

Sixth U.S.-China Living Marine Resources Joint Coordination Panel Meeting

Minutes

In accordance with the Protocol on Marine and Fishery Science and Technology Cooperation between the United States of America and the People's Republic of China, the U.S.-China Joint Coordination Panel for Living Marine Resources (LMR) held its sixth meeting in New Orleans, Louisiana, United States, on January 21, 2005. The meeting was co-chaired by Mr. LI Kexin, Vice President of the Chinese Academy of Fishery Sciences (CAFS) of the Ministry of Agriculture of the People's Republic of China, and Dr. James McVey, Aquaculture Program Director for the National Sea Grant College Program of the National Oceanic and Atmospheric Administration (NOAA) of the U.S. Department of Commerce.

On behalf of the American delegation, Dr. James McVey opened the meeting by extending a warm welcome to the Chinese delegation and expressed his desire that they enjoy their stay in New Orleans and the Aquaculture America Conference. Professor LI Kexin expressed his pleasure to lead the Chinese delegation from the People's Republic of China and appreciated the preparation for holding this meeting. The co-chairs introduced their respective delegation members (see list of delegates in Appendix I).

Dr. McVey and Professor LI gave overviews of the LMR priorities during their respective opening remarks. The co-chairs reaffirmed that the U.S.-China LMR Program has established an effective vehicle for cultivating win-win partnerships and collaborative relations between the two countries. The U.S. scientific and commercial sectors have benefited from access to large scale fisheries and aquaculture production technologies practiced in China, and the Chinese scientific community has gained access to U.S. research labs to assist its scientists in addressing disease, genetic and biotechnology issues, and environmentally-friendly fish farming techniques.

The co-chairs shared the common understanding that the U.S. and China will continue collaborative efforts to optimize ecosystem based management for living marine resources by promoting scientific research and education between the two countries. The Panel Co-chairs have committed to producing a Six-Year Plan for the Living Marine Resources Panel. The delegations agreed to the agenda for the 6th LMR panel meeting (see Appendix II).

Both Chinese and the U.S. Executive Secretaries, Mr. Michael Abbey and Mr. LI Yingren, reported on the status of cooperative activities of 2002-2003, which were endorsed at the fifth LMR meeting. Both delegations reviewed and discussed the interim activities and expressed their satisfaction with the program (see Appendix III for more details).

Both parties agreed to consider the list of projects for collaborative research projects for the next interim, 2005-2006 (see Appendix IV). Due to budget limitations, both sides shared the same understanding that the LMR program would require efforts to select the highest priority projects

mutually beneficial to both countries. In this context, both sides agreed that the panel should use a working team on a provisional basis to develop a vision and more efficient and effective implementation plan for the LMR projects. This team will identify long-term goals in two-year increments related to the six-year action plan for the LMR Panel (see Appendix IV, Section X). It was also agreed to bring together accomplishments for the first ten years of cooperation into a summary document and for inclusion in the existing LMR website.

The LMR Joint Coordination Panel confirmed the need to continue the ongoing framework to facilitate collaborative activities under the auspices of the U.S.-China Marine and Fishery Science and Technology Protocol. These minutes will be submitted to the 17th U.S.-China Joint Working Group Meeting of the Protocol for review and endorsement.

The Chinese delegation agreed to host the seventh LMR meeting in China in 2006 or 2007. The co-chairs will decide the schedule and location for the next meeting through correspondence. The minutes were signed on January 21, 2005 in New Orleans, Louisiana, United States in English and Chinese, both texts being equally authentic.

James P. McVey
U.S. Chairperson
Aquaculture Program Director
National Sea Grant College Program
National Oceanic and Atmospheric
Administration
United States of America

LI Kexin
Chinese Chairperson
Vice-President
Chinese Academy of Fishery Sciences
Ministry of Agriculture
People's Republic of China

Appendix I

LIST OF PARTICIPANTS

U.S. Delegates

Dr. James P. McVey, Co-Chair
Aquaculture Program Director
National Sea Grant College Program
National Oceanic and Atmospheric
Administration (NOAA)
1315 East-West Highway
Silver Spring, MD. 20910
Email: jim.mcvey@noaa.gov

Michael Abbey, Executive Secretary
Asia Program Manager
International Activities Office
NOAA Research
1315 East-West Highway
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Tufts University School of Veterinary
Medicine
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North Grafton, MA 01536
Phone: (508) 839-7970
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Dr. Cheng Sheng Lee
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Aquaculture
The Oceanic Institute
41-202 Kalaniana'ole Hwy.
Waimanalo, HI 96795
Oceanic Institute, (808) 259-3107
University of Hawaii, (808) 956-8877,
Gilmore Hall 102
cslee@oceanicinstitute.org

Dr. Charles Yarish
Professor
Ecology & Evolutionary Biology
University of Connecticut at Stamford
One University Place
Stamford, CT 06901-2315
Email: charles.yarish@uconn.edu

Mr. John Curtis
Director
Bridgeport Regional Vocational
Aquaculture School
60 St. Stephens Road
Bridgeport, CT 06605

Email: jcurtis@bridgeportedu.net

Dr. Chuck Helsley

Researcher Emeritus
SOEST, University of Hawaii
2525 Correa Rd.
Honolulu, HI 96822
Phone 808 956-2873
Email: helsley@hawaii.edu

P.R.C. Delegates

Professor LI Kexin, Co-Chairman

Vice President
Chinese Academy of Fishery Sciences
No. 150 Qingtatum, South Yongding Rd.
Beijing 100039, P.R. China
Email:

Professor JIA Xiaoping

Director
South China Fisheries Research Institute
Chinese Academy of Fisheries Science
Email:

Professor WANG Qingyin

Deputy Director
Yellow Sea Fisheries Research Institute
Chinese Academy of Fisheries Science
106 Nanjing Road
Qingdao, Shandong, 266071, China
Email: qywang@public.qd.sd.cn

Professor XU Zhuqing

Associate Professor
Director, Division of Science and
Technology,
Chinese Academy of Fishery Sciences
Email:

Professor WANG Lijun

National Marine Environmental Monitoring
Center, State Oceanographic Administration
(SOA)
42 Linghe Street. PO Box 303
Dalian, 116023, China
86-411-84782532 (phone)
86-411-84783336 (fax)
Email: ljwang@nmemc.gov.cn

Mr. LI Yingren

Chinese Executive Secretary
Director, Division of Foreign Relations and
Cooperation
Chinese Academy of Fishery Sciences
No. 150 Qingtatum, South Yongding Rd.
Beijing 100039, P.R. China

Email: liyr@cafs.ac.cn
86.10.68671170 (phone)
86-10-68671170 (fax)

Appendix II

Meeting Agenda
6th China-U.S. Living Marine Resources
Joint Coordination Panel Meeting

January 17 – 22, 2005
New Orleans, Louisiana
U.S.A.

Sunday 16 Jan	1700	Chinese delegation arrives UA372 from S.F. Hotel: New Orleans Marriott 555 CANAL STREET NEW ORLEANS, LA 70130-2300 Phone: 504-581-1000 Fax: 504-523-6755
	1830 – 1930	Meet in lobby for Dinner Ninja (Japanese) 8433 Oak Street New Orleans, LA. 70118 504.866.1119
Monday 17 Jan.	0700 – 0800	Breakfast at hotel Meet in Lobby/
	0815 – 1430	FIELD TRIP with: Albert“Rusty”Gaude’ III Associate Area Fisheries Agent Louisiana Sea Grant/LSU AgCenter Plaquemines, St. Bernard, Orleans Parishes
	1200 – 1300	Lunch Restaurant name/address
	1500 – 1730	Meet in Lobby for walking/shopping
	1730	Meeting of Co-chairs and Executive Secretaries (lobby)
	1800 - 2100	Dinner (with Jim McVey) Bruning’s (Seafood) 1924 WestEnd Parkway

New Orleans, LA. 70124
504.282.9395

Tuesday 0700 – 0830 Breakfast at hotel
18 Jan 0830 – 1230 Attend sessions on own
1230 Meet in hotel lobby for lunch
Five Happiness (Chinese)
3605 S Carrollton Ave
New Orleans, LA 70118
(504) 482-3935
1330 – 1700 Attend sessions on own
1700 – 1800 Happy Hour
1800 – 2100 President's Reception (light dinner), location TBA

Wednesday 0700 – 0830 Breakfast at hotel
19 January 0800 – 1200 Attend sessions on own
1200 Meet in hotel lobby for lunch
Lillette (Bistro)
3637 Magazine Street
New Orleans, LA. 70115
504.895.1636
1300 – 1630 Attend sessions on own
1730 – 2100 Meet in lobby for dinner
Restaurant name and address
Korea House (Chinese/Korean)
3547 18th Street
Metairie, LA 70005
504.888.0654

Thursday 0700 – 0830 Breakfast at hotel
20 Jan 0830 – 1230 Attend sessions on own
1230 Meet in lobby for lunch
Mother's Restaurant(Creole)
401 Poydras
New Orleans, La 70130
(504) 523-9656
1330 – 1730 Attend sessions on own
1900 – 2100 Meet in lobby for Dinner
Five Happiness (Chinese)
3605 S Carrollton Ave
New Orleans, LA 70118
(504) 482-3935

Opening Session of 6th LMR Panel

Friday 0700 – 0900 Breakfast at hotel at Café du Marche (lobby floor)
21 January 0830 – 0900 U.S. delegation to meet in restaurant for discussion
0915 – 0930 Welcome and Introduction of the Delegations
James McVey, U.S. Chair (lead)
LI Kexin, Chinese Chair
0915 – 0940 Opening Remarks and Overview of U.S. National LMR Priorities
0940 – 1010 Opening Remarks and Overview of Chinese National LMR
Priorities
1015 – 1025 Adoption of the Agenda (U.S. lead)
1025 – 1050 Coffee Break

Review of Cooperative Activities

1050 – 1145 Review of 2002-2004 Activities
Michael Abbey, U.S. Executive Secretary
LI Yingren, Chinese Executive Secretary
1145 – 1200 Supplementary Reports from Panel Members
1300 – 1400 **Working Lunch** in meeting room

Discussion and Adoption of New Collaborative Activities Proposals

1400 - 1420 **Shrimp Culture**
A. Endocrinology of Shrimp Reproduction
XIANG Jianhai, IOCAS,
Hans Laufer, University of Connecticut
B. Development & Introduction of SPF/SPR Shrimp
Prof. Wang Qingyin, Yellow Sea Fisheries Institute
Dr. Huang Jie, Yellow Sea Fisheries Institute, CAFS
Dr. Gary Pruder, Oceanic Institute, Hawaii
Dr. Donald Lightner, Univ. of Arizona
Dr. Addison Lawrence, Texas A&M University
C. Molecular Genetic Markers in panaeid
Prof. Xiang Jianhai, IOCAS
Dr. Acacia Alcivar-Warren, Tufts University

1420-1440 **Shellfish Culture**
A. Scallop Mass Mortality-Mechanism of Chlamys farreri

- Dr. YANG Hongsheng, Institute of Oceanology, CAS
 Dr. Ximing GUO, Rutgers University
- B. Ecology and Management of Crassostrea ariakensis**
 Dr. Que Huayong, Institute of Oceanology
 Dr. Mark Luckenbach, Virginia Institute of Marine Science
- C. Genetic Breeding and Genetic Markers Screening**
 Professor Zhang Goufan, Institute of Oceanology
 Dr. Ximing GUO, Rutgers University
- D. Molecular Genetic Market Technique of Bivalves**
 Prof. XIANG Jianhai, IOCAS
 Dr. Dennis Hedgecock, University of Southern California
- E. Genome Study of Scallop**
 Prof. XIANG Jianhai, IOCAS
 Dr. Ximing GUO, Rutgers University
- 1440-1500 **Finfish**
- A. Immunology of Cobia and Redfish**
 Dr. Stephen Kaattari, VIMS
 Dr. FENG Juan, South China Sea Fisheries Inst.
- B. Chinese Sturgeon in Yangtze Estuary**
 Dr. Boyd Kynard, Anadromous Fish Res. Center, USGS
 Dr. PING Zhuang, East China Sea Fisheries Res. Inst.
- C. Functional Genomics and Molecular Marker of Marine Fish**
 Dr. Zhanjiang Liu, Auburn University
 Prof. CHEN Songlin, Yellow Sea Fish. Research Inst.
- 1500-1520 **VIROLOGY**
- A. Study of Virology on Aquatic Organisms**
 Dr. Huang Jie, Yellow Sea Fisheries Institute, CAFS
 Dr. Donald Lightner, Univ. of Arizona
 Dr. Robin M. Overstreet, Gulf Coast Res. Lab.
- B. Diagnostic Technology by Gene Chips**
 Dr. Huang Jie, Yellow Sea Fisheries Institute, CAFS
 Dr. Donald Lightner, Univ. of Arizona
 Dr. John Stubbs, San Francisco State Univ.
- C. Virology of haliotis diversicolor Reeve**
 Dr. WANG Jiangyong, South China Sea Fish. Res. Inst.
 Dr. Carolyn Friedman, University of Washington
- 1520-1540 **ALGAE**
- A. Seaweed Cultivation, Biology and Biotechnology
 Prof. FEI Xiugeng, Institute of Oceanology
 Dr. Susan F. Brawley, University of Maine
 Dr. Charles Yarish, University of Connecticut
- 1540-1600 **Harmful Algal Blooms**
- A. China-US Cooperation on Receptor Binding Assay**
 Dr. Francis VanDolah, National Ocean Service, NOAA
 Mr. Tod Leighfield, National Ocean Service, NOAA

Prof. ZHU Mingyuan, First Institute of Oceanography
 Ms. ZOU Yinglin, First Institute of Oceanography

B. Collaboration between UCONN and Chinese Universities
 Dr. LIN Senjie, UCONN
 Dr. HE Peimin, Shanghai Fisheries University
 Dr. MI Tiezhu, Ocean University of China
 Prof. LIU Guangxing, Ocean University of China
 Dr. JIAO Nianzhi, Xiamen University
 Dr. HUANG Bangqin, Xiamen University
 Dr. LIN Yuanshao, Xiamen University

1600-1630 Coffee Break (in room)

1630-1700 **Ecosystem Modeling Including Offshore Aquaculture**
 A. Impact of Large Scale Mariculture
 Prof. FANG Jianguang, Yellow Sea Fish. Res. Inst.
 Dr. Michael Rust, Northwest Fish. Science Center, NOAA

B. Mathematical Modeling on Carrying Capacity of Cage based Marine Fish Farming
 Mr. HUANG Honghui, South China Sea Fish. Res. Inst.
 Dr. Changsheng Chen, UMASS

C. Marine Eutrophication Bioremediation w/ Seaweeds
 Prof. HE Peimin, Shanghai Fisheries Institute
 Dr. Charles Yarish, UCONN

1700-1720 **OTHERS**
 A. Risk Assessment of Alien Marine Species
 Prof. WANG Lijun, National Marine Environmental Monitoring Center, SOA
 Dr. James T. Carlton, Williams-Mystic

B. Discovery of Marine Microbial Drugs
 Prof. YE Dezan, Third Institute of Oceanography
 Dr. Bill J. Baker, Univ. of South Florida

C. Adaptation of Microorganisms to the Deep Sea
 Dr. Zeng Runying, Third Institute of Oceanography
 Dr. Douglas Bartlett, SCRIPPS

D. Molecular Cloning of Immune Defense Gene
 Dr. SONG Linsheng, Institute of Oceanology
 Dr. Ximing GUO, Rutgers University

E. Polypeptide from Chlamys Farrei (PCF)
 Dr. Tingyu QU, Univ. of Illinois at Chicago
 Dr. MI Sun, Yellow Sea Fisheries Institute

1720-1740 **Aquaculture Education Exchange**
 A. Education and Exchange Activities
 Mr. John Curtis, BRVAS
 Prof. Li Jiale, Shanghai Fisheries University

B. Cooperation in the Application of GIS in Fisheries
 Prof. Xu Liuxiong, Shanghai Fisheries University

Dr. Loh Lee Low, Alaska Fisheries Science Center

C. Fisheries Management Training

Prof. Xu Liuxiong, Shanghai Fisheries University

D. Sea Grant

Prof. ZHOU Yingqi, Shanghai Fisheries University

Chuck Helsley, Prof. Emeritus, U. of Hawaii

Michael Abbey, NOAA Research

1740-1745

LMR Administration

A. Strategic Plan

Dr. James McVey, Sea Grant, NOAA

Prof. LI Kexin, Chinese Academy of Fishery Sciences

1745-1800

Break

1800 – 1830

Closing Remarks

James McVey, U.S. Chair

LI Kexin, Chinese Chair

Signing of minutes of discussion

The 6th LMR Panel concludes and adjourns

1930 – 2200

Banquet in honor of the Chinese Delegation
(meet in lobby)

Bacco

310 Chartres Street

New Orleans, Louisiana 70130

Phone #: (504) 522-2426

Fax #: (504) 521-8323

Saturday
22 Jan.

0630 – 1100

Breakfast at hotel

Chinese Delegation return to China

Departure from Hotel at 0440

N.O. to S.F. UA1233 at 0645

Appendix III

*****Summary Report 2003-2004*****

I. Shrimp

A. Endocrinology of reproduction, maturation, and spawning of *Fenneropenaeus chinensis*

Dr. Hans Laufer had been invited to visit Qingdao for joint study, but due to busy work and lack of funds, he did not come to China. Due to the same reason Dr. Li Fuhua was unable to visit Dr. Laufer's lab.

U.S. contact: Dr. Hans Laufer, University of Connecticut
Chinese contacts: Dr. LI Fuhua, Institute of Oceanology, CAS
Professor XIANG Jianhai, Institute of Oceanology, CAS

C. B. Shrimp virology and development of specific pathogen-free (SPF) shrimp seed

Since 2000, the SPF *F. chinensis* breeding project had focused on the using of nauplii population. Dr. Carlos Pantoja from Dr. D. V. Lightner's lab came to YSFRI in 2000 and 2001 to select SPF candidate nauplius populations. More than ten populations were screened and shipped to US side. After re-quarantined in UA, the candidates were sent to Texas A&M and OI for breeding and growth. In the period of 2002 to 2004, SPF *F. chinensis* were successfully bred in 7 populations. The US side agreed to send back some SPF populations to YSFRI for further research.

As an accompanying work of SPF *F. chinensis* breeding, collaboration on shrimp virology study was also engaged between the laboratories of YSFRI and UA. Effective collaboration progressed successfully on research on WSSV gene cloning, probe development, pathogenicity of WSSV and time course of infection, cDNA library of WSSV infected gill cells, rapid detection of WSSV, HPV, YHV, IHNV, and TSV, materials exchange, and academic communication. These collaborations promote the research of shrimp virology in both sides and provide the theoretical bases and technological supports for disease control.

U.S. contacts: Dr. Donald Lightner, University of Arizona
Dr. Steve Arce, The Oceanic Institute
Chinese contacts: Professor HUANG Jie, Yellow Sea Fisheries Research Institute, CAFS
Professor WANG Qingyin, Yellow Sea Fisheries Research Institute, CAFS

C. Molecular genetic markers in penaeid shrimp

Dr. Acarcia Alcivar-Wareen had been invited to visit to Qingdao, due to lacking of funds, she did not come to China.

Chinese contact: Professor XIANG Jianhai, Institute of Oceanology, CAS

U.S. contact: Dr. Acacia Alcivar-Warren, Tufts University

II. Shellfish

A. Scallop mortality in China

The scallop mortality in China was investigated in previous stage. In order to look for a way to solve the scallop kill problem, Dr. Yang Hongsheng of IOCAS carried out research on the physico-ecological characteristics for the filter-feeding bivalves and deposit-feeding sea cucumber, conducted both in laboratory and fields from 2002, including clearance rate, absorbance efficiency, N and P excretion rates of the Jicon scallop *Chlamys farreri* and other species, and the budgets of C, N, P for bivalves, and on the mechanism of self-pollution for coastal mariculture systems. The bioremediation of the macroalgae *Laminaria japonica* and *Gracilaria lemaneiformis* and the sea cucumber *Apostichopus japonicus*, in coastal culture systems, especially experiments on the growth characteristics and ecological functions of *G. lemaneiformis* were conducted in bivalve culture areas, and a polyculture pattern of *C. farreri*, *L. japonica*, *G. lemaneiformis* and *A. japonicus* was established.

U.S. contacts: Dr. Susan Ford, Haskin Shellfish Research Lab, Rutgers University

Dr. Ximing Guo, Haskin Shellfish Research Lab, Rutgers University

Chinese contact: Professor ZHANG Fusui, Institute of Oceanology, CAS

B. Genetic breeding and genetic markers screening in bay scallop

The implementation of joint research was postponed, but the two sides have exchanged information on the progress of the research.

U.S. contact: Dr. Ximing Guo, Rutgers University

Chinese contact: Professor ZHANG Guofan, Institute of Oceanology, CAS

C. Shellfish disease

This project has not been implemented due to the same reason.

Chinese contact: Professor XIANG Jianhai, Institute of Oceanology, CAS

U.S. contact: Dr. Fulin Chu and Dr. Eugene Burreson, Virginia Institute of Marine

D. Culture potential of *Crassostrea ariakensis* in the mid-Atlantic region of the U.S.

Scientists from the US visited China in fall 2004. Problem of oyster disease and farming technology were discussed. In order to solve the problem of degradation of oyster stock in the East coast of the US, a batch of Jinjiang oyster seeds was sent to the US side for growth test.

U.S. contacts: Dr. Standish K. Allen, Jr., Virginia Institute of Marine Science
Mr. Lowell Bahner, National Marine Fisheries Service/NOAA

Chinese contacts: Professor QIU Dequan, Zhanjiang Ocean University
Professor WANG Aimin, Hainan University

III. Finfish

A. Introduction of Pacific threadfish (*Polydactylis sexfilis*)

In the research of Pacific threadfish (moi), the South China Fisheries Research Institute (SCSFRI) and Dr. Cheng-Sheng Lee from the Oceanic institute in Hawaii established cooperation and exchanged their views on the culture of moi, Dr. Lee gave the researchers of SCSFRI some helpful advice and publications. The experiment on the culture of moi has been done at SCSFRI and following results were achieved: two groups of fry of moi (1,000 and 100,000 ind. respectively) were introduced and stocked in earthen ponds with the stocking density of 75,000 ind./ha. Experiment time lasted 6~7 months. The fish grew to the size of 300g/ind. at harvest with the survival rate of 70%.

U.S. contact: Dr. Cheng-Sheng Lee, The Oceanic Institute

Chinese contact: Professor LI Jiaer, South China Sea Fishery Research Institute, CAFS

IV. Algae

A. Porphyra

Dr. He Peimin and Dr. Jiang Min were invited by Institute of Environment Research, the University of Connecticut as visiting researchers. They participated in researches at Institute of Environment Research and Seaweed Biotechnology key lab in the University of Connecticut from May, 2001 to March, 2003. They established the technology of breeding with shells and without shells for 3 local species of American *Porphyra*, and studied the stages of free conchosporangia and development regulation of free conchosporangia. With development regulation technology, they made the free conchosporangia releasing massive spores for seeding on nets in any time of the year. 12 nets of the young seedlings of *P. leucosticta* were cultured on the Nori farm of Bridgeport Regional Vocational Aquaculture School for 43 days, the blades of seedlings grew up to 1.5 cm in length. 8 nets of the younger seedling of *P. amplissima* and *P. purpurea* were cultured in Maine and the blades grew up to 10-12 cm in length.

After returning to China, the scientists took part in the projects of “Studies on the seaweed/finfish integrated re-circulating aquaculture system” from 2003 to 2004, and assisted in

the development of a technology for extracting and purifying phycoerythrin and polycharides from *Porphyra yezoensis*.

U.S. contacts: Professor Charles Yarish, University of Connecticut
Dr. Shili Liu, University of Connecticut
Mr. John Curtis, BRVAS

Chinese contacts: Professor FEI Xiugeng, Institute of Oceanology, CAS
Professor HE Peimin, Shanghai Fisheries University
Professor TANG Xiaorong, Ocean University of Qingdao
Professor WANG Qingyin, Yellow Sea Fishery Research Institute,
CAFS

Invited Visiting Professorship

Dr. Yarish was recently informed that I will be the first e-Professor at Shanghai Fisheries University (SFU), April, 2004, Shanghai, People's Republic of China by President Yingqi Zhou. He had been appointed by that University's Board of Trustees as a Guest Visiting Professor in 2002 which continues till the present.

Publications:

1. Sahoo, D. and C. Yarish. 2005. Mariculture of Seaweeds and their Utilization. R. Andersen (Ed.) Handbook of Phycological Methods. Academic Press. Chapter 15.
2. **Tang, X.R., H.X. Jiang, X.G. Fei and C. Yarish. New life cycles of *Porphyra katadai* var. *hemiphylla* in culture. J. Appl. Phycol. In press, 2005.**
3. Kraemer, G. P., R. Carmona, C. Neefus, T. Chopin, S. Miller, X. Tang and C. Yarish. 2004. Preliminary examination of the bioremediation and mariculture potential of a Northeast U.S.A. and an Asian species of *Porphyra*. Bull. Fish. Res. Agen. Supplement No. 1: 77-82.

Conference Proceedings and presentations

I. Invited symposium "Seaweed Culture and Integrated Aquaculture Developments" at "Aquaculture – An Ecologically Sustainable and Profitable Venture for The Meetings of the World Aquaculture Society's Aquaculture 2004 meetings, Honolulu, Hawaii, March 1-5, 2004.

(1) He, P. , M. Jiahai, X.G. Fei , C. Yarish (abstract # 1326) "*PORPHYRA* AQUACULTURE DEVELOPMENT AND ITS USE IN BIOREMEDIATION IN CHINA" published in a book Of Abstracts, Pp. 262, abstract #1326 (invited presentation).

(2) Yarish, C. *, G. Kraemer, J. Kim, Carmona, P. He, C.H. Sohn, C.D.Neefus, T. Chopin, D. Snellgrove, G.C. Nardi, K. Shadel, J.J. Curtis, R. Pereira "THE BIOREMEDIATION POTENTIAL OF THE ECONOMICALLY IMPORTANT RED ALGA,

Porphyra , IN AN INTEGRATED AQUACULTURE SYSTEM WITH FINFISH“ published in a book Of Abstracts, Pp. 659, abstract #737 (invited presentation

II. Invited symposium “Pharmacological Aquaculture” at “Aquaculture – An Ecologically Sustainable and Profitable Venture for The Meetings of the World Aquaculture Society’s Aquaculture 2004 meetings, Honolulu, Hawaii, March 1-5, 2004.

Yarish, C., D.B. Sahoo, X.G. Fei, P. He, C.H. Sohn, M. Notoya, A. Buschmann and T. Chopin. “Mariculture of seaweeds and their utilization: Opportunities for the Pharmaceutical and Phyocosupplement Industries” (abstract #1166) published in a book Of Abstracts, Pp. 659, abstract #1326 (invited presentation).

III. Invited keynote speaker to The 5th Asia-Pacific Conference on Algal Biotechnology, October 18-21, 2003, Qingdao, P.R. China.

(1) C. Yarish , C.D.Neefus, G. Kraemer, R. Carmona, P. He, Tang, R. Pereira, T. Chopin, G.C. Nardi, J.J. Curtis and D.B. Sahoo. “Seaweed Cultivation and Biotechnology: Opportunities for Integrating Seaweeds in Aquaculture Systems for Bioremediation and Industry Diversification.” Published in a book of Abstracts, Pp. 14, K-2.

(2) Invited participant to The UNESCO Program of the International Training Workshop on Application of Marine Biotechnology at the Institute of Oceanology, Chinese Academy of Sciences, Qingdao, PR China, Oct. 21, 2003. Dr. Yarish presented a paper and workshop entitled “Introduction to the large scale cultivation of seaweeds.”

IV. Co-organizer and co-convener (with R. De Philippis) of an invited symposium entitled “Use of Algae in Environmental Management ” at The 5th Asia-Pacific Conference on Algal Biotechnology, October 18-21, 2003, Qingdao, P.R. China.

He, P., M. Jiang, C. Yarish, S.J. Lin, C.F. Chen, Y.Q. Dai, Q.L. Wu and B. Shi. “Eutrophication and bioremediation by Porphyra cultivation in Lusi nori farm. Published in a book, Pp. 106, S4-P-2.

V. The 5th Asia-Pacific Conference on Algal Biotechnology, October 18-21, 2003, Qingdao, P.R. China (contributed papers).

(1) Tang, X.R., H.X. Jiang, X.G. Fei and C. Yarish. “New life cycles of *Porphyra katadai* var. *hemiphyllo* in culture.” Published in a book of Abstracts, Pp. 71, S3-O-3.

(2) He, P., C. Yarish, X. Tang, R. Pereira and J. Curtis. “The free conchosporangia culture of Northeast American *Porphyra* species: Applications for a finfish/seaweed recirculating aquaculture systems in an urban environment.” Published in a book of Abstracts, Pp. 76, S3-O-8.

VI. Invited Symposium “Integrated Aquaculture and Balanced Ecosystem Management:

Polyculture on a Grand Scale” at the Coastal Zone ’03 Coastal Zone Management Through Time, July 13-17, 2003.

C. Yarish, C.D.Neefus, G. Kraemer, R. Carmona, P. He, Tang, R. Pereira, T. Chopin, G.C. Nardi and J.J. Curtis. “The bioremediation potential of *Porphyra* spp. in an integrated aquaculture system with finfish: implications for coastal zone management for coastal New England” In U.S. National Oceanic and Atmospheric Administration. Coastal Services Center. 2003. Coastal 03. Proceedings of the 13th Biennial Coastal Zone Conference, Baltimore, MD, Jul 13-17, 2003. NOAA/CSC/20322-CD. CD-ROM. Charleston, SC: NOAA Coastal Services Center.

VII. Keynote/plenary lectures at national/international conferences related to activities in China.

(1) Invited keynote speaker to the Chinese Phycological Society, Suzhou University, Suzhou, PR China, November 3, 2003. Dr. Yarish’s paper was entitled “Integrating seaweeds in aquaculture: new opportunities for bioremediation and biotechnology.”

(2) Invited keynote speaker to The 5th Asia-Pacific Conference on Algal Biotechnology, October 18-21, 2003, Qingdao, P.R. China. Dr. Yarish’s paper was entitled “Seaweed Cultivation and Biotechnology: Opportunities for Integrating Seaweeds in Aquaculture Systems for Bioremediation and Industry Diversification.” See #III for full details.

V. Harmful Algal Bloom (HAB)

A. Collaborative research on technology to address the HAB issue

Increasing frequency and intensity of harmful algal blooms (HABs) and their associated adverse public health impacts pose a major concern for countries facing HAB problems. A receptor binding assay (RBA) has been developed for HAB toxins and may be the most viable alternative to the mouse assay for shellfish toxicity monitoring and management of HABs. Establishment of the RBA technology in China was done through a fellowship training in 2002, and an expert mission from US NOAA in 2004 to assist in the implementation of this technique at the First Institute of Oceanography.

Ms. Zou Yinglin from First Institute of Oceanography SOA, went to NOAA National Ocean Service, Center for Coastal Environmental Health and Biomolecular Research in Charleston, US from May 6 to June 15, 2002 to participate in a training program on receptor assay technology for HAB toxins.

As invited by the First Institute of Oceanography SOA, Mr. Tod Leighfield, from the NOAA National Ocean Service, Center for Coastal Environmental Health and Biomolecular Research visited FIO, SOA during 5-11 December of 2004, as IAEA expert to implement receptor binding assay. Mr. Leighfield gave a presentation on the new method for detection of HAB toxins and conducted receptor assay in the FIO laboratory.

In December 2003, Dr. Senjie Lin visited Shanghai Fisheries University where he gave a seminar entitled “Detection and quantification of HABs using molecular techniques.” He met with students from Dr. Peimin He’s laboratory and the newly established Biotechnology Center.

In the same month, Dr. Lin spent 10 days in Qingdao. He gave four lectures at the Ocean University of China on the application of molecular techniques on studies of HAB phytoplankton. He instructed a group of students from different laboratories there on DNA extraction from HAB species and PCR cloning. While in Qingdao, he also visited the Academy of China Institution of Oceanography and gave an informal seminar there. At the completion of the visit to Qingdao, Dr. Lin flew to Xiamen University located at the southeast of China. He was invited to give a seminar and to meet with faculty and students from the School of Environmental and Ocean Sciences. Prospective collaboration was discussed.

The outcome of the ongoing research collaboration includes the following.

1. Visiting Professorship of Dr. Lin with Shanghai Fisheries University was established to facilitate more extensive collaboration in research and student advising.
2. A manuscript on Rubisco structure and expression in the potentially harmful seaweed *Enteromorpha clathrata* has been submitted for peer-reviewed publication. Further collaboration with Dr. Peimin He on HAB research is under way.
3. A grant proposal was developed with Professor Zhigang Yu’s research group (PI: Dr. Tiezhu Mi) at Ocean University of China and submitted to the Young Scientist Research Funds in China. This project was to develop a PCNA-based molecular technique to study in situ growth of *Heterosigma akashiwo*, a raphidophyte HAB species. This grant has recently awarded.
4. A collaborative research project on using molecular technique to study grazing of HAB phytoplankton was initiated with Professor Guangxing Liu at Ocean University of China. Finally, collaboration on studies of HAB with the key national laboratory in the School of Environmental and Ocean Sciences, Xiamen University (Drs. Nianzhi Jiao, Bangqin Huang, and Yuanshao Lin) was initiated.

U.S. contacts: Dr. Senjie Lin, University of Connecticut
Dr. Charles Yarish, University of Connecticut

Chinese contacts: Professor ZHOU Mingjiang, Institute of Oceanology, CAS
Professor ZHU Mingyuan, First Institute of Oceanography, SOA
Professor WANG Qingyin, Yellow Sea Fisheries Research Institute, CAFS
Dr. HE Peimin, Shanghai Fisheries University

VI. Ecosystem Modeling

A. Management of Extractive and Fed Aquaculture Using Ecosystem Models

The collaborative effort has resulted in research projects on Jiaozhou Bay, Shandong Province and Xincun Lagoon, Hainan Province. These models developed in the joint program have provided new knowledge of the impact of aquaculture in these semi-closed bays. In Jiaozhou Bay, the large number of scallop aquaculture rafts significantly reduced the plankton. This may

have reduced the growth rate of scallops and stressed the animals. The scallop culture operations subsequently experienced losses and were moved to other locations. In Xincun Lagoon, the model indicated that fish pens were causing poor water quality and marginal oxygen levels. As a result of our research, new management practices were instituted that limit the number of fish pens to prevent the catastrophic losses of fish experienced in the 1990s. Several publications and presentations of the results of the research are listed below. In addition, Dr. Chen established a cooperative modeling program with Shanghai Normal University and was a guest lecturer in November 2004.

CONFERENCE PRESENTATIONS, WORKSHOPS, AND SEMINARS

Approaching Coastal Aquaculture from an Ecosystem Perspective, Aquaculture in the Ocean Ecosystem Session, North Pacific Marine Science Organization (PICES), October 12-16, 2003

Integrated Aquaculture and Ecosystem Management: Polyculture on a Grand Scale (Moderator/Speaker), Coastal Zone'03: Coastal Management Through Time, Baltimore, MD, USA, July 13-17, 2003

U.S. contacts: Dr. Mac V. Rawson, University of Georgia

Dr. Changsheng Chen, University of Massachusetts-Dartmouth

Dr. Charles Yarish, University of Connecticut

Chinese contacts: Professor ZHU Mingyuan, First Institute of Oceanography, SOA

Dr. WANG Yan, Shanghai Fisheries University

Dr. WANG Daoru, Hainan Marine Development, Planning and Design Institute

VII. Aquaculture educational exchange

In November 2002, Prof. Charles Yarish, The University of Connecticut and Mr. John Curtis, Principle of Bridgeport Vocational Aquaculture School were invited to visit Shanghai Fisheries University. Prof. Charles Yarish gave a lecture on "Seaweed Biotechnology and Cultivation".

In November 2003, Prof Charles Yarish was invited to visit Shanghai Fisheries University and gave a lecture on "Development of Seaweed/Finfish Integrated Recirculating Aquaculture System".

In December 2003, Dr. Senjie Lin was invited to visit Shanghai Fisheries University and gave a lecture on "Use of Molecular Markers for the Detection of HABs".

Remote education

Making use of the existing equipment, initiative lecture series on ornamental aquaculture for the students of Bridgeport Regional Vocational Aquaculture School (BRVAS). The lecture was in four sections. Shanghai Fisheries University (SFU) provided course materials. The lecture was given once in 2002 and 2003, respectively. Charles Yarish became first e-Professor at Shanghai Fisheries University (SFU), April, 2004, Shanghai, People's Republic of China by President Yingqi Zhou. He had been appointed by that University's Board of Trustees as a Guest Visiting Professor in 2002 which continues till the present.

In order to practice the remote education technology, SFU opened an online English course such as “Ichthyology” and “The Introduction of Fisheries”. The directors from USA will instruct the students (The students can be not in BRVAS). The students obtained certificates if they passed the course.

The field trip of students of BRVAS

In April 2004, one teacher and 3 students were invited to visit Shanghai Fisheries University. BRVAS organized the students to have a field trip to Shanghai. It included the SFU Whale Museum, SFU Aquatic Biology Museum, and the related farming facility.

Academic exchange

2002 is the 90th anniversary of the founding of SFU. SFU invited U.S. experts of ocean and fisheries to take part in the academic activities.

Education and Research cooperation

In 2002, SFU designated scholars to take part in some related Sino-US scientific project. The highlight of cooperation was on marine pharmaceuticals and aquatic process. SFU discussed the cooperating graduate education and exchange graduate education with related universities.

U.S. contact: Mr. John Curtis, BRVAS

Dr. Charles Yarish, University of Connecticut

Chinese contact: Professor ZHOU Yingqi, Shanghai Fisheries University

VIII. Data and Information

A. Data retrieval of historical pollock catches in the Central Bering Sea

U.S. contact: Dr. Loh-Lee Low, AFSC/NMFS/NOAA

Chinese contact: Professor ZHOU Yingqi, Shanghai Fisheries University

B. Introduction of Chinese fishery websites

Prof. Yang Ningsheng and Ms. Eileen McVey had exchanged idea about this project. The information Center of CAFS has collected information and finished a report on the Chinese fishery websites.

Chinese contact: Professor YANG Ningsheng, Information Center, CAFS

U.S. contact: Ms. Eileen McVey, The NOAA Library

IX. NMFS Aquaculture Research and Management

Both sides have obtained progress in the development of culture system (such as polyculture and anti-wave cage culture), and the research on the biology, physiology, growth and reproduction of culture species. In China, the possible impact of released species on the ecosystem has been concerned by scientists and fisheries administrators. Many researches on the impacts of marine aquaculture to the environment has been done and some ecological models and standards for marine culture have been developed for the industry. More standards for marine aquaculture are on the way of development.

Due to fund limitation, the two sides had no expert exchange, but the development of the

mentioned researches in the two countries is going well.

U.S. contact: Dr. Michael Rust, Northwest Fisheries Science Center/NMFS/NOAA
Chinese contact: Mr. LI Yingren, Chinese Academy of Fishery Sciences

X. Strategic Planning Team for Living Marine Resources Panel

There has been no activity to report.

U.S. contact: Dr. James McVey, U.S. Chairperson

Chinese contact: Mr. ZHANG Xianliang, Chinese Chairperson

Appendix IV

*******Work Plan 2005-2006*******

I. SHRIMP

A. Endocrinology of shrimp reproduction, maturation and spawning:

Both sides would like to continue cooperative research on molecular endocrinology of shrimp reproduction, maturation and spawning. As part of the project, the samples preserved at the Institute of Oceanology, CAS, will be analyzed at Dr. Hans Laufer's lab. The mechanism regulating the reproductive process of shrimp will be studied further to improve the "shrimp breeding technique." In 2005-2006, one scientist from the Institute of Oceanology, CAS will be sent to USA for 6 months and one scientist from USA will be invited to visit China for 1-2 weeks for the following:

- Measurement of MF in blood and gonads of immature and mature females
- The variance of MF in female at various stages of vitellogenesis and ovarian maturation
- Effects of eyestalk ablation on MF level in Chinese shrimp
- MF feeding trials on ovarian development of Chinese shrimp
- Studies on the identification and amino acid sequence of MOIH in *Fenneropenaeus chinensis*.

Chinese contact: Prof. Xiang Jianhai IOCAS,

US contact: Dr. Hans Laufer, University of Connecticut

B. Development and Introduction of SPF/SPR Shrimp Stocks

Collaborative Goals:

- Development of SPF/SPR shrimp stocks under collaboration effect;

- Introduction of the selected SPF/SPR populations and relevant technology of breeding for SPF/SPR Penaeid shrimp;
- Foundation of the High Health Shrimp System (HHSS)

Research Topics:

- Breeding and Introduction for SPF/SPR stocks;
- Introduction of quarantine technology for SPF/SPR shrimp;
- Introduction of technology to hold the NBC (nucleus breeding center);
- Foundation of the HHSS in China.

Chinese contacts: Prof. Wang Qingyin, Yellow Sea Fisheries Research Institute, CAFS

Dr. Huang Jie, Yellow Sea Fisheries Research Institute, CAFS

US contacts: Dr. Gary D. Pruder, The Oceanic Institute, Hawaii

Dr. Donald V. Lightner, Veter. Univ. of Arizona

Dr. Addison L. Lawrence, Texas A&M University

C. Joint study on molecular genetic markers in penaeid shrimp

Both sides would like to continue cooperative research in the following areas:

- Develop genetic marker techniques for shrimp
- Screen disease resistance genes or genetic markers in *Fenneropenaeus chinensis*.
- Genome map construction techniques of *Fenneropenaeus chinensis*.

The purpose for this program is to develop molecular genetic marker techniques for the study of population genetics, MAS, and location, isolation and cloning of genes in shrimp. The final purpose is to breed disease resistant Chinese shrimp *Fenneropenaeus chinensis*.

During 2005-2006, two scientists from Tufts University will come to China to work for two weeks, and two scientists from Institute of Oceanology, CAS, will be sent to Dr. Warren's lab to work for 6 months.

Chinese contact: Prof. Xiang Jianhai, Institute of Oceanology, CAS

US contact: Dr. Acarcia Alcivar-Warren, School of Veterinary Medicine, Tufts University

II . Shellfish

A. Scallop mass mortality--Mechanism of mass mortality of cultured scallop *Chlamys farreri*

The following items will be studied by Dr. Ximing Guo from Haskin Shellfish Lab, Rutgers University, in cooperation with Dr. Yang Hongsheng from the Institute of Oceanology, Chinese Academy of Sciences.

- Relationships between sudden changes of the principal environmental factors and scallop mortality rate
- Relationships between change of germ plasm and scallop mortality rate

Scientist from IOCAS will study the relationship between sudden change of these main environmental factors and scallop mortality. Staffs of Haskin Shellfish Lab., Rutgers University, will study the relationship between degeneration of germ plasm and scallop mortality rate. One Chinese scientist will participate in research work in Haskin Lab. in

cooperation with U.S. scientists.

Chinese Contact: Dr. Yang Hongsheng, Institute of Oceanology, CAS

US contact: Dr. Ximing Guo, Haskin Shellfish Research Lab, Rutgers University

B. Ecology and management of the Asian oyster *Crassostrea ariakensis* in Bohai Sea

A joint field survey of *Crassostrea ariakensis* reefs in the coast of Shandong, China conducted in the summer of 2003 and 2004, respectively has proved to be productive. Therefore, it is necessary to continue this project to gain further understanding of the formation of oyster reefs in Bohai Sea.

Chinese contact: Dr. Que Huayong, Institute of Oceanology, CAS

U.S. contact: Dr. Mark Luckenbach, Virginia Institute of Marine Science

C. Genetic breeding and genetic markers screening in bay scallop

Professor ZHANG Guofan from the Institute of Oceanology of CAS and Dr. Ximing Guo from Rutgers University have agreed to continue cooperative study on the selective breeding and genetic makers in the bay scallop, *Argopecten irradians*. The objectives of the project are as follows:

- The genetic structure of U.S. stock of bay scallop
- The genetic differentiation in different generations of the cultured population after transplantation to China from the U.S. and the relationship between these genetic variation and traits
- Selective breeding and establishment of self-fertilization and crossing between different populations
- Genetic markers screening in bay scallop

Dr. Ximing Guo will work for 1-2 weeks in China, and one scientist from China will visit Dr. Guo's lab for 6 months.

Chinese contact: Professor ZHANG Guofan, Institute of Oceanology, CAS

U.S. contact: Dr. Ximing Guo, Rutgers University

D. The molecular genetic maker technique, genetics and breeding of bivalve molluscs

Cooperation studies will be carried out in the following items

- Develop molecular markers and genetic probes of marine shellfish
- Analyze the population genetic structure and variation in the wild and cultured stocks of oyster and scallop by molecular technique.

Dr. Dennis Hedgecock will be invited to visit the Institute of Oceanology, CAS for one week, and one Chinese scientist from Prof. Jianhai Xiang's lab will go to Dr. Dennis Hedgecock's lab to work for six months.

Chinese contact : Prof. Xiang Jianhai, Institute of Oceanology, CAS

US contact: Dr. Dennis Hedgecock, Bodega Marine Laboratory, University of California

E. Genomic study of scallop

Prof. Xiang Jianhai and Dr. Ximing Guo would like to do further cooperation in the following areas:

- --Development of molecular genetic marker techniques and screen the highly polymorphic markers in scallop;
- --Construction of linkage and physical map of *Chlamys farreri* and *Argopecten irradians*
- --Mapping of the important economic quantitative traits

Chinese contact : Prof. Xiang Jianhai, Institute of Oceanology, CAS

US contact: Dr. Ximing Guo, Haskin Shellfish Lab, Rutgers University

III. Finfish

A. The immunology of cobia and redfish and vaccine preparation

Due to the continual growth of cobia and redfish cultured in China, further study on immunological prevention techniques are necessary for disease control, including the immunology of the two fish species and for vaccine application. We are now beginning to work on non-special immunity and mortality, special immunity about the condition of Ig production and Ig⁺ cell distribution, and the vaccine preparation of vibriosis. The cooperation work plan includes the 18-month research stay in USA, and the U.S. scientist for a 1-2 month research stay in Guangzhou. The research and exchange will last 3 years, the summary of activities will be reported annually.

US contact: Dr. S Kaattari, Virginia Institute of Marine Science

Chinese contact: Dr. Feng Juan, South China Sea Fisheries Research Institute, CAFS

B. Research on Chinese Sturgeon, *Acipenser sinensis*, in the Yangtze Estuary and Coastal East China Sea

Chinese sturgeon, *Acipenser sinensis*, is an anadromous species that presently only remains in the East China Sea and the Yangtze River, China. Adult fish spawn in the upper Yangtze River and young fish feed and grow in the East China Sea. Adult Chinese sturgeon, to a maximum of 400 cm total length and 425 kg body weight, is one of the largest fish to enter any river in the world. The population supported a historical fishery in the middle and upper Yangtze River. However, since the 1950s, the population of Chinese sturgeon has greatly declined mainly due to over fishing, damming and habitat alteration. Therefore, commercial capture of Chinese sturgeon was prohibited in 1983, the species was listed as a Category I protected wild animal (highest level of protection) by the Chinese government in 1988 and classified as an endangered species in 1994 when it was put on the IUCN's Red List.

The Yangtze estuary is an important and singular passage for the migration of Chinese sturgeon between marine and fresh water. Every year from May to September, an abundance of young

Chinese sturgeon concentrate in the estuary from spawning sites in the upper river to feed and physically adapt to the marine environment. It is necessary and urgent for the establishment of a natural reserve for Chinese sturgeon in the Yangtze estuary and coastal areas.

The Yangtze estuary and coastal areas is in the city precinct of Shanghai which is one of the largest cities in China located in the Yangtze estuary. A proposal for the establishment of a natural reserve for Chinese sturgeon at the Yangtze estuary and coastal areas was approved by the City Government of Shanghai. However, research on the biology of Chinese sturgeon at the Yangtze estuary and coastal area is insufficient. Particularly, information on habitat and behavior of the species on this area is scarce.

The East China Sea Fisheries Research Institute of the Chinese Academy of Fishery Sciences, which is located in Shanghai City, is a national fisheries research institution, and the fisheries conservation study at the Yangtze estuary and coastal area is one of the major research fields of the institute. Dr. Ping Zhuang, who is the deputy director and a research professor of the institute, leads the research project of the natural reserve for Chinese sturgeon at the Yangtze estuary and the coastal areas. Dr. Zhuang has been studying the biology and conservation of Chinese sturgeon for 23 years.

S.O. Conte Anadromous Fish Research Center, U.S. Geological Survey, is a federal institution in the United States. Dr. Boyd Kynard is principal investigator and leader of the fish ecology and behavior section of the Center. Dr. Kynard has been working on sturgeon behavior and conservation for many years, and he is experienced expert for conservation of anadromous fish species.

Drs. Kynard and Zhuang have collaborated on research related to sturgeon conservation for 10 years. Dr. Kynard has been to China many times for spawning behavior studies of the Chinese sturgeon in the middle and upper Yangtze, and has obtained valuable data. In 2002, Drs. Kennard and Zhuang began a study of natural reserves areas for Chinese sturgeon in the Yangtze estuary and the coastal areas. In September 2002, Dr. Zhuang invited Dr. Kennard to China and made a field survey of the Yangtze estuary. From 2000-2002, as a visiting scholar, Dr. Zhuang worked in Dr. Kynard's laboratory for 2 year, to do research in sturgeon ecology, behavior and conservation. Dr. Zhuang learned valuable research method in the USA. Drs. Kynard and Zhuang believe that the future collaboration (as put forward in this proposal) will be very helpful for the conservation of Chinese sturgeon. The collaborative plan is as follows:

1. Distribution and migration of Chinese sturgeon in the Yangtze estuary and coastal areas. Using PIT tag, radio tag, or acoustics tags, to investigate the inhabit duration, distribution, migration route, and migration behavior of young Chinese sturgeon in the Yangtze estuary and coastal areas.
2. Habitat investigation of Chinese sturgeon in the Yangtze estuary and coastal area by means of laboratory experiments and field investigations in order to test the habitat preference of young Chinese sturgeon and to infer the optimum habitat in the wild.
3. Physical adaptation of Chinese sturgeon during migration from a fresh water environment to the ocean. By means of radioimmunoassay, to exam serum hormones that is related to osmosis for the understanding of endocritic acclimatization, and to

exam serum Na^+ K^+ Cl^- and Na^+/K^+ -ATP in gill, kidney and intestines for the understanding of ionic accommodation.

4. Effects of environmental alteration on the habitat of Chinese sturgeon at the Yangtze estuary and coastal area. Effects of pollution and hydro-project in the upper Yangtze on environmental factors, biological resources, and the feed of Chinese sturgeon in the Yangtze estuary and coastal areas.
5. Suggestions and strategies for the conservation of Chinese sturgeon in the Yangtze estuary and coastal areas. Based on the anticipated research detailed above, work out the suggestions and strategies for the conservation of Chinese sturgeon in the Yangtze estuary and coastal areas.

US contact: Dr. Boyd Kynard, S.O. Conte Anadromous Fish Research Center, U.S. Geological Survey

Chinese contact: Dr. Zhuang Ping, East China Sea Fisheries Research Institute, CAFS

C. Functional Genomics and Molecular Marker Assisted Selection of Marine Fish

Polypeptide from Chlamys Farrei (PCF) was found to have an antioxidative effect to cultured cells, which may also have a beneficial effect or therapeutic potential to brain aging. Brain aging and cognitive impairments have a close relationship with neural stem cell (NSC) activity. We have established stable human neural stem cell (hNSC) culture in the lab since 2001. We propose to explore the effect of PCF on the proliferation and differentiation of hNSCs under cultured conditions for our start. The data obtained from in vitro cell cultures will be a basis for future in vivo studies about the effects of PCF on endogenous NSC in animals.

Main foci: Construction of cDNA library, Sequencing and blast analysis of ESTs, Screening of disease resistance related functional genes and molecular markers from Japanese flounder (Paralichthys olivaceus) and turbot (Scophthalmus maximus) and the development of molecular marker assisted selection technique in cultured marine fish.

Work plan: During June of 2005, Prof Z. Liu of the United States will visit the Yellow Sea Fisheries Institute, Qingdao, China. During January of 2006, Prof Songlin Chen of China will visit Auburn University in the United States. The culture of hNSCs and evaluation of the effects of PCF on the proliferation and differentiation of hNSCs will be performed in my lab at the Department of

Psychiatry of University of Illinois at Chicago (UIC).

U.S. contact: Prof. Zhanjiang Liu of the Department of Fisheries and Allied Aquacultures and Program of Cell and Molecular Biosciences, Auburn University

China contact: Professor Songlin CHEN, Yellow Sea Fisheries Research Institute, CAFS,

IV. Virology

A. Study on Virology of Aquatic Organism

The purpose of collaborating in this area is as follows:

- To continue and deepen the collaborative research between the US and Chinese;
- To help build upon and advance Chinese research;
- To contribute to the further development of international collaborative research on shrimp and fish virology and to learn from the U.S. experience;

Research Topics:

- Shrimp capability of resistance to viral infection;
- Study on receptors of shrimp virus;
- Virus-coded enzymes and identification of the relevant gene;
- Tissue culture and virological study with SPF shrimp;
- Identification of a new found virus as the potential pathogen of scallop and gene clones;
- Development of a vaccine for viruses in marine fish.

Chinese contact: Dr. Huang Jie, Yellow Sea Fisheries Research Institute, CAFS

US contacts: Dr. Donald V. Lightner, Veter. Science Depart., Univ. of Arizona,

Dr. Robin M. Overstreet, Professor, Gulf Coast Res. Lab.

B. Study on Diagnostic Technology by Gene Chips for the Virus and Microorganism of Aquatic Organism

Collaborating Purposes:

- To establish and consummate the manufacturing technique of the gene chips for aquatic organism pathogens;
- Developing applicable technique for gene chips.

Research Topics:

- Collection and Analysis on the DNA sequences of aquatic pathogens;
- Development of gene probes of aquatic pathogens for gene chips;
- Development on the techniques of specimen treatment for the application of gene chips;
- Collaboration and training on the manufacture technology, producing techniques, and the equipment of gene chips;
- Application the techniques of gene chips for the diagnosis of aquatic pathogens.

Chinese contact: Dr. Huang Jie, Yellow Sea Fisheries Research Institute, CAFS

US contacts: Dr. Donald V. Lightner, Professor, Veter. Science Depart., Univ. of Arizona

Dr. John Stubbs, Professor, San Francisco State University

C. Virology of haliotis diversicolor Reeve

Haliotis diversicolor Reeve has occurred on many commercial aquaculture farms between 1999 and 2003. The symptoms of the infected abalone were as follows: The pleopod of infected abalone became stiff and the surface of it became black, the mantle shrank. The infections were non-discriminatory and highly lethal, found in all size of abalones. A kind of spherical virus was detected in the tissues of the mantle, gill and intestine. The pathogenicity of the virus was confirmed by the experimental infection, the virus was purified by sucrose gradient centrifugation. The nucleic acid of the virus is dsDNA.

The cooperative work plans mainly involve isolation and the purification of nuclei acid analysis of the shellfish virus. The cooperative work plan includes an 18 month researchs stay in the USA, and 1-2 month research stay for a U.S. scientist in Guangzhou. The research and exchange will last 3 years, a summary of activities will be reported annually.

Chinese contact: Dr. Wang Jiangyong, South China Sea Fisheries Research Institute, CAFS

U.S. Contact: Carolyn Friedman, University of Washington

V. Algae

A. Seaweed cultivation, biology and biotechnology

The objectives of our on-going collaborative research projects with PR China are:

(1) To attempt to set up a small, pilot-scale, Chinese-US style nori farm in US coastal waters (Cobscook, Maine) using New England Porphyra species in conjunction with the University of Maine (Prof. Susan Brawley), University of Connecticut (Charles Yarish) and the Bridgeport Regional Vocational Aquacultural High School (reciprocal exchanges of scientists are expected; Prof. FEI is our key person with respect to this program); In association with this work, Prof. Susan Brawley and Mr. Nic Bluoin (University of Maine) spent two weeks in Qungdao with

Prof. FEI planning the details of the pilot farm experiments.

(2) To do comparative physiological and developmental research on select American species and determine which species of *Porphyra* have the greatest nutrient removal abilities (from finfish and inorganic sources) under various conditions of irradiance, temperature, and water flow.

We have many isolates of *Porphyra* species in the UConn culture collection that were initially isolated with the help of Prof. FEI during a six month visit in 1995-1996. With Prof. HE (he has been hosted by UConn and BRVAS since May of 2001) and FEI's ongoing assistance, we are now continuing with a plan to move a small demonstration nori farm alongside salmonid farms into Coscook Bay, Maine.

There is also agreement with the Bridgeport Regional Vocational Aquaculture School (BRVAS, Mr. J. Curtis) to continue working with them and SFU on cooperative educational endeavours. It is expected that the receiving side will arrange for living and research expenses, in the respective host country, for periods of up to six months. I would like to invite Prof. HE to UConn for a short visit (about 3 months) later in 2005 to continue to work out design plans on the integrated aquaculture projects in China and the US.

U.S. Contact: Charlie Yarish, UCONN

Prof. Susan Brawley, University of Maine

John Curtis, Bridgeport Regional Vocational Aquaculture School

Chinese Contact: Prof. HE Peimin of Shanghai Fisheries University

Prof. FEI Xiugeng, Institute of Oceanography

VI. Harmful Algal Bloom

A. China-US cooperation on the Receptor Binding Assay to detect HAB toxins

The RBA is a rapid, reliable, and accurate assay, which has been developed for HAB toxins in a high throughput format by NOAA. Training and technology transfer for this method is being supported in part by United Nations Development Programme/IAEA. Collaborative testing of the robustness of the method will include ten international laboratories. The laboratories will use shared supplies and test a variety of shellfish matrices both naturally contaminated and laboratory spiked materials. The next phase of the RBA towards acceptance and implementation is to undergo an international collaborative study of the method for submission to the AOAC. The First Institute of Oceanography of China and NOAA National Ocean Service, Center for Coastal Environmental Health and Biomolecular Research would like to continue their cooperation in this field. The main activities include:

1. Both sides will participate the UNDP/IAEA International Collaborative Study on the RBA
2. Both sides will conduct calibration and comparison on methods used for HAB toxin assay, such as mouse bioassay, RBA, HPLC, LC-MS etc.
3. Both sides will carry out scientist exchange visit.

The cooperation period will be 2005-2006

US Contacts: Dr. Frances Van Dolah, NOAA, National Ocean Service
Mr. Tod Leighfield, NOAA, National Ocean Service
Chinese contacts Professor ZHU Mingyuan, First Institute of Oceanography
Ms. ZOU Yinglin, First Institute of Oceanography

B. Collaboration between the University of Connecticut and Several Universities in China on HAB Research

1. Visiting Professorship of Dr. Lin with Shanghai Fisheries University was established to facilitate more extensive collaboration in research and student advising.

U.S. Contact: Dr. Senjie Lin, University of Connecticut
Chinese Contact: Prof. HE Peimin of Shanghai Fisheries University

2. A manuscript on Rubisco structure and expression in the potentially harmful seaweed *Enteromorpha clathrata* has been submitted for peer-reviewed publication. Further collaboration with on HAB research is under way.

U.S. Contact: Dr. LIN Senjie, University of Connecticut
Dr. Charles Yarish, University of Connecticut
Chinese Contact: Dr. HE Peimin of Shanghai Fisheries University

3. A grant proposal was developed with Professor YU Zhigang's research group at Ocean University of China and submitted to the Young Scientist Research Funds in China. This project was to develop a PCNA-based molecular technique to study in situ growth of *Heterosigma akashiwo*, a raphidophyte HAB species. This grant has recently awarded..

U.S. Contact: Dr. LIN Senjie, University of Connecticut
Chinese Contact: Dr. MI Tiezhu, Ocean University of China

4. A collaborative research project on using molecular technique to study grazing of HAB phytoplankton

U.S. Contact: Dr. LIN Senjie, University of Connecticut
Chinese Contact: Professor Guangxing LIU at Ocean University of China

5. Collaboration on studies of HAB with the key national laboratory in the School of Environmental and Ocean Sciences, Xiamen University was initiated.

U.S. Contact: Dr. LIN Senjie, University of Connecticut
Chinese Contact: Drs. Nianzhi JIAO, Bangqin HUANG, and Yuanshao LIN, Xiamen University

VII. Ecosystem Modeling Including Offshore Aquaculture

There are three areas of collaborative research. The main areas of focus are listed under each heading. The topics are as follows:

A. Impact of Large Scale Mariculture on Ecosystem and Environment

1) *Study on the interaction between intensive bivalves culture and the environment in coastal waters*

- a) *Biodeposit rate of maricultured scallop, oyster, mussel from longline*
 - b) *Variations of benthos macro and micro population in the mariculture regions*
 - c) *Impact of bivalve culture on the ecosystem and environment*
 - d) *Environmental carrying capacity of intensive bivalve culture regions.*
 - e) *Sustainable management regulation.*
 - f) *Monitoring technology for biotoxins such as DSP, ASP, PSP, AZP;*
 - g) *Application of GIS for mariculture*
 - h) *Monitoring the Chlorophyll concentrations in longline culture areas by using satellite remote sensing technology.*
 - i) *Harmful effect of the resuspension of sedimentary matters to cultivated bivalves.*
 - j) *Carrying capacity of coastal waters for mariculture*
- 2) *Environmental Carrying capacity of shallow sea regions for fish cage culture*
The mainly focus:
- a) *Feeding behavior of cultivated fish in cages*
 - b) *Decomposition mechanism of biosediment from rudimental diet and feces of fish.*
 - c) *Horizontal and vertical Transportation of particulate matters in cage culture area.*
 - d) *Indicator organisms for pollution in the seabed of cage culture regions.*
 - e) *Environment carrying capacity models*
- 3) *Large scale mariculture on fishery resources*
- a) *Influence of mariculture on spawning and feeding ground of economical fishery organisms.*
 - b) *Influence of large scale mariculture on vegetation growing on seabed and intertidal zone.*

Chinese contact: Prof. Fang Jianguang, Yellow Sea Fisheries Research Institute, CAFS
US contact: Dr. Michael Rust, Northwest Fisheries Science Center, NMFS, NOAA
Dr. Charles Yarish, University of Connecticut

B. Mathematical modeling on carrying capacity of cage based marine fish farming

Cage based marine fish farming in coastal waters in China has grown dramatically during the last decade. The rapid expansion of cage based marine fish farming also led to growing concern on environmental impacts. To mitigate the adverse impacts and make cage based marine fish farming environmentally sustainable, one of the important strategies is aimed at scientifically controlled stocking density. This is related to the carrying capacity of the receiving water, which is mainly governed by the flushing characteristics of the water body concerned.

Study area

Dapeng Ao Cove is a shallow sub-tropical semi-enclosed embayment located in the southwestern Daya Bay at the north part of South China Sea, and with an area of about 1400 ha. The cage based marine fish farming site is located in 5m of water and in an area of poor tidal flushing with a max current flow about 0.1m/s and mainly in southwest-northeast direction. Cage based marine fish farming activities are confined to 30 ha in the southeast part of the cove, with 4200 floating fish cages occupying about 4.0 ha. Each fish cage is approximately 3m×3m×3m. The main culture species are grouper, sea bream, snapper, pomfret and cobia. The annual fish production is about 450 tonnes. Fish are mainly fed using trash fish which amount to about 3-

10% of the fish stock in the cages.

Study objective

The general objective is to establish a mathematical model to simulate the effects of cage based marine fish farming on water quality and define the carrying capacity for sustainable development of cage based marine fish farming in Dapeng Ao Cove - the maximum production of fish in the cage farm without environmental deleterious effects.

Study content

Data analysis: To analyse the existing data with respect to the carrying capacity for cage based marine fish farming and its environmental impact. Data include biogeochemical variables surveyed in the cove seasonally from 2001 to 2002, field hydraulic data collected by S4ADW in wet and dry seasons in 2002, and related data from published literature. The establishment of a series of parameter for the water quality model is described below.

Hydrodynamic model: To develop a hydrodynamic model, based on a finite volume ocean model (FVCOM), to compute the tidal flushing in the cage based marine fish farming. The model is aimed to provide basic hydraulic data for use in the water quality model described below.

Water quality model: To simulate the diffusive movement for each of the substances under considerations, i.e., salinity, biochemical oxygen demand (BOD), dissolved oxygen, suspended solids, ammonia nitrogens and dissolved phosphorous,

Modeling the effects of cage based marine fish farming: Upon completion of model calibrations using observed data, the models are used to assess the effects of cage based marine fish farming in Dapeng Ao Cove using the established series of parameter. The end goal is to predict the upper level of fish stock that can maintained in the farmed area without violating the defined acceptable water quality levels of the ambient water quality.

Chinese contact: Mr. HUANG Honghui, South China Sea Fishery Research Institute, CAFS

US contact: Dr. Changsheng Chen, The School of Marine Science & Technology
University of Massachusetts-Dartmouth New Bedford, MA 02744

C. Marine Eutrophication Bioremediation with Seaweeds

In recent years, marine eutrophication has become a very serious issue. In China, the marine pollution comes from the industrial, agricultural, as well as human activity. Fish aquaculture activity is also a big pollution source due to its release of nutrients from excess feed to the surrounding waters. Higher eutrophication resulted in red tides, which is harmful to aquaculture and aquatic biology resources. Bioremediation of eutrophication with seaweed has been given paid more attention by scientists and the government. According to past research results, *Porphyra* cultivation could significantly decrease the nitrogen and phosphorus concentration in local coastal waters. Seaweed cultivation would be a good way to control seawater eutrophication and red tides. We wish to continue to research marine eutrophication bioremediation with seaweeds in the areas of higher eutrophication and higher occurrences of red tides, such as, the Xiangshan coast and harbors, Zhejiang Province, China. Areas of collaborative research will include:

- 1) Studying on the N and P uptake dynamics and bioremediation with different seaweeds cultivation in the Xiangshan coast and harbors, Zhejiang Province, China.

- 2) Developing the technology to identify harmful algal species with particular DNA molecular biology, and the establishing of an alarm system for red tides with DNA molecule.
- 3) Developing the technology for seaweed/finfish integrated recirculating system and trying to apply that technology in China.
- 4) Developing and improving the technology of extraction and purification of active substances from seaweeds, such as phycoerythrin, polyaccharides, etc. to further develop them as marine origin medicine.

Chinese Contact: Prof. HE Peimin, Shanghai Fisheries University

US contact: Dr. Charles Yarish, University of Connecticut

Dr. Senjie Lin of The University of Connecticut

VIII. Others

A. Risk assessment of alien marine species invasion

Objectives:

One or several intentionally introduced species such as *strongylocentrotus intermedius* will be chosen as study objects. The ecological environmental parameters of the introduced species in the donor region and in the recipient region will be obtained through research. The status of the introduced species in the recipient region including distribution, quantity, individual zoology and environmental demand by investigating will also be obtained. Experiments including food contesting, hybridization etc between the introduced species and the native species would also be ideal. Based on the obtained information, we can evaluate and predict impacts of the introduced species on local ecology and further assess ecological invasion risk of introduced species. This research may contribute to a method designed to assess ecological invasion risk for intentionally introduced species in China. It is hoped that a workshop or conference can be convened at the end of the research period.

Chinese contact: Prof. WANG Lijun, National Marine Environmental Monitoring Center,
SOA

US Contact: James T. Carlton, Williams College and Mystic Seaport
Steven Murray, California State University Fullerton

B. Discovery of marine microbial drugs and ecology of drug-producing marine microorganisms

Aim

To exchange technologies used for the discovery of marine microbial drugs and to understand the characteristics of the biological and chemical ecologies of drug-producing microorganisms in order to get fundamental information for developing and utilizing pharmaceutical marine microbial resources. An ideal outcome would also be to discover 1 or 2 new products for potential medical uses. It is hoped that the project will continue for three years.

Collaborative foci

1. Screen models for marine microbial drugs and screen of drug-producing marine microorganisms
2. Chemical process of marine bioactive microbial secondary products
3. Techniques for classification and identification of drug-producing marine microorganisms
4. The biologically and chemically ecological characteristics of drug-producing marine microorganisms

Yearly breakdown of work:

1st year

Scientists from China to visit with their collaborators in the U.S. for discussions of the technologies and methodologies to use on the screen models for marine microbial drugs and on downstream work for the bioactive substances. To start testing screen models and screening pharmaceutical marine micro-organisms in China.

2nd year

- a. To exchange one scientist from both sides. One American will join in the screening of drug-producing microorganisms in China and one Chinese takes part in the chemical analysis of bioactive substances in the U.S.
- b. To carry out the works of Items 1 and 2 above listed in “foci”.

3rd year

- a. To carry out the works of Item 3 and 4 above listed in “foci”.
- b. Discuss the possibility of a seminar in China or the U.S., attended mainly by collaborators and interested members of the community in order to estimate the achievements of this cooperative project and to discuss further research.

Expected achievements

1. Produce regulations for the development of marine microbial resources for drugs.
2. Produce 3 to 5 papers.
3. Discover 1 or 2 new products for potential medical uses and for joint application of patents.

Background for the cooperative research

Prof. Dezan Ye is a member of the the Lab of the State Oceanic Administration for Marine Biogenetic Resources headed by Prof. Xun Xu, the China Technological Academician. One of the current research programs of the key laboratory is “Collections of Species and Construction of cDNA Libraries of Marine Organisms for Potential Pharmaceutical Application” funded by the Ministry of Science and Technology, China. Plenty of bioactive strains of microorganisms were isolated, screened and stored in this program, and more strains, in on going projects relevant to the ocean and deep sea as well as the Arctic and Antarctic environments. All the production will lay on a base for the cooperation. Dr. Bill J. Baker will contribute to the analysis of secondary metabolites from marine microorganisms, biosynthesis of marine natural products and chemical ecology of marine organisms. He showed great interesting in building up a cooperative project during his visiting to the key Lab in early 2001 2002. The Proposed project will provide an opportunity for Chinese collaborators to focus on the upstream work of marine microbial drug discovery and for American collaborators, in the downstream work so that it will

accelerate development of their expected products. Furthermore, the project will work towards a combination of the methodologies in study of the biological and chemical ecology of drug-producing microorganisms.

Chinese contact: Prof. Ye Dezan, The Third Institute of Oceanography, SOA

US contact: Dr. Bill J. Baker, Department of Chemistry, University of South Florida

D. Study on adaptation of microorganism to the deep sea environment and exploitation of biogenetic materials

The adaptation of microorganism to extreme conditions in deep sea such as high pressure and cold played an important role in life diversity research. At the same time, their bioactive materials with these special functions could be applied in many fields such as industry, agriculture and pharmacy. Today the study of deep-sea microorganism has become one of the foci in marine biological research.

Research Foci:

- 1. The cold seep is a typical area located in the juncture of two sections of the earth's crusts where it is rich in reductive hydrocarbon. Most of the microorganisms here are chemoautotrophic and act as the energy-supporters in the cold seep ecosystem. In this project, we will study the microbial diversity of deep sea sediment at cold seep area, analysis the assemblage of the microorganism community and the characteristics of phylogeny, and discuss the relationship between the diversity and the environment.*
- 2. Screen the gene that codes the enzyme related to the oxidation and reduction of sulfate and methane from microorganism in cold seep sediment, including sulfate reductase and methane oxidase. Consequently, we will analysis their function and regulation of the gene expression, study microbial adaptive mechanisms to the cold seep environment and discuss it's applied potential in industry and environmental protection and so on. The period of the project would be for three years.*

Yearly breakdown of work:

1st year

- a. Scientists from China to visit their collaborators in the U.S. for discussions of the research parameters of the sea area and the way to share samples.*
- b. Begin the microbial diversity study in cold seep area.*

2nd year

To exchange one scientist from both sides. One Chinese will takespart in the sample collecting, total DNA preparation, and sulfate reductase screening in the U.S. One American will joins the study of microbial diversity and function of sulfate reductase in China.

3rd year

Discuss the possibility of a seminar in China, attended mainly by collaborators in order to summarize the achievements of this cooperative project. Complete a report of the research and publication of results.

Expected outcomes:

- 1. After fulfilling the project we will comprehensively understand the microbial diversity in deep sea at cold seep area, realize the role that the microorganism played in the cycles of substance and energy in these deep sea areas. The results would create a good basic reference for the researches of microbial diversity characteristic in special deep sea geologic structures and the change of microbial community to accompany the movement of geologic structures.*
- 2. Understand the function and gene expression regulation of sulfate reductase, and study the microbial adaptive mechanism to cold seep environment further. The exploitation study of this gene will be continued to be carried out.*

Chinese contact: Dr. Zeng Runying, Third Institute of Oceanography, SOA,

US contact: Dr. Douglas H. Bartlett, Marine Biology Research Division of Scripps Institution of Oceanography, University of California

Prof. Pieter Visscher, University of Connecticut

E. Molecular cloning expression and application of the genes involved in the immune defense of marine invertebrates

The project objectives

1. Studies on the defense systems of marine invertebrates.
2. Purification and characterization of the immune factors from marine invertebrates.
3. Identification and cloning of the genes involved in immune defense.
4. The expression patterns of the disease-resistance genes under the infection of pathogen and/or environmental stresses.
5. Establishment of gene-assisted selection.
6. Expression of the cloned immune-related genes *in vitro*.

Dr. Song Linsheng [or a graduate students in his lab] will be sent to Dr. Guo's lab to work for 1-2 years. Dr. Guo will be invited to work or give lectures in the Insititue of Oceanology, CAS.

Chinese contact: Dr. Song Linsheng, Institute of Oceanology, CAS

US contact: Dr. Ximing Guo, Haskin Shellfish Research Laboratory, Institute of Marine and Coastal Sciences, Rutgers University

F. Polypeptide from *Chlamys farrei* (PCF)

To investigate the influence of marine PCFs on nerve stem cell proliferation and differentiation

Collaborating foci: To help us understand the influence of PCFs to nerve stem cell proliferation and differentiation, both principal investigators from the Marine Enzyme-Engineering Lab of Yellow Sea Fisheries Research Institute (YSFRI) of the Chinese Academy of Fishery Sciences (CAFS) and the University of Illinois at Chicago will investigate ways to affect proliferation and differentiation. PCFs seem to play a major role in the protective actions on nerve stem cells, but little work has been done on the level of basic research. The advantage of this PCF is that it has antioxidative and anti-aging effects, so that it could be applied to biology and medicine.

Current research has found the protective effects of PCF on Hela cells and hairless mice damaged by UVA or UVB. Our data indicates that these protective effects may be mediated by enhancing the expresses of Bcl-2 protein, by inhibiting the activities of NOS, by increasing the activities of antioxidatants and eliminating the free radicals.

In 2005-2006, one scientist from the Yellow Sea Fisheries Research Institute of CAFS will be sent to the U.S. for up to 6 months and one scientist from the U.S. will be invited to visit China for 1-2 weeks to do the following collaborative research. The proposed project is to build on the information available.

1. The purification of PCF samples will be done in Marine Enzyme-Engineering Lab.
2. The influences of PCF to nerve stem cell proliferate and differentiation will be explained. This research will be jointly done between the Marine Enzyme-Engineering Lab and the University of Illinois at Chicago.
3. The function mechanism of PCF will be investigated.

U.S. contact: Dr. Tingyu QU, The University of Illinois at Chicago.

Chinese contact: Dr. MI Sun, Yellow Sea Fisheries Research Institute, CAFS.

IX. Aquaculture Education Exchange

A. Education and Exchange Activities

1. SFU would like to continue cooperative activities related to education and exchange activities with the Bridgeport Regional Vocational Aquaculture School, and to complete the plan which, as of yet, has not been finished.

In the area of remote education

- a. Making use of the existing equipment, initiate a lecture series on ornamental aquaculture for the students of Bridgeport Regional Vocational Aquaculture School (BRVAS). The lecture will be in four sections. Shanghai Fisheries University (SFU) will provide course materials.

- b. In order to practice the remote education technology SFU will open an online English course such as "Ichthyology" and "The Introduction of Fisheries". The directors from USA will instruct the students (not restricted to BRVAS). The students will obtain certificates if they pass the course.

Time: The lecture will be once in 2005 and 2006, respectively.

2. Education and Research Cooperation

SFU will designate scholars to take part in some related Sino-US scientific projects. The highlight of the cooperation is on marine pharmaceuticals and aquatic process. The US can find the list and SFU will select suitable scholars. SFU will discuss the cooperating graduate education and exchange graduate education with related universities.

Time: To be agreed upon by the parties

3. Promote Global High School Aquaculture Instruction

- * Co-author a proposal to WAS that would officially create a component of the world organization specific to secondary level students with a goal of recognition at the next WAS Triennial Meeting

- * Create similar sub-chapters in respective countrys' Aquaculture Societies with the dates to be decided

Specific steps to accomplish the goal could be:

- * Two on-site working sessions: one each in US and China (if funding is available) dates and time to be discussed

- * Electronic communication (fax, e-mail, etc.)

- * Video-conferencing equipment

This cooperative project will bring an awareness of the importance of aquaculture education at the secondary level (high school) and how it would ultimately increase the quality of student entering colleges/universities.

Chinese contact: Prof. Li Jiale, Shanghai Fisheries University

US contact: John Curtis, Director, BRVAS

Dr. Charles Yarish, University of Connecticut

B. Cooperation in the Application of GIS in Fisheries

To continue and extend the co-operation in the application of GIS in fisheries between NWFS and SFU, and could hold a Workshop at SFU in 2005.

Chinese contact: Prof. Xu Liuxiong, Shanghai Fisheries University

US contact: Loh Lee Low

C. Training Course on Fisheries Management for Chinese Fishery Officers

To discuss the possibility to invite U.S. lecturers to hold a training course on fisheries management for Chinese fishery officers at SFU.

Chinese contact: Prof. Xu Liuxiong, Shanghai Fisheries University

US contact: Barry Costa-Pierce, University of Rhode Island, Rhode Island Sea Grant

D. Workshop on Introduction of Sea Grant Program and Related Marine Science Higher Education.

To discuss the possibility to hold a workshop on introduction of Sea Grant Program and related marine science higher education.

Chinese contact: Prof. Zhou Yingqi Shanghai Fisheries University

US contact: Chuck Helsley, Professor Emeritus, University of Hawaii

Michael Abbey, NOAA Research

X. Living Marine Resources Panel Administration

A. Strategic Planning Team for Living Marine Resources Panel

During the course of the 5th LMR meeting, both sides agreed that the LMR Panel needed to develop a vision and efficient and effective implementation plan for the future. It is recommended that each side identify 4-6 top scientists and administrators to develop a vision and a five-year action plan for the future activities of the LMR Panel. The plan should cover where aquaculture and fisheries sectors will likely be moving over the next decade and what aquaculture and fisheries project priorities both countries will mutually concentrate on.

U.S. contact: Dr. James McVey, U.S. Chairperson

Chinese contact: Mr. LI Kexin, Chinese Chairperson

Chinese version of summary to be placed here

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