Annexes

Annex 1 – The 2nd International Symposium on Cage Aquaculture in Asia (CAA2)

The 2nd International Symposium on Cage Aquaculture in Asia (CAA2) was held in Hangzhou, China from 3–8 July 2006. The symposium was organized by the Asian Fisheries Society (AFS) with support from Zhejiang University, the China Society of Fisheries and several other organizations. Approximately 300 people (including 150 from overseas) from over 25 countries attended the event. Many organizations, institutions and individuals supported and contributed to the success of CAA2, which was organized under the chairpersonship of Dr Chan-Lui Lee, President of AFS, Professor Wu Xinzhong, Mr ChenJian, Dr Xu Haisheng and other staff of the Secretariat and the Organizing Committee of CAA2.

The proceedings of CAA2 are being managed by the AFS editorial board, namely Prof Zhou Yingqi, Dr Yang Yi and Dr Sena de Silva. The proceedings will include the special lectures and keynote presentations given by Dr Meryl Williams, Prof Xu Junzhou, Prof Yngvar Olsen, Dr Zilong Tan, Dr Arne Fredheim, Dr Ulf Erikson and Prof Ho Ju-Shey, together with many papers presented in the technical sessions on freshwater cage culture; marine cage culture; nutrition, feed and feeding; environmental impacts and management; disease prevention and health management; policy, management, economics and marketing.

The FAO Special Session documented here will become an integral part of the AFS Proceedings once these are finalized.

FAO Special Session: a Global Overview of Cage Aquaculture

The FAO Special Session was composed of a total of nine papers which were presented to the plenary over three consecutive days (Annex 1). The list of FAO-sponsored participants/presenters is attached as Annex 2.[1]

In the global overview, A. Tacon highlighted that the production of farmed aquatic organisms in caged enclosures is relatively recent aquaculture innovation; commercial marine cage culture was pioneered in Norway in the 1970s with the development of salmon farming. The development and use of intensive cage-farming systems was driven by a combination of factors, including the increasing competition faced by the aquaculture sector for available water resources and space. While there is little statistical information on the total global production of farmed aquatic species within cage culture, there is some information on the number of cage-rearing units, and production statistics are being reported to FAO by some member countries. These data have been complemented, to the extent possible, by expert information. To date, cage culture has been largely restricted to the culture of higher value (in marketing terms) feed-fed omnivorous and carnivorous fish species. The shift towards intensive cage-culture systems has also brought its share of problems and constraints. Despite these, cage aquaculture is currently one of the fastest growing segments of global aquaculture production and is predicted to have great development potential, particularly if it promotes using an integrated multi-trophic approach to cage culture in near–shore areas as well as making use of the expansion possibilities of siting cages far from the coasts. This development needs to be supported by appropriate policy and planning, and legal and management frameworks.

S. de Silva reported that cage culture in Asia is very diverse, in particular with regard to the intensity and size of operations. Asia has the lowest per caput availability of freshwater among all the continents. Consequently, cage culture is now often seen as a very effective way of secondarily utilizing this relatively scarce primary resource for foodfish production. The great bulk of inland cage-farming operations tend to be subsistence farming. Marine and brackish water cage farming in Asia is a relatively recent development, and increasingly gaining popularity. Most marine cage farming depends on trash fish as the primary feed, which is a factor that will impact on long-term sustainability.

In China, J.X. Chen noted that the beginning of modern intensive cage culture for food production and ornamental purposes dates back to the 1970s. It was first adopted in freshwater, afterwards in brackish and marine environments. Due to its advantages, cage and pen culture quickly expanded countrywide. In some sites, the balance of the ecosystem has been affected due to an overload of cages and pens with consequent problems. The fishery policies of the Chinese government require local authorities to limit the number of cage and pen-fish operations to a reasonable level in order to keep the ecological balance in a harmonious environment.

[1] Note that the full list of participants will be made available in the AFS Proceedings of CAA2.

A. Rojas reported that aquaculture is currently a significant commercial activity throughout Latin America and the Caribbean. While there are 33 Latin American and Caribbean countries involved in aquaculture, Chile and Brazil account for the bulk of production. In his presentation, Dr Rojas paid special attention to the case of Chile, as the majority of the cages used for fish production in Latin America and the Caribbean is located there.

An overview of the status and future prospects of cage and net-pen culture of marine and freshwater finfish in North America was provided by C. Bridger. After four decades of evolution and growth, North American cage-culture production and diversity are growing and the potential for future development and sustainability appears bright. A great deal of public research and private innovation in cage-culture technology, development of new species and advancement of management techniques has taken place in North America. However, much more technological development will have to take place if open ocean aquaculture is to meet its projected potential.

J.A. Grøttum reflected that since its beginnings 30 years ago, the aquaculture industry in Northern Europe has matured. The majority of production is in Norway, Scotland, Ireland and Faeroe Islands. However, countries such as Finland, Iceland, Sweden and Denmark also have cage-culture industries. All relevant aquaculture production using cage technology in Northern Europe is carried out in marine waters. Over the years, there has been a significant decrease in the environmental impact from the cage aquaculture industry in Europe. Despite the problems, there has been a more or less continuous growth in production, and the industry has become an important economic contributor to some of the remote rural regions of Europe.

F. Cardia noted that for the Mediterranean countries, marine cage culture started to develop widely in the mid-1980s, mainly in Spain and Greece. The rapid development of cage culture in the 1990s, mainly in Turkey and Greece, culminated in a market crisis in the late 1990s and even more during the period 2000-2002, with a drop of market prices to minimal values. Several constraints currently limit the expansion and the development of marine cage culture in the Mediterranean. These include the need for species diversification, the development of suitable commercial feeds and a positive market response to newly introduced farmed species.

S. Leonard observed that cage aquaculture was an emerging activity in the countries of Sub-Saharan Africa. Presently only a handful of successful examples exist - the tilapia farms in Zimbabwe, Zambia, Malawi, Kenya, Ghana and Uganda. There is also potential for brackish and marine water cage culture, but as yet there has been little development in this subsector in the region.

The main constraint to the development of competitive cage culture in the region is the unavailability of locally produced, high quality feeds at competitive prices. If this and some other constraints are addressed, it is estimated that the region offers enormous scope for the commercial development of aquaculture of small, medium and industrial scales.

From the Oceania region, M. Halwart on behalf of M. Rimmer and his co-authors informed that cage aquaculture is little practiced in the region; most of the limited production is from Australia and New Zealand. Among the reasons for the limited development of cage aquaculture in the region are the considerable community concern regarding the impacts of large-scale aquaculture, the moratorium on further development of marine aquaculture in New Zealand and the low population bases and relatively poor infrastructure in many of the Pacific Island countries.

Annex 2 – Agenda

Monday, 3 July, 2006

Day 0: Pre-Symposium Activities		
1000 – 2000	Symposium and Exhibition Registration	1000 – 2000
1000 – 2000	Exhibition Set-up	1000 – 2000
1000 – 2000	Poster Set-up	1000 – 2000

Tuesday, 4 July, 2006

Day 1: Opening Ceremony, Special Lectures, Keynote Address and Trade Exhibition		
0830 – 0925	**Opening Ceremony:** **Leader of ZJU** *"Welcome to Zhejiang University and Caa2"* **Dr Chan-Lui Lee, Chair CAA2 and President Asian Fisheries Society** *"Welcome address and CAA2"* **Leader of Chinese Fisheries Bureau** *"address for CAA2"*	Chair: Prof. Y.Q.Zhou
0925 – 1000	Special Lectures 1 – Dr Meryl Williams ***"Who will Supply World Demands for Fish"***	
1000 – 1030	**Morning Tea**	1000 – 1030
1030 – 1105	Special Lectures 2 - Prof. Xu Junzhou ***"Cage Culture in China"***	Chair: Prof. Y.Q.Zhou
1105 – 1330	**Trade Exhibition and Poster Viewing - Lunch**	1105 – 1330
1330 – 1410	Keynote1 - Prof. Yngvar Olsen ***"Environmental Interaction between Cage Culture and the Surrounding Water Masses"***	Chair: Dr. Ulf Erikson
1410 – 1450	Keynote 2 - Dr. Zilong Tan ***"Health management practices for cage aquaculture in Asia - a key component for sustainability"***	
1450 – 1530	Keynote 3 - Dr. Arne Fredheim ***"Technological trends and challenges in global open ocean fish farming"***	
1530 – 1600	**Afternoon Tea**	1600 – 1625
1600 – 1640	Keynote 4 - Dr. Ulf Erikson ***"A review of harvesting and post-harvesting procedures of marine fish in cage culture with specific reference to cobia compared with Atlantic salmon"***	Chair: Prof. Yngvar Olsen
1640 – 1720	Keynote5 - Prof. Ju-Shey Ho ***"Pest management: a challenge of cage aquaculture extension in Asia"***	
0900 – 1800	**Trade Exhibition (Open to Public)**	0900 – 1800
1830– 2100	**Welcome Address, Cultural Performance and Symposium dinner**	1830– 2100

Wednesday, 5 July, 2006

Day 2: FAO reviews, concurrent Scientific Sessions and Trade Exhibition						
0800 – 0840	FAO review 1 - Dr. Albert G.J. Tacon ***"A review of cage culture: Global overview"***					Chair: Dr Chan-Lui Lee
0840 – 0920	FAO review 2 – Prof. Sena De Silva ***"A review of cage culture: Asia-Pacific"***					
0920 – 0945	**Morning Tea**					0920 – 0945
	Room 139 **Freshwater cage culture** (Chair: SiFa Li Nguyen Thanh Phuong)	**Room 225** **Marine cage culture** (Chair: Arne Fredheim Ketut Sugama)	**Room 138** **Nutrition, feed and feeding** (Chair: Sena De Silva Shi-Yen Shiau)	**Room 140** **Environmental impacts and management** (Chair: Chang Kwei Lin Yngvar Olsen)	**Room 223** **Disease prevention and health management** (Chair: Zilong Tan Phan Thi Van)	

0920 – 1005	**CAGE CULTURE OF RAINBOW TROUT IN WEST AZERBAIJAN, IRAN** Armin Eskandari, Naser Agh	**IMPROVEMENT ON AQUACULTURE CAGE NET VOLUME DEFORMATION** Chai-Cheng Huang, Hung-Jie Tang, Jen-Ya Pan	**A RAPID APPRAISAL APPROACH TO IDENTIFY LOCALLY AVAILABLE FEED INGREDIENTS FOR SMALL-SCALE CAGE AQUACULTURE** Mohiuddin A. Kabir Chowdhury, Bureau D. P., Ponniah A. G.	**ENVIRONMENTAL IMPACT ON CAGE CULTURE IN RESERVOIR** Jiazhang Chen, Bing Xuwen	**A GLOBAL SUCCESS STORY OF CAGE-BASED AQUACULTURE – SALMON FARMING AND THE TECHNOLOGY OF VACCINATION, KEY TO SUSTAINABILITY** Alistair Brown, William J. Enright	0920 – 1005
1005 – 1025	**GROWTH POTENTIAL OF TRIPLOID FISH *Nandus nandus* IN CAGES IN RELATION TO CLIMATE CHANGE** S Banik, Nandita Ray, Abir Shib, Sankar Banik, Surajit Debnath	**COMMERCIAL SCALE PRODUCTION OF POMPANO *Trachinotous ovatus* IN OFFSHORE OCEAN CAGES: RESULTS OF 2004 AND 2005 PRODUCTION TESTS IN HAINAN, CHINA, BY ASA-IM / USB** Michael C. Creme, Hsiang Pin Lan, H.R. Schmittou, Zhang Jian	**Nitrogen, Phosphorus, And Energy Waste Outputs Of Four Marine Cage Cultivation Fish Fed By Trash Fish** Zhongneng Xu, Xiaotao Lin	**INTEGRATED CAGE-CUM-POND AQUACULTURE SYSTEMS: A CONCEPTUAL MODEL** James S. Diana, Yang Yi and C. Kwei Lin	**IMPACT OF INFECTION WITH CAPSALID MONOGENEANS IN MARINE FISH CULTURED IN ASIA** Leong Tak Seng, Anxing Li, Zilong Tan	1005 – 1025
1025 – 1045	**CAGE CULTURE AS A SOURCE OF SEED PRODUCTION FOR ENHANCEMENT OF CULTURE-BASED FISHERIES IN SMALL RESERVOIRS OF SRI LANKA.** Soma Ariyaratne	**HUMPBACK GROUPER *Cromileptes altivelis* CULTURE WITH DRY PELLET AND TRASH FISH IN FLOATING NET CAGE IN EKAS BAY LOMBOK WEST NUSATENGGARA** Bejo Slamet, Titiek Aslianti, Anak Agung Alit	**EFFECTS OF REPLACEMENT OF WHITE Fishmeal BY SOYBEAN MEAL AND BROWN Fishmeal ON GROWTH PERFORMANCE AND BODY COMPOSITION OF LARGE YELLOW CROAKER *Pseudosciaena crocea*** Qingyuan Duan	**DNA DAMAGE AS BIOMARKER FOR ASSESSING THE EFFECTS OF SUSPENDED SOLIDS TO FISH** Chong-Kim Wong	**HISTOPATHOLOGICAL AND ULTRASTRUCTURAL STUDY ON NOCARDIOSIS IN LARGE YELLOW CROAKER, *Larimichthys crocea*** Guoliang Wang, Shan Jin, Hong Yu, Yijun Xu, Siping Yuan	1025 – 1045
1045 – 1105	**ASSESSMENT OF SUBMERGED TILAPIA FISH CAGE FARMING IN LAKE BUHI** Plutomeo M. Nieves, Grace B. Brizuela, Ronnel R. Dioneda Sr., Allan B. de Lima	**OPTIMISING FISH FARMING THROUGH ANALYSIS AND MODELLING OF PRODUCTION DATA: A CASE STUDY OF JAPANESE YELLOWTAIL (*Seriola dumerili*)** Clive Talbot	**THE EFFECT OF RED KWAO KREUA (*BUTEA SUPERBA*) AND 17-A-METHYL TESTOSTERONE (MT) ON SOME GROWTH** Kriangsak Meng-Umphan, Rogelio Carandang Jr.	**AN OVERVIEW OF POTENTIAL USE OF GENETIC STUDIES IN RELATION TO CULTURED MARINE FISH SPECIES IN SINGAPORE** Genhua Yue, Wang C. M., Lo L.C., Zhu Z.Y., Lin G., Feng F., Li J., Yang W.T., Chou R. , Lim H.S., Orban L.	**DISEASE SURVEILLANCE IN MARINE FISH FARMED IN GUANGDONG, CHINA** Anxing Li, S. Weng, L. Labrie, W. Chen, J. He, E. Ho, L. Grisez, Z. Tan	1045 – 1105
1105 – 1125	**AQUACULTURE PRACTICE IN NON-FEEDING CAGES IN RESERVOIR** Jian Zhu, Yan Xiaomei	**RECENT DEVELOPMENTS OF GROUPER AQUACULTURE IN INDONESIA** Ketut Sugama	**TECHNICAL AND ECONOMICAL EVALUATION OF SMALL SCALE SILVER CARP (HYPOTHALMICHTHYS MOLITRIX) CAGE CULTURE FOR YOUTH IN THE RIVER NILE OF EGYPT EFFECT OF CAGE SIZE** Nour A.M., Essa M.A., Omar Eglala, Zaki M.A. and Mabrouk H.A.	**ENVIRONMENTAL CARRYING CAPACITY OF CAGE AQUACULTURE BASED ON DRY MATTER CONVERSION RATE IN XIANGSHAN HARBOR** Huiwen Cai, Sun Yinglan	**EXPERIMENTAL VERTICAL TRANSMISION OF NODAVIRUS IN Epinephelus coides, Rachycentron canadum AND DISEASE PREVENTION BY EGGS DISIFECTION WITH CHEMICAL IN HATCHERIES** Phan Thi Van, Pham Van Thu, Vo Anh Tu, Le Thi May, Pham Duc Phuong	1105 – 1125
1125 – 1145	**TRIAL OF MONOSEX GIFT TILAPIA CAGE CULTURE IN MEKONG DELTA, VIET NAM** Nguyen Van Hao, Nguyen Nhut	**DEVELOPMENT AND EXPERIMENT ON THE GRADING DEVICE WITH FRUSTUM OF PYRAMID VOLUME WITH THE INSTANCE OF GRADING FOR RED SEA BREAM CULTURED IN OPEN OCEAN CAGES** Guofu Zheng, TANG Yan-li, SHAO Qing, DING Lan ,ZHU Jian-kang, WEI Guan-yuan, HUANG Gui-fang	**FEED INGREDIENTS AND PROCESSING FOR INTENSIVE FARMING OF CARNIVOROUS FISH** Trond Storebakken	**DEVELOPMENT OF MARICULTURE AND BIOREMEDIATION OF SEAWEEDS IN CHINESE COASTAL WATERS** Yufeng Yang, Fei Xiugeng	**STUDIES ON PATHOGEN OF GREAT YELLOW CROAKER IN OFF-SHORE CAGE CULTURE** Jinyu Shen,	1125 – 1145

1145 – 1205		**LARVE FISH OF EPINEPHELUS COIOIDES PREDATION SUCCESS ON THE PSEUDODIAPTOMUS ANNANDALEI OF COPEPODA: CALANOIDA UNDER CALM AND TURBULENT HYDRODYNAMIC CONDITIONS** Jiang-Shiou Hwang, Chien-Huei Lee, Shin-Hong Chen	**EFFECTS OF FISHMEAL REPLACEMENT BY PLANT PROTEINS ON GROWTH AND BODY COMPOSITION OF JUVENILE JAPANESE SEABASS *Lateolabrax japonicus*** Jinyun Ye	**IMPACT OF CAGE FISH FARMING ON SEDIMENT ENVIRONMENT IN DAYA BAY** Honghui Huang, Lin Qing, Li Chunhou, Gan Juli, Jia Xiaoping	**IMPACT OF FISH VACCINATION AND CHALLENGES FOR DEVELOPMENT OF VACCINES** Kjersti Gravningen	1145 – 1205
1205 – 1400	**Trade Exhibition and Poster Viewing - Lunch**					1200 – 1400
1400 – 1440	FAO review 3 - Mr. Jiaxin Chen ***"A review of cage culture: China"***					1400 – 1440
1440 – 1520	FAO review 4 - Dr. Alejandro Rojas ***"A review of cage culture: Latin America and the Caribbean"***					1440 – 1520
1520 – 1545	**Afternoon Tea**					1520 – 1545
	Room 139 **Freshwater cage culture** Chair: Ida Siason Fatima Yusoff)	**Room 225** **Marine cage culture** **(**Chair: Chai-Cheng Huang Clive Talbot)	**Room 138** **Nutrition, feed and feeding** **(**Chair: Trond Storebakken Roshada Hashim K.S. Mai)	**Room 140** **Policy,management,Economic and market** (Chair: Matthias Halwart Marilou G. Directo)	
1545 – 1605	**VERIFICATION STUDY ON THE FISH CAGE FEEDING AND STOCK MANIPULATION SCHEME IN LAKE BATO** Plutomeo M. Nieves, Grace B. Brizuela, Victor S. Soliman, Salve G. Borbe	**OVERVIEW OF STUDIES ON MARINE FINFISH REPRODUCTION AND LARVICULTURE IN THE UNITED STATES** Zhihua Lin	**REPLACEMENT OF Fishmeal BY POULTRY BY-PRODUCT MEAL AND MEAT AND BONE MEAL IN AQUAFEEDS –AN UPDATE (2004-2006)** Yu Yu	**STATUS OF FISH PENS AND FISH CAGES IN THE LAGUNA DE BAY, PHILIPPINES** Marilou G. Directo, Jacqueline N. Davo	1545 – 1605
1605 – 1625	**USING OF FINE MESS CAGES IN CLOSED CIRCULATORY SALINE WATER SYSTEM AQUARIUM IN GIANT FRESHWATER PRAWN LARVAL (*MACROBRACHIUM ROSENBERGII*) REARING** Krasindh Hangsapreurke, Boonyarath Pratoomchat and Prasert Prasongphol	**A NEW PRACTICE OF OYSTER RAFT CULTURE IN HONG KONG** Kwok Cheong Chung	**EFFECT OF LYOPHILISED WHOLE YEAST Saccharomyces cerevisiae AS PROBIOTIC SUPPLEMENT IN THE FORMULATED DIETS ON GROWTH, NUTRITIONAL QUALITY AND IMMUNITY OF *Labeo rohita* (HAM.)** Arvind Kumar, Partha Bandyopadhyay	**AN ECONOMIC ANALYSIS ON MARINE CAGE AQUACULTURE IN ZHEJIANG PROVINCE, P.R.China** Haiyang Zhu	1605 – 1625
1625 – 1645	**CAGE AQUACULTURE: A ECOFRIENDLY TECHNOLOGY FOR ENHANCEMENT OF RESERVOIR FISH PRODUCTION** Praveen Tamot	**NUMERICAL 3D MODELING OF NETTING-------CONCERNING WITY FISH CAGE** Junting Yuan, Yingqi Zhou, Bo Zhao	***EFFECTS OF DIFFERENT DIETARY FATTY ACID SOURCES AND THEIR PROPORTIONS ON GROWTH AND BODY COMPOSITIONS OF JUVENILE YELLOW CATFISH Pelteobagrus fulvidraco*** Jiqiao Wang, Wenhui Wang, Guize Liu, Xin Cheng, Wen-kuan Li, Xiaonian Luo, Jingwei Li	**STATUS AND IMPACTS OF TILAPIA FISH CAGE FARMING IN LAKE BATO: SOME POLICY AND MANAGEMENT OPTIONS FOR SUSTAINABLE DEVELOPMENT** Plutomeo M. Nieves	1625 – 1645
1645 – 1705	**FISH CULTURE IN FLOATING CAGES CAN ENHANCE RESERVOIR FISH PRODUCTION** Ankush Saxena	**GROWTH-OUT TRIALS OF *COBIA RACHYCENTRON* CANADUM IN SEA CAGES USING EWOS PELLET FEED AND TRASH FISH** Nguyen Quang Huy, Bui Van Hung, Le Anh Tuan, Nhu Van Can, Tran Mai Thien,Niels Svennevig	**EFFECTS OF DIETARY PHOSPHORUS LEVELS ON GROWTH PERFORMANCE AND BODY COMPOSITION OF JUVENILES BLACK SEA BREAM *SPARUS*** Wanglong Hu, Shao Qing-Jun Xu ZiRong Liu JianXin Xu JunZhuo,YE JinYun	**SUSTAINING FISH PRODUCTION AND LIVELIHOODS IN THE RESERVOIR'S FISHERIES IN INDONESIAN: A SOCIOECONOMIC UPDATE** Sonny Koeshendrajana, Fatriyandi Nur Priyatna1, Sena S. De Silva	1645 – 1705
1705 – 1725	**THE CAGE AQUACULTURE OF *Perca fluviatilis* IN ZHEJIANG PROVINCE** Bingquan Zhu, YanJie Wang, JiaYing Wang, ZhongQi Jiang and HaiSheng Xu	**MARINE FISH CAGE CULTURE IN CHINA** Yongquan Su	**EFFECTS OF Fishmeal PARTIAL REPLACEMENT BY SOYBEAN MEAL ON GROWTH, BODY COMPOSITION OF FINGERLINGS BLACK SEA BREAM *Acanthopagrus schlegeli*** Jinyun Ye	**OPEN-SEA FARMING: OPERATIONAL CONSTRAINTS** Darko Lisac, Refa Med srl	1705 – 1725

1725 – 1745	**CAGE CULTURE OF CATFISH IN THE MEKONG DELTA**; VIET NAM Nguyen Thanh Phuong, C. Kwei Lin and Yang Yi	**BURNT MUSCLE PHENOMENA IN CULTURED YELLOWTAIL *Seriola quinqueradiata*** Daisy Cristina Arroyo Mora	**A STUDY ON FEEDING FORMULATION AND STOCKING DENSITY FOR NURSING SEX-REVERSAL TILAPIA (*Oreochromis niloticus*) FRY IN NET CAGE HAPA** Thepparath Ungsethaphand, Boonyarath Pratoomchat and Prasert Prasongphol	**THE THEORETICAL MODLE OF SOCIAL COST-BENEFIT ANALYSIS ON CASE AQUACULTURE** Chen Sun	1725 – 1745
1745 – 1805				**AN INQUIRY INTO EXTERNALITY OF CAGE CULTURE AND THE GOVERNMENTS MACRO-CONTROL OF CHINA** Wei Yang	1745 – 1805
0900 – 1700	**Trade Exhibition (Open to Public)**				0900 – 1700

Thursday, 6 July, 2006

Day 3: FAO reviews, concurrent Scientific Sessions and Trade Exhibition						
0800 – 0840	FAO review 5 – Dr. Christopher J. Bridger ***"A review of cage culture: Northern America"***					0800 – 0840
0840 – 0920	FAO review 6 – Dr. Jon A. Grøttum ***"A review of cage culture: northern Europe"***					0840 – 0920
0920 – 1000	FAO review 7-Dr. Francesco Cardia ***"A review of cage culture: The Mediterranean"***					0920 – 1000
1000 – 1025	**Morning Tea**					1000 – 1025
	Room 139 **Freshwater cage culture** (Chair: Jo Jae-Yoon Weimin Wang)	Room 225 **Cage culture related topics** (Chair: Pichai Sonchaeng Ye Jinyun)	Room 138 **Policy,management, Economic and market** (Chair: Albert G.J. Tacon Matthias Halwart, Chen Sun)	Room 140 **Environmental impacts and management** Chair: Niels Svennevig James S. Diana)	Room 223 **Disease prevention and health management** Chair: Jushey Ho Jennifer L. Watts)	
1025 – 1045	**PEN CULTURE TECHNOLOGIES IN LAKE GAOBAO, YANGZHOU, CHINA** Min Kuanhong	**PROTECTION OF *Procambarus clarkii* AGAINST WHITE SPOT SYNDROME VIRUS USING RECOMBINANT ORAL VACCINE EXPRESSED IN *Pichia pastoris*** Rajeev Kumar Jha, Zirong Xu, Shijuan Bai, Jianyu Sun, Weifen Li, Jian Shen	**NECESSARY OF BUILDING CAGE AQUICULTURE ASSOCIATION FROM A PERSPECTIVE OF PUBLIC CHOICE** Ning Cao, Gao Jian	**THE REVIEW OF MARINE ENVIRONMENT ON CARRYING CAPACITY OF CAGE CULTURE** Hao Zhang, Duqi Fang Minjie	**A NON-HAEMOLYTIC GROUP B *Streptococcus* sp. FROM HYBRID TILAPIA (*Oreochromis niloticus* x *Oreochromis aureus*)** Ahmed H. Al-Harbi	1025 – 1045
1045 – 1105	**CULTURE SINCE THE INTRODUCTION OF NYLON NET CAGE IN SOUTH OF VIET NAM** Boun-Teng Lyi	**STUDIES ON THE SODIUM PUMP, AQUAPORIN 3 AND CFTR IN SEA BREAM: IMPLICATIONS FOR CULTURE AT ISO-OSMOTIC SALINITY** Norman Y.S. Woo	**CAGE FISH CULTURE AND SMALL SCALE FISHERY BASED LIVELIHOOD OF FISHERS COMMUNITY IN POKHARA VALLEY, NEPAL** Suresh Kumar Wagle	INTEGRATED CAGE-CUM-POND CULTURE SYSTEMS WITH HIGH-VALUED STINGING Md. Abdul Wahab	**CHARACTERIZATION OF A REL/NF B HOMOLOGUE IN A GASTROPOD ABALONE *Haliotis diversicolor supertexta*** Yusheng Jiang, Xinzhong Wu	1045 – 1105
1105 – 1125	**INTEGRATED CAGE-CUM-PEN CULTURE SYSTEM WITH *Clarias garlepinus* IN CAGES AND CARPS IN OPEN PONDS** Madhav K. Shrestha, Narayan P. Pandit, Yang Yi, C. Kwei lin, James S. Diana	**ISOLATION, CHARACTERIZATION AND IDENTIFICATION OF POTENTIAL PROBIOTIC BACTERIA FROM THE INDIAN MAJOR CARPS *Catla catla* (HAM.), *Labeo rohita* (HAM.) AND *Cirrhinus mrigala* (HAM.)** Partha Bandyopadhyay	**AN ALTERNATIVE CAGE CULTURE MANAGEMENT BASED ON PROPERTY RIGHT SYSTEM AT INDONESIAN RESERVOIR CASE STUDY AT JATILUHUR, CIRATA AND SAGULING RESERVOIR** Fatriyandi Nur Priyatna, Sonny Koeshendrajana, Sena S. De Silva	**SUTABLE SITE SELECTION FOR RED TILAPIA CAGE CULTURE IN PING RIVER, CHIANGMAI AND LUMPHUN REGION, THAILAND USING GEOGRAPHIC INFORMATION SYSTEM(GIS)** Prachaub Chaibu, Buncha Chawanchai, and Damgurng Chamnankha	**EXPRESSION IN LIPO POLYSACCHARIDE-STIMULATED *Epinephelus awoara* SPLEEN BY SUPPRESSION SUBTRACTIVE HYBRIDIZATION** Li Wang, Xinzhong Wu	1105 – 1125

1125 – 1145	**TECHNICAL AND ECONOMICAL EVALUATION OF SMALL SCALE FISH CAGE CULTURE FOR YOUTH IN THE RIVER NILE OF EGYPT 1-EFFECT OF STOCKING DENSITY OF NILE TILAPIA (Oreochromis niloticus), MONOSEX FINGERLINGS** Omar E.A., Nour A.M. Essa M.A., and Zaki M.A.	**ANALYSIS ON MUSSEL MARKET OF CHINA** Xiang Gao	**RESOURCE PRODUCTIVITY AND PROFITABILITY OF MILKFISH (*Chanos chanos*, Forsskal) CAGE AQUACULTURE IN THE COSTAL AREAS OF LINGAYEN GULF, PHILIPPINES** Rosie S. Abalos, Ruben C. Sevilleja	**CARRYING CAPACITY ASSESSMENT FOR GROUPER CULTURE DEVELOPMENT IN FLOATING NET CAGES, PEGAMETAN BAY, BALI INDONESIA.** Bambang Priyono, Tri Heru Prihadi, Murniyati	**CLONING AND EXPRESSION OF FUR GENE FROM *Vibro alginolyticus*** Ronghua Qian	1125 – 1145
1145 – 1205	**PRODUCTIVITY ENHANCEMENT OF CAGE FISH CULTURE BY IMPROVING LOCATION SPECIFIC FARMING METHODS IN LAKES AND RESERVOIR OF MID HILLS, NEPAL** Jay Dev Bista	**RESPONSE OF THE OYSTER *Crassostrea ariakensis* TO RICKETTSIA-LIKE ORGANISM (RLO) INFECTION AND ENVIRONMENTAL STRESS UNDER EXPERIMENTAL CONDITIONS** Yang Zhang, Xinzhong Wu, Yusheng Jiang and Jian Chen	**TCDC Consultant (Fisheries and Aquaculture Extension), Integrated Management of Lagoon Activities, Hanoi Agricultural University (HAU) Campus** Kibria M.G., Ario Pieter Van Dujn and Runia Mowia	**MANAGEMENT OF SUSTAINABLE FLOATING NET CAGE AQUACULTURE ON RESERVOIR** Murniyati		1145 – 1205
1205 – 1315	**Trade Exhibition and Poster Viewing - Lunch**					1205 – 1315
1315 – 1355	FAO review 8 -Mr. Patrick Blow ***"A review of cage culture: Sub-Saharan Africa"***					1315 – 1355
1355 – 1435	FAO review 9 - Dr. Michael Rimmer ***"A review of cage culture: Oceania"***					1355 – 1435
1435 – 1500	**Afternoon Tea**					1435 – 1500

	Room 225 Open Forum	Room 138 Industry Session	Room D Environmental impacts and management (Chair: Yongquan Su, Genhua Yue)	
1500 – 1520	**Members of Expert Panel:** Dr. Ulf Erikson Prof Yngvar Olsen Dr Francesco Cardia Alistair Brown Dr Zilong Tan Dr Albert Tacon Dr Chang Kwei Ling Dr Arne Fredheim Dr Matthias Halwart Dr. Jon Grottum Prof Xiaoping Jia Prof Sena De Silva Prof Wu Changwen	Industry Session sponsored by National Renderers Association Inc.	**INTEGRATING SEAWEEDS INTO FISH CAGE MARINE CULTURE SYSTEMS: A KEY TOWARD SUSTAINABILITY** Shannan Xu	1500 – 1520
1520 – 1540			**DECISION SUPPORT SYSTEM FOR SUSTAINABLE ENVIRONMENTAL MANAGEMENT OF MARINE FISH FARMS** R. Mayerle, W. Windupranata and K-J. Hesse	1520 – 1540
1540 – 1600			**TSUNAMI IMPACT AND RELIEF EFFORTS IN THAILAND** Chang Kwei Lin, Pradit Sripatrprasite	1540 – 1600
1600 – 1620			**IMPACT OF HEAVY METAL TO FISH AQUACULTURE IN FLOATING NET CAGE IN CIRATA RESERVOIR, INDONESIA** Tri Heru Prihadi, Murniyati, Idil Ardi	1600 – 1620
1620 – 1640			**USE OF SIMULATION MODELING TO DESCRIBE NITROGEN RETENTION EFFICIENCY IN A FISH/BIVALVE INTEGRATED CULTURE SYSTEM** Jennifer L. Watts	1620 – 1640
1640 – 1700			**THE CONTROL OF EUTROPHIC WATER IN CAGE WATER BY FLOATING-BED SOILLESS CULTURE OF PLANTS** Bing Xuwen, Chen Jiachang	1640 – 1700
1700 – 1730				1700 – 1730
0900 – 1700	Trade Exhibition (Open to Public)			0900 – 1700
1800 – 1930	Closing Ceremony and Happy Hour – Foyer of Exhibition Area			1800 - 1930

Friday and Saturday, 7 and 8 July, 2006

Day 4-5: Post-Symposium Tours	
Tour 1	2-day tour on off-shore cage culture in Zhujiajian
Tour 2	Day tour on fisheries/aquaculture in Lake Taihu, Zhejiang Institute of Freshwater Fisheries and pear culture sites
Tour 3	West Lake tour and city tour in Hangzhou

Annex 3 – List of FAO-sponsored participants/presenters

RESOURCE PERSONS

BRIDGER, C.J.
Aquaculture Engineering Group Inc.
73A Frederick Street
St. Andrews, New Brunswick
E5B 1Y9, Canada
E-mail: chris.bridger@aquaengineering.ca

CARDIA, Francesco
Aquaculture Consultant
Via A. Fabretti 8
00161 Rome, Italy
Tel.: (+39) 0644241200/3384662879
E-mail: fra.car@tiscali.it

CHEN, Jiaxin
Aquaculture Consultant
106 Nanjing Road
Qingdao
China 266071
E-mail: cjxin828@public.qd.sd.cn

DE SILVA, S.S.
Network of Aquaculture Centres in Asia-Pacific
Suraswadi Building
Department of Fisheries, Kasetsart University
Ladyao Bangkok 10900
Thailand
Tel.: (+66) 25611728
Fax: (+66) 25611727
E-mail: sena.De Silva@enaca.org

GRØTTUM, Jon Arne
Norwegian Seafood Federation
PO Box 1214, Pirsenteret
N-7462 Trondheim, Norway
Tel.: (+47)73 870950
E-mail: jon.a.grottum@fhl.no

LEONARD, Shivaun
Aquaculture Consultant
68 Jones Circle
Chocowinity, NC 27817 USA
E-mail: ShivaunLeonard@yahoo.com

ROJAS, A.
ARMpro Limitada
Casilla 166 – Traumen 1721
Puerto Varas
Tel.: (+56) 65 235200
Fax: (+56) 9 1008686
E-mail: arojas@armpro.cl

TACON, A.G.J.
Aquatic Farms Ltd
49-139 Kamehameha Hwy
Kaneohe, HI 96744 USA
E-mail: AGJTACON@aol.com

FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS (FAO)

HALWART, Matthias
Fishery Resources Officer (Aquaculture)
Aquaculture Management and Conservation Service (FIMA)
Fisheries and Aquaculture Department
Viale delle Terme di Caracalla
00153 Rome, Italy
Tel.: (+39) 06 570 55080
Fax: (+39) 06 570 53020
E-mail: matthias.halwart@fao.org

This document contains nine papers on cage aquaculture including a global overview, one country review for China, and seven regional reviews for Asia (excluding China), northern Europe, the Mediterranean, sub-Saharan Africa, Latin America and the Caribbean, North America and Oceania, all of which were presented during the FAO Special Session on Cage Aquaculture – Regional Reviews and Global Overview at the Asian Fisheries Society Second International Symposium on Cage Aquaculture in Asia (CAA2), held in Hangzhou, China, from 3 to 8 July 2006. Each review, by geographic region, gives information about the history and origin of cage aquaculture; provides detailed information on the current situation; outlines the major regional issues and challenges; and highlights specific technical, environmental, socio-economic and marketing issues that cage aquaculture faces and/or needs to address in the future. The review recognizes the tremendous importance of cage aquaculture today and its key role for the future growth of the aquaculture sector. The global overview discusses the available data on cage aquaculture received by FAO from member countries; summarizes the information on cultured species, culture systems and culture environments; and explores the way forward for cage aquaculture, which offers especially promising options for multitrophic integration of current coastal aquaculture systems as well as expansion and further intensification at increasingly offshore sites.

ISBN 978-92-5-105801-5 ISSN 0429-9345

9 789251 058015

TC/M/A1290E/1/09.07/1700