

Integrated Oyster
**Market Research
Product Development, Evaluation
Promotion and Consumer Education for the
Gulf of Mexico's Oyster Industry**

Sea Grant Award No. NA16RG2195 (GSAFFI #88) Project R/LR-Q-23 Year 2
PROJECT FINAL REPORT (Years 1 & 2)

GULF OYSTER MANUAL



September 2004



**The Mississippi Department
of Marine Resources**

Managing Your Marine Resources Today for a Sound Tomorrow



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September 2004

This research program and publication of the Gulf & South Atlantic Fisheries Foundation, Inc. was supported by the National Sea Grant College Program with support from the National Oceanic and Atmospheric Administration, Office of Sea Grant, U.S. Department of Commerce, under Grant No. NA16RG2195 (GSAFFI #81 & #88) Project R/LR-Q-23 Year 1 and 2. The views expressed herein are those of the authors and do not necessarily reflect the views of the U.S. Department of Commerce or any of its sub-agencies.

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Foreword

The World's An Oyster...

Oysters, oh glorious oysters! People either love it or hate it. But those of us who revel in its mystique know that oysters, whether served raw on the halfshell or elaborately prepared into a delicate entrée, never cease to delight the senses. In fact, this quintessential mollusc has pleased the human palate and captured people's imagination since time immemorial. Perhaps more than any other seafood, these humble creatures of the flats have graced hundreds of gourmet restaurants and filled pages of cookbooks and family recipes worldwide.

Americans have always shown a great liking for eating oysters -- especially raw oysters on the halfshell. Unfortunately, its popularity also led to an increase in the number of reported cases of preventable *Vibrio*-related illnesses and mortalities associated with eating raw oysters. This prompted the NOAA National Sea Grant Program to award a two-year, multi-state collaborative oyster marketing research and consumer education grant to the following agencies: Gulf and South Atlantic Fisheries Foundation, Florida Department of Agriculture's Bureau of Seafood and Aquaculture Marketing, Louisiana Seafood Promotion and Marketing Board, and the Seafood Technology Bureau of the Mississippi Department of Marine Resources.

The goal of this project was to increase the overall sales and consumption of Gulf oysters through the development and promotion of safer post-harvest processed (PHP) oysters products, processes and technologies. It also seeks to develop effective education and promotion strategies aimed at the general consumers and food service professionals. Awareness of the risks involved in eating oysters and information on the availability of equally good tasting and safer product alternatives was the main focus of the project's education program. In this regard, the Florida Department of Agriculture and Consumer Services developed appropriate consumer education materials and communication strategies targeted at food service professionals and the at-risk consumer segment of the population.

Expanding the market for oysters also called for increased visibility and availability of these new product alternatives. The Oyster Task force of the Louisiana Seafood Promotion and Marketing Board took the lead in developing and implementing a PHP oyster marketing and promotion program aimed at the general oyster-eating population as well as potential new oyster consumers.

Consumer acceptance of new PHP oyster product alternatives ultimately depended on whether they taste better and provided more appealing value-added attributes than raw oysters. To this end, the Mississippi Department of Marine Resources conducted sensory evaluation tests on commercially available PHP oysters and other, new value-added oyster products. It is hoped that the results of these tests will be used by the seafood processing and restaurant industries to improve the sensory quality and consumer acceptability of current post-harvest processed oysters, screen other promising value-added

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oyster products for later development, and aid in the production of PHP oyster marketing and consumer education materials as well as industry–focused technology transfer strategies.

At the conclusion of the Gulf Oyster Project, the collaborating agencies held a public conference and incorporated the project’s findings into a comprehensive “Gulf Oyster Manual.” This manual highlights the key research, outreach, and technology transfer programs implemented by this project, but written in the language of the target audience, i.e., extension professionals, potential investors or entrepreneurs interested in oyster post harvest processing technologies. Given the nature and interests of the target audience, this manual incorporates a sample feasibility study and business opportunity plan for a hypothetical company, Heavenly Oysters Factory, using the primary research findings and data generated by this project as inputs. The pro-forma business plan contained in this manual is just a guide to help people tailor their own plans that suit their particular business needs and situation. Those interested in more detailed technical information regarding the findings of this project are referred to the two-volume reports published by the Gulf and South Atlantic Fisheries Foundation, Inc.:

Jamir, et al. 2003. *Final Report: Integrated Oyster Market Research, Product Development, Evaluation, Promotion and Consumer Education for the Gulf of Mexico’s Oyster Industry*. Sea Grant Contract #NA16RG1720 (GSAFF #81) Project R/LR-Q-23 Year I.

Jamir, et al. 2004. *Final Report: Integrated Oyster Market Research, Product Development, Evaluation, Promotion and Consumer Education for the Gulf of Mexico’s Oyster Industry*. Sea Grant Contract #NA16RG2195 (GSAFF #88) Project R/LR-Q-23 Year II.

Acknowledgements

The authors would like to acknowledge the support and contributions of the following organizations and individuals who made this project possible. Gwen Hughes, Charlotte Irsch and David Medici of the Gulf and South Atlantic Fisheries Foundation, Inc. for all the hard work involved in running the administrative and financial aspect of this multi-state and multi-agency project. The Mississippi Department of Marine Resources provided substantial support for this project, more specifically: Jeff Davis, Rod Jordan, Jan Welker, Clay Boulet, Irvin Jackson, Lauren Thompson, Tom van Devender, Joe Jewell and William “Corky” Perret. Staff support from the Coastal Research and Extension Center of the Mississippi State University (MSU-CREC) are also acknowledged, especially Neil Bogart, Jonathan Wilborn, April Gandy, and Michael Lynn Tynes of the MSU-CREC Department of Food Science and Technology, and to Patrick Broussard, Tommy Schultz and Susan Deblanc of MSU-CREC Experimental Seafood Processing Laboratory. Gordon Larson of Gulfside Productions provided the video footage and edits that went into the development of the CD/DVD version of various commercial PHP technologies. Thanks is also extended to all the able and energetic staff of Florida Bureau of Seafood and Aquaculture Marketing as well as the Louisiana Seafood Promotion Board who also contributed vast amounts of time and effort to make this project a success.

Of course the project is largely indebted to the region’s participating seafood processing firms, especially Ameripure Processing Company, Motivatit Seafoods, Bluepoints International Fisheries, Inc., Water Street Seafood, and Joey’s Oysters, who graciously shared their facilities and expert advice to make this project grounded in reality. The same goes to Bradford’s Oyster Company, Crystal Seas Seafood, Fournier and Sons, Gulf Stream Seafood, J and W Seafood, Terry’s Seafood and all of the Mississippi seafood dealers who went out of their way to assist the project team in whatever capacity they could. Thank you very much.

This research project and publication of the Gulf and South Atlantic Fisheries Foundation, Inc. was supported by the National Sea Grant College Program with financial support from the National Oceanic and Atmospheric Administration, Office of Sea Grant, U.S. Department of Commerce, under Grant No. NA16RG1720 Project R/LR-A-23 Years 1 and 2. The views expressed herein are those of the authors and do not necessarily reflect the views of the U.S. Department of Commerce or any of its sub-agencies.

Support for this project also came from other agencies like the Gulf Oyster Industry Initiative, Florida Sea Grant College Program, the Oyster Task Force of the Louisiana Seafood Promotion Board, Mississippi Sea Grant College Program, Mississippi State University (MSU) Coastal Research & Extension Center, and the MSU Department of Food Science, Nutrition and Health Promotion.



Bon Appetit!

The Gulf Oyster Project Team

Principal Investigator

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Mississippi State University



The Gulf Oyster Project

PROJECT TITLE:

Integrated Oyster Market Research, Product Development and Evaluation, Promotion and Consumer Education for the Gulf of Mexico's Oyster Industry

AMOUNT OF GRANT:

YEAR 1

Federal: \$ 200,000

Match: \$ 100,000

Total: \$ 300,000

YEAR 2

Federal: \$ 200,000

Match: \$ 100,000

Total: \$ 300,000

AWARD PERIOD:

From: October 1, 2001

To: September 30, 2004

GRANTEE:

Gulf & South Atlantic Fisheries Foundation, Inc.
Lincoln Center, Suite 740
5401 West Kennedy Boulevard
Tampa, FL 33609

I. INTRODUCTION

Every year millions of Americans love to eat oysters, especially raw oysters on the half-shell. For a small segment of the population, however, eating raw or undercooked oysters could cause serious illness or even death from *Vibrio vulnificus*, a bacterium commonly found in warm waters, including approved oyster harvesting areas in the Gulf of Mexico. Infection can also occur when cuts, burns, or sores come in contact with seawater containing *V. vulnificus*. As a warm water species, the amount of *V. vulnificus* found in oysters tends to be higher during warm weather months of April through October. What makes it difficult for consumers to detect *V. vulnificus* is that it does not change the appearance, taste, or odor of oysters.

Although most healthy individuals are not at risk from *V. vulnificus* infections, those with any of the following conditions belong to the “at risk” category: liver disease; alcoholism; diabetes; AIDS or HIV infection; gastric disorders; inflammatory bowel disease; cancer (including lymphoma, leukemia, Hodgkin’s disease); hemochromatosis/hemosiderosis; steroid dependency (as used for conditions such as emphysema, chronic obstructive pulmonary disease, etc.); and any illness or medical treatment which results in a compromised immune system. While there is no shortage of quality medical/health care professionals in the U.S., the level of awareness among medical professionals regarding the at-risk population and how they communicate the risks to their patients is still inadequate.

Failure to educate and warn at-risk individuals of vibriosis could lead to an increase in vibrio-related illnesses. The economic impact of negative newspaper publicity on the Gulf’s oyster industry is enormous, causing as much as a 40% decline in dockside price of oysters and a net welfare loss of up to \$13 million to oyster growers and harvesters.

While the need to inform at-risk consumers of the dangers of eating raw oysters contaminated with *V. vulnificus* is paramount, it is equally important to educate the at-risk and general consumers of the availability of equally satisfying PHP oyster products with “safety added” features and other oyster value-added products (VAP) that everyone can enjoy. This win-win strategy requires an integrated R&D effort that combines consumer research, new product development and technological innovations with appropriate consumer education, market promotion and technology transfer programs.

The main activities of the Year 1 “Gulf Oyster Project” center primarily on the implementation of research and outreach projects aimed at (a) documenting the economic and operational characteristics of currently available commercial oyster post-harvest processing (PHP) technologies, (b) objective assessment of the sensory characteristics of various PHP and new oyster value-added products (VAP), and based on the results of these research projects, (c) develop factual consumer education and technology transfer materials for use by the region’s extension professionals, state seafood marketing boards, and the Gulf oyster industry.

Year 2 of the Gulf Oyster Project is essentially a continuation and expansion of Year 1 activities. Among the key activities conducted by various collaborating agencies and industry cooperators during the second phase of this project were: (a) exploratory analysis of the demographic characteristics of various oyster consumers who participated in the structured surveys and outreach programs, (b) studies on the

marketability of VAP and PHP oyster products among Gulf states and California consumer groups, and (c) intensification of consumer education and outreach activities aimed at promoting greater awareness and interest on VAP and PHP oyster products among the general seafood consuming public.

II. PROJECT GOALS AND OBJECTIVES

The long-term goal of the Gulf Oyster program is to increase the overall consumption and sale of oyster products through:

- Promotion of new oyster PHP and VAP processes and technologies,
- Development of acceptable and safer oyster product alternatives, especially for V.v. at-risk consumers, and
- Formulation of effective consumer and food service professional education and product promotion strategies.

More specifically, the objectives of this two-year project are three-fold:

- To continue the development and evaluation of the sensory characteristics of commercially available PHP oyster products (heat-cold pasteurization, quick freezing, high hydrostatic pressure) versus raw oysters and other existing or new value-added product categories (oyster cheese ball).
- To continue educating wholesalers, retailers, processors, food service professionals, high-risk individuals and general seafood consumers on the availability, safety and sensory characteristics of new, commercially available PHP and other value added oyster products.
- To continue the development of technology transfer (targeted at oyster processors and extension professionals), consumer education (aimed at the wholesale, retail and food service industry professionals), and general seafood consumer market promotion materials and strategies centered on commercially available PHP and value-added oyster products (VAP) and processing technologies.

Continuation of the education and promotion efforts by various collaborating agencies was essential throughout Year 2 in order to keep-up the momentum developed by Year 1 project activities. The ability to persuade seafood consumers, processors, and food service professionals to accept non-traditional oyster product forms and new oyster processing technologies depends, to a large extent, on the enthusiasm, level of support, unrelenting commitment, and vigorous effort of the cooperating agencies and Gulf oyster industry leaders in the pursuit of their long-term goals.

III. APPROACH

A. Theoretical Framework:

Maintaining the existing market share of traditional (raw oysters) requires an in-depth understanding of the industry’s current and potential oyster consumer markets. Developing markets for new, post-harvest processed (PHP) products is even more complicated as it requires greater consumer education and product promotion efforts. Significant amounts of capital investment, risk and commitment on the part of the oyster industry in the form of new processing methods, technologies and facilities are also expected.

The same hurdle is expected with respect to educating the food service professionals and at-risk consumers about the dangers of eating raw oysters and the availability of safer alternatives. This is the reason why this project’s educational and technology transfer programs extended to oyster harvesters, processors, restaurateurs and seafood retailers as well as to the at-risk market segment.

Furthermore, aside from the essential consumer understanding and new oyster product R&D components of this project, most of the project collaborator’s time and resources were devoted towards developing and implementing appropriate consumer education and/or technology transfer programs. The principles of *diffusion theory* and the *individual adoption process* provided the theoretical framework that guided various participants of this project. Part 3 of this manual provides a short description of these principles and the efforts made by the collaborators to reach out to their target audiences.

NOTE: Due to significant reductions in the overall proposal’s budget as well as other industry considerations, the technology transfer aspect of this project was limited to developing communication materials and implementation of technology transfer-related activities up to the “evaluation” step of the process only.

B. Collaborators and Sub-Contracted Work:

This project required close cooperation with the Florida Department of Agriculture and Consumer Services (Bureau of Seafood and Aquaculture Marketing), Louisiana Seafood Promotion Board/Oyster Task Force, the Mississippi Department of Marine Resources (Seafood Technology Bureau) as well as industry groups such as Motivait Seafood Company, Ameripure Oyster Company, etc. Because of this, close coordination and more involved project planning were emphasized. Periodic face-to-face and telephone meetings were conducted throughout the project to evaluate the progress of the different programmed activities and to plan necessary updates.

The major project activities and their implementation schedule for Year 1 of the Gulf Oyster Project is shown in Table 1.

Table 1. Gulf Oyster Project Schedule of Activities Matrix (Year 1).

ACTIVITY DESCRIPTION	TIME SCHEDULE											
	October 2001 – June 2003											
Pre-Project Implementation:												
a. Program Planning & Preparation	x	x	x									
b. Contracts Processing	x	x	x									
I. New PHP/VAP Oyster Product R&D:												
a. Literature Review		x	x	x								
b. Consumer/Product Profiling				x	x	x	x	x	x	x		
c. Sensory Evaluation				x	x	x	x	x	x	x		
d. Plan/Dev. Tech. Transfer Materials			x	x	x							
e. Print Tech. Transfer Materials					x	x	x	x	x			
f. Industry Extension Activities					x	x	x	x	x	x	x	x
g. New PHP Economic Study			x	x	x	x						
II. Consumer/Food Svc. Prof. Education:												
a. Restaurant/Chef Focus Group				x	x							
b. Dev. Video & PHP Processors Guide					x	x	x	x				
d. Print Education Materials					x	x	x	x				
e. Dev. PHP/VAP Oyster PR/Brochures		x	x	x	x	x	x	x				
f. Print PHP/VAP Promo. Materials					x	x	x	x				
g. LA Trade/Seafood Show Participation		x	x								x	
h. FL Trade/Seafood Show Participation				x				x		x	x	
i. Local Seafood Show Participation				x	x	x	x	x	x	x		
III. Program Close-Out:												
a. Public Presentation												x
b. Final Report Preparation (last 3 mos.)										x	x	x
c. Other Closing Activities (last 3 mos.)										x	x	x

The second year of this two-year program had three major components corresponding to the three objectives of this project as outlined in Table 2 below (Gulf Oyster Project Schedule of Activities Matrix).

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Table 2. Gulf Oyster Project Schedule of Activities Matrix (Year 2).

ACTIVITY DESCRIPTION	DURATION (Months)												
	Y1	October 2002 – September 2004											
Pre-Project Implementation:													
a. Program Planning & Preparation	Y1	x	x	x									
b. Contracts Processing	Y1	x	x	x									
Objective 1. New PHP/VAP Oyster Product Research & Development:													
a. Literature Review	Y1												
b. Consumer/Product Profiling	Y1												
c. Oyster Sensory Evaluation	Y1												
d. Plan/Dev. Tech. Transfer Materials	Y1												
e. Print Tech. Transfer Materials	Y1												
f. Industry Extension Activities	Y1												
g. Integration & Dissemination											x	x	x
h. New PHP Economic Study			x	x	x	x	x	x	x	x			
i. PHP Shelf-Life & Sensory Evaluation			x	x	x	x	x	x	x	x			
j. PHP/VAP Handbook Section Write-up			x	x	x	x	x	x	x				
Objective 2. Consumer/Food Service Professional Education:													
a. Restaurant/Chef Focus Group	Y1												
b. Dev. Video & PHP Processors Guide	Y1												
d. Print Education Materials	Y1												
e. Dev. PHP/VAP Oyster PR/Brochures			x	x	x	x	x	x	x				
f. Print PHP/VAP Promo. Materials						x	x	x	x				
g. LA Trade/Seafood Show Participation			x	x					x				
h. FL Trade/Seafood Show Participation					x				x		x		
i. Local Seafood Show Participation				x	x	x	x	x	x	x			
j. Gulf Oyster Handbook Write-up			x	x	x	x	x	x	x				
k. Oyster Handbook Editing/Integration								x	x	x	x	x	
l. Handbook Printing/Dissemination											x	x	x
Objective 3. Technology Transfer													
a. Plan/Dev. Tech. Transfer Materials	Y1												
b. Print Tech. Transfer Materials	Y1												
c. Dev. PHP Processors Guide & Video	Y1												
d. Industry Extension Activities				x	x	x	x	x	x	x			
e. Integration & Dissem. of Proj. Output											x	x	x
Program Close-Out:													
a. Public Presentation	Y1												x
b. Final Report Preparation (last 3 mo)	Y1												*****
c. Other Close-Out Activities (last 3 mo)	Y1												*****

1. New Oyster Product Research/PHP Processing Technology Transfer:

New Oyster Product R&D

Reduction or elimination of adverse health risks or illnesses resulting from eating *Vibrio vulnificus* infected oysters requires proper communication of risks, adequate consumer education, and the availability of equally tasty and reasonably priced PHP oyster products with safety added features. Year 2 research projects continued and expanded on Year 1 activities and findings to include: analysis of marketing considerations for PHP and VAP oyster products, consumer preferences for PHP raw oyster products in coastal Mississippi, sensory differences of Gulf PHP oysters, consumer acceptability of PHP and VAP oysters, and PHP oyster shelf-life studies. Food scientists and economists at Mississippi State University under the supervision of the Seafood Technology Bureau (STB) of the Mississippi Department of Marine Resources, the lead agency in-charge of this important Gulf Oyster Project component, conducted these studies.

Industry Technology Transfer

Based on the economic and production performance of currently available commercial PHP oyster processing facilities, supplemented by research findings from both Year 1 and Year 2 projects, appropriate technology transfer strategies and extension materials aimed at promoting the benefits of new PHP technologies to other commercial oyster processors were developed, implemented, and distributed. STB took the lead in the pilot implementation of this project component (i.e., Awareness, Interest, and Evaluation steps of the Individual Adoption Process).

2. Food Service Professionals and Consumer Education/Market Promotion:

Food Service Professionals and At-Risk Consumer Education

The insights gained from targeted focus group sessions, as well as relevant research/surveys conducted during Year 1 project, were used to develop appropriate consumer education materials and communication strategies targeted at food service professionals and the at-risk consumer segment of the population. Awareness of the risks involved in eating *Vibrio vulnificus* infected oysters and information on the availability of equally good tasting product alternatives with safety added features (i.e., PHP and VAP oysters) was the main focus of this project's consumer education program aimed at the *V. vulnificus* at-risk population. The ability of the Florida Department of Agriculture and Consumer Services to get the Florida Winn Dixie Pharmacies actively involved in the Gulf Oyster Project's consumer education effort gave tremendous boost to the effectiveness of Year 2 activities aimed at reaching the at-risk segment of the U.S. population.

Since restaurants contribute about 60% of the total seafood consumed in the United States, participation in national conventions of food service professionals (e.g., International Hotel, Motel and Restaurant Show; American Culinary Federation; and International Boston Seafood Show) was another approach used to effectively reach this key group of people. The Florida Department of Agriculture and Consumer Services was the lead agency that developed and implemented consumer education materials and strategies targeted at this group.

Gulf Oyster, Commercial PHP and Other Value-Added Oyster Product General Consumer Market Promotion

One way to effectively reduce the health risk associated with eating raw oysters, as well as expand the market for oysters, is to increase the visibility and availability of safer, but equally tasty product alternatives. This “demand-pull” strategy would also encourage seafood processors to consider the trial and adoption of oyster PHP technologies. This requires the development of appropriate commercial PHP oyster market promotion strategies and materials targeted at the general oyster consumers, as well as new converts. Participation in local and national seafood/trade shows was effectively utilized to reach a large audience. The Oyster Task Force (OTF) of the Louisiana Seafood Promotion Board was the lead agency in-charge of this project component. OTF was also the lead agency that planned and coordinated the Gulf Oyster Project Public Presentation aspect of this project.

IV. PROGRAM EVALUATION

All of the major project deliverables and activities planned for Year 2 (Phase 2) of the Gulf Oyster Project have been achieved despite some delays at the start (contract negotiation period) and close to the end of the project (due to hurricanes that passed through Florida and the Northern Gulf of Mexico).

Pre-planning activities by all project team members were conducted in Tampa, Florida to review Year 1 accomplishment and to identify, coordinate and allocate Year 2 research, education and outreach activities. Year 2 project activities were concentrated on three key result areas: (1) continuation of targeted product and consumer marketing research, (2) implementation of *Vibrio vulnificus* at-risk consumer education initiatives, and (3) promotion of VAP and PHP oyster products to seafood consumers and PHP oyster processing technologies to the Gulf oyster industry.

Planning for Year 2 activities, especially with respect to the allocation of lead responsibilities among the cooperating agencies, were greatly facilitated by knowledge gained during the implementation of the Year 1 project, as well as the trust developed among various implementation teams. Understanding the core competencies of each collaborating agency and the strengths of each project team members enabled the Gulf and South Atlantic Fisheries Foundation, Inc. to better assign tasks and control the quality of expected project deliverables.

Given the prior experience, university collaboration, staff capabilities, project team’s competency and strategic congruency of Mississippi DMR-STB’s program goals with those of the Gulf Oyster Project, much of Year 2 research and development subcontracts were awarded to this group for implementation. The close working relationship among the project staff of MS-DMR Seafood Technology Bureau and the subcontracted scientists and extension professionals of Mississippi State University’s Sensory Science Laboratory and MSU Coastal Research and Extension Center enabled the smooth implementation of various Year 2 research projects. These included (a) Consumer Acceptability of Post Harvest Process and Value Added Oyster Product, (b) Economic Analysis of Commercial PHP Oyster Processing Plants, (c) Sensory Differences of Gulf Raw, VAP and PHP Oyster Products, (d) Shelf Life Studies and Acceptability

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of Various PHP Oyster Products, and (e) Analysis of Consumer Preferences for Post Harvest Processed Raw Oyster Products in Coastal Mississippi.

The long-standing interest, industry contacts, and prior work by the Florida Bureau of Seafood and Aquaculture Marketing staff made them the ideal lead agency tasked with the development and implementation of consumer education efforts targeted at the *Vibrio vulnificus* at-risk population. The impact of the Gulf Oyster Project in addressing the major health concerns of this segment of the population has been made more apparent with Florida's "signing-on" of the senior officers of Winn Dixie Pharmacies into the program. Finally, the difficulty of identifying and involving influential people in the communication chain has been addressed, thereby enabling the Gulf Oyster Project to reach the target population with relative ease and certainty.

Among the collaborating agencies, the Louisiana Seafood Promotion Board is perhaps the most experienced, focused and effective team with it comes to the promotion of seafood products to the general consumers and in the political arena. As such, they were assigned the lead role with respect to this component of the Gulf Oyster Project. By participating in tandem with the major seafood promotion program and activities planned by the Louisiana Seafood Promotion Board throughout the year, the Gulf Oyster Project was able to maximize its VAP and PHP oyster product promotion effort way beyond what the meager project budget could hope to achieve. Because of this, the project was able to reach not only local and regional seafood consumers, traders, processors, restaurateurs, and chefs but also national and international contacts as well (e.g., through the International Boston Seafood Show, the American Culinary Federation, the International Hotel, Motel and Restaurant Show, and the ACME Oyster House and the International Federation of Competitive Eating).

Aside from their main project responsibilities, it should also be noted that all of the collaborating agencies were also very active in V.v. consumer education, general seafood promotion and VAP/PHP oyster technology outreach at the various county, state, and regional mass gatherings.

V. CONCLUSION/RECOMMENDATION

After working for two years on the Gulf Oyster Project, a number of important lessons and research findings were learned by the project team. First, what started as an experimental organization to enable a motley crew of geographically dispersed institutions to run a complex and somewhat ambitious research and outreach project, later became a model of what could be done with only a limited amount of resources, but with ample technical guidance and a clear vision of where one needs to go. The key factors that pulled the project team together and deliver a credible product can be summed up in the following:

- (a) Commonality of vision and program goals,
- (b) Strategic fit among various collaborating agency programs and the Gulf Oyster Project,
- (c) Ability of the Gulf and South Atlantic Fisheries Foundation, Inc. to match the strengths and core competency of individuals and organizations with the requirements of the job,
- (d) Early industry buy-in and support,
- (e) Professionalism and competence of project personnel, and
- (f) Commitment of all involved with the long-term goals of the project.

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Reaching out to the *Vibrio vulnificus* at-risk segment of the population through the traditional network of medical/health care professionals has proven to be a very difficult and expensive proposition for similar programs and institutions prior to the breakthrough achieved by the Gulf Oyster Project. In reality, the Gulf Oyster Project's ability to enlist the participation of Winn Dixie Pharmacies in this important consumer education effort was a combination of dogged persistence, years of preparation, and pure luck on the part of the dedicated staff of the Florida Bureau of Seafood and Aquaculture Marketing. This communication link needs to be explored by other states and regions as it may well be the most effective and economical way of reaching a relatively very small segment of the population most affected by V.v. infections.

Should the above scenario turn out to be true, then a dedicated institution like the Interstate Shellfish Sanitation Conference may be enough to deal with the problem. As the health issues pertaining to the V.v. at-risk segment of the population gets adequately and effectively addressed in the future, the Gulf oyster industry needs to face up to its real problem – the bigger issue relating to the safety of eating raw oyster products in general. Dr. Linda Andrews framed it well when she noted that the food safety aspects surrounding the consumption of raw oysters parallels consumer resistance to accepting pasteurized milk. By comparison, the Gulf oyster industry situation is much better than that of the dairy industry. For example, the Gulf Oyster Project's sensory evaluation studies concluded that PHP oyster products were not perceived to be different from raw oyster products. Furthermore, the project's consumer acceptability studies also indicated that oyster consumption levels would increase if taste and food safety issues would be adequately addressed. Pasteurized milk, on the other hand, has its own distinctive flavor that is different from raw milk. Yet, through aggressive consumer education and promotion, pasteurized milk eventually became highly acceptable and safer particularly for children and pregnant women. The last point leads to a need to focus our future research and consumer education efforts on marketing and the economics of PHP/VAP oyster production systems.

Although research results indicate parity of PHP oysters with raw oyster products, the current commercial methods and technologies to produce safer, PHP oyster products are still in the infancy stage. As such, PHP oysters cannot hope to compete in the market on the basis of price alone. A more viable positioning strategy would be to emphasize the perceived and real benefits that consumers could derive from eating oysters with added safety features. Fear detracts a large segment of the population from eating raw oysters, but the comforting element of product safety and quality branding sells products.

For the majority of the oyster lovers, the issue of product safety is not a major selling point. Also, price is not a motivating factor to buy given that the demographic characteristics of the population belonging to this category include older men with higher levels of formal education. Rather, perceptions of high product quality associated with delicate gourmet taste and social status should be explored. Such characteristics are particularly appealing to the development of appropriate oyster-based value added products.

In closing, it is recommended that future research, development and consumer education efforts should focus more on targeted oyster marketing research, new oyster VAP product development and testing, PHP technologies and process improvements, and consumer education aimed at enhancing the perception and acceptability of safer VAP/PHP oyster products to the general public.

Business Opportunity Plan

Among the major objectives of the Gulf Oyster Project was the development of technology transfer materials and strategies centered on commercially available post-harvest processed (PHP) and value-added oyster products (VAP) targeted at oyster processors. This required integrating all of the Gulf Oyster Project's research findings and translating them into a language and format that could be easily understood by seafood processors, entrepreneurs and potential investors – the Business Opportunity Plan.

The Gulf Oyster Business Opportunity Plan is the first step in the feasibility study needed by potential investors and entrepreneurs to determine whether the innovation had potential for development. Those who want to take the plunge need to develop more firm-specific feasibility studies and business plans that are specifically tailored to the company's needs and available resources. An omnibus outline of topics to consider in your feasibility study or business plan is provided in Table 3. The list below only serves as a guide and memory jogger as some of the topics may not apply to your particular enterprise or data may not be available.

Table 3. Omnibus Business Plan/Feasibility Study Guideline

1.0 Executive Summary

1.1. Geographic Location of the Industry

1.2. Brief description of the project

- 1.2.1. History of business
- 1.2.2. Nature or kind of industry
- 1.2.3. Type of organization
- 1.2.4. Who are the major players in the business
- 1.2.5. General business, market, technology, organizational strategies
- 1.2.6. Give a brief summary of the major market, technical and financial characteristics of the project and conclusions on its feasibility
- 1.2.7. Outline the timetable of the business project
- 1.2.8. Specify proposed management for the business, including type of business organization, organizational chart and functions of each unit, use of professional firms or consultants, etc.

2.0 Marketing Aspect

2.1. General market information

2.1.1. Market Analysis

- 2.1.1.1. Overall Market
- 2.1.1.2. Market Demographics
- 2.1.1.3. Market Trends and Growth
- 2.1.1.4. Market segmentation and targeting
- 2.1.1.5. Identification of consumer wants and needs
- 2.1.1.6. Product requirements, characteristics and availability
- 2.1.1.7. Analysis of the competition; size, scope, and share of the market sales history of all producers and their market shares
- 2.1.1.8. Target market selection, positioning, and marketing strategy

2.1.2. Target Market Description – A brief description of the target market to include the following:

- 2.1.2.1. Areas of dispersion
- 2.1.2.2. Methods of transportation and existing rate of transportation
- 2.1.2.3. Channels of distribution and general trade practices
- 2.1.2.4. Direct competitors and their position

2.1.3. Target Market Demand – This may be considered as equivalent to the sales quantity, consumption, or usage, and may refer either to past or historical demand or to the future demand, in which case, the following should be considered:

- 2.1.3.1. Total consumption/demand for the product, at least within the area of distribution, for the past 5 years
- 2.1.3.2. Major users and consumers of the product
- 2.1.3.3. Quantity used and specifications, including quality
- 2.1.3.4. Projected consumption, market potential, and major trends for this product over the next 5 years
- 2.1.3.5. Prospects of new product entry and threat of substitute products

2.1.4. Supply for past 5 years, classified as source-imported or locally produced, if applicable. For imports, specify the form in which goods are imported, the prices, and the brand. For locally produced goods, the companies producing them, their production capacities, brands, and market shares shall be specified

- 2.1.4.1. Factors affecting trends in past and future supply
- 2.1.4.2. Competitive position

GULF OYSTER PROJECT

- 2.1.4.3. Distribution channels
- 2.1.4.4. Selling price – Include a price study through all levels of distribution indicating the past domestic and import prices, the high and low prices within the year, the effect of seasonality (if any), and reasons for principal fluctuations
- 2.1.4.5. Competitiveness of the quality of the product

2.2. Competitive Analysis

2.2.1. Industry Structure Analysis

- 2.2.1.1. Bargaining power of suppliers
- 2.2.1.2. Bargaining power of buyers
- 2.2.1.3. Threat of substitute products
- 2.2.1.4. Threat of new entrants
- 2.2.1.5. Intra-industry rivalry

2.2.2. Industry Overview

- 2.2.2.1. Industry Overview
- 2.2.2.2. Nature of Competition
- 2.2.2.3. Changes in the Industry
- 2.2.2.4. Primary Competitors
- 2.2.2.5. Competitive Products/Services

2.2.3. SWOT Analysis

- 2.2.3.1. Strengths and Weaknesses
- 2.2.3.2. Opportunities and Threats

2.3. Marketing strategy and program

- 2.3.1. Marketing Objectives
- 2.3.2. Market Segments
- 2.3.3. Target Market and Customers
- 2.3.4. Customer Needs
- 2.3.5. Customer Buying Decisions
- 2.3.6. Positioning

2.3.7. Strategy Pyramid/Profit Zone

2.4. Marketing Mix

2.4.1. Description of present marketing practices of competitors

2.4.2. Proposed marketing program of the project describing the selling organization, the terms of sales, channels of distribution, location of sales outlets, transportation and warehousing arrangements, and their corresponding costs

2.4.3. Promotion and advertising plans, including incentives, publicity, trade shows and costs involved

2.4.4. Packaging

2.5. Projected sales

2.5.1. Expected annual volume of sales for the next five years considering demand, supply, competitive position and marketing program

2.5.2. Identification and assessment of emerging markets

3.0 Technological/Production Aspects

3.1. Product(s):

3.1.1. Description of the product(s) including specifications of their physical, mechanical, chemical, biological and/or agronomic properties (whichever is applicable).

3.1.2. Uses of the product(s)

3.1.3. Species/commodity (product mix) selection and criteria for evaluation

3.2. Production process

3.2.1. Availability of economically viable and stable technology/production process

3.2.2. Description of the process showing detailed flow charts indicating material and energy requirements at each step, and normal duration of the process. Specify by-products resulting from the operations.

3.2.3. Alternative processes considered and justification for adopting said process; interrelatedness of products and processes

3.2.4. Technological assistance needed, if any

3.3. Plant size and production schedule

3.3.1. Rate annual and daily capacity per shift, operating days per year, seasonality/cyclicality, indicating factors used in determining capacity

3.3.2. Expected production volume for the next five years considering start-up and technical factors

3.4. Machinery and equipment

3.4.1. Machines and equipment layout indicating the floor plan

3.4.2. Specifications of the machinery and equipment required, indicating rated capacities of each piece

3.4.3. List of machinery and equipment to be bought and origin as to local or imported

3.4.4. Quotations from suppliers, machinery guarantees, delivery dates, terms of payment, and other arrangements

3.4.5. Comparative analysis of alternative machinery and equipment in terms of cost, reliability, performance, and spare parts availability

3.5. Plant location

3.5.1. Desirability of location in terms of distance from the source of raw materials and market and other factors; and a comparative study of different locations, indicating advantages and disadvantages

3.6. Plant layout

3.6.1. Description of the plant layout

3.7. Building and facilities

3.7.1. Types of building and cost of construction

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3.7.2. Floor area required

3.7.3. Land improvements such as road, drainage, etc. and their respective costs

3.7.4. Expansion (Program of expansion, if any)

3.8. Raw materials (Backward linkages)

3.8.1. Description and specification of their physical, mechanical, chemical or biological properties (whichever is appropriate)

3.8.2. Annual quantities to be used

3.8.3. Current and prospective costs of raw materials, terms of payment, and long-term contracts, if any

3.8.4. Availability, continuity of supply, and current and prospective sources

3.8.5. Material balance or material process chart

3.8.6. Current, prospective, or alternative sources

3.9. Utilities

3.9.1. Electricity, fuel, water, steam, and supplies indicating the uses, quantity required, availability, sources, and alternative sources and costs

3.10. Waste disposal

3.10.1. Description and quantity of waste to be disposed of

3.10.2. Description of the waste disposal method

3.10.3. Methods used in other plants or facilities

3.10.4. Cost of waste disposal

3.10.5. Clearance from proper authorities or compliance with legal requirements

3.11. Production cost - Detailed breakdown of production costs, indicating the elements of cost per unit output

3.12. Material cost

3.12.1.1. Direct materials

3.12.1.2. Indirect materials

3.13. Labor cost

- 3.13.1.1. Direct Cost
- 3.13.1.2. Indirect Cost

3.14. Manufacturing overhead cost

- 3.14.1.1. Administrative Expenses
 - 3.14.1.1.1. Indirect Labor
 - 3.14.1.1.2. Services (Power, Rent, Insurance, Royalties, Transportation)
- 3.14.1.2. Depreciation
 - 3.14.1.2.1. Machinery and equipment
 - 3.14.1.2.2. Buildings & other improvements
 - 3.14.1.2.3. Others
- 3.14.1.3. Taxes and Permits
- 3.14.1.4. Other Manufacturing Expenses

3.15. Total manufacturing cost per year

- 3.15.1.1. Basic assumption: (Examples)
 - 3.15.1.1.1. Number of working days/year
 - 3.15.1.1.2. Depreciation (Building, Machinery, Equipment, Others)

3.16. Labor requirements

- 3.16.1. Detailed breakdown of the direct and indirect labor and supervision required for the manufacture of the product(s), indicating compensation including fringe benefits

4.0 Management Aspects

4.1. Management of the business firm (or collaborating firms)

- 4.1.1. Management during the pre-operating period (firms or persons involved or to be involved in marketing, engineering, and other studies)
- 4.1.2. Management during the operating period (type of business organization, organizational chart and functions of each unit, management personnel)

specifying the duties and time to be devoted to the project, qualifications, and compensation)

4.1.3. Labor (skills required for each job, recruitment and training programs, compensation, fringe benefits, and facilities)

4.1.4. Professional firms or consultants to be hired, if any.

4.2. Timetable for various phases of the project

4.3. Other information, for example, pending legislation, information regarding intangibles, etc.

5.0 Financial Feasibility Aspects

5.1. Total project cost (fixed and working capital)

5.2. Initial capital requirements

5.3. Pre-operating cash flow relative to the project time-table

5.4. Financial projections for the five years of operations to include:

5.4.1. Balance sheets

5.4.2. Income statements

5.4.3. Cash flows

5.5. Supporting schedule and assumptions to the financial projections to include:

5.5.1. Collection on sales

5.5.2. Inventory levels

5.5.3. Payment period for purchases and expenses

5.5.4. Elements of production cost, selling, administrative, and financial expenses

5.6. Financial analyses (to be done for all sets of financial statements described above) showing return on investment, return on equity, break-even volume, and price analysis

- 5.6.1. Unit cost estimates and detailed breakdown of all cost factors from first year until normal operation is attained.
- 5.6.2. Unit cost
- 5.6.3. Break-even point analysis
- 5.6.4. Capital recovery, and earnings showing the cash pay-off period, rate of return, and discounted cash flow-rate of return
- 5.6.5. Others (e.g., sensitivity analysis, viability of firm under various types and scales of operations)

6.0 Social, Economic, Legal and Environmental Aspects

6.1. Contributions to the local economy

- 6.1.1. Net amount of dollars earned or saved
- 6.1.2. Labor employed
- 6.1.3. Taxes paid

6.2. Legal parameters

6.3. Social

6.4. Environmental

A Cautionary Note to Readers

This report provides, among other things, estimates of the cost of constructing and operating various Post-Harvest Processing (PHP) facilities within the Gulf states. The reader is advised that the construction and operating costs of these facilities were based on limited observations of facilities and economic models made by the research team. They are only approximations and should not to be considered as firm estimates. This report does not provide detailed engineering and operational plans for the oyster PHP facilities.

The authors have taken what we believe is a conservative approach to arrive at the cost estimates, but some costs may be understated and some construction costs may have been overlooked. The reader is also advised that the operating processes documented in this report are based on the actual performance and operation of the above-mentioned facilities and do not necessarily reflect the best management practices available. Potential investors are advised to engage professional engineering, construction and environmental firms, as well as oyster PHP facility operators in developing any final business plan that may be used to finance such a facility.



Heavenly Oysters

A NAME YOU CAN TRUST

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A Feasibility Study and Business Opportunity Plan for

Post Harvest Processed



Top Quality Gulf Oysters

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Sample plan only

Feasibility Study and Business Opportunity Plan for Various Oyster Post Harvest Processing Facilities:

- a. Heat Cold Pasteurization (HCP)
- b. High Hydrostatic Pressure Treatment (HHP)
- c. Individually Quick Frozen (IQF)

Executive Summary

This business opportunity plan looks into the feasibility of establishing post harvest processing (PHP) facility to supply tasty and safer Gulf oysters to high-end, white tablecloth seafood restaurants in Louisiana, Mississippi and California. Currently, PHP oysters account for 20% of the national market for raw oysters and shows good growth potential as consumers become aware of the risks of eating *Vibrio vulnificus* infected oysters and the availability of safer product alternatives. The Food and Drug Administration's tightening of regulations on raw, unprocessed oysters to reduce *V. vulnificus* related illnesses/fatalities and California's seasonal market closure, except for PHP oysters, supports this projection. Like pasteurized milk, PHP oysters have the potential of being the wave of the future.

Heavenly Oysters Factory's competitive goal is to be recognized as the "Cadillac" of the PHP Gulf oyster industry by providing "gourmet, consistently top quality Gulf oysters with safety features added." Type B (Risk-Averse Individuals) and Type C (V.v. At-Risk Individuals) will be the main target market for **Heavenly Oysters Factory** products, but Type A (Oyster Lovers) frequenting high-end restaurants and oyster bars are an added bonus. "Word-of-mouth" buzz, aggressive consumer information/education campaign, partnership with restaurants, and strict adherence to high quality and safety standards will be the hallmark of **Heavenly Oysters Factory** marketing strategy.

Preliminary sensory evaluation research showed no detectable difference between PHP and raw, unprocessed oysters. However, post harvest processing of oysters reduces harmful bacteria in oysters to non-detectable levels. The technical description and comparative economic analysis of three PHP technologies, i.e., Heat-Cool Pasteurization (HCP), High Hydrostatic Pressure (HHP), and Individually Quick Frozen (IQF), are presented to assist in investment decisions.

Initial investment cost is lowest for IQF at \$0.75M, highest for HHP at \$2.55M, and moderate for HCP at \$0.91 M. Internal Rate of Return is highest for IQF at 70.40%, lowest for HHP at 35.69% and moderate for HCP at 67.54%. At a current wholesale price of \$0.25/halfshell, both the HCP and IQF plant would break-even at 50,000 cases of processed raw halfshell oysters while the HHP will break-even at 100,000 cases. The costs of oyster shellstock (30%) and wage labor (13% to 18%) account for the largest cost component for all three processing operations.



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Marketing Aspect

1.1. General market information

1.1.1. Market Analysis

1.1.1.1. Overall Market

Every year millions of Americans love to eat oysters, especially raw oysters on the half-shell. In 2003, the oyster industry landed 37 million pounds of meat valued at \$103 million – an increase of 2.6 million pounds and \$14.0 million compared to 2002 oyster landings. Leading the country in oyster production is the Gulf region at 72% with 29.2 million pounds of meat landed valued at \$74.16 million.

1.1.1.2. Market Demographics

The Gulf Oyster Project (Jamir et al. 2004) conducted various consumer education, product promotion, sensory evaluation and marketing research on raw and post harvest processed (PHP) oysters. Respondents were mainly residents of U.S. coastal states bounding the Gulf of Mexico. Consumer surveys were also conducted; mainly respondents from the state of Mississippi.

The raw oyster consumption behavior revealed by the survey was strongly influenced by gender, age and formal education. Marital status, race and household income did not have a significant influence on raw oyster consumption. The Gulf Oyster survey indicated that more male respondents (56%) ate more raw oysters than female respondents (25%) as shown in Table 4.

Gender	Non-consumer		Consumer		Total	
	Number	Percent	Number	Percent	Number	Percent
Female	193	75%	66	25%	259	100%
Male	111	44%	141	56%	252	100%
Total	304	59%	207	41%	511	100%
Chi-square value = 49.206 ***						

The breakdown of oyster consumption for each age segment is shown in Table 5. The ratio of raw oyster consumers vs. non-consumers generally increases with age. Raw oyster consumer comprised only 38% of the 18-29 age group but jumps to as much as 57% among 40-49 age group, and levels at about 46% for people age 50 or older.¹ On average, about 40% of the Mississippi respondents were raw oyster consumers while the rest do not consume raw oysters. Possible reasons why people do not want to consume raw oysters is covered in later sections of this plan.

Table 5. Distribution of respondents by age group and raw oyster consumption

Age group	Non-consumer		Consumer		Total	
	Number	Percent	Number	Percent	Number	Percent
18-29	186	62%	112	38%	298	100%
30-39	43	66%	22	34%	65	100%
40-49	26	43%	34	57%	60	100%
50-59	26	54%	22	46%	48	100%
60 & above	19	54%	16	46%	35	100%
Total	300	59%	206	41%	506	100%

Chi-square value = 9.690*.

The level of formal education completed by the respondents had very strong influence on raw oyster consumption among coastal Mississippi residents (Table 6). In general, raw oyster consumption increased with increasing level of formal education, with a low 13% for those who completed only elementary education, increasing significantly to 35% of those who completed high school education, and leveling off at about 45% for those with college or advanced degrees.

¹ It should be noted that the Gulf Oyster Project’s report gives only the ratio of raw oyster consumer vs. non-consumer for each age group. Multiplying this ratio with the population size of each age group would provide a means to estimate of the total raw oyster consumption of each age group.

Table 6. Distribution of respondents by education and raw oyster consumption

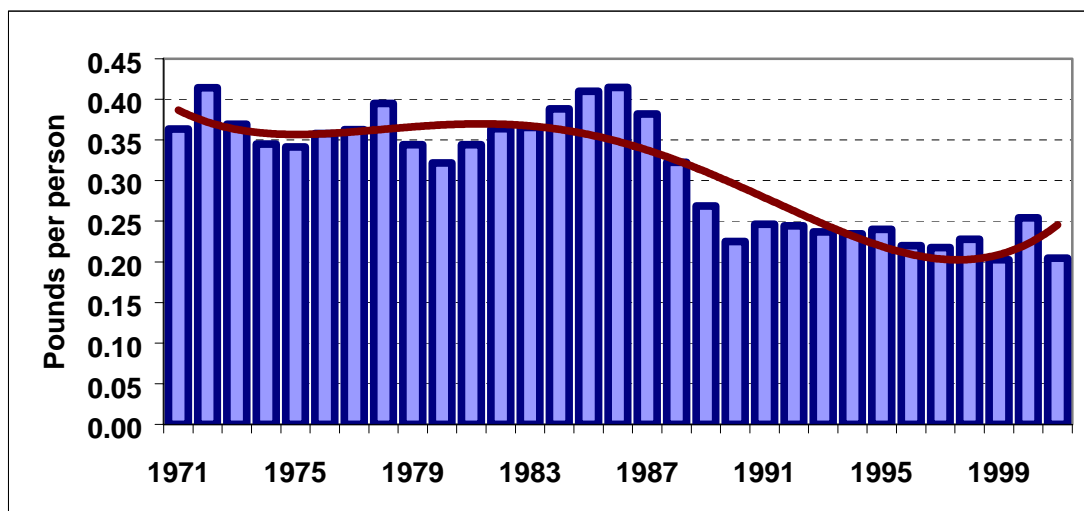
Education	Non-consumer		Consumer		Total	
	Number	Percent	Number	Percent	Number	Percent
Elementary	14	88%	2	13%	16	100%
High School	115	65%	62	35%	177	100%
Some college	106	54%	91	46%	197	100%
Completed college	40	54%	34	46%	74	100%
Advanced degree	20	56%	16	44%	36	100%
Total	295	59%	205	41%	500	100%

Chi-square value = 11.103 *

1.1.1.3. Market Trends and Growth

The U.S. per capita consumption of oysters has declined from about 0.35 pounds in 1971-1989 to less than 0.25 pounds starting in 1989 (Figure 1). Oyster consumption may be affected by a multitude of factors that may vary across regions, ethnicity, income levels, age groups, gender, and awareness of potential risks.

Figure 1. Trend in U.S. per capita oyster consumption.



One factor negatively affecting the Gulf oyster industry is the pathogen *Vibrio vulnificus* – a bacterium naturally inhabiting warm coastal waters. For a small segment of the population, eating raw or undercooked oysters could cause serious illness or even death from *V. vulnificus*. Between 1989 and 1996, the Centers for Disease Control and Prevention (CDC) documented 149 serious illnesses resulting in 75 fatalities from *V. vulnificus* infection or an average of 40 culture-confirmed cases, 35 hospitalizations, and 12 deaths reported each year for the Gulf region. Most healthy individuals are not at risk from *V. vulnificus*, however, failure to educate and warn high-risk individuals could lead to an increase in vibrio-related illnesses. The resulting media frenzy and negative newspaper publicity results in a drop in demand for oysters and a corresponding decline (as much as 40%) in dockside prices of oysters. This leads to a net welfare loss of \$13 million dollars to oyster growers and harvesters.

An increase in oyster consumption back to pre-1989 levels is being forecasted based on the advances made by seafood technologists and regulatory agencies in controlling the health impacts of *V. vulnificus*. The development of safer oyster post harvest processing techniques (PHP) and value added products (VAP) have been found to reduce the abundance of *V. vulnificus* in oyster tissues to non-detectable levels. Just like in the introduction of safer, pasteurized milk products, PHP and VAP technologies carry the promise of making oysters safer for all consumers regardless of an individual's medical condition or perceived danger from oyster consumption. Collaborating agencies in the Gulf Oyster project developed and implemented oyster PHP technology transfer programs to increase the availability and supply of safer and equally tasty oyster products in the market.

Under the auspices of the National Shellfish Sanitation Program (NSSP) and the Interstate Shellfish Sanitation Conference (ISSC), *Vibrio vulnificus* Risk Management Plans are also underway to reduce the number of illnesses arising from the consumption of raw or undercooked oysters by 40% for 2005-2006 and 60% for 2007-2008 among core reporting states (California, Florida, Louisiana and Texas). The ISSC and various state agencies that participated in the Gulf Oyster Project are also implementing aggressive consumer education programs to reduce *V. vulnificus* related illnesses among the high-risk population while also promoting the consumption of safer and equally tasty VAP and PHP oyster products among the general population.

In general, increase in seafood consumption is generally related to the influx of seafood eating immigrant population, especially from Europe and Asia. The decline in birth rate among third generation Americans meant that most of the country's population growth, and seafood consumption, have to come from the outside. All of the above factors point to a future increase in

oyster per capita consumption and overall demand, especially for safer but equally tasty VAP and PHP oyster products.

1.1.1.4. Market segmentation, targeting and positioning (STP)

Based on the above survey, there are at least three large, potentially viable post harvest processed oyster consumer market segments that could be identified within the United States²:

- a. **Type A: Oyster Lovers**. High-income, mostly male middle-aged and older coastal residents with some college education who love to eat oysters.
- b. **Type B: Risk-Averse Individuals**. High-income, mostly middle-aged and older coastal residents with some college education but are highly averse to eating raw oysters due to real or perceived health risks.
- c. **Type C: Vibrio vulnificus At-Risk Individuals**. High-income, middle-aged and older coastal residents with some college education but are afflicted with medical conditions (those with compromised immune systems or pre-existing medical conditions such as cancer, diabetes, or liver disease) that place them at high-risks from eating raw oysters contaminated with *V. vulnificus* bacteria.

The current bulk of raw oyster consumers belong to the Type A market segment. From a practical marketing perspective, these oyster consumers are already a captured market for raw oyster products, and are not likely to shift to the more expensive PHP oyster substitute. So, in the short-term, they are not the main target market for PHP oysters. Given their high-income level and influence on the overall supply and demand for oyster products sold in restaurants, winning over this group to patronize PHP oysters will remain an important part of **Heavenly Oysters Factory's** long-term marketing strategy. Key to influencing this market segment is the year-round availability of equally tasty and consistent quality PHP oyster products.

Both Type B and Type C market segments refrain from eating raw oysters because of associated real or imagined risk factors. Being risk averse to eating raw oysters, they are currently non-consumers that need to be convinced to try equally tasty but safer PHP oyster products. The potential size of this market is

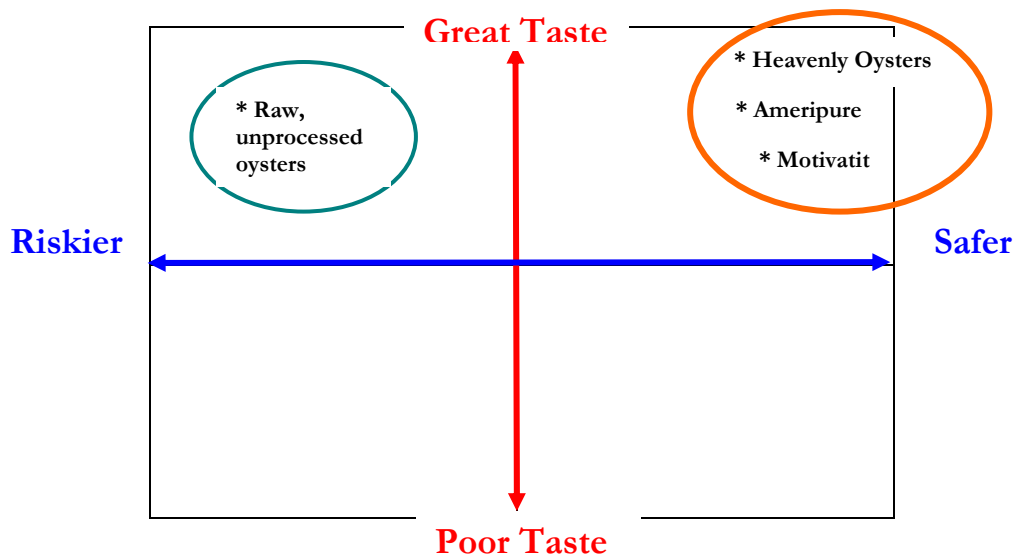
² Market segmentation used in this business opportunity plan was based on qualitative assessment of the Gulf Oyster Project data. More refined and objective segments could be derived by applying advanced quantitative techniques such as multivariate statistical methods on socioeconomic and demographic variables of consumer tests and psychographic studies.

large, as indicated in Table 7. Although a large percentage of non oyster consumers do not eat raw oysters because they are “slimy” (42%), “smelly” (27%) or because they are turned off by their “appearance” (36%), those who do not eat raw oysters for health reasons comprise a large fraction of the non oyster consumers as well. The size of the segment could be glimpsed at the percentage of non oyster consumers who gave the following reasons for not eating raw oysters: personal safety and concern/illness not allergies (25%), allergies (Doctor’s advice/Personal experience)(5%), and Doctor’s advice due to illness (4%). If we add “Aversion to new things (No specific reasons)” (2%) to the list, they all add up to about 37% of the non oyster consumers. The latter group (Types B and C consumer segments) are the primary target market for **Heavenly Oyster Factory’s** PHP oyster products.

<i>Reason for not eating raw oysters</i>	<i>Number</i>	<i>Percent</i>
Slimy	128	42%
Appearance	110	36%
Smell	82	27%
Personal safety and concerns/illness, not allergies	75	25%
Think would taste bad	68	22%
Color	47	15%
Think grit, sandy/internal waste is bad	44	14%
Allergies (Doctor’s advice/Personal experience)	14	5%
Doctor’s advice due to illness	13	4%
Not sure where to get them	10	3%
Aversion to new things (No specific reasons)	7	2%
Don’t know what to do with them	7	2%

In relation to these two targeted market segments, **Heavenly Oysters Factory** will position its PHP oyster products and tailor its marketing campaign using the theme, “*High Quality Gulf Oysters with Safety Features Added.*” This contrasts with the equally tasty but more risky raw unprocessed oysters (RUO) that are traditionally served by seafood restaurants on the half-shell (see Figure 2).

Figure 2. Strategic Positioning Map for Gulf Oyster Products.



1.1.1.5. Identification of consumer wants and needs

Oysters are a high-end seafood product that possess real, as well as perceived, qualities that appeal to consumers (Table 8). Aside from safety concerns, survey results indicate that a majority of oyster lovers eat these quintessential molluscs because they **taste good** and they are **fun to eat!** Like any other food, eating oysters is also an acquired taste (i.e., 13% acquired it out of habit or become used to eating oysters) which is another major reason cited by consumers as to why they eat raw oysters. These consumer responses are important because they enable **Heavenly Oysters Factory** to focus our company’s product development and advertising efforts on the “benefits” of eating oysters vs. the usual emphasis on the inherent “features” of PHP oyster products.³

³ Features are product attributes offered by the company. Advantages are what these features can do. Benefits are advantages that meet the explicit needs of the customers, i.e., what they will get when they use the product. For example, all **Heavenly Oysters Factory** products are high hydrostatic pressure treated (Feature), to kill harmful bacteria that may be in raw oysters (Advantages), so that oyster lovers and at-risk consumers could relax, enjoy the delicious taste of oysters and have fun (Benefits).

Table 8. Distribution of consumers by reason for eating raw oysters

Reason for eating raw oysters	Number	Percent
Tastes good	156	75%
Fun to eat	79	38%
Nutritional benefits	32	15%
Habit (Become use to eating oysters)	26	13%
Believe to be an aphrodisiac	11	5%
Image (Peer pressure)	4	2%

1.1.1.6. Product requirements, characteristics and availability

From the previous tabulated survey results, consumers indicated that they want delicious and safe oyster products. They are turned off primarily by the oyster’s slimy texture, appearance, smell and color. Irrespective of socioeconomic background, coastal Mississippi residents ate raw oysters about 4.77 times last year (Table 9). About half of the respondents did not eat oysters last year, 11% ate once a year, 17% three times a year, 11% ate six times a year, while the frequent eaters (twelve times a year to weekly and daily consumption) comprise 10% of the survey respondents.

Table 9. Distribution of respondents by frequency of eating raw oysters last year

Eating frequency	Number	Percent
Never	265	52%
Once a year	56	11%
Three times a year	87	17%
Six times a year	54	11%
Twelve times a year	35	7%
Weekly	11	2%
Daily	3	1%
Total	511	100%

Survey respondents indicated that they would eat more raw oysters if health and safety concerns are reduced or eliminated (Table 10). Among consumers, 76% indicated they would eat more if the concerns are reduced or eliminated while a lower percentage (27%) gave the same response among the non-consumers. Over half (57%) of the non-consumers were not interested in changing their preferences – clearly a large chunk of the market which makes them a good target for **Heavenly Oysters Factory** advertising and promotional campaigns. The same response is evident with respect to the distribution of respondents who would eat more raw oysters if they were available year-round (Table 11). In this case, 75% of the non-consumers said they would not eat more oysters even if they were available year-round while 66% of consumers said they would eat more.

Table 10. Distribution of respondents who would eat more raw oysters if health and safety concerns were reduced or eliminated

Decision	Non-consumer		Consumer		Total	
	Number	Percent	Number	Percent	Number	Percent
Will not eat more	174	57%	34	16%	208	41%
Will eat more	81	27%	158	76%	239	47%
Don't know/not sure	49	16%	15	7%	64	13%
Total	304	100%	207	100%	511	100%

Chi-square value = 123.124 **.

Table 11. Distribution of respondents who would eat more raw oysters if they were available year round

Decision	Non-consumer		Consumer		Total	
	Number	Percent	Number	Percent	Number	Percent
Will not eat more	227	75%	45	22%	272	53%
Will eat more	27	9%	136	66%	163	32%
Don't know/not sure	50	16%	26	13%	76	15%
Total	304	100%	207	100%	511	100%

Chi-square value = 190.707 **.

1.1.1.7. Target Market

The targeted markets for **Heavenly Oysters Factory’s** PHP oyster products are the high-end, 18 years of age and over raw oyster consumers and non-consumers (Type B and C) of Mississippi, Louisiana, and California. The estimated demand for raw oysters for the three states is presented in Table 12. Our oysters will be positioned against raw unprocessed oysters based on consistent quality, great taste and superior product safety for all consumers to enjoy.

Table 12. Estimated demand for raw oysters for the target markets in California, Mississippi and Louisiana. ⁴

2000 Census			
18 years of age and over			
	Total Population	Male	Female
California	24,621,819	12,130,354	12,491,465
Mississippi	2,069,471	977,930	1,091,541
Louisiana	3,249,177	1,539,808	1,709,369
Total	29,940,467	14,648,092	15,292,375
Raw Oyster Consumers		8,202,932	3,823,094
Non-Consumers		2,214,792	1,032,235
Total Raw Oyster Consumers (est.)		10,417,723	4,855,329
Est. Raw Oyster Consumption (lb)		2,604,431	1,213,832
Est. No. Oysters (Shells)		90,553,453	42,203,734

⁴ Population estimates were based on 2000 Bureau of Census and Statistics data available at <www.census.gov>. Conservative per capita oyster consumption was pegged at 0.25 pounds per year based on the statistics provided by the National Marine Fisheries Service. An average oyster flesh yield of 13 grams was used based on the VAP/PHP sensory evaluation studies conducted by the Gulf Oyster Project. Interpolations on raw oyster consumption were derived from the Mississippi market research data gathered as part of the Gulf Oyster Project and assumed to apply on the three target market states, i.e., 41% of the population are raw oyster consumers, 27% of non-consumers will eat raw oysters if health and safety issues were reduced or eliminated. To remain conservative, it was assumed that current oyster consumers would not increase their consumption level even if health and safety issues were eliminated.

1.1.2. Target Market Description:

Heavenly Oysters Factory selected Louisiana and Mississippi seafood and grocery store buyers of raw oyster products because of their proximity to the oyster grounds, the proposed location of the processing facilities, and ready access to great seafood restaurants that cater to tourists and local population. However, given stiff regional competition and the limited size of the market within this geographic area, **Heavenly Oysters Factory** will also tap the enormous seafood market of California – a once traditional market for raw Gulf oyster products.

California is a good market for post harvest processed oyster products not only because of its large affluent population and the presence of significant Asian and Hispanic immigrants. Recently, California also banned the purchase of untreated Gulf oysters from August through October – a move that has cost local producers an estimated \$20 million. This emergency ruling was in response to the relatively large number of *V. vulnificus* related illnesses among at-risk population that sickened an estimated 75 people and killed 48 in the state since 1993. Although the ruling was placed in effect from May 1 until August 12, California’s legislators are pushing to upgrade the rule to permanent law.

The State of California, however, has allowed post harvest processed oysters (i.e., High Hydrostatic Pressure Treatment and Low Heat Pasteurization) coming from the Gulf of Mexico to remain on California grocery shelves year-round. PHP oysters have been a boon to the industry where a significant number of potential consumers are turned off because of potential health risks. With the commercialization of post harvest processing techniques and better information about the availability of safer and equally tasty oyster products, treated oysters now account for about 20 percent of the national market despite their higher prices compared to the traditional raw unprocessed oyster products.

1.1.2.1. Competitiveness of the quality of the product

The main competitors for the PHP oyster products of **Heavenly Oysters Factory** are the traditional raw, unprocessed oysters (RUO) harvested from the Gulf of Mexico. Evaluation of the sensory characteristics of RUO vs. PHP oyster products harvested from the same sites at the Gulf of Mexico by a trained panel indicated very minimal difference between these two competing products (Figures 3 to 7) based on appearance, aroma, basic taste and texture. In fact, the difference is so small that the researchers believe they would not be noticeable to ordinary raw oyster consumers. This preliminary finding is important for **Heavenly Oyster Factory’s** claim that our PHP oysters are of

equal taste and quality as the raw unprocessed Gulf oysters being sold by the competition.

Figure 3. Descriptive analysis for appearance of processed Gulf oysters compared to raw unprocessed oysters as control.

Descriptive Analysis for Appearance of Processed Gulf Oysters

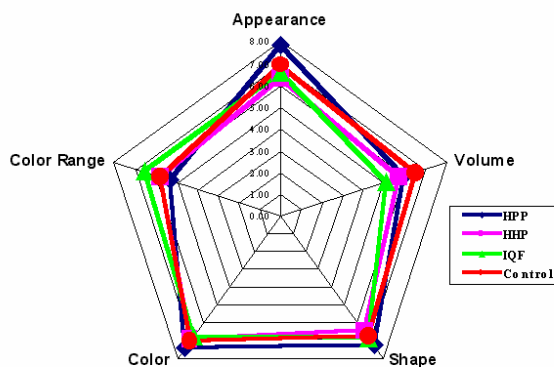


Figure 4. Descriptive analysis for aroma of processed Gulf oysters compared to raw unprocessed oysters as control.

Descriptive Analysis for Aroma of Processed Gulf Oysters

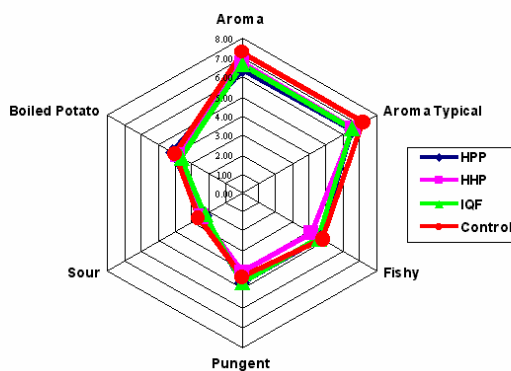


Figure 5. Descriptive analysis for flavor of processed Gulf oysters compared to raw unprocessed oysters as control.

Descriptive Analysis for Flavor of Processed Gulf Oysters

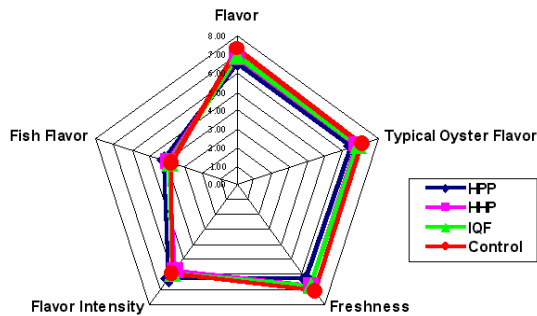


Figure 6. Descriptive analysis for basic tastes of processed Gulf oysters compared to raw unprocessed oysters as control.

Descriptive Analysis for Basic Tastes of Processed Gulf Oysters

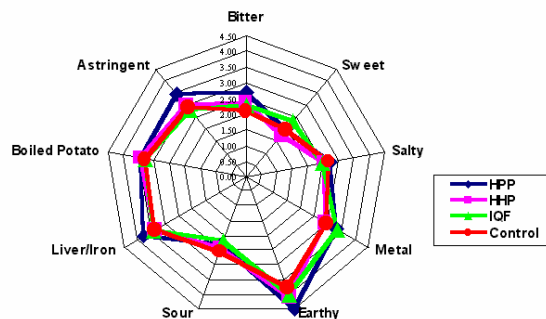
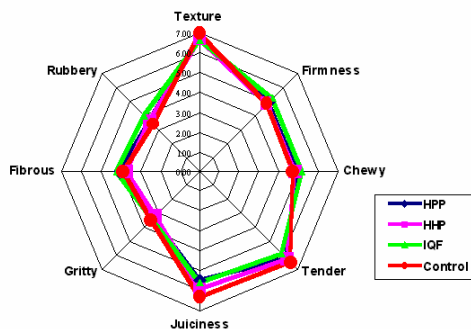


Figure 7. Descriptive analysis for texture of processed Gulf oysters compared to raw unprocessed oysters as control.

Descriptive Analysis for Texture of Processed Gulf Oysters



1.1.2.2. Sources of raw oysters for consumption

As indicated in Table 13, respondents from coastal Mississippi preferred to buy most of their raw oysters for consumption from seafood restaurants (27%), at oyster bars (15%), from seafood markets (21%), and from the docks (15%). This is a little different from other regions where 60% of seafood purchases are accounted for by restaurant sales. This maybe related to the relative accessibility of the population to the coast and the availability of oysters for sale at the docks compared to other states.

Sources of raw oysters	Number	Percent
Restaurant	137	27%
Seafood market	109	21%
Direct from the dock	77	15%
Oyster bar	78	15%
Recreational catch	35	7%
Retail grocery store	19	4%

1.2. Marketing Strategy and Programs

1.2.1. Marketing Objectives

The overarching goal of the **Heavenly Oysters Factory** is to provide top quality, safe oyster products for all seafood consumers to enjoy. More specifically, the marketing objectives of the company are:

- a) To achieve 10% share of the national market for PHP oyster products within five years.
- b) Achieve sales equivalent to 20% of its production capacity during the initial year of the business, and to increase production capacity up to 100% within five years of operations.

1.2.2. Marketing Strategy and Program

Heavenly Oysters Factory will concentrate on producing high quality, “gourmet” post harvest processed Gulf oysters designed for the high-end, white tablecloth seafood restaurant clientele. We will not compete with the low-cost raw oyster market segment but will focus our efforts on developing loyal followers one customer at a time through word-of-mouth buzz, aggressive information campaigns, cultivating partnerships with restaurants, and strict adherence to high quality and safety standards. Achievement of Good Housekeeping seal of quality and similar high prestige awards will be aimed for as a means to reinforce **Heavenly Oysters Factory** reputation and commitment. In short, our goal is to be the “Cadillac of the PHP oyster industry.”

Once an adequate customer base is developed, secondary distribution channels for **Heavenly Oysters Factory** products will be opened primarily on select specialty seafood stores and supermarkets with reputable seafood counters and departments. Advertising on in-flight magazines and opening of internet-based sales channels for overnight deliveries will also be explored. Specialty and holiday theme recipes will be developed as part of the **Heavenly Oyster Factory**’s continuing consumer education and support program.

Heavenly Oysters Factory will make sure that the pricing of our products will always be commensurate with high expectations of quality. In order to achieve this goal, we will invest money and effort in essential Total Quality Management, sensory evaluation, and customer satisfaction research programs. As the Cadillac of the PHP oyster industry, development of “Wow!” oyster eating experiences, over and over again is our ultimate goal. In this regard, Heavenly Oysters Factory will also invest in new product lines that suit our customer’s epicurean tastes, fantasies and expectations of safety.

1.2.3. Promotion and Advertising Plans

The ability of new products or innovations to flourish in the market place depends, to a large extent, on whether the target consumers are aware of their existence and benefits. While 63% of raw oyster consumers and 36% of non-consumers believe that there were available methods to render raw oysters safe and leaves no detectable levels of harmful bacteria, coastal Mississippi respondents were not widely aware of the availability of post harvest processed raw oysters. In general, about one in five of the respondents were familiar with the whole, shucked, or half-shell raw oysters that have been processed with a high-pressure method (Table 14). Pasteurized, in-shell or shucked raw oysters were known to only 14% of the respondents. One out of ten respondents indicated they knew of individually quick frozen (IQF) half-shell or whole shell raw oysters. Less than one in ten respondents were aware of heat shocked in-shell or shucked raw oysters.

Table 14. Distribution of respondents by awareness of post harvest processed raw oysters

Oyster products	Non-consumer		Consumer		Total	
	Number	Percent	Number	Percent	Number	Percent
Pressurized (HPP)	49	16%	50	24%	99	19%
Pasteurized (HCP)	40	13%	34	16%	74	14%
Individually quick frozen (IQF)	24	8%	26	13%	50	10%
Heat shocked (HS)	28	9%	20	10%	48	9%

In terms of source of information, coastal Mississippi respondents learned about post harvest processed oyster products from a wide variety of mass media (Table 15). The most widely used means of information delivery was through word-of-mouth (“somebody told me” at 19%), television (14%), magazines (12%), and newspapers (12%). These statistics correspond well with the usual types and sources of information that are available to the general consumer. Other delivery methods such as radio (5%), trade shows (4%), brochures (4%), scientific journals (3%) and conferences (1%) were accessed less by the respondents. Aside from radios, the latter sources are available only to highly specialized groups of people.

Table 15. Distribution of respondents by source of information about postharvest processed raw oysters

Information source	Non-consumer		Consumer		Total	
	Number	Percent	Number	Percent	Number	Percent
Somebody told me	50	16%	45	22%	95	19%
Television	44	14%	30	14%	74	14%
Magazines	41	13%	20	10%	61	12%
Newspapers	32	11%	28	14%	60	12%
Radio	12	4%	13	6%	25	5%
Trade shows	10	3%	9	4%	19	4%
Brochures	9	3%	10	5%	19	4%
Scientific journals	7	2%	10	5%	17	3%
Conferences	1	0%	4	2%	5	1%
Symposia	1	0%	1	0%	2	0%

In order to be effective and efficient, **Heavenly Oyster Factory’s** advertising and promotion campaign will follow the systematic procedures involving the Integrated Information/Technology Adoption Life Cycle Model and Individual Adoption Process for reaching Target Audiences or Market Segments (Jamir et al. 2004). Figure 8 is a schematic representation of how the different components relate to each other. In order to provide focus to the advertising campaign, the target audience is selected first. These are done in two levels:

- (1) The target market segment or audience, and
- (2) The psychographic groups within each target market segment or audience (i.e., innovators, early adopters, early majority, late majority, laggards and non-adopters).

Thereafter, the details of the advertising/promotion campaign will be spelled out following the sequential stages of the individual adoption process (i.e., awareness, interest, evaluation, trial and adoption/rejection).

Table 16 outlines a sample of the advertising/promotion strategy planned for the **Heavenly Oysters Factory** following the integrated model discussed above.

Figure 8. Integration of the Information/Technology Adoption Life Cycle Model with elements of the Individual Adoption Process as applied to intended Targeted Audiences or Market Segments.

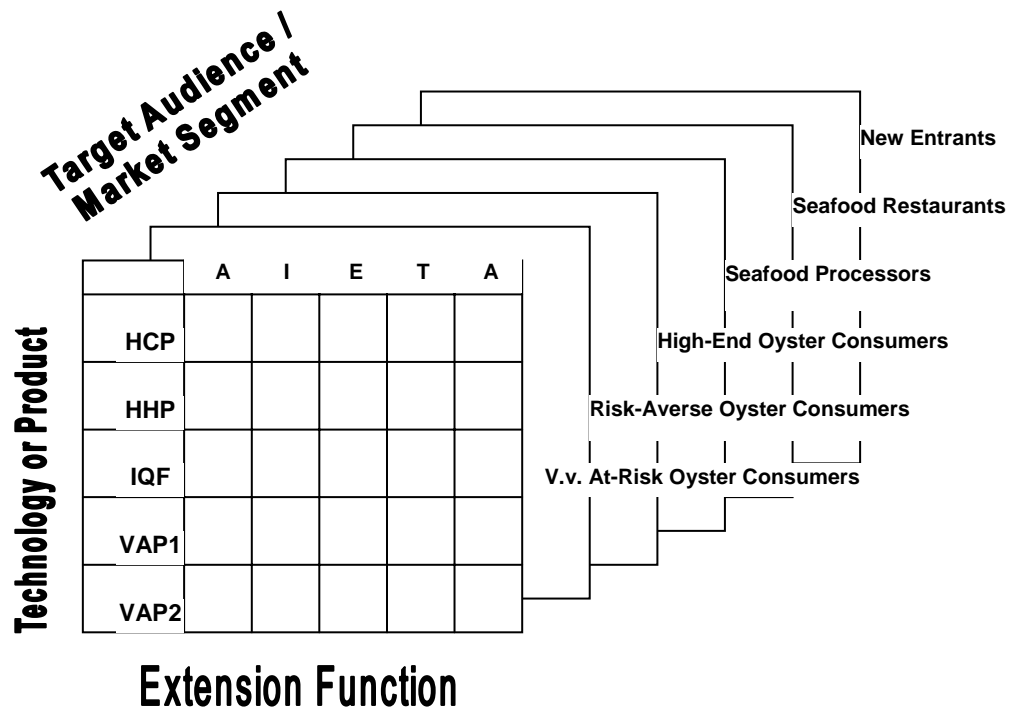


Table 16. Sample outline of Heavenly Oysters Factory’s PHP Oyster Advertising and Promotion Plan.

Information/Technology Transfer Strategies Worksheet					
VAP/PHP Oyster Product or Technology	Awareness	Interest	Evaluation	Trial	Adoption
Target Audience	Type C Market Segment: <i>Vibrio vulnificus</i> At-Risk Oyster Consumers eating at seafood restaurants and oyster bars				
Message	<i>Top Quality Gulf Oysters with Safety Features Added.</i> So have fun eating Heavenly Oyster Factory’s delicious PHP oyster treats.				
Communication Strategy	Reader’s Digest & feature articles on PHP in Food Section of Newspapers	Postcards & menu listing of PHP products; information placed on customer’s tables	Waiting staff trained to provide factual information about PHP oysters to customers as part of menu	Provide free trial samples of Heavenly Oysters Factory PHP oysters to consumers.	Offer discount coupons for the purchase of Heavenly Oysters Factory PHP oysters
Communication Medium	Newspaper, word-of-mouth buzz	Brochures, posters, postcards	Workshops, fact sheets/memory jogger	Word-of-mouth, PHP products	Discount coupons, word-of-mouth buzz, testimonials
Schedule	Pre-Launching of Product to target markets (one week Friday specials x total of 3 months)	First six months of the launch	First six months	First six months	First six months
Resources	\$ 2,000 editorial contract; liaison with 30 CA, 20 LA, 10 MS restaurants	\$5,000 for materials development, printing & distribution	\$15,000 staff training & incentives	\$10,000 free samples	\$ 5,000 discount coupons/restaurant redemption
Responsibility	VP Marketing & Manager of Promotions	Manager of Promotions & Participating Restaurants	HOF Training Group & Participating Restaurant Waiting Staff	Distribution Manager and Restaurant Chefs & Waiting Staff	Manager of Promotions/Waiting staff

1.2.4. Packaging

Post harvest processing of raw oysters results in the gaping of oyster shells. This necessitates the application of plastic bands to hold the shells closed together prior to packaging and transport in order to preserve meat quality. While this presents an added cost during manufacturing, the use of sky blue colored plastic band with the **Heavenly Oysters Factory** name and logo is an excellent way to differentiate the product from the competition and to create brand recognition.

Supermarket-bound PHP products will be packaged in clear plastic bags with the **Heavenly Oysters Factory** brand name and logo. This is the second preferred type of packaging whole or full shell PHP oysters by coastal Mississippi respondents. Among the advantages of this type of packaging compared to the more preferred traditional method of packaging them in sacks include: ability to see the products, customer does not have to touch or smell the oysters, prevents contamination, and it could hold ice without dripping.

Aside from plastic packaging, PHP oysters bound for the restaurants or individuals (via internet orders) will also have to be packed and sealed in cardboard boxes for ease of handling and transport.

2.0 Technological/Production Aspects

2.1. Production process

2.1.1. Availability of economically viable and stable technology/production process:

As of 2004, four of the five commercial raw oyster post harvest processing plants operating within the United States is located in the Gulf of Mexico. This section of the feasibility study and business opportunity plan presents three of the PHP processes available, i.e., heat-cool pasteurization (HCP), high hydrostatic pressure (HHP), and individually quick frozen (IQF). It is left to the reader to determine which is their choice of technology or process.

For further details on the technologies described here, consult the original economic modeling work made by Posadas and Posadas (2004) contained within Jamir et al. (2004).

2.1.2. Description of the Process

The Heat-Cool Pasteurization Process:

After the raw oysters are received, washed and graded, they are first individually banded to keep the shells closed throughout the process. Next, the oysters are placed in trays and the batch is loaded into a holding cart. Each batch is processed by dipping them first in a hot water bath followed by a dip in a cold water bath, hence the name “Heat-Cool Pasteurization.” Then the oysters undergo final sorting and quality control procedures before they are counted and packaged in boxes. The whole process is diagrammatically shown below (Figure 9).

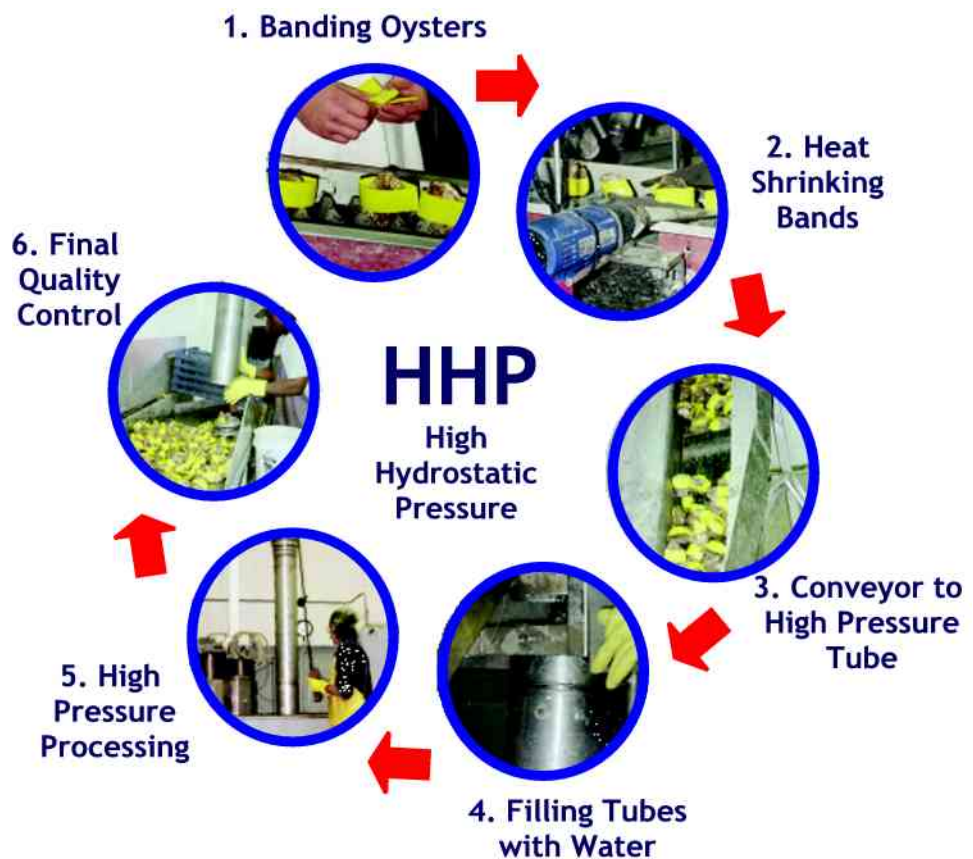
Figure 9. The Heat-Cool Pasteurization Process.



2. High Hydrostatic Pressure Process:

Similar to the Heat-Cool Pasteurization Process, oysters are first received, washed and sorted upon delivery to the plant. Then plastic bands are placed around each oyster prior to heat shrinking in order to hold the shells tightly together throughout the process. The oysters then pass through the conveyor belt and for loading into high-pressure tubes. Once filled with oysters, the high-pressure tubes are filled with water in preparation for the high-pressure treatment that follows. The last step in the process involves final quality control before the batch of oysters are sorted and boxed for cold storage or shipment. The elements of the High-Hydrostatic Pressure Process is shown below (Figure 10):

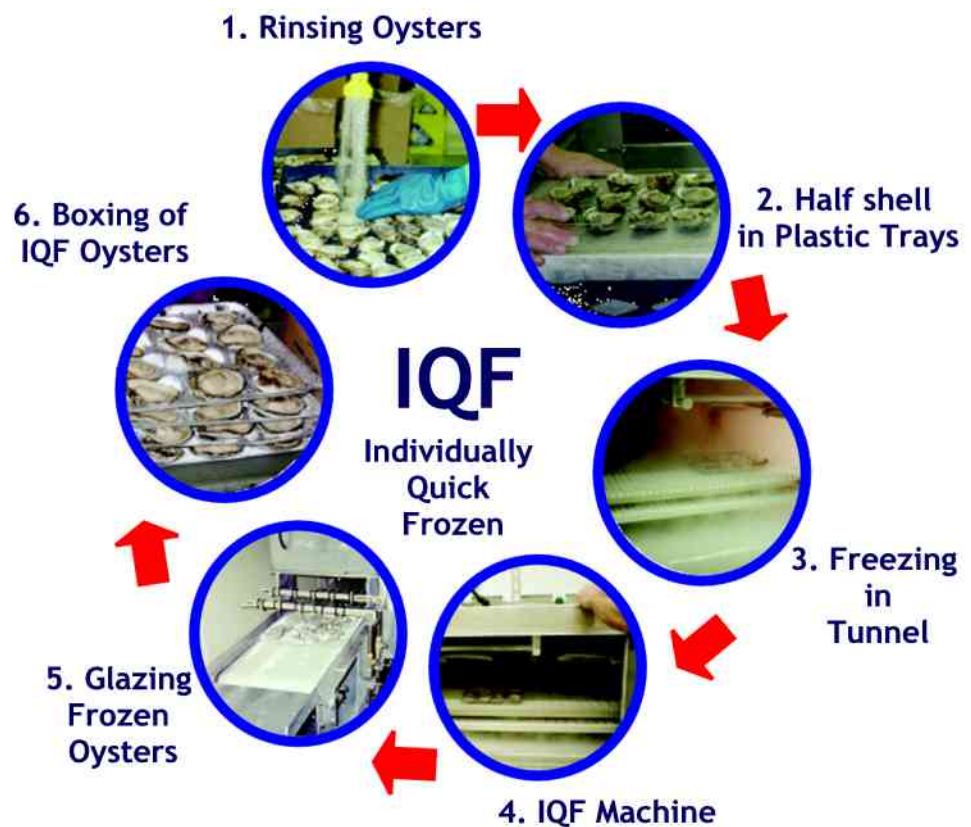
Figure 10. The High Hydrostatic Pressure Process.



3. Individually Quick Frozen Process:

Once the oysters are received, washed and sorted, the IQF process commences either with an optional High-Pressure or Heat-Cool Pasteurization Process or straight into freezing. Individual oysters on the half-shell are arranged in plastic trays specially designed to hold a dozen. The plastic trays are placed on a conveyor belt that runs through the freezing tunnel where the IQF machine rapidly freezes each oyster to the desired temperature. Once the oysters in plastic trays exit the tunnel, a glazing of water is sprinkled to seal the flavor and maintain the quality of meat. The oysters are then boxed and placed in cold storage and are ready for shipping. The elements of the IQF process are graphically shown below (Figure 11):

Figure 11. The Individually Quick Freezing Process.



2.1.3. Technological Assistance

Both the Heat-Cool Pasteurization Process and the High Hydrostatic Pressure Treatment are patented technologies and processes. Technical assistance and royalty agreements are available from the Ameripure Processing Company of Franklin, Louisiana for the HCP technology, and from Motivaitit Seafood Company of Houma, Louisiana for HHP technology.

2.2. Space and Building Requirement

It was assumed that the three models are operated as a single plant, single location, one product line commercial post-harvest processing production system. The space requirements and building specifications are listed in Table 17. The processing building space would require 2,000 sq ft with different specifications for the ceiling height. Multipurpose, refrigeration and administrative building spaces were assumed at 1200, 1000 and 800 sq ft, respectively. The assumed technical parameters of the CPHPS processing facilities for the three PHP systems were based on observed processing production conducted at the different processing plants visited (Table 17).

Detailed descriptions of the postharvest processing production processes observed during visits with processing plants were described in posters, leaflets, videotapes and CDs published by the Seafood Technology Bureau, Mississippi Department of Marine Resources (DMR-STB) (<http://www.dmr.state.ms.us/>) and the Gulf Oyster Project (GOP) (<http://www.gulfoysters.net/index.html>).

2.3. Processing Capacity

A single HCP processing line consisting of a 5000-gal warm-water tank and a 3,500-gal ice-water tank could process 8 batches per hour or a total of 64 batches per 8-hour-day processing schedule (Table 18a). In order to operate the HCP processing plant at full capacity, it would require 384 sacks of suitable single oysters per day, 8,160 sacks per month, or 97,920 sacks per year (Table 19). In terms of the size of oyster lease or public reef, at least 196 acres of productive oyster growing area producing at least 500 sacks per acre would be required to supply this processing facility with suitable oysters year-round.

Table 17. Space requirements and building specifications for postharvest processing plants for raw oysters in the Gulf of Mexico. Based on specifications provided by (Muth et al., 2000).

HCP System	Unit	Quantity
No. of processing plants	plant	1
Processing building space: 12' ceiling height, concrete floor	sq ft	2,000
Multipurpose building space	sq ft	1,200
Refrigeration building space	sq ft	1,000
Administration building space	sq ft	800
HHP System		
No. of processing units	plant	1
Processing building space: 16' ceiling, 6' below enclosure, concrete floor	sq ft	2,000
Multipurpose building space	sq ft	1,200
Refrigeration building space	sq ft	1,000
Administrative building space	sq ft	800
IQF System		
No. of processing plants	plant	1
Processing building space: 9-10' ceiling height, concrete floor	sq ft	1,200
Multipurpose building space	sq ft	1,200
Refrigeration building space	sq ft	1,000
Administrative building space	sq ft	800

With a single 210 liter high hydrostatic pressure processor, a HHP processing facility could process 8 batches per hour or 144 batches per 18-hour-day processing schedule (Table 18b). At full capacity, the HHP processing plant would need 432 sacks of single oysters per day, 9,180 sacks per month, or 110,160 sacks per year (Table 19). About 220 acres of oyster growing area producing at least 500 sacks per acre would be required to supply the HHP processing facility with oysters for 12 months each year.

It was assumed that a single freezer tunnel could process 12 batches per hour or 192 batches per 16-hour-day processing schedule (Table 18c). About 614 sacks per day of winter oysters, 13,056 sacks per month or 78,336 sacks per 6-month processing period would be required to operate the IQF facility at full capacity. A minimum of 157 acres of productive oyster growing area would be necessary to supply the winter oysters needed to run the IQF facility for the specified 6-month processing period (Table 19).

Table 18a. Technical parameters used in developing processing facilities for Heat-Cool Pasteurization (HCP) post-harvest processing plants for raw oysters in the Gulf of Mexico.

HCP Processing Facility		
Parameter	Unit	Quantity
Number of boiler	Unit/plant	1.00
Number of 5,000-gal warm water tank	Tank/plant	1.00
Number of chilling and condensing unit	Unit/plant	1.00
Number of 3,500-gal ice-water tank	Tank/plant	1.00
Number of sacks of oysters per batch	Sack/batch	6.00
Length of processing:		
Heating process	Minute/batch	24.00
Cooling process	Minute/batch	15.00
Loading and unloading process	Minute/batch	5.00
Total processing time	Minute/batch	44.00
Number of batches per hour	Batch/hour	8.00
Number of processing hours per shift	Hour/shift	8.00
Number of processing shifts per day	Shift/day	1.00
Number of processing hours per day	Hour/day	8.00
Number of operating days per week	Day/week	5.00
Number of operating weeks per month	Week/month	4.25
Number of operating months per year	Month/year	12.00
Dozen of half shell oysters per case	Oyster/case	8.33

Table 18b. Technical parameters used in developing processing facilities for High Hydrostatic Pressure (HHP) post-harvest processing plants for raw oysters in the Gulf of Mexico.

HHP Processing Facility		
Parameter	Unit	Quantity
Number of 215-L high hydrostatic pressure processor	Unit/plant	1.00
Number of pounds of oyster shell stock per sack	Pound/batch	100.00
Number of pounds of shell stock per batch	Pound/batch	300.00
Number of sacks of oyster shell stock per batch	Sack/batch	3.00
Length of processing:		
Pressurized process	Minute/batch	5.00
Loading and unloading process	Minute/batch	2.50
Total processing time	Minute/batch	7.50
Number of batches per hour	Batch/hour	8.00
Number of processing hours per day	Hour/day	18.00
Number of operating days per week	Day/week	5.00
Number of operating weeks per month	Week/month	4.25
Number of operating months per year	Month/year	12.00
Dozen of half shell oysters per case	Oyster/case	8.33

Table 18c. Technical parameters used in developing processing facilities for Individually Quick Frozen (IQF) post-harvest processing plants for raw oysters in the Gulf of Mexico.

IQF Processing Facility		
Parameter	Unit	Quantity
Number of freezer tunnel	Unit/plant	1.00
Number of half-shell oysters per batch	Tank/plant	960.00
Length of processing:		
Freezing process	Minute/batch	5.00
Glazing process	Minute/batch	1.00
Loading and unloading process	Minute/batch	3.00
Total processing time	Minute/batch	9.00
Number of batches per hour	Batch/hour	12.00
Number of processing hours per shift	Hour/shift	8.00
Number of processing shifts per day	Shift/day	2.00
Number of processing hours per day	Hour/day	16.00
Number of operating days per week	Day/week	5.00
Number of operating weeks per month	Week/month	4.25
Number of operating months per year	Month/year	6.00
Dozen of half shell oysters per case	Oyster/case	12.00

Table 19. Oyster shellstock requirements for post-harvest processing plants for raw oysters in the Gulf of Mexico.

Raw Oysters	Unit	HCP	HHP	IQF
Number of halfshell oysters per sack	Oyster/sack	300	300	300
Sack of oyster shellstock per case of halfshell oyster	Sack/case	0.33	0.33	0.48
Sack of oyster shellstock per day	Sack/day	384	432	614
Sack of oyster shellstock per month	Dack/month	8,160	9,180	13,056
Sack of oyster shellstock per year	Sack/year	97,920	110,160	78,336
Acre of oyster lease or public reef	Acre	196	220	157
Sack of oyster shellstock per acre	Sack/acre	500	500	500

3.0 Financial Feasibility Aspects

3.1. Investment Requirements

The three hypothetical CPHPS models developed for the Gulf of Mexico PHP raw oysters proved to be an economically viable processing systems given the technical parameters assumed and prevailing market conditions. The rate of utilization of production capacity (RUPC) was assumed to start at 20% during the first year and would reach full capacity during the fifth year.

Initial fixed investment required (IFIR) to establish an HCP processing system would be \$0.91M (Table 20). With the assumed input usage and cost structures, annual operating capital required (AOCR) to operate the HCP system at full capacity during the fifth year would be \$4.34M. At prevailing market conditions, the HCP system could generate annual gross sales during the fifth year (AGS5) amounting to \$7.34M. Annual production at full capacity (APFC) would be 293,760 cases of HCP processed halfshell raw oysters. Discounted investment indicators showed that HCP processing system had an internal rate of return (IRR = 67.54%) greater than the required rate of return (RRR= arbitrarily set at 35%). At a discount rate of 10%, the net present value of the HCP system (NPV = \$5.96M) is positive, indicating an economically viable investment alternative.

Establishing an HHP processing system for raw oysters could be considered an economically viable alternative. The HHP processing system would require IFIR = \$2.55M and AOCR = \$4.66M (Table 20). With APFC = 330,480 cases of HHP processed halfshell raw oysters, AGS5 were projected to reach \$8.26 M. At these assumed technical parameters and market conditions, the HHP processing system could be considered an economically viable alternative since it had an IRR = 35.69%, which is slightly higher than RRR = 35% and a positive NPV =\$5.45M.

The IQF processing system proved to be an economically viable raw oyster processing system. It has the potential to produce 163,200 cases of frozen halfshell oysters per six-month processing period. It would require IFIR = \$0.76M to establish the processing system, and AOCR = \$3.10M to operate the system. With an expected AGS5 reaching \$5.88M, the IQF system would be a viable processing system with NPV = \$5.64M and IRR = 70.40%.

Table 20. Model results and investment analysis of post-harvest processing production systems for raw oysters in the Gulf of Mexico.

Model Results	Unit	HCP	HHP	IQF
Number of halfshell oysters processed per day	Oyster/day	115,200	129,600	184,320
Number of cases of halfshell oysters processed per day	Case/day	1,152	1,296	1,280
Number of halfshell oysters processed per month	Oyster/month	2,448,000	2,754,000	3,196,800
Number of cases of halfshell oysters frozen per month	Case/month	24,480	27,540	27,200
Number of halfshell oysters processed per year	Oyster/year	29,376,000	33,048,000	23,500,800
Number of cases of halfshell oyster frozen per year	Case/year	293,760	330,480	163,200
Investment Analysis				
Initial fixed investment requirement	\$M	0.91	2.55	0.76
Annual gross receipts at full capacity	\$M/yr	7.34	8.26	5.88
Annual operating capital requirements at full capacity	\$M/yr	4.34	4.66	3.10
Discount rate	%	10.00	10.00	10.00
Net present value	\$M	5.96	5.45	5.64
Internal rate of return	%	67.54	35.69	70.40

3.2. Average Production Costs

The total annual costs of the CPHPS models were estimated as a function of RUPC or annual processed raw oyster production (APROP). Total processing costs (TC) consisted of total fixed or ownership costs (TFC) and total variable or operating costs (TVC). For the HCP processing system described in Tables 17 and 18a-c, the average total cost (AC = TC | APROP) would range from \$0.25/halfshell to \$0.17/halfshell (Figure 12). At the current wholesale price (CWP = \$0.25/halfshell), the HCP plant would break-even at more than 50,000 cases of processed raw halfshell oysters.

For the HHP processing system described earlier, \$0.30 = ATC = \$0.17 per processed halfshell raw oyster (Figure 13). The HHP system would attain break-even position at APROP > 100,000 cases of processed raw oysters. The estimated ATC for the IQF system would range from \$0.27 to \$0.16 per processed halfshell raw oyster (Figure 14). The break-

even point for the IQF system would occur at APROP < 50,000 cases of processed raw halfshell oysters.

The majority of total processing costs for the three PHP systems were incurred in the purchase of single oysters (31.3%-34.1%), hiring of hourly workers (13.2%-17.6%), cost of operating capital (8.3%-8.7%), purchase of banding materials (4.4%-5.9%), royalty fees for HCP and HHP (5.9%), packaging materials (2.7%-5.9%), cost of natural gas for HCP and IQF (5.9%-14.7%), and electric consumption (3.6%-4.7%) – (See Table 21).

Table 21. Percent distribution of annual processing costs of PHP systems for raw oysters in the Gulf of Mexico.

Cost Items	HCP	HHP	IQF
Variable Costs:			
Oyster shellstock	31.3%	31.4%	34.1%
Wage Labor	17.6%	17.7%	13.3%
Operating interest	8.7%	8.3%	8.4%
Banding materials	5.9%	5.9%	4.4%
Royalty fees	5.9%	5.9%	0.0%
Packaging materials	5.9%	5.9%	2.7%
Natural gas	5.9%	0.0%	14.7%
Electricity	4.7%	4.7%	3.6%
Salary Labor	3.0%	2.7%	4.1%
Liability insurance	2.4%	2.1%	3.3%
Fuel and oil	1.9%	1.9%	1.4%
Repair and maintenance	1.4%	4.3%	2.0%
Water	0.6%	0.3%	0.4%
Communication and internet	0.2%	0.2%	0.3%
Total Variable Costs	95.4%	91.2%	92.9%
Fixed Costs:			
Plant management	1.7%	2.2%	3.4%
Depreciation	1.6%	3.4%	2.3%
Interest on investment	0.9%	2.3%	1.0%
Insurance for building and equipment	0.4%	0.9%	0.4%
Total Fixed Costs	4.6%	8.8%	7.1%
TOTAL COSTS	100.00%	100.00%	100.00%

Figure 12. *Estimated average costs of Heat-Cool Pasteurization (HCP) post-harvest processing system for raw oysters.*

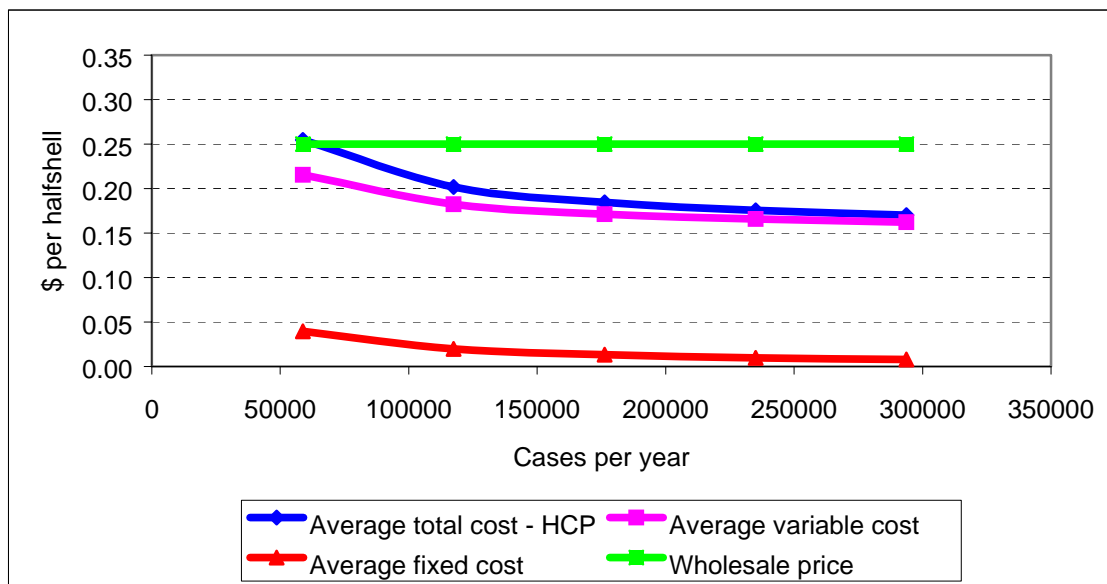


Figure 13. *Estimated average costs of High Hydrostatic Pressure (HHP) post-harvest processing system for raw oysters.*

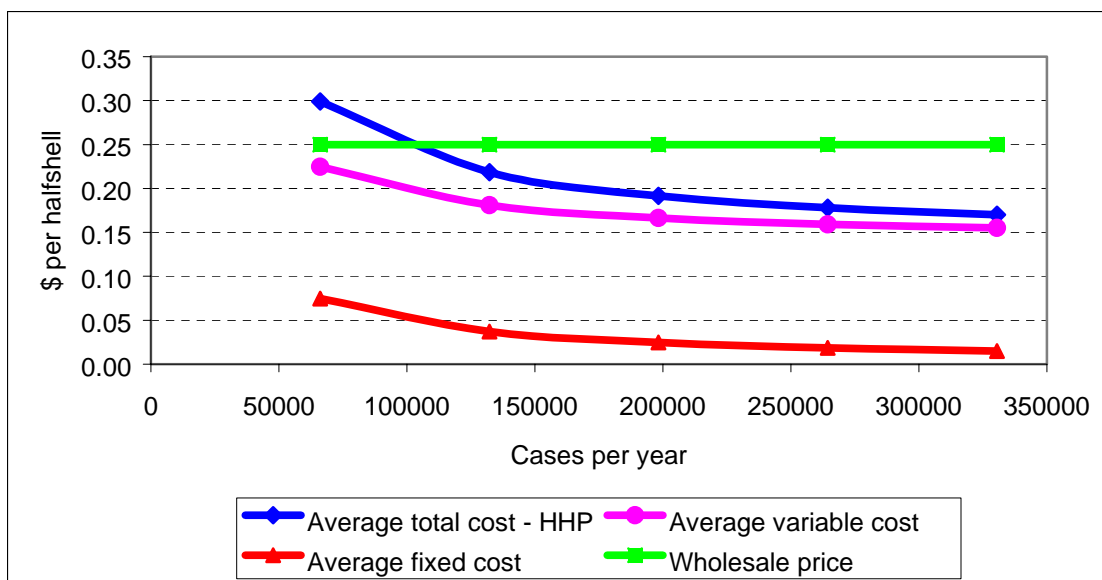
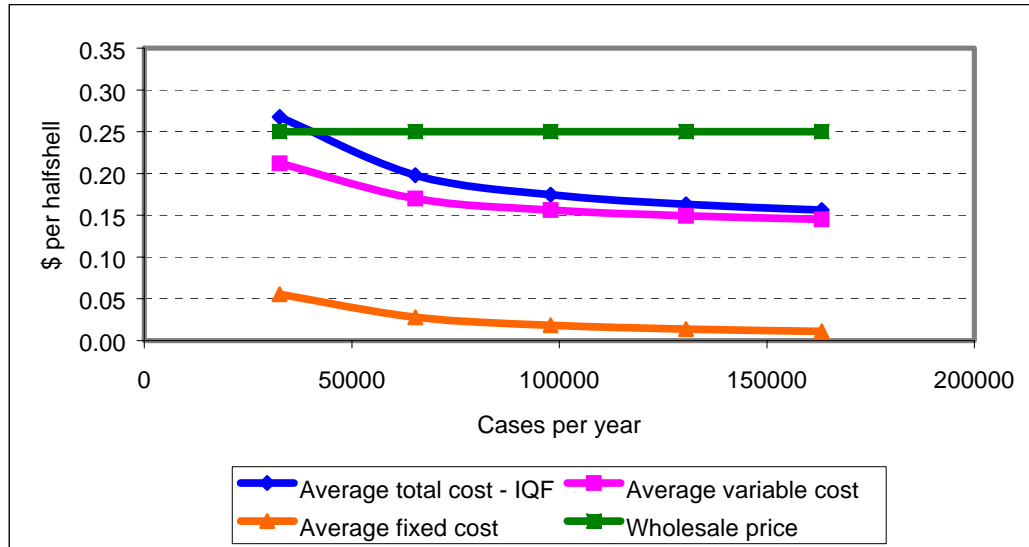


Figure 14. *Estimated average costs of Individually Quick Frozen (IQF) post-harvest processing system for raw oysters.*



Extension and Outreach

I. THEORETICAL FRAMEWORK

Throughout the life of the Gulf Oyster Project, the collaborators worked hard to develop, implement and experiment with different outreach and consumer education strategies. Conducting wide-scale product promotion campaigns aimed at increasing oyster consumption among the general seafood consumers while at the same time educating the V.v. at-risk segment of the consumer population about the risk of eating raw oysters and the availability of equally tasty but safer alternatives is very difficult, expensive and time-consuming. On the supply-side of the equation, promoting value-added oyster products and post-harvest processing technologies to reluctant seafood processors requires serious technology transfer programs and resources. Given insufficient resources, the large geographic divide separating major population centers along the Gulf of Mexico coast, and limited numbers of qualified extension professionals to deal with the problem, local state agencies and concerned industry groups have no choice but to join forces and tackle the challenges themselves.

Faced with the enormous task ahead, the project needed some guiding principles that could bind or integrate the fragmented consumer education and technology transfer efforts of these three major collaborating agencies. In light of this, the general principles contained in the modified diffusion theory of information dissemination provided an overarching framework for developing the group's communication strategies. Tactical implementation guidelines were provided by the technology adoption life cycle model (TALC) and the Individual Adoption Process (IAP). In essence, one of the important side benefits derived from this project is that, by necessity and expediency, it became an informal crash course in technology transfer and communication strategies for these novice "extension and outreach professionals."

(1) Diffusion Theory and the Technology Adoption Life Cycle Model

Diffusion is the process by which (1) an *innovation* is (2) *communicated* through certain *channels* (3) *over time* (4) among the members of a *social system* (Rogers 1995). An *innovation* is an idea, practice, or object perceived as new by an individual or other unit of adoption. The characteristics of an innovation, as perceived by the members of the social system, determine its rate of adoption.

A *social system* is a set of interrelated units that are engaged in joint problem solving to accomplish a common goal. A system has *structure*, defined as the patterned arrangements of the

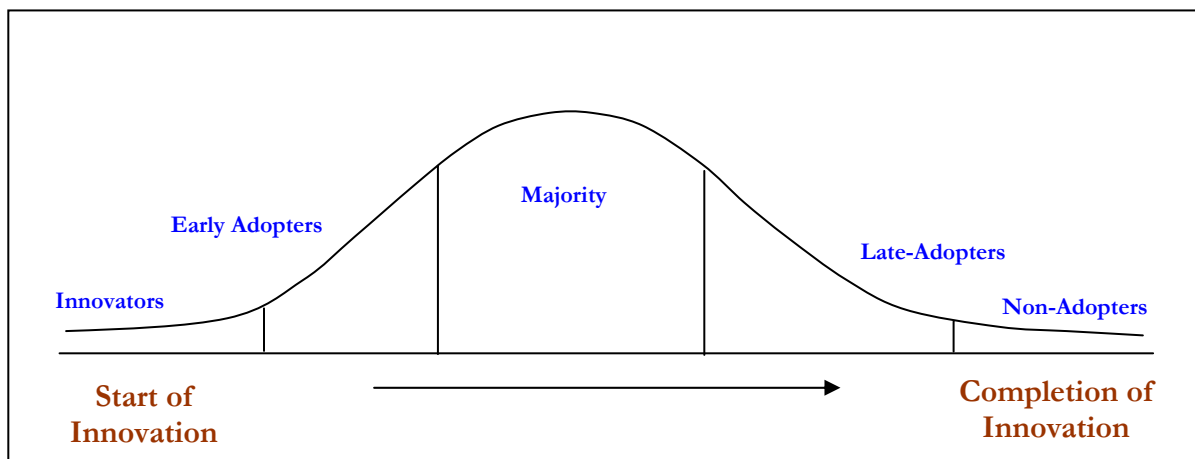
units in a system, which gives stability and regularity to individual behavior in a system. The social and communication structure of a system facilitates or impedes the diffusion of innovations in the system. *Time* is involved in diffusion in (1) the innovation-decision process, (2) innovativeness, and (3) an innovation's rate of adoption.

Diffusion models were first applied by health organizations to understand and predict the spread of contagious diseases or epidemics (e.g., Rogers 1995; Debelak 2003). Diffusion research emerged out of the troubles that change agents had in getting people to use innovations and information that had been developed specifically for them, usually at public expense, for example, the Gulf Oyster Project's *V. vulnificus* education efforts aimed at preventing raw oyster consumption by high-risk individuals. In the business community, market forecasters use them to simulate the spread of ideas, products or techniques through groups of people.

The practical aspect of this theory is captured in the *Technology Adoption Life Cycle Model* (TALC). The model relates how communities or groups respond to *discontinuous innovations*. An *innovation* is an idea, practice, or object perceived as new by an individual or other unit of adoption. Truly *discontinuous innovations* are new products or services that require the end users and the marketplace to dramatically change their behavior in exchange for promises of equally dramatic benefits.

Figure 15 shows the typical innovation adoption pattern and the type of people involved in the process. The curve has three distinguishable parts, i.e., (1) when adoptions occur very slowly, but at a slightly increasing rate, (2) increasing rate of adoption, and (3) decreasing rate of adoption. The first part of the curve involves mainly a small group of innovators who are always ahead of the others in recognizing and adopting new ideas or technology that may still be in their infancy. The community's early adopters or the trendsetters follow the innovators. Finally, once the innovation becomes mainstream, the majority and late adopters join the bandwagon.

Figure 15. Technology Adoption Life Cycle Model.



Applied to marketing, the model postulates that when a marketplace is confronted with the opportunity to switch to a new infrastructure paradigm – e.g., new oyster product forms or processing technology – customers self-regulate along an axis of risk aversion, with the risk-immune

innovators moving to the forefront while the risk-allergic laggards retreat to the rear of the line. In-between, the model identifies three additional communities, i.e., early adopters (visionaries), early majority (pragmatists), and later majority (conservatives). The reason for this is because each group in the continuum represents a unique *psychographic* profile – a combination of psychology and demographics that makes its marketing responses different from those of the other groups (Moore 1991). Understanding each profile and its relationship to its neighbors is a critical component in the development of consumer education, technology transfer and marketing strategies.

The TALC model indicates that innovations are usually accepted first by the innovators, who seldom make up more than 2 to 3 percent of the larger population. Innovators aggressively pursue innovations because technology is of central interest in their lives. Innovators usually have relatively little influence on the general population as a whole. Still, winning them over is very important at the onset of a marketing campaign because their endorsement reassures the other players in the marketplace that the product does in fact work.

The idea takes off when it is taken up by the early adopters, which comprise about 13 percent of the population and who tend to be the respected opinion leaders. Like the innovators, they buy into new product concepts very early in their life cycle. Unlike innovators, however, they are usually not technologists but visionaries and entrepreneurs who find it easy to imagine, understand, and appreciate the benefits of an innovation and relate their potential benefits to their other concerns. These are people smart enough to see what those innovators are doing, and influential enough to spread the idea into the next group, the early majority.

The early majority shares some interest in technology as the early adopters but is mainly driven by practical considerations. They are content to wait and see how other people are making out before they buy in themselves. Because there are many people in this segment, roughly 33 percent of the whole adoption life cycle, winning their business is key to any substantial profits and growth. The late majority shares all the concerns of the early majority, except they wait until the innovation has become an established standard with adequate service and support. As a group, the late majority tends to buy from large, well-established companies. Like the early majority, this group comprises about 33 percent of the total buying population in any given segment, hence, getting their loyalty could result in high profits.

Finally there are the late adopters and non-adopters. In general these two groups are averse to any innovation and would not buy new products unless, they are deeply embedded in another product that they do not even know it is there. In terms of marketing and technology transfer programs, the late adopters and non-adopters are not worth pursuing.

An example of how this diffusion model could be applied to estimate the target audience of a technology transfer program by *psychographic* groups is provided Berry and Wilson (2004). Previous research contracted by Apple gave an estimated 50 million knowledge workers based in the U.S. Ignoring the estimated 8 million laggards and late adopters, Table 22 shows the breakdown of these diffusion group categories (market segments) using the standard TALC classification outlined above.

Table 22. Breakdown of U.S. Knowledge Workers by Diffusion Group.

TALC Segment	Fraction of the Population	Multiplier	Calculated Population (in Millions)
Innovators	3%	x 50 million =	1.5
Early Adopters	13%	x 50 million =	6.5
Early Majority	33%	x 50 million =	16.7
Late Majority	33%	x 50 million =	16.7
Total Computer Market Population	82%	x 50 million =	41.4

Substantial research literature has already been written concerning variables that relate to innovativeness. These factors are important as they could be used for effective audience segmentation (or *narrowcasting* in modern political terminology). Similar to market segmentation principles, *audience segmentation* is a strategy in which different communication channels or messages are used with each sub-audience. Effective targeting or tailoring of communication approaches is possible only after breaking down a heterophilous audience into a series of relatively more homophilous sub-audiences.

Enumerated below is Roger’s (1995) summary and generalization of various diffusion research findings, grouped into three major headings: (a) socioeconomic status, (b) personality values, and (c) communication behavior.

(a) Socioeconomic Status:

- *Earlier adopters are not different from later adopters in age.*
- *Earlier adopters have more years of formal education than later adopters.*
- *Earlier adopters are more likely to be literate than are later adopters.*
- *Earlier adopters have higher social status than later adopters.* Evidence suggests that earlier adopters are not only of higher status but are on the move in the direction of still higher levels of social status. In fact, they may be using the adoption of innovation as one means of getting there.
- *Earlier adopters have a greater degree of upward social mobility than later adopters.*
- *Earlier adopters have larger social units (farms, schools, companies, etc.) than later adopters.* The social characteristics of earlier adopters mark them as more educated, of higher social status, and the like. They are wealthier and have large units. Socioeconomic status and innovativeness appear to go hand in hand.

(b) Personality Values:

- *Earlier adopters have greater empathy than later adopters.* Empathy is the ability of an individual to project himself or herself into the role of another person. This is important as the innovator must be able to project into the role of individuals who are outside of the local system, such as innovators in other systems, change agents, and even scientists and R&D workers.
- *Earlier adopters maybe less dogmatic than later adopters.* Dogmatism is the degree to which an individual has a relatively closed belief system, i.e., a set of beliefs that are strongly held.
- *Earlier adopters have a greater ability to deal with abstractions than do late adopters.* Innovators must be able to adopt a new idea largely on the basis of rather abstract stimuli, such as are received from the mass media. Later adopters can observe the innovation in the here-and-now of a peer's operation, hence, need less ability to deal with abstractions.
- *Earlier adopters have greater rationality than later adopters.* Rationality is use of the most effective means to reach a given end.
- *Earlier adopters have greater intelligence than later adopters.*
- *Earlier adopters have a more favorable attitude toward change than late adopters.*
- *Earlier adopters are better able to cope with uncertainty and risk than late adopters.*
- *Earlier adopters have a more favorable attitude toward science than later adopters.* Because most innovations are the product of scientific research, it is logical that innovators are more favorably inclined toward science.
- *Earlier adopters are less fatalistic than later adopters.* Fatalism is the degree to which an individual perceives a lack of ability to control his or her future.
- *Earlier adopters have higher aspirations (for formal education, occupations, etc.) than later adopters.*

(c) Communication Behavior:

- *Earlier adopters have more social participation than later adopters.*
- *Earlier adopters are more highly interconnected through interpersonal networks in their social system than later adopters.* Connectedness is the degree to which an individual is linked to others.
- *Earlier adopters are more cosmopolite than later adopters.* Innovator's interpersonal networks are more likely to be outside, rather than within, their system. They travel widely and are involved in matters beyond the boundaries of their local system. Cosmopolitanism is the degree to which an individual is oriented outside a social system.
- *Earlier adopters have more change agent contact than later adopters.*
- *Earlier adopters have greater exposure to interpersonal communication channels than later adopters.*
- *Earlier adopters seek information about innovations more actively than later adopters.*
- *Earlier adopters have greater knowledge of innovations than later adopters.*

- *Earlier adopters have a higher degree of opinion leadership than later adopters.* In systems with norms favorable to change, opinion leaders are more likely to be innovators.

In recent years, additions or modifications to the classic diffusion theory have evolved, centering mainly on the use of formal or informal networks or connections in spreading a “buzz,” mainly through word of mouth communication (e.g., Rosen 2000, Gladwell 2002). Using the analogy of the rapid spread of epidemics, the success of a buzz depends primarily on three components: (a) the characteristics of the network and the players, (b) the “stickiness” of the message, and (c) the context.

- (a) Network Characteristics deals with the type of connections and the kinds of people who are critical in spreading information. Buzz travels in invisible networks roughly parallel to that of the airline system. Within this network are three important types of players or hubs, i.e., the *mavens*, *connectors*, and *salesmen*.

Mavens are people who are listened to because they have demonstrated significant knowledge or “authority” over a certain area (e.g., computers, cooking, or sports). Their motivation is usually to educate and to help, not to persuade. *Mavens* are information brokers who share and trade what they know.

In every group there are the *Connectors* or those who are more central because they are charismatic, are trusted by their peers, or are simply more socially active.

If *Mavens* are data banks: they provide the message, *Connectors* are social glue: they spread it, *Salesmen* are persuaders: they possess the skills to persuade us when we are unconvinced of what we are hearing.

- (b) Stickiness of the Message suggests that in order to be capable of sparking “epidemics,” ideas have to be memorable and move us to action.
- (c) The Power of Context suggests that “epidemics” are sensitive to the conditions and circumstances of the times and places in which they occur.

Rosen (2000) identified ten principles at work in social networks that affect buzz, as follows:

Principle 1: The Networks are invisible. The networks are too complex that we do not have the right perspective to see the huge social networks of which we are a part.

Principle 2: People link with others who are similar to them. It is human nature for people to make contact with others like themselves.

Principle 3: People who are similar to each other form clusters. This homophily principle implies that people tend to interact with others who are similar to them, resulting in clusters – sets of people who share similarities in some dimension of their lives, and as a result, who frequently communicate with one another.

Principle 4: Buzz spreads through common nodes. We all belong to more than one cluster or clique, which is one way buzz spreads. We are usually connected to our family through one cluster, to our colleagues at work through another, and to our friends from college through yet another cluster. In this way clusters are interconnected to larger networks, ultimately linking people who belong to distant clusters.

Principle 5: Information gets trapped in clusters. Because people tend to talk only among their peer group, tightly knit clusters tend to prevent buzz from spreading around.

Principle 6: Network hubs and “connectors” create “shortcuts.” It only takes very few shortcuts between nodes (connectors) and distant clusters to turn a big world into a small world.

Principle 7: We talk to those around us. Geography still matters. The closer people were to one another, the more likely they were to talk.

Principle 8: Weak ties are surprisingly strong. Since people tend to form networks with individuals just like themselves who are likely to be exposed to the same sources of information, people *outside* of these networks are important in bringing in fresh data.

Principle 9: The Internet nurtures weak ties. With the advent of the Internet, it becomes easier to maintain or develop weak ties than by mail or the telephone. Dropping the person a friendly note via e-mail is an easy way to keep in touch without too much obligation.

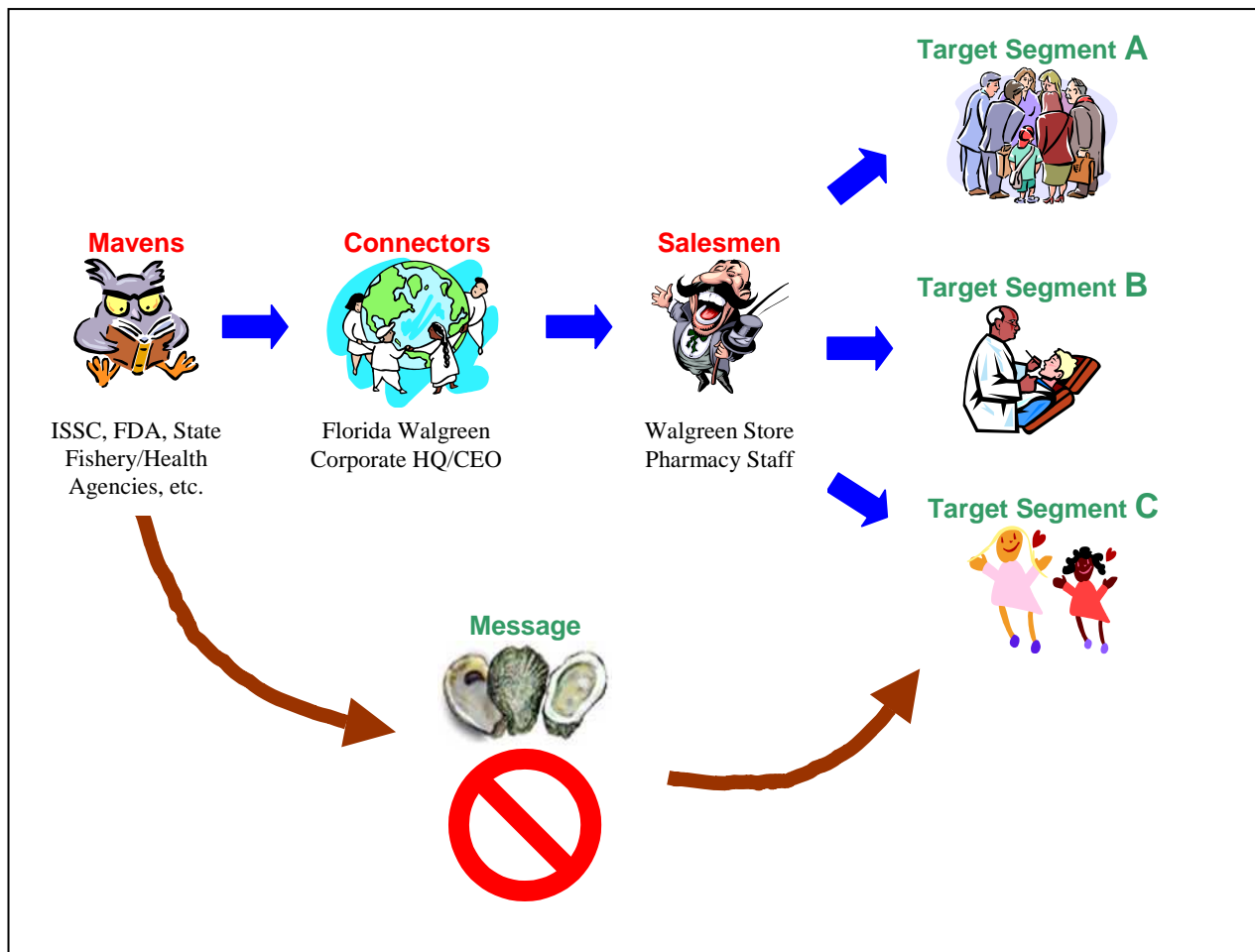
Principle 10: Networks go across markets. You never know how people in one market category are linked to people in other categories. Messages that you try to direct to one group of people can easily find their ways to other people.

Figure 16 shows a simplified diagram outlining how buzz spreads through a network composed of mavens, connectors and salesmen. Good segmentation and characterization of the target audience adds greater precision to the communication process. Knowing your target audience enables better selection of communication channels and development of appropriate messages to effectively reach them. For example, instead of developing generic consumer education materials aimed at the general public, more compelling messages focusing on the risks posed by eating raw oysters to each of the three consumer groups (i.e., the medical professionals, children, and V.v. at-risk segment of the population) could be specially crafted and tested to insure “stickiness” and higher rate of success.

Development of appropriate consumer education materials requires the assistance of experts in various fields. This is the role that mavens are most willing and able to fill, like for example the V.v. education experts at the Interstate Shellfish Sanitation Conference (ISSC) or designated local Sea Grant seafood extension professionals. Reaching the target audience in the most expedient way requires the selection, recruitment, active participation and involvement of the right connectors. Earlier efforts to solicit the participation of medical health professionals (e.g., through doctors or nurses network) met with a blank wall. The ability of the collaborators from Florida to win over the corporate leaders at Walgreen Pharmacies was a major “mega-hub” network breakthrough for the project. With literally just a stroke of a pen, this project’s V.v. at-risk consumer education program

was able to effectively tap hundreds of retail pharmacy outlets belonging to the Florida Walgreen's network of pharmacies, and to get their pharmacists (now also acting as the *de facto* V.v. at-risk consumer education "salesmen") to flag and enclose consumer education materials to all V.v. at-risk individuals who are having their prescriptions filled. Such is the power of buzz and communication networks, especially when all the right components are in place. But what goes on in the individual's mind and how innovations get adopted or discarded is another topic that will be discussed in the next section.

Figure 16. Schematic diagram of how buzz could spread to the target audience through a network of mavens, connectors, salesmen.



(2) The Individual Adoption Process

The *innovation-decision process* is a mental process through which an individual (or other decision-making unit) passes from first knowledge of an innovation to forming an attitude towards an innovation, to a decision to adopt or reject, or to implement a new idea, and to confirm this decision. More formally, the five stages in the individual adoption process (IAP) are as follows:

- (1) Awareness. This is the first stage in the process where a person becomes aware of a new idea, product, or practice for the first time and possess only general information about it. If his interest is kindled, he will try to learn more about it. At this stage, the adopter simply needs to be notified of the innovation's existence, e.g., through mass media channels, fellow oyster processors, government personnel, etc.
- (2) Interest. At this stage a person develops an interest in the new idea or practice. General information is not enough and the person actively seeks additional detailed information to know what the innovation really is, what it will do and how it will work for him. Since the adopter is basically interested in becoming informed, the preferred information sources are similar to those in the awareness stage.
- (3) Evaluation. As the prospective adopter accumulates information, he weighs the pros and cons of the new idea and mentally relates it to his own situation. The person determines whether (a) the idea is a good one and (b) if it is good for him. At this stage, the adopter needs trustworthy sources of information, which includes trusted fellow oystermen, observation of results obtained by commercial seafood processors who adopted the PHP technologies, and other trusted individuals in the community or industry (the opinion leaders).
- (4) Trial. At this stage a person tries the new idea or practice. After initial trial, he may adopt the innovation for sustained use or choose not to use it. At this stage the adopter goes beyond knowledge and into actual hands-on-experience. His information needs at this point are more pragmatic and would include how-to-do-it publications, instructions with the product, experienced oyster processor's assistance, government extension agents, etc.
- (5) Adoption. At this stage the individual decides that the new idea is good enough for full-scale use. It is reasoned that he is likely to continue full use until something new starts the cycle again. Therefore, what is more important here is the adopter's own experience and observations about the merits of the innovation as well as confirmation from his peers that his decision was the right one

Extension or marketing professionals need to realize that different functions and types of information are needed at each stage in the individual adoption process. For example, raising V.v. at-risk consumer's awareness and interest concerning PHP oysters of VAPs that are safer for them to consume simply require access to general information about the risks of eating raw unprocessed oysters that may be contaminated with *Vibrio vulnificus* or availability of equally tasty but safer VAP

or PHP oyster products. This could be effectively accomplished through the use of mass media channels, industry peers, or government agency notices.

Persuasion skills and appropriate communication strategy becomes critical once the V.v. at-risk consumer gets more interested and start evaluating the *pros* and *cons* of eating raw unprocessed oysters or VAP/PHP oysters. At this time, the testimonials of trusted friend who tried or tasted the products as well as the results of local demonstration projects form the main basis for their decision to try the innovation. As consumers would most likely trust the views of peers or medical providers at this stage in the process, it is important to get these informal leaders actively involved or knowledgeable. This is one of the reasons why this project aimed at recruiting medical practitioners and health professionals to get involved in the Gulf Oyster Project's consumer education effort.

The medical advice of health care providers like pharmacists, primary care physicians, nurses, etc., as well as the assistance of knowledgeable outreach professionals, seafood restaurant workers and industry mentors are important to the V.v. at-risk consumers or PHP technology adopters at the trial stage. Instructions and demonstrations on the proper construction, installation and operation of PHP machineries should be made available to interested investors or entrepreneurs to insure that these devices perform as specified. No amount of scientific documentation or expert opinion can substitute for the individual investor or entrepreneur's first-hand observation as to how the system operates. For the reluctant oyster consumers, there is also no substitute to the actual experience and tasting of savory VAP/PHP oyster products.

II. THE PRACTICE OF EXTENSION AND OUTREACH

It should be kept in mind that the extension and outreach program pursued by the Gulf Oyster Project differs from others on at least two major items: (1) it is well-grounded on sound communication and technology transfer models following the traditional “laboratory-to-farm” philosophy of the U.S. extension community, and (2) right from the start the collaborators intentionally designed and based their communication strategies, consumer education materials and outreach/technology transfer activities on the results and findings of the accompanying directed research projects. The idea behind the latter is that valid scientific research findings should be the basis or “meat” of any consumer education program. While the project is by no means perfect, thanks to the dedicated effort of the collaborators and industry partners, the resulting extension and outreach is by all counts comparable to what extension professionals could deliver.

PROJECT RESULTS

Those interested in reading the detailed narrative of the Gulf Oyster Project’s Year 1 and Year 2 programmatic activities and accomplishments are referred to the respective published Final Reports, *“Integrated Oyster Market Research, Product Development, Evaluation, Promotion and Consumer Education for the Gulf of Mexico’s Oyster Industry”* Project R/LR-Q-23 Year I (July 2003) and Year II (September 2004). The results of the Gulf Oyster Project are organized based on the stated objectives of the two-year project.

A. Objectives

Objective 1. *To develop and evaluate the sensory characteristics of commercially available Post Harvest Processed (PHP) oyster products (heat pasteurized, individually quick frozen, high hydrostatic pressure treated) versus raw oysters and other value added product categories (e.g., oyster cheese ball).* Objective 1 has been achieved.

(1) The MS-DMR Seafood Technology Bureau is the lead cooperator in-charge of the research and development aspects of the Gulf Oyster Project. MS-DMR Seafood Technology Bureau staff and scientists from the Mississippi State University completed the following research projects:

- “Sensory Differences of Gulf Post Harvest Processed (PHP) Oysters” conducted by Dr. Patti Coggins
- “Consumer Acceptability of Post Harvest Processed (PHP) and Value Added (VAP) Oysters – Year 2” by Dr. Linda Andrews
- “Shelf Life of Post Harvest Processed Oysters” by Dr. Linda Andrews
- “Marketing Considerations for Post Harvest Processed and Value Added Oyster Products” by Dr. Benedict Posadas, Ruth Posadas, Dr. Linda Andrews, and Susan DeBlanc

GULF OYSTER PROJECT

- “Consumer Preferences for Post Harvest Processed Raw Oysters in Coastal Mississippi” by Dr. Benedict Posadas and Ruth Posadas
- “Bibliography on Oysters and Other Shellfish Post Harvest Processing Technologies” compiled and sorted by the MS-DMR Seafood Technology Bureau staff
- “Gulf Oyster Recipes” featuring new value added oyster products and recipe formulations derived from the Gulf Oyster Project; developed and published jointly by the MS-DMR Seafood Technology Bureau and Mississippi State University’s Coastal Research and Extension Center.
- Developed and printed 5,000 copies each of brochures, fact sheets, posters and power point presentations on various commercially available PHP technologies (i.e., Heat-Cool Pasteurization, High Hydrostatic Pressure, and Individually Quick Frozen oysters).
- Developed video documentation (300 copies on VHS tape and 150 copies on CD/DVD video/movie format) of commercially available PHP technologies for oysters through subcontract with Gulf Side Productions.

(2) The Florida Bureau of Seafood and Aquaculture Marketing conducted Focus Group Research on 15 American Culinary Federation (ACF) seafood chefs at the International Hotel/Motel and Restaurant Show held in Philadelphia on March 16, 2003.



Objective 2. *To educate wholesalers, retailers, processors, food service professionals, high-risk individuals and general consumers of the availability, safety and sensory characteristics of new, commercially available PHP and other value added oyster products.* Objective 2 has been achieved.

(1) Mississippi DMR Seafood Technology Bureau

Education and Promotional Events. Local, statewide, regional and national consumer education and outreach activities were high on the list of all the cooperating agencies for both the Year 1 and Year 2 project period. The MS-DMR STB participated in numerous education and promotion events where PHP and VAP oyster products were highlighted, for example:

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the Louisiana Seafood Industry Convention and Field Day, Fish and Wildlife Show Extravaganza, Interstate Shellfish Sanitation Conference, Louisiana Restaurant Show, International West Coast Seafood Show, Jackson County Trade Show and Fair, Mississippi Business Expo, International Boston Seafood Show, and the Biloxi Cajun Crawfish Festival.

Public Conferences. As part of its mission, the MS-DMR STB staff also participated in various food technology, health and safety meetings and conferences like: International Food Technology Convention and Food Expo, Mississippi Food Safety Task Force Meeting, Oyster Forensic Science Workshop and Oyster Ecology and Management Workshop, and the World Aquaculture Society Convention.

Other Related Activities. The MS-DMR STB staff also distributed Gulf Oyster Project educational materials during the AFDO Basic HACCP and Sanitation Training Course, supplies the education materials to Public Affairs Office of the MS Department of Marine Resources and all permitted members of the MS Seafood Industry, Mississippi State Research and Extension Center (MSU-CREC), Gulf and South Atlantic Fisheries Foundation, Florida Sea Grant College Program, Northeastern Regional Aquaculture Center, and the National Marine Fisheries Service among others. The bureau also conducts semi-annual mail-outs to 91 newly certified Seafood Dealers (11 new dealers) on seafood safety including updated ISSC NSSP regulations and education materials on Post Harvest Processing of Oysters to reduce *Vibrio vulnificus*-related illnesses. Aside from the above engagements, the bureau also offers technical assistance to two Mississippi seafood dealers who adopted PHP technologies.

(2) Louisiana Seafood Promotion and Marketing Board

Industry Promotion. The LSPB promoted PHP and VAP oyster products and technologies at the National Restaurant Show in Chicago where Gulf Oyster Project developed brochures and informational materials were distributed to attendees visiting the seafood displays. While at the National Restaurant Show, the Louisiana project team conducted product comparison demonstration at the American Leadership Conference where approximately 200 Executive Chefs from around the country tasted PHP oysters that were harvested and processed in Louisiana.

Advertisement. Advertisements were placed in the Louisiana Cooking magazine (approximately 30,000 readers), Seafood Business magazine (advertised twice; approximately 45,000 readers), and Chain Leader magazine (approximately 50,000 readers) to promote the Gulf Oyster Project's Public Conference held in conjunction with the First Gulf Coast Seafood Pavilion on July 31, 2004 to August 2, 2004 and also to promote the three commercially available oyster PHP technologies.

Trade Shows. The LSPMB participated in the International Boston Seafood Show, the International Hotel/Motel and Restaurant Show, the Louisiana Restaurant Show, and the National Restaurant Show where about 500 brochures were distributed at each trade show.

Legislative Promotion. Louisiana held the Louisiana State Legislature and Washington, D.C. "Mardi Gras/Louisiana Alive" events to showcase Louisiana's seafood to the country's

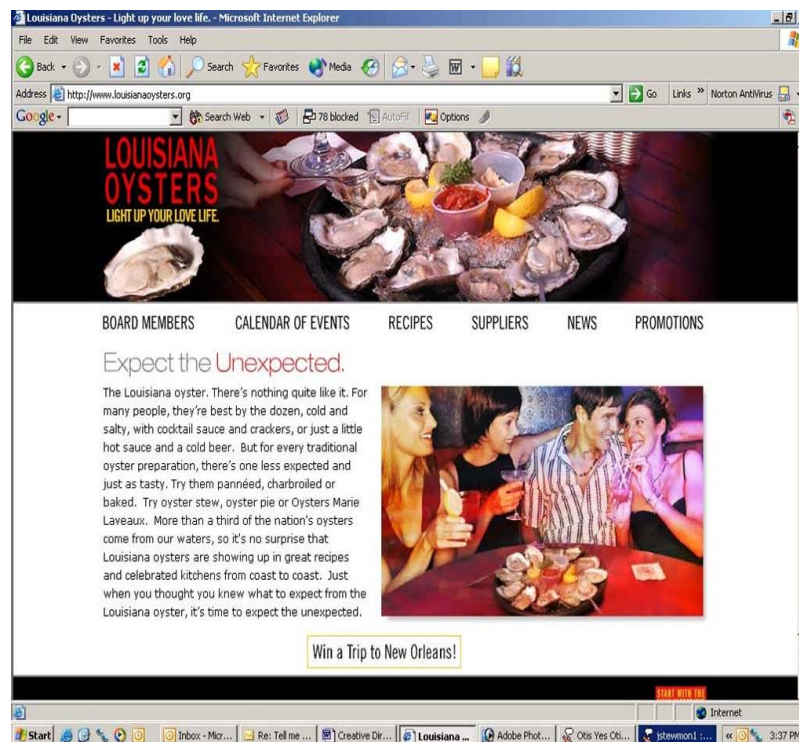
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lawmakers. Other D.C. festivities include the Louisiana Oyster Task Force annual Legislative Appreciation Reception participated by approximately 300 individuals from the media, food service industries, and legislators. Approximately 3,000 people attended the event, held in honor of the Louisiana Legislature.

Media Promotion. In order to promote public awareness of oyster products, the LSPMB partnered with the ACME Oyster House and the International Federation of Competitive Eating to host the annual Louisiana Oyster Challenge held during the French Quarter Festival in New Orleans. As expected, there was extensive local (Louisiana Television news) and national media coverage (NBC's nationally syndicated *"The Today Show"*) of this event where 12 competitive eaters slurped down dozens of Gulf oysters within 10 minutes.

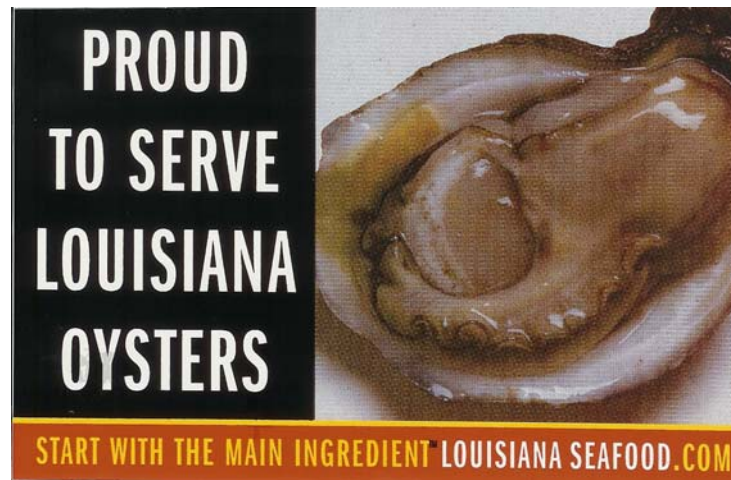
Press Releases. The LSPMB staff prepared several articles for submission to the North American Precip Syndicate (NAPS), e.g., *"Belly Up to the Raw Bar."* This enables national newspapers and magazines to access the article for one year. Additional articles were submitted to *Waterbottoms*, an in-house quarterly publication of the Louisiana oyster industry.

Website. Aside from the Gulf Oyster Project's official website, the LSPMB complements its widespread media exposure with its catchy seafood promotion theme (*"Start with the Main Ingredient"*) and their newly designed website at www.louisianaoysters.org. This is the official website of the Louisiana Oyster Task Force and features important industry events and information.



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Billboard. Located at prime city locations, the Louisiana Oyster Billboards affords great exposure for the oyster industry and receives a lot of positive feedback from various sectors.



Seafood Pavilion. The first annual Gulf Coast Seafood Pavilion was held on July 31, 2004 through August 2, 2004 in conjunction with the Louisiana Restaurant Show. Forty-eight exhibitors and 16,000 qualified buyers attended this debut event that features locally grown and produced seafood products.

Public Conference. The LSPMB hosted both Years 1 and 2 Gulf Oyster Project's Public Conference held in New Orleans. The Year 2 consumer education and public conference was held at the Ernest Morial Convention Center in conjunction with the Louisiana Restaurant Show.



(3) Florida Bureau of Seafood and Aquaculture Marketing

In order to promote VAP and PHP oysters to the general seafood consuming public, the Florida Bureau of Seafood and Aquaculture Marketing team brought product samples for display and promotion at various prestigious trade shows such as the International Boston Seafood Show (as part of the Florida Fresh Pavilion) and to chefs and restaurateurs at the International Hotel/Motel and Restaurant Show held in New York City. Aside from their normal booth participation, the Florida Seafood and Aquaculture Marketing group also conducted focus group research and taste tests featuring raw vs. various PHP oyster samples among the chefs who attended the American Culinary Federation's annual International Hotel/Motel and Restaurant Show held in Philadelphia.

Getting the word out to the *Vibrio vulnificus* at-risk population has been a major problem for most organizations trying to reach them. The perseverance of the Florida cooperators led to a major breakthrough – i.e., the active participation and direct support of the Winn Dixie Pharmacies in this effort. For their part, the Florida team coordinates the ordering and distribution of relevant educational materials with the Interstate Shellfish Sanitation Conference and the Winn Dixie Corporation. To date, Winn Dixie has distributed both the English and Spanish versions of the ISSC *Vibrio vulnificus* informational brochure at their 300 Florida pharmacies.

Objective 3. *To develop technology transfer (targeted at oyster processors), consumer education (aimed at the wholesale, retail and food service industry professionals), and general seafood consumer market promotion materials and strategies centered on commercially available PHP and value-added oyster products (VAP) and processing technologies.* Objective 3 has been achieved.

The lead cooperators for this aspect of the project are: the Florida Bureau of Seafood and Aquaculture Marketing for the V.v. at-risk segment of the population, the Louisiana Seafood Promotion Board for PHP/VAP oyster promotion to the general seafood consumers, and the Mississippi Seafood Technology Bureau for PHP/VAP technology transfer activities aimed at the members of the Gulf oyster industry and seafood processing companies. Although most of the educational materials were developed during Year 1 of the project, the Gulf Oyster Project cooperators created additional promotional or educational materials as needed.

A press release regarding the Gulf Oyster Project, PHP oysters and the at-risk consumers was developed by the Florida project cooperators and distributed nationwide to all newspapers with a readership of over 50,000 as well as to all television stations and daily and weekly newspapers in Florida. Another press release highlighting the role of Winn Dixie Pharmacies in the Gulf Oyster Project's *Vibrio vulnificus* at-risk consumer education effort was made in the same manner by the Florida project team.

9. ADVANCEMENT OF THE FIELD

A. Integrated Research and Development Model

While most academic research projects are narrowly focused based on the investigator's expertise and area of interest, the Gulf Oyster Project deliberately followed a different, albeit more difficult path. Essentially, the Gulf Oyster Project is a combination of three projects integrated together to form an abbreviated and highly inexpensive version of new product/technology research and development process commonly practiced by private corporations. Following a real-life "theory-to-practice" approach, the Gulf Oyster Project integrates laboratory research with industry prototype documentation, field validation, and development of technology transfer materials and strategies designed to sell a product(s). Since the project need to addresses real industry problems and issues involving food, it was important to gather and incorporate consumer information in all phases of the program. Hence, the Gulf Oyster Project's main focus involving: (1) market and new product development and testing, (2) technology documentation and feasibility analysis, and (3) consumer education and outreach.

B. Research-Based Consumer Education/Technology Transfer Program

Following the above R & D model, the Gulf Oyster Project intentionally incorporated research-based approaches as part of the development of its consumer education and technology transfer materials and programs. This insures that the information being provided to the target audience is fact-based and current. This is a very important consideration for the Gulf Oyster Project collaborators since this project involves convincing potential seafood consumers to try and possibly adopt new VAP and PHP oyster products as part of their regular seafood orders. In the case of potential investors, entrepreneurs or industry adopters, it is imperative that current and accurate information be made available for their review, especially those concerning potential market supply/demand conditions and the technical and economic performance of these new VAP/PHP products and technologies under commercial operations.

C. Market-Oriented vs. Production-Oriented Development

The underlying philosophy of the Gulf Oyster Project emanates from the belief in the primacy of the market as a major factor in the success or failure of innovations, whether it be the introduction of new PHP technologies or new VAP oyster products designed to expand the current market for Gulf oysters or significantly decrease the occurrence of *Vibrio vulnificus*-related illnesses. Working to address the critical issues on both sides of the demand (consumers) and supply (producers) side of the equation is needed if we are to achieve the long-term goals of this project. Hence, the reason why the consumer education and promotion efforts of the Gulf Oyster Project is being conducted in tandem with efforts to promote new PHP/VAP processing technologies to the Gulf oyster industry.

10. PROJECT ACCOMPLISHMENTS

A. Presentations:

At the end of first year implementation of the Gulf Oyster Project, a public presentation was held at the Royal Sonesta Hotel in New Orleans on June 5 and 6, 2003. In this public conference, the results of various research projects, consumer education effort, and displays of various educational materials developed through the Gulf Oyster Project were presented to the public and the Gulf oyster industry.

A Public Presentation entitled “Oyster Education Public Conference” was held at the Ernest Morial Convention Center in New Orleans, Louisiana on July 31, 2004. In this conference, the results of Year 2 Gulf Oyster Project were presented to the public. Participation by industry and interested organizations was high, especially since this public conference was done in conjunction with the “1st Gulf Coast Seafood Pavilion” and the “Louisiana Restaurant Show.”

Dr. Andrews and Dr. Coggins made a poster presentation of the results of the Gulf Oyster Project’s consumer acceptability/sensory studies at the 2004 Institute of Food Technology (IFT) Convention held in Las Vegas, Nevada.

B. Technology and Information Transfer/Development of Consumer Education and Market Promotion Materials:

The main goal of Phase 1 (Year 1) of the Gulf Oyster Project was to conduct the necessary background research that will serve as the basis for developing appropriate technology transfer, consumer education, and market promotion materials and communication strategies. Hence, most of the technology transfer and consumer education materials were developed and completed as part of the Gulf Oyster Project - Year 1 implementation. Among the consumer education, outreach, technology transfer and market promotion materials developed by the Gulf Oyster Project during the first year of implementation are as follows:

- (1) Video/CD of **“Available Post Harvest Processing Technologies for Oysters.”** (150 copies on DVD/CD format and 300 copies on VHS format).
- (2) Brochure on **“Available Technologies for Post Harvest Processing of Oysters.”** (5,000 copies).
- (3) Poster on **“Post Harvest Processing Technologies for Oysters.”** (5,000 copies).
- (4) Fact sheet on **“Post Harvest Processing for Oysters.”** (5,000 copies).

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- (5) CD/Powerpoint Presentations on (1) Individually Quick Frozen, (2) Heat-Cool Pasteurization, and (3) High Hydrostatic Pressure Technologies for post harvest processing of oysters.
- (6) The “Gulf Oyster Project’s Website” (www.GulfOysters.net) was developed and regularly updated to highlight project activities, make available Gulf Oyster consumer education materials, and provide product safety information for *Vibrio vulnificus* At-Risk Individuals. Complementary website pages and links were also developed at the official Mississippi Department of Marine Resources website (www.dmr.state.ms.us), the Louisiana Seafood Promotion Board’s newly designed website (www.LouisianaSeafood.com), and the Florida Department of Agriculture and Consumer Services/Bureau of Seafood and Aquaculture Marketing website (www.Fl-Seafood.com).
- (7) Two issues of “The Oyster Shack” was published electronically and made available for download at the Gulf Oyster Project website. The Mississippi Department of Marine Resources also published quarterly newsletters that included a public outreach column for the Seafood Technology Bureau’s programs. The Louisiana Seafood Promotion Board and Oyster Industry Task Force also published regular issues of the “Water Bottoms” promoting local seafood including oysters.
- (8) Various sensory evaluation and consumer surveys on new VAP and PHP oyster products were conducted by the researchers from the Mississippi State University across the state and the region as part of the Gulf Oyster Project subcontracts.

The activities during the second year of the project primarily centers on consumer education and outreach using the materials that were developed during the Year 1 project implementation. Additional education materials were also developed, mainly the Oyster Education Public Conference proceedings available in CD/DVD version, a web-based downloadable version of the “Available Oyster PHP Technologies” originally produced by the Mississippi project team, a Gulf Oyster recipe book containing new value added products developed or tested by the project team, and technical manuals and power point presentation slides on the economics and marketability of PHP/VAP products and technology.



Louisiana Oyster Task Force
July 2004

produced by and for
the Louisiana oyster industry.

Sweet Sonya Devours 432 Oysters



Sonya Thomas slid 36 dozen ice-cold Louisiana oysters down her gullet, effortlessly. The Asian American, a slip of a woman, only 100 pounds, actually doubled last year's record at the **Acme World Oyster Eating Championship** in New Orleans on April 17, 2004.

At the table were notables including *Crawfish Nick* Stipelcovich of Metairie, Louisiana, *Crazy Legs* Conti of New York City, *Ken Tender Vittle* Title of Atlanta, Robert Passman of Magnolia, Mississippi, and Eric *Badlands* Booker of Long Island.

When the bell sounded, Sonya raised her slim arms in joy and Rich Shea of the International Federation of Competitive Eating awarded her the championship. Turner Broadcasting and the Associated Press along with local television stations eased in for close-ups and a few words. And the 2004 World Oyster Eating Champion was also featured in Time Magazine!

Louisiana Legislators' 2004 Oyster Reception

At dusk on April 21, 2004, the movers and shakers of the Louisiana oyster industry talked with Louisiana legislators at the Pentagon Barracks Courtyard. Information exchange at this well-attended annual event is always lively. For more, see the write up on the final 2004 legislation.

The oyster industry wishes to extend their gratitude to the following for their contribution to an elegant repast: Acme Oyster House, Avoyelles on the River, Drago's Seafood Restaurant & Oyster Bar, Galatoire's Restaurant, La Cote Brasserie, Marcello's Wine Market, Parrain's Seafood Restaurant, Pascale's Manale Restaurant, the Gulf Oyster Industry Council, Louisiana Seafood Promotion and Marketing Board, and the Louisiana Oyster Dealers and Growers Association.



pearls of health

11. BENEFITS

- Industry guide to consumer market segments. The results of the Gulf Oyster Project's Consumer Acceptability Survey provides business decision makers with key segmentation variables that they can use to target their potential customer base. The Gulf Oyster Project identified key factors that influence oyster-buying behavior such as: degree of risk aversion, age, gender, and level of formal education.

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- Facilitation of technology transfer. On the supply side of the equation, the Gulf Oyster Project focused on gathering factual technical, economic and marketing information about potential investment value of commercially available PHP technologies. The main reason for doing so is because the successful adoption of innovation not only depends on the technical feasibility but must also satisfy the economics of bringing the innovation or product into the market place. The ability of the Gulf Oyster Project to account for the dollars and cents involved with respect to the three commercially available PHP technologies (i.e., Heat-Cool Pasteurization, High Hydrostatic Pressure Treatment, and Individually Quick Frozen) will hasten the rate of adoption (i.e., from awareness to interest, evaluation, trial and adoption) of the new processes and PHP technologies by potential investors or entrepreneurs.
- Contribution to consumer's level of awareness of safer Gulf oyster products. Survey results point to a lack of awareness among respondents about the risks associated with eating raw oysters as well as the availability of equally tasty and safer PHP oyster product alternatives in the market. The extensive effort made by the collaborating agencies to educate the general public, especially the *Vibrio vulnificus* at-risk segment of the population, help address this dearth of public awareness. Through the Gulf Oyster Project's support, adequate consumer education and outreach materials are now available to help volunteer organizations, concerned state agencies and the region's oyster industry in their consumer education and seafood promotion efforts.
- Choice of information channel to reach seafood consumers. Survey results indicated that the most widely used means of delivery of information within the Gulf region are (in order of popularity): word of mouth ("somebody told me"), television, magazines, and newspapers. These are the same mass media that are being used by the Gulf Oyster Project to promote Gulf oysters to seafood consumers, e.g., Louisiana Seafood Promotion Board's participation and support of the widely televised and headlined, "Louisiana Oyster Challenge" co-sponsored with the ACME Oyster House and International Federation of Competitive Eating, industry trade shows (International Boston Seafood Show, American Culinary Federation, and International Hotel, Motel and Restaurant Show), and various local, state and regional fairs.
- Documentation of consumer acceptance and sales potential of Post Harvest Processed oyster products. Seafood processors and food service industries could now be assured of the market potential for PHP products as indicated by the following findings: (1) Survey results indicated that 77% of those surveyed would buy more oysters with perception of increased safety. The trend to "buy more" was for those with more education, (2) All Post Harvest Processed oysters scored "good" acceptability regardless of ethnic background, and (3) Processing treatments have not altered the perceived attributes of the Gulf oysters. It also did not change the consumer acceptability of Gulf oyster.
- Public health benefits: persistence pays off. The participation of Winn Dixie Pharmacies in the providing important point-of-sales consumer education materials to *Vibrio vulnificus* at-risk individuals could not have happened if there was no Gulf Oyster Project. Prior to

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the Gulf Oyster Project, much of the frustration and difficulty encountered by similar consumer education programs centered on the ability to get the medical/health professionals to participate in notable public health awareness programs like this. With Winn Dixie Pharmacies' long-term commitment and involvement in this endeavor, the ability of oyster industry and other public health agencies to actually reach most of the at-risk segment of the population is now a reality. Essentially, the Gulf Oyster Project, through the dogged persistence of the Florida Bureau of Seafood and Aquaculture Marketing team, provided other states and interested organizations with a workable model to follow.

- Ready resources for state/county extension agents, industry groups, and state agency personnel. Both the findings of the research projects and consumer education/technology transfer materials are made available to interested parties by requesting the Mississippi Seafood Technology Bureau or the Gulf and South Atlantic Fisheries Foundation, Inc.

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Appendix

New Oyster VAP Recipe Book



A Taste of Heaven

New Oyster Recipes from the Gulf of Mexico



September 2004

Integrated Oyster Market Research, Product Development, Evaluation, Promotion and Consumer Education for the Gulf of Mexico's Oyster Industry Project

(Sea Grant Award No. NA16RG2195 [GSAFFI #88] Project R/LR-Q-23 Year 2)



LOUISIANA SEAFOOD
PROMOTION AND MARKETING BOARD



**The Mississippi Department
of Marine Resources**

Managing Your Marine Resources Today for a Sound Tomorrow





Appetizers

1. *Banana Fried Oysters*

½ lb. banana chips, ground to a fine powder
2 teaspoons black pepper, ground
oysters soaked in pineapple juice
¼ lb. yellow corn flour
¼ lb. corn meal

Combine banana chips, pepper, corn flour and corn meal. Dip oysters in mixture. Fry.

2. *Oyster Fritters*

1 cup of chopped oysters
1 egg, beaten
Flour
Salt and pepper

Mix together chopped oysters, beaten egg and seasonings.
Add just enough flour to hold together.
Drop by spoonfuls into hot grease.
Fry until golden.

3. *Oyster Cakes*

oysters, chopped
1 egg
1 teaspoon Worcestershire sauce



1 teaspoon lemon juice
1 teaspoon. Seafood seasoning
1 teaspoon parsley flakes

1/4 teaspoon dry mustard
1 tablespoon mayonnaise
1 teaspoon prepared mustard
1/4 cup cracker or bread crumbs
2 tablespoon olive oil

Place oysters into a large mixing bowl. In a separate mixing bowl, beat eggs, Worcestershire sauce, lemon juice, seafood seasoning, dehydrated parsley flakes, dry mustard, mayonnaise and prepared mustard in a separate mixing bowl.

Add cracker crumbs to the mixture. Fold dressing into oysters. Shape into slightly flattened patties and chill. You can either sauté the cakes in 2 tablespoons of extra virgin olive oil on both sides until they are golden brown, or you can broil until golden brown on each side. Yield: the number of crab cakes depend on their size.

4. Oyster Quiche

1 pint oysters
1/3 cup green onions, finely chopped
1/2 teaspoon basil leaves
1 tablespoon parsley, fresh
dash of garlic powder
1/2 teaspoon salt
1/2 tablespoons margarine
1 1/2 cup Swiss cheese, grated
1/2 cup mushrooms, finely chopped
1/4 cup green pepper, finely chopped
1 cup milk
2 eggs
paprika



Simmer oysters 10 minutes, cut up and drain well. Sauté mushrooms, green peppers and onion in ½ tablespoon margarine. Add basil, parsley, garlic and salt to well combined eggs and milk. Beat until foamy, then blend in cheese.

Combine well-drained oysters to sautéed vegetables. Spoon oyster mixture evenly into pie shell and add milk mixture. Sprinkle with paprika. Bake at 350°F for 50 minutes or until cheese is lightly browned and quiche is set. Let cool for 10 minutes and serve.

5. *Oysters Wrapped in Bacon*

12 strips of bacon
12 raw oysters in their own juice
3 tablespoons brown sugar

Sprinkle brown sugar on the strips of bacon. Wrap one strip of bacon around each oyster. Place in preheated oven at 350°F and bake for 35 minutes.

6. *Episcurean Cheesed Oysters*

1 (16 oz) pkg Cheese-It crackers
½ teaspoon paprika
¼ teaspoon rubbed oregano
fat for deep frying
2 eggs
2 tablespoons water
1 pint oysters, for deep-frying

Crush crackers with rolling pin into very fine crumbs between waxed paper. Mix with paprika and oregano and set aside. Beat eggs with water. Dip oysters into eggs and roll in crumbs. Lay on flat surface at least 30 minutes to set crust. Fry



in moderately hot fat, 375 degrees, until crusty, about 4 to 5 minutes. Drain on paper towels. Garnish with lemon wedges and dill pickles. Serve with tartar sauce. Serves 5.

7. *Coconut Oysters*

oysters
1 cup evaporated milk
2 eggs
1 large box cracker meal
½ cup grated coconut
2 tablespoon seasoning salt
oil

Add seasoning salt to oysters and set aside for a few hours. Beat eggs well and in a small bowl. Combine cracker meal and coconut in a mixing bowl. Place shrimp in evaporated milk, then eggs, then cracker and coconut mixture. Fry in a large pan until golden brown.

8. *Oyster-stuffed Mushrooms*

1 pint of mushrooms
One 5 ounce can of oysters, chopped
1/4 cup of crumbled cooked bacon
1/4 cup of bread crumbs
1/4 teaspoon of dried parsley
1/2 teaspoon of instant minced onion
Dash of basil
1 tablespoon of oyster liquid

Wash the mushrooms. Remove stems. Prepare mixture and heap into mushroom caps. Arrange on plate lined with paper towel. Microwave for 3-4 minutes.



9. *Oyster Cocktail*

24 oysters, off the shell
4 tomatoes, chopped fine
1 onion, chopped fine
½ cup vinegar
seasonings to taste (highly seasoned)

Put all ingredients together in a sauce pan. Cover. Let cook quickly for 6 minutes. Then serve.

10. *Oyster Lasagna*

1 can Smoked Oysters
¼ lb. Lasagna noodles
1 tablespoon oil
2 tablespoons margarine
¼ cup onion, finely chopped
¼ cup celery, finely chopped
1 cup garlic, finely chopped
6 oz tomato paste
2 ½ cups stewed tomatoes
½ teaspoon salt
½ teaspoon chili powder
½ teaspoon pepper
½ teaspoon basil
¼ teaspoon oregano
½ lb. cottage cheese
½ lb. Mozzarella cheese, grated

Cook noodles in 4 quarts of boiling, salted water approximately 15 minutes. Add oil to water so lasagna does not stick together. Drain and cool slightly. While noodles are cooking, melt margarine in a large skillet. Add onions, celery and garlic. Sauté for 5 minutes. Stir in tomato paste, tomatoes, salt, chili powder, pepper, basil and oregano. Cover and simmer 30 minutes. Remove from stove and stir in smoked oysters. Grease an 8-inch square baking dish.



Arrange ingredients in layers in baking dish - oyster sauce, noodles, cottage cheese and mozzarella cheese. Use 1/3 of each per layer and sprinkle remaining mozzarella cheese on top. Bake at 350 degrees for 35-40 minutes.

11. Oyster Alfredo

2 garlic cloves

fresh ginger

½ cup cream

1 tablespoon butter

salt

pepper

sprinkle of freshly grated nutmeg

½ cup fresh shucked oysters with their liquor

squirt of lemon

¼ cup chopped Italian flatleaf parsley

1 cup short pasta (conchiglie, ziti, mostaccioli, etc.)

¼ cup Parmigiano Reggiano

Mince 2 fat garlic cloves and an approximately equal amount of fresh ginger, and sauté all in a tablespoon of good olive oil until it's aromatic. Add ½ cup cream, 1 tablespoon butter, salt, pepper and a sprinkle of freshly grated nutmeg. Bring to a boil and cook for just a minute or so, until the cream thickens. Add ½ cup fresh, shucked oysters with their liquor and a squirt of lemon; add ¼ cup chopped Italian flatleaf parsley; turn down heat and continue cooking just until the oysters are warmed through.

Meanwhile you've been cooking 1 cup of short pasta; drain it and stir it into the sauce with ¼ cup Parmigiano Reggiano.



12. *Oyster Pasta with Beans and Greens*

8 oz. bowtie pasta
4 cups chopped onion
1 cup chopped mushrooms
2 cups fresh raw oysters
4 cloves garlic, peeled and minced
1 teaspoon dried rosemary
4 cups spinach
1/4 cup raisins
1/2 cup broth
1 can (15 oz.) white beans, drained and rinsed
2 – 4 tablespoons slivered almonds
2 – 4 tablespoons Parmesan cheese, coarsely shredded

Cook pasta according to package directions. Drain; keep warm.

Meanwhile, spray a large skillet with vegetable cooking spray. Sauté onion, mushrooms, garlic and rosemary with oysters until tender, 5 to 8 minutes.

Add kale, raisins and broth to skillet; heat to boiling. Reduce heat and simmer, covered, until kale is wilted, 5 to 8 minutes.

Stir in beans and cook until broth is evaporated, 3 to 4 minutes. Stir bean mixture into pasta; sprinkle with half of the Parmesan cheese and nuts; toss. Season to taste with salt and pepper. Sprinkle with remaining cheese to serve.

13. *Oyster Spinach Pizza*

1 can refrigerated pizza crust
1 jar of prepared alfredo sauce
1 box of frozen spinach (thawed and squeezed dry)
1 cup mozzarella cheese
assorted pizza toppings of your choice...we like ham.
Parmesan cheese



Spread the dough into a pan as instructed on the package. In a bowl mix the alfredo sauce and spinach. Spread on to pizza dough. Top with mozzarella and any of your desired toppings. Sprinkle with parmesan cheese and bake according to the pizza dough instructions. Voila! Spinach pizza!

You can also make the pizza dough in the bread machine or by hand and make your own alfredo sauce, but then it is no longer 'quick and easy.' Give this a try...your family will love it! If you have extra spinach/sauce mixture, add extra spinach to it for a yummy side dish.

14. *Chicago-Style Oyster Pizza*

- 1 package active dry yeast**
- 1 tablespoon sugar**
- 1 ½ cups warm water**
- 3 ½ cups flour**
- ½ cup cornmeal**
- 1 tablespoon salt**
- 3 tablespoons olive oil**
- 2 teaspoons olive oil**
- ½ lb. oysters, cooked and chopped**
- 1 cup grated mozzarella cheese**
- ½ cup grated Parmesan cheese**
- ½ cup tomato sauce**
- 2 teaspoons crushed dried oregano**

Combine 1/2 cup warm water (105-115°F) with the yeast and sugar in a small bowl; (remaining 1 cup will be drawn later). Allow to sit until foamy (about 5 minutes).

Meanwhile combine flour, cornmeal and salt in a large mixing bowl. Stir in first portion (3 tablespoons) of olive oil. Add yeast mixture; mix well. Slowly add remaining warm water (1 cup, 105-115°F); stir until stiff and sticky.

Turn dough onto a lightly floured board. Knead until smooth, moist and elastic (about 10 minutes). Measure 1 teaspoon olive oil into a large bowl (reserve remaining teaspoon); spread oil around surface. Place dough into bowl; cover



with damp cloth. Allow to rise in a warm place until doubled in bulk (1 to 2 hours). Lightly oil four 10-inch round cake pans with remaining 1 teaspoon oil (1/4-teaspoon per pan); set aside.

Later punch dough down; turn onto a lightly floured surface. Cut into four pieces. Gently knead each into a ball.

Preheat oven to 500°F. On a floured surface flatten pizza dough balls with palm of hand. Place one ball into each pan; gently stretch dough to edges, building up edges to hold filling. Cover pans with a damp cloth; allow to rest (about 15 minutes).

Combine cheeses in a small bowl. Take 1/2 of cheese mixture from bowl; scatter that amount evenly among the 4 pizzas, leaving crust edges bare. Top each pizza with oysters and tomato sauce. Season each with oregano; sprinkle each with remaining cheese mix.

Bake 15 minutes. Reduce heat to 400°F; bake 10 additional minutes, until crusts are brown and cheese is bubbly and golden. Cool slightly and serve in pan.

15. Broccoli and Oyster Pasta with Creamy Spiced Tomato Sauce

1 package (12 oz.) dried pasta spirals

1 lb. broccoli florets

3 cups fresh raw oysters

3/4 lb. tomatoes, chopped

3/4 cup light sour cream

3/4 cup plain nonfat yogurt

1/2 cup chopped black olives

1/4 cup chopped fresh cilantro

1 tablespoon chili powder

2 teaspoons crushed dried oregano

3 cloves garlic, peeled and minced

1/4 teaspoon salt

1/4 teaspoon ground black pepper

1/4 cup grated Parmesan cheese



Prepare the pasta according to package directions, adding the broccoli and oysters for the last 4 minutes. Drain; set aside.

In a medium saucepan, combine tomatoes, sour cream, yogurt, olives, cilantro, chili powder, oregano, garlic, salt and pepper. Cook over medium heat for 15 minutes, stirring frequently.

Toss pasta with sauce and sprinkle with Parmesan. Serve immediately in warmed bowls.

16. Oyster Pasta with Sun-Dried Tomatoes and Broccoli

8 oz. penne pasta

2 cups broccoli floret

2 cups fresh raw oysters

1 4-oz. jar sun-dried tomatoes in oil, drained of half the oil and chopped

1 lemon, juiced

½ teaspoon garlic salt

½ cup Parmesan cheese, grated

¼ cup basil, chopped

1/8 teaspoon ground black pepper

Bring a large pot of salted water to a boil. Add the penne and cook 5 minutes. Add the broccoli and oysters and continue cooking until the penne and broccoli are tender and the oysters have curled, about 5 more minutes.

Drain and put in a serving bowl; immediately add sun-dried tomatoes, lemon juice and garlic salt; toss to mix. Add Parmesan cheese, black pepper and basil; toss and serve.



17. *Spaghetti and Oysters in Roasted Garlic Sauce*

- 6 large cloves garlic**
- 1 tablespoon oyster liquid**
- 8 oz. spaghetti pasta**
- 4 oz. evaporated milk**
- 2 tablespoons cornstarch**
- 1 lb. fresh raw oysters**
- 1 ½ cups oyster liquid, divided**
- 1 cup sliced mushrooms**
- 2 tablespoons thinly sliced green onion**
- ½ teaspoon crushed red pepper flakes**
- 1 tablespoon chopped fresh sage**
- ½ teaspoon salt**
- ¼ teaspoon ground black pepper**
- 3 tablespoons nonfat sour cream**

Preheat oven to 350° F.

Place unpeeled garlic cloves on a piece of aluminum foil. Drizzle with 1 tablespoon oyster liquid and wrap tightly. Bake in oven until tender, about 45 minutes. When cool enough to handle, squeeze pulp from cloves, mash and set aside.

When garlic is done, cook spaghetti according to package directions; drain.

Dissolve cornstarch in evaporated milk in a small bowl and set aside.

Heat a large, nonstick skillet over medium-high heat. Add 1/2 cup oyster liquid, mushrooms, green onions and red pepper flakes and simmer over high heat until liquid evaporates, about 7 minutes. Add oysters to skillet along with remaining oyster liquid, roasted garlic, sage, salt and pepper; bring to a boil, reduce heat and simmer for 4 to 5 more minutes. Stir in reserved cornstarch mixture, simmer until slightly thickened, about 3 minutes. Whisk in sour cream.

Toss with spaghetti and serve immediately.



18. *California Oyster Spaghetti*

1 (16 oz) package uncooked angel hair pasta
3 tablespoons olive oil
2 cups fresh raw oysters
2 tablespoons chopped garlic
2 tablespoons dried basil
2 tablespoons Cajun-style blackened seasoning
salt and pepper to taste
10 roma (plum) tomatoes, diced
2/3 cup crumbled feta cheese

Bring a large pot of lightly salted water to a boil. Add pasta and cook for 5 to 8 minutes or until al dente. Drain.

Heat olive oil in a large skillet over medium heat. Stir in the garlic, basil, Cajun seasoning, salt, and pepper, then mix in the tomatoes. Stir in oysters. Cook until tomatoes are semi soft, and oyster edges curl. Toss with pasta, and serve with crumbled feta cheese on top.



Asian Delight

19. *Noodle Marmaduke*

¼ cup sliced onion
2 tablespoon butter
1 lb oysters
3 tablespoon sherry wine
1 can beef consommé
1 (6 oz) can mushrooms
3 tablespoon lemon juice
1 teaspoon salt
¼ teaspoon pepper
Dash of garlic powder
¼ lb medium noodles
1 cup sour cream
chopped parsley

Put onions and oysters in butter and cook until oysters are done. Stir in sherry, consommé, mushrooms and juice, lemon juice, salt, pepper, and garlic powder. Simmer uncovered for 15 minutes. Stir in uncooked noodles and cook until they are tender. Stir in sour cream and garnish with parsley. Serves 6.

20. *Oyster Wantons*

8 oz cream cheese
1 cup Monterey Jack cheese, shredded
½ teaspoon garlic powder
¼ teaspoon garlic pepper
¼ teaspoon onion powder
12 wonton wrappers
oysters



Mix ingredients together. Place about a tablespoon onto the wonton wrapper. Moisten a fork with egg to seal. Fry in hot oil.

21. *Oyster Stir-Fry*

24 raw oysters in their own juices
2 celery stalks in 1/4" slices
1 red bell pepper, sliced
2 carrots cut in matchstick pieces
1/2 white onion, sliced
8 oz can water chestnuts, drained
19 oz package frozen sugar snap peas or 2 cups fresh sugar snap peas
1 1/2 cups cut broccoli, frozen or fresh
2 tablespoons oil
1/3 cup water
2 teaspoons sugar
1 package stir fry oriental seasoning mix

Blend seasoning, soy sauce, sugar, and water. Set aside. In large skillet, stir-fry vegetables. Add oysters and stir-fry until they shrink, probably 2-4 minutes. Add seasoning. Stir-fry 1 minute or until it thickened.

22. *Pineapple Ginger Oyster Stir Fry*

1 1/2 lb. fresh raw oysters
2 tablespoons peanut oil
2 cups fresh pineapple chunks
3 tablespoons molasses
2 tablespoons fresh lime juice
1/4 teaspoon crushed red pepper flakes
8 green onions, cut into 2-inch pieces
1/4 cup minced crystallized ginger



Heat a large wok or skillet over high heat. Add oil and when hot add pineapple and molasses and stir-fry until pineapple is brown and tender. Stir in the lime juice, red pepper flakes, green onions and oysters. Sauté until scallions are bright green and the oysters are fully cooked, about 15 minutes. Toss in ginger and serve over rice.



South of the Border

23. *Battered Fried Oysters*

2 ½ dozen medium-sized oysters; freshly shucked
vegetable oil for deep frying
2 eggs
2 tablespoons water
horseradish sauce to taste
1 ½ cup
1 ½ teaspoon salt
½ teaspoon freshly ground black pepper
1/8 teaspoon cayenne pepper

Drain oysters. Preheat oil in deep fryer to 375°C. Combine eggs, water and horseradish sauce. Combine flour, salt, pepper and cayenne in a bowl and mix thoroughly. Dip oysters in egg mixture, then in seasoned flour to coat. Place side by side but not touching on a platter and allow to dry for a few minutes. When ready to fry the oysters, dip again in seasoned flour. Fry in batches of 6 to 8 until golden brown (about 3 minutes). Drain oysters by placing on a platter lined with paper towels. Can be set in a 200°F oven until ready to serve. Yield: 4 servings.

24. *Baked Oyster Quesadillas*

1 container (8-oz.) nonfat cottage cheese
1/3 cup grated Monterey Jack cheese
2 cups fresh raw oysters
8 (8-in.) corn tortillas
1 cup salsa



Preheat oven to 450°F.

Process cottage cheese and Monterey Jack cheese in a blender or food processor until smooth. Stir in oysters. Spread 2 tablespoons of cheese mixture onto ½ of the tortillas. Top with remaining tortillas. Cut into quarters and transfer to baking sheets. Bake for 10 to 12 minutes, or until they begin to brown and edges start to curl. Remove from oven and transfer to platter or serving dishes. Serve immediately with salsa.

25. Quick Oyster Fajitas

2 cups fresh oysters, drained
2 – 3 tablespoons fajita seasoning or marinade
½ onion, sliced
½ green pepper, sliced
4 to 6 tortillas, warmed

In a shallow bowl, toss oysters with fajita seasoning. In large non-stick skillet, over medium-high heat, stir-fry onion and green pepper until almost tender. Add oysters and cook until done and the onion and green pepper are tender. Wrap portions in flour tortillas with salsa.

26. Seafood Enchiladas

1 onion, chopped
1 tablespoon butter
½ lb. fresh raw oysters
½ lb. fresh crabmeat
¼ lb. shrimp – peeled, deveined and coarsely chopped
8 oz. Colby cheese
1 cup half-and-half cream
½ cup sour cream
¼ cup butter, melted



1 ½ teaspoons dried parsley
½ teaspoon garlic salt
6 (10 inch) flour tortillas

Preheat oven to 350°.

In a large skillet, saute onions in 1 tablespoon butter until transparent. Remove the skillet from heat, and stir in oysters, crabmeat and shrimp. Mix in 1 cup shredded cheese. Place a large spoonful of the mixture into each tortilla. Roll the tortillas up around the mixture, and arrange the rolled tortillas in a 9x13 inch baking dish.

In saucepan, combine half and half, sour cream, 1/4 cup butter, parsley and garlic salt. Stir until the mixture is lukewarm and blended. Pour this sauce over the enchiladas, and sprinkle with remaining cheese.

Bake in preheated oven for 30 minutes.



Party Dips

27. *Oyster Dip*

- 8 oz cream cheese, softened**
- 2 tablespoon mayonnaise**
- 1 teaspoon lemon juice**
- ¼ teaspoon garlic salt**
- 1 dash Tabasco sauce**
- ½ cup chopped ripe olives**
- 1 (9 oz.) can smoked oysters, drained and chopped**

Combine cream cheese, mayonnaise, lemon juice, garlic salt, and hot sauce in a small bowl. Mix until well blended. Fold in olives and smoked oysters. May be covered and refrigerated for up to 3 days.

28. *Oyster Dip*

- 2 cups sour cream**
- 1 cup chopped broiled oysters**
- ¼ teaspoon dill weed**
- ½ teaspoon salt**
- ¼ teaspoon black pepper**
- 2 teaspoons chopped parsley**
- 2 chopped green onions**
- 1 teaspoon Lawry's seasoning salt**

Mix together and chill. Makes 2 ½ cups.



29. *Oyster Cheese Dip*

4 cups sour cream
1 can Campbell's cheese soup (10 oz.)
1 can diced green chilies (4 oz.)
1/8 teaspoon ground red pepper
2 cups chopped cooked oysters
1 small white onion chopped

Mix together. Salt to taste if desired. Chill.

30. *Blue Cheese Oyster Dressing and Dip*

1/2 cup nonfat yogurt
1/4 cup instant nonfat dry milk
1 cup cooked oyster, chopped
1/2 cup chopped green onion
2 oz. blue cheese, crumbled
1 clove small garlic, peeled and minced
1/4 teaspoon crushed dried basil
1/4 teaspoon crushed dried rosemary
1/8 teaspoon salt

Stir together in small bowl drained yogurt and milk. Stir in oysters. Mix in green onions, blue cheese, garlic, basil, rosemary, and salt. Cover and refrigerate 30 minutes before serving.



31. *Low-Fat Southwestern Oyster Dip*

16 oz. fat free cream cheese with garden vegetables
1 cup cooked, chopped, oysters
1 can (15-oz) black beans, drained
1 jar (16-oz.) thick and chunky medium salsa
½ cup red bell pepper, seeded and diced
½ cup green onion, chopped

Spread cream cheese into an 8-inch serving plate.

In a medium bowl combine oysters, black beans and salsa. Spoon over cream cheese. Place small circle of red peppers on top of this mixture in the center of the plate. Encircle the red peppers with the green onions. Keep refrigerated until ready to serve. Serve with tortilla chips or crackers.

32. *Tofu Spinach Oyster Dip*

1 package (8-oz.) firm tofu, drained
1 cup water
¼ cup reduced-calorie mayonnaise
1 tablespoon lemon juice
1 cup cooked, chopped oysters
1 package (10-oz.) frozen chopped spinach, thawed and squeezed dry
1 package dried vegetable soup mix
¼ cup chopped green onion
¼ teaspoon garlic powder

In a blender, combine tofu, water, mayonnaise and lemon juice; blend until smooth. Transfer to a medium bowl.

Add oysters, spinach, soup mix, green onion and garlic powder; mix well. Refrigerate several hours or preferably overnight.



Soup 'n San

33. Oyster Soup

1 (4 oz) can mushrooms
2 cans chicken broth
2 chicken bouillon cubes
2 dozen raw oysters
2 small onions, chopped
3 tablespoon butter

34. Oyster-onion Shortbread

12-15 well drained oysters
1 small onion
5 tablespoon butter
1 can creamed corn
½ cup milk
Jiffy corn muffin mix
1 egg
Tabasco sauce
8 oz sour cream
½ teaspoon dill weed
¼ teaspoon salt
8 oz sharp cheddar

Combine corn, milk, muffin mix, egg and hot sauce. Pout into buttered 10" skillet. Saute onions in butter until tender and add oysters. Simmer until edges curl. Drain well.



Mix sour cream, dill, salt, and $\frac{1}{2}$ of cheese. Fold in sautéed oyster. Spoon this onto mix in the skillet. Bake at 435°F (220°C) for 30-45 minutes. Top with remaining cheese immediately after removing from oven. Let sit 5-10 minutes, then serve while hot.

35. *Seafood Court Bouillon*

4 lbs whitefish, cod
1 $\frac{1}{2}$ - 2 pints oysters, drained
2 lbs peeled shrimp
4 oz sliced mushrooms
 $\frac{1}{4}$ cup sherry wine
1 lemon – sliced
2 tablespoon parsley

Place fillets in large casserole dish. Sprinkle with oysters, shrimp, and mushrooms. Cover with Creole sauce. Sprinkle with wine and top with lemon slices and parsley. Bake 20-25 minutes at 350°F. Serve over rice. Serves 12-15.

36. *Oyster Cornbread Dressing*

2 dry cornbread mixes
2 eggs
 $\frac{2}{3}$ cup milk
1 sweet potato
1 stalk celery – chopped
 $\frac{1}{2}$ onion – chopped
1 bunch green onion – chopped
3 tablespoons butter
oysters
1 (16 oz.) pkg hot sausage



Make cornbread according to package. Let cool; crumble. Set aside. Boil sweet potato until tender. Mash – set aside. Cook sausage and drain. Chop celery, onion, and green onions. Sauté with butter. Add to cooked sausage to skillet with vegetables. Add oysters. Add cornbread and sweet potato. Mix together and enjoy!



Grills & Kabobs

37. *Oyster Kabobs*

16 raw oysters in juice
½ cup Mesquite marinade with lime juice
1 green bell pepper cut in 1" pieces
16 cherry tomatoes
½ onion cut in pieces

Place raw oysters with their own juices in medium-sized mixing bowl. Lightly pierce oyster with fork. Add marinade and refrigerate for at least 30 minutes. Do the same with the vegetables. After refrigeration, place oysters in vegetable on skewers however you like. Grill until oysters are done and vegetables are tender.

38. *Oysters in White Sauce*

16 raw oysters in juices
1 cup white sauce – BBQ

Place raw oysters with their own juices in medium-sized mixing bowl. Lightly pierce oyster with fork. Add white sauce and refrigerate for at least 30 minutes. After refrigeration, place oysters on skewers. Grill until oysters are done.



39. *Smoky Citrus Oyster Kabobs*

1 lb. fresh raw oysters
6 (10-in.) skewers
1/3 cup smokey barbecue sauce
1/3 cup orange marmalade
2 tablespoons horseradish

Preheat grill.

Thread oysters onto skewers (if using bamboo skewers, soak in water 30 minutes before using to prevent burning).

In a bowl stir together barbecue sauce, orange marmalade and horseradish; mix well.

Place skewers on a lightly oiled grill and cook, basting frequently and turning often, about 8 to 12 minutes. Serve immediately.

40. *Grilled Oysters with Minty Yogurt Sauce*

1 lb. fresh raw oysters
1 teaspoon salt
1/2 teaspoon ground black pepper
1 container (8-oz.) plain yogurt
2/3 cup chopped fresh mint leaves
3 cloves, large garlic, crushed
1 tablespoon lime juice
1 teaspoon grated fresh gingerroot
2 limes, sliced

Season oysters with salt and pepper. Place in a non-reactive (glass, plastic or stainless steel) dish and set aside.

In a small bowl, combine yogurt, mint leaves, garlic, lime juice and ginger. Mix



well and set aside about 1/4 of the marinade. Pour the remainder over the oysters. Turn to coat evenly. Marinate for several hours or overnight.

Preheat grill.

Lightly oil rack before cooking. Remove oysters from marinade and grill until thoroughly cooked, until edges curl. Baste occasionally with reserved marinade. Serve warm with limes as garnish.

41. Pineapple Mango Salsa over Grilled Oysters

1 cup diced pineapple
3/4 cup diced red bell pepper
1/2 cup diced red onion
1/2 cup diced fresh mango
1/2 cup Mango KERNS® from LIBBY'S® Refrigerated All Nectar
1/4 cup chopped fresh cilantro
1/4 teaspoon grated lime peel
1/4 teaspoon crushed red pepper
1/4 teaspoon ground cumin
1/8 teaspoon ground cinnamon
1 lb. fresh raw oysters

Combine pineapple, bell pepper, onion, mango, nectar, cilantro, lime peel, crushed red pepper, cumin and cinnamon in medium bowl; cover. Marinate in refrigerator for 1 hour. Bring to room temperature.

Grill or broil oysters for 3 to 5 minutes on each side or until oyster edges curl. Serve salsa over oysters.



Say Cheese!

42. *Oyster Cheese Ball*

2 cups boiled fresh oysters
1 bag (12 oz) finely shredded extra sharp cheddar cheese
1 – 8 oz. cream cheese
1 teaspoon ground red pepper
3 teaspoons ground parsley
2 cups chopped almonds
½ teaspoon salt
½ teaspoon black pepper
3 chopped green onions

Mix all ingredients together except almonds. Form into a ball. Roll in almonds. Chill. Serve with crackers.

43. *Oyster, Ham and Cheese Quiche*

2 tablespoons all-purpose flour
1/2 teaspoon salt
1 cup half-and-half
3 eggs
2 slices Swiss cheese
1 recipe pastry for a 9 inch single crust pie
1/2 cup chopped fresh spinach
1/2 cup canned mushrooms
1 cup fresh raw oysters
1 (4.5 ounce) can ham, flaked
1/2 cup shredded cheddar cheese



Preheat oven to 350°. Beat together flour, salt, half-and-half and eggs in a medium bowl. Place Swiss cheese flat in the pie crust. Arrange spinach evenly over Swiss cheese, then cover with mushrooms and oysters. Pour the flour and eggs mixture over mushrooms. Cover with flaked ham and top with cheddar cheese. Bake in the preheated oven 45 to 55 minutes, until surface is golden brown.

44. *Oyster Cheese Ball*

8 oz cream cheese, softened
1 (3.66 oz) can smoked oysters, drained slightly
1 tablespoon Worcestershire sauce
½ teaspoon garlic powder
1 teaspoon curry powder
¾ cup chopped pecans

In medium sized bowl, combine cheese and oysters. Add Worcestershire sauce, garlic powder, and curry powder to oyster mixture. Mix well and form in to balls. Pour pecan pieces onto a piece of wax paper. Roll oyster cheese ball in pecans. Refrigerate until hardened. Serve with crackers.



Healthy Choice

45. *Oyster Spinach Stuffed Shells*

- 24 jumbo pasta shells**
- 2 tablespoons butter**
- 2 cups fresh raw oysters**
- ½ cup chopped peeled onion**
- 2 cloves garlic, minced**
- 1 teaspoon Italian seasoning**
- ¼ teaspoon ground black pepper**
- 16 oz. nonfat cottage cheese**
- 1 box 10-oz. frozen chopped spinach, thawed and well-drained**
- 4 oz. egg substitute**
- 15 ¼ oz. spaghetti sauce, divided**

Preheat oven to 350°F.

Prepare pasta according to package instructions; set aside.

In a large preheated skillet, melt butter and sauté onion, garlic, Italian seasoning and pepper until tender. Remove from heat; stir in oysters, cottage cheese, spinach and egg substitute.

Divide mixture evenly into cooked shells. Spread ½ cup spaghetti sauce in bottom of 13x9x2-inch baking pan; arrange shells over sauce. Top with remaining sauce and cover with foil. Bake 30 minutes, until hot and bubbly. Serve hot.



46. *Oyster Stuffed Red Peppers*

4 red bell peppers, halved lengthwise, seeded
2 tablespoons olive oil
1 small onion, diced
4 garlic cloves, minced
1 large tomato, chopped
2 cups corn kernels
¼ cup chopped black olives
2 tablespoons chopped fresh basil
2 cups fresh raw oysters
1 cup ricotta cheese
1/8 teaspoon coarse salt
1/8 teaspoon ground black pepper
½ cup shredded mozzarella
4 large basil leaves, cut in half

Preheat oven to 350°F.

Drop pepper halves into boiling, salted water and cook 5 minutes; drain and set aside.

In a large skillet, heat oil over medium-high heat. Add onion and cook until soft, about 5 minutes. Add garlic and cook 30 seconds longer. Stir in tomato, corn, olives, and basil. Cook 5 minutes, stirring once or twice. Remove from heat and stir in oysters and ricotta cheese. Season to taste with salt and pepper.

Stuff mixture into prepared pepper halves and arrange in a greased 13x9x2-inch baking dish. Cover with foil and bake 15 minutes. Remove cover, sprinkle with mozzarella, and bake 5 minutes longer. Garnish each with a basil leaf.

47. *Oyster Wraps*

2 dozen fried oysters
4 flour tortilla wraps
1 cup shredded lettuce



- 1 cup chopped tomatoes**
- 1 cup ranch dressing**
- 1 cup finely shredded cheese**
- 1 cup buffalo sauce**

Fry oysters in your favorite batter. Lay about 4 or 5 on a tortilla wrap. Layer with lettuce, tomatoes, cheese and ranch dressing. Wrap. Dip in buffalo sauce.

48. Oyster Spinach Dress-Up

- 1 package (10-oz) frozen chopped spinach**
- 1 cup cooked oysters**
- 1 can (10-oz) bean sprouts, drained**
- 2 cans (4-oz) sliced mushrooms, undrained**

Cook spinach according to package directions; drain.

Stir in oysters, bean sprouts and mushrooms. Heat thoroughly and serve.

49. Oyster and Vegetable Stuffed Mushrooms

- 1 lb. large mushrooms**
- 1 lb. fresh raw oysters**
- 1 tablespoon margarine**
- ½ cup chopped green onion**
- 1 celery rib, chopped**
- 1 tomato, chopped**
- ½ teaspoon crushed, dried marjoram**
- 1/8 teaspoon ground black pepper**
- 1 tablespoon soft bread crumbs**
- 1 tablespoon chopped fresh parsley**



Preheat oven to 400°F.

Wipe mushrooms with a damp cloth or mushroom brush and twist off stems. Set the caps aside and finely chop stems.

In a heavy frying pan over medium heat, melt margarine. Add green onions, celery and mushroom stems. Cook until vegetables are soft, about 5 minutes.

Add tomato, marjoram and pepper and cook covered for another 5 minutes. Stir in bread crumbs and parsley. Remove from heat. Stir in oysters.

Arrange mushroom caps in a single layer in a 13x9x2-inch baking dish and mound bread crumb mixture onto each. Bake uncovered for 15 to 20 minutes, or until lightly browned.

50. Spinach with Ginger Oysters and Shiitake Mushrooms

1 oz. dried shiitake mushrooms
2 cups hot water
3 cups fresh raw oysters
1 ½ lb. fresh spinach
2 teaspoons peanut oil
½ yellow onion, chopped
1 tablespoon fresh ginger, grated
2 teaspoons lite soy sauce
2 teaspoons arrowroot powder

Soak mushrooms in 2 cups hot water for 30 minutes. Rinse mushrooms under a thin stream of cold, running water, rubbing to remove any grit lodged in membranes under caps. Squeeze mushrooms gently to remove excess liquid. Discard mushrooms stems. Sliver caps. Set aside.

Strain soaking liquid through a paper coffee filter. Set aside 1/3 cup for this recipe. Refrigerate remainder for another use. Carefully wash spinach, discarding stems. Set wet leaves aside.



In a heavy-bottomed skillet or wok with a tight-fitting lid, heat oil for a minute or so over medium-high heat, add onion and ginger. Stir to combine. Sauté for about 3 minutes, stirring almost constantly, until onion begins to wilt. Add reserved mushrooms, oysters and spinach leaves and immediately cover pan. Reduce heat to medium and cook 4 minutes.

Meanwhile, combine soy sauce and arrowroot with 1/3 cup mushroom liquid. Stir to dissolve arrowroot. When spinach is cooked, turn off heat and remove lid. Immediately stir arrowroot mixture into pan. Continue stirring gently to coat spinach; a thick sauce will develop. Serve very hot.



Mardi Gras Flavor

51. *Creole Oysters with Rice*

- 3 tablespoons butter**
- 1 lb. fresh raw oysters**
- 1 package (16-oz.) frozen peas and carrots**
- 1 teaspoon paprika**
- ½ teaspoon crushed dried oregano**
- ½ teaspoon dried thyme**
- ½ teaspoon garlic salt**
- ¼ teaspoon cayenne pepper**
- ½ cup oyster liquid**
- 2 tablespoons tomato paste**
- 2 cups cooked rice**

In a large skillet, melt butter over medium heat. Add frozen vegetables and cook until thoroughly heated. Add paprika, oregano, thyme, garlic salt, and cayenne pepper and stir to coat. Dissolve the tomato paste in the chicken broth. Pour in skillet along with cooked rice. Add oysters. Stir well and cook until thoroughly heated and oyster edges curl. Serve immediately.

52. *Super Bowl Jambalaya*

- 2 tablespoons unsalted butter**
- 1 tablespoon extra virgin olive oil**
- ¼ pound smoked ham, cubed**
- ½ pound andouille sausage or kielbasa, chopped**
- 3 cloves garlic, minced**



1 large onion, chopped
Two 16-ounce cans stewed tomatoes

1 large green bell pepper, chopped
3 to 4 ribs celery, chopped
2 pounds fresh raw oysters
3 whole bay leaves
½ teaspoon cayenne pepper (or more to taste)
¾ teaspoon dried thyme
2 cups oyster liquid
2 cups uncooked white rice
2 pounds small shrimp, peeled and deveined
Salt to taste

Melt the butter in the oil in a large skillet. Sauté the ham and sausages until crisp, about 6 minutes. Add the garlic and onion and cook an additional 2 minutes.

Add the tomatoes to the skillet with the green pepper and celery. Season with bay leaves, cayenne pepper, and thyme. Stir and reduce the heat to a simmer.

Meanwhile, in a separate pan, bring the oyster liquid to a boil, add the rice, and cook over medium heat for 5 minutes.

Mix the rice and stock into the main ingredients. Add the shrimp and salt if desired. Cover the skillet and simmer on top of the stove approximately 20 minutes, or until the rice is tender. If there is too much liquid, remove the cover for the last 10 minutes of cooking. Add oysters for the last 10 minutes of cooking. Remove bay leaves.

53. Southern Flavor Breading

1 cup unbleached white flour
1 teaspoon onion powder
1 teaspoon parsley
1 teaspoon paprika
1 teaspoon garlic powder
½ teaspoon salt
¼ teaspoon pepper



Mix all of the ingredients. Use as breading to fish, poultry, pork or beef.

Supper & Casserole

54. *Quick and Easy Oyster Casserole*

- 1 cup butter, melted**
- ½ (16 oz) package saltine crackers, crushed**
- 2 (8 oz) can oysters**
- 1 ½ tablespoons heavy whipping cream**
- 1 teaspoon Worcestershire sauce**
- 2 (14.75 oz) cans cream-style corn**

Preheat oven to 425 degrees F (220 degrees C). Grease a 9x13 inch casserole dish. Drain the oysters, reserving juice.

In a small mixing bowl combine margarine and crushed saltine crackers. Cut the oysters into small pieces, set aside. In a small mixing bowl combine cream, oyster juice and Worcestershire sauce.

Spread one can of corn onto the bottom of the casserole dish. Layer 1/2 of the oysters over the corn, 1/2 of the cracker mixture. Repeat layering with remaining ingredients. Pour the oyster juice mixture over the top of the entire casserole. Cover the casserole dish with aluminum foil.

Bake casserole for 20 minutes. Remove foil and bake an additional 30 minutes.

55. *Pepper and Pineapple Oyster Stew*

- 1 lb. fresh raw oysters**
- 4 carrots, sliced**
- ½ cup oyster liquid**



3 tablespoons teriyaki sauce
1 tablespoon cornstarch

1 can (8 oz.) pineapple chunks in juice, drained and juice reserved
1 green bell pepper, seeded and cut into 1 inch pieces

Mix carrots, oyster liquid and teriyaki in 3 1/2-quart slow cooker; cover and cook on low for 7-8 hours. Mix cornstarch with reserved pineapple juice; stir into carrot mixture. Stir in oysters, pineapple and green pepper. Cover and cook on high 15 minutes or until thickened and bubbly.

56. Broccoli, Mushroom and Oyster Casserole

2 cups ziti pasta
1 cup nonfat milk
4 teaspoons flour
2 teaspoons minced fresh marjoram
3 sprigs fresh thyme, minced
2 tablespoons olive oil
1 small onion, peeled and finely chopped
1 cup small broccoli florets
1 cup mushrooms, thinly sliced
1/2 small red bell pepper, julienned
1/2 cup thinly sliced green onions
2 cloves garlic, crushed
1/2 teaspoon salt
1/4 teaspoon ground black pepper
2 cups fresh raw oysters
1/4 cup shredded Monterey Jack cheese

Prepare pasta according to package directions; rinse with cold water and drain well.

Preheat oven to 350°F. Spray a 2-quart casserole with vegetable cooking spray. Place drained pasta in casserole and set aside.



Combine milk, flour, marjoram and thyme in a small bowl and mix well; set aside.

Heat a large, nonstick skillet over medium-high heat. Add oil and sauté onion, broccoli, mushroom, bell pepper, green onion, garlic, salt and pepper for 4 minutes, stirring frequently. Add reserved milk mixture and stir until thickened, about 4 minutes; do not boil. Remove from heat and add oysters

Sprinkle oyster mixture over pasta. Sprinkle with cheese and bake uncovered for 15 minutes, or until cheese is melted and mixture is hot. Serve immediately.

57. Rice and Oyster Casserole

3 cups raw brown rice
2 lbs hot bulk sausage
2 cups onion, chopped
2 cups celery, chopped
2 pints, oysters, drained
½ cup dried parsley flakes

Cook brown rice according to directions. Crumble sausage and cook in skillet. Remove sausage and use drippings to cook onion and celery until tender. Drain well. Mix vegetables, sausage, oysters, rice and parsley. Place in 9x13 casserole dish and bake for 30 minutes at 350°F. Cover and bake for 20 minutes more. Serves 8-10.

58. Oyster Broccoli and Cheese Casserole

1 lb. raw oysters
1 lb. grated cheddar cheese
1 small box frozen spinach, drained
1 ½ teaspoon salt
1 ½ teaspoon pepper
½ lb. shredded provolone cheese



2 tablespoons flour
2 tablespoons sour cream
½ stick butter, melted

Layer 1/3 of the oysters in a well-greased casserole dish. Mix together spinach, salt, pepper, flour, sour cream and butter. Place 1/3 of the mixture on top of the oysters, then 1/3 of the cheeses. Repeat with oysters, spinach mixture and cheeses until gone. Bake at 350°.

59. Scalloped Oysters

3 (10 oz) containers of shucked oysters
2 cups oyster crackers
8 oz mushrooms, sliced
1 onion, chopped
1 clove garlic, minced
¼ cup butter
¼ cup flour
1 cup milk
1 ½ teaspoon salt
¼ teaspoon pepper
2 teaspoon lemon juice
2 teaspoon lemon zest
1 dash nutmeg
1 teaspoon Worcestershire sauce
2 tablespoons parsley
2/3 cup fresh bread crumbs

Drain the oysters, reserving the liquid. In a saucepan over medium heat, melt the butter and then add the onions and mushrooms, cook until tender. Add the garlic and cook another 2 minutes. Add the flour and cook another 2 minutes, making sure the flour is well combined. Add the reserved oyster liquid and milk, stir with a whisk until all the flour is worked into the liquid and a smooth, thick sauce is formed. Cook for 5 minutes. Remove from heat. Add the remaining ingredients, except breadcrumbs. Place in a casserole dish and top with the fresh breadcrumbs. Bake at 350F degrees for 25 minutes.



60. *Oyster and Pear Skillet Supper*

- 1 can (16 oz.) pear slices in juice**
- 2 tablespoons vegetable oil**
- 1 lb. fresh raw oysters**
- ½ teaspoon salt**
- 1 cup sliced onion**
- 2 cloves garlic, finely chopped**
- ¼ cup dry white wine**
- 2 tablespoons soy sauce**
- 2 tablespoons corn starch**
- ½ teaspoon crushed dried thyme**
- 4 cups packed spinach leaves, torn (about 5 oz.)**

Drain pears, reserving $\frac{3}{4}$ cup liquid; set aside. In large skillet, heat oil over medium-high heat until hot. Add onion and garlic to skillet; cook and stir 3 to 5 minutes or until onion is crisp-tender.

In small bowl, combine reserved pear liquid, wine, soy sauce, cornstarch and thyme; mix until cornstarch is dissolved. Gradually add to vegetables in skillet; cook and stir until mixture thickens. Add oysters to pan; cover and cook 5 minutes. Add pear slices to skillet. Place spinach on top of pears and oysters in skillet; cover and cook 5 minutes or until spinach is wilted and oysters are cooked through. Serve at once.