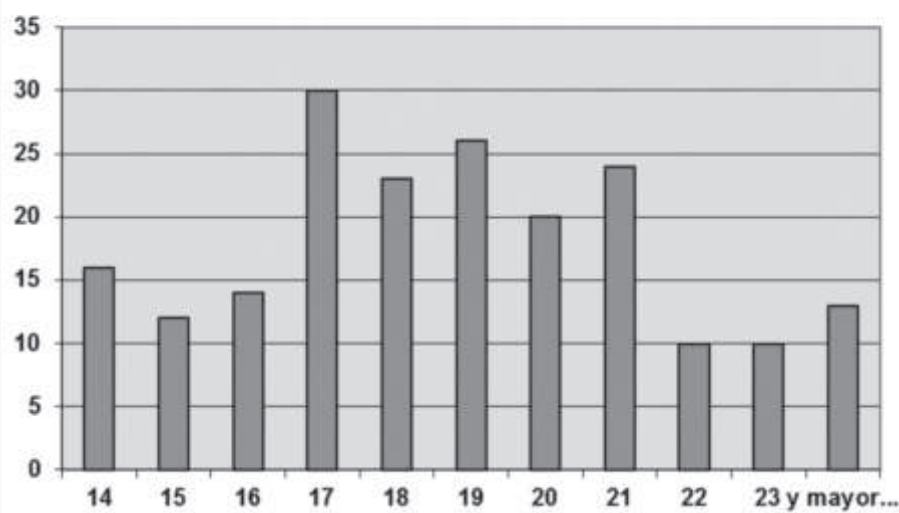


Charles "Sandy" Harris photo

Pacific white shrimp harvested from SeaPro bio-floc system at Topolobampo, Gulf of California, Sinaloa, Mexico at 10.9 tons/hectare, Nov. 2010.

bacteria provided by Keeton Industries, using their WSR™ preblend of beneficial microbes. The objective was to keep sludge production and ammonia levels under

% Distribution of sizes (grams)



GAGE TECHNICAL GEAR

From: Grundéns USA

WATERPROOF BREATHABLE

Packable



Gage Weather Watch - 420 Gage Nylon Shell
The toughest lightweight foul weather outer shell available. Waterproof, breathable fabric, fully taped seams. Not a replacement for Heavy Duty PVC rain gear but a great backup set to have in your quiver.

WWW.GRUNDENS.COM
Need to find an Authorized Dealer
Call 800-323-7327

Research and Sampling Gear

Anyone can build you a net. We build target specific gear.

30 years plus of designing, fabricating and field testing our own devices in saltwater marsh, inland river systems and the open ocean. No baseball, no soccer, no fish hooks or waders...just straight up sampling gear. No other shop has our in-the-field experience.

Pelagic.....Benthic.....Endobenthic.....Epibenthic..... we've got designs of gears to fit your need or we'll design something specifically for you. Its **ALL** we do.

* Skate Trawls * Mini-Missouri nets * Heavy Duty Collection Seines * and more

Our shop is small and family owned. We're located deep in the Cajun Country of Southwest Louisiana. No fancy building, catalog or sales pitch. We might be small and we may be slow **but what we deliver works!**

Innovative Net Systems

A Division of Trawl and Repair Service LLC.
PO Box 255-111 Zothique Rd.
Milton, Louisiana 70558
tel: (337) 856-1948
www.fishtrawls.com



control while optimizing dissolved oxygen (DO) profiles for producing beneficial microbial bio-floc.

Feeding rates were managed by routine evaluation of multiple production parameters of DO, TAN levels, pH, temperature, and by incorporating feed consumption sampling trays, exhibiting an 8 gram animal by Aug. 13, 2010.

A final feed conversion ratio (FCR) was calculated at 1.41:1, based on total round weight harvested and total feed applied – molasses application not included as part of the FCR calculation.

Partial harvesting was implemented with the initial harvest in September to service strong a national market demand for 12-15 gram whole shrimp.

The second harvest was in October for a special client order, and the final harvest was completed Nov. 5, as required by aquaculture sanitation agreements regarding biosecurity policies for regional WSSV management.

Charles "Sandy" Harris is a biologist and director of Construcción e Ingeniería Ambiental, SA de CV (CIASA) of Los Mochis, Sinaloa, Mexico.

Acknowledgements:

SEA PRO wishes to express sincere gratitude to the following companies and individuals:

Charles W. "Sandy" Harris, director of Construcción e Ingeniería Ambiental, SA de CV of Los Mochis, Sinaloa, Mexico, for systems design engineering, procurement, installation, operational training, and probiotic program management;

Jim Keeton, president, Keeton Industries of Wellington, CO, for providing probiotic and sludge digestion microbes as well as recommendations during the study;

Eduardo Ayala, of Propulsion Neumatica, SA de CV of Monterrey, Nuevo Leon, Mexico for providing high quality, trouble free blower systems and importing the US diffuser tubing;

Jim Dartez, president of Reliant Water Systems of New Orleans, LA, for providing dissolved oxygen monitoring equipment;

Jonathan Rhoten, of Deutrel Industries in Lancaster, CA, for providing the biological catalyst "Open All Water Oxygen Formula" for air systems maintenance; and

The Secretaria de, Agricultura, Ganaderia, Desarrollo Rural, Pesca y Alimentacion, SAGARPA Sinaloa offices in Culiacan, for project economic support.

SEA PRO SHRIMP BIO-FLOC PRODUCTION SUMMARY

700,000 PL's stocked			
Harvest	Kgs Harvested	Average Weight Grams	Individual Count
Preharvest	3,500	12.58	278,219
Secondary harvest	1,000	16.76	59,666
Final harvest	4,841	18.34	263,959
Total harvested (Kgs)	9,341 601,844		601,844
Survival	86.0%		
Yield	10,615 kgs/ha		

SMART CHOICE!

All NEW SMART3 Colorimeter

In the field or in the lab! Easy-to-use software lets you select a test factor from over 80 pre-programmed calibrations. Data logger holds up to 500 time and date stamped data points to download via a USB connection.

- Lithium rechargeable batteries
- Waterproof to IP67
- Seven languages

Visit our website for New Products!
www.lamotte.com

LaMotte

PO Box 329 • Chestertown, MD 21620
800-344-3100 • f 410-778-6394

Save money with improved management practices

What if you had an integrated production management system that reduced costs and increased profitability?

In-Situ® Aquaculture System automates oxygen control as well as feed and inventory management.

With feed costs on the rise, you need an efficient way to track feed usage and pond inventory. In-Situ Feed and Inventory Management software calculates an optimum feed rate for each pond and relays this information to your feed truck. Fish are fed exactly what they need.

Visit www.in-situ.com or call David Chance at 501-553-2293.



In-Situ Aquaculture™

Healthy water
Healthy fish
Healthy profits