



FRDC Sponsorship International Symposium for Genetics in Aquaculture XIII

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In submitting this report, the researcher has agreed to FRDC publishing this material in its edited form.

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Acknowledgments

Plenary Speakers:

Professor Ben Hayes

Doctor Lene Kleppe

Professor Francesc Piferrer

Keynote Speaker:

Dr Lior David

Scientific Committee Members:

Professor Dean Jerry – James Cook University, Australia

Professor Alexandre Hilsorf – UMC Universidade, Brazil

Professor Paulino Martinez Portela – Faculty of Veterinary, Acuigen, Spain

Professor Uthirat Na-Nakorn – Kasetsart University, Thailand

Professor Francesc Piferrer – Institute of Marine Sciences (ICM), Spain

Doctor Nick Robinson – Nofima, Norway

Professor Rouvay Roodt-Wilding – Stellenbosch University, South Africa

Doctor Morten Rye – Akvaforsk Genetics, Norway

Professor Liang Xufang – Huazhong Agricultural University, China

Associate Professor Zhanjiang Liu, Auburn University, United States

Conference Organising Committee:

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Illumina

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Exhibitors Sponsors:

AGRF

LGC

ThermoFisher Scientific

The Center for Aquaculture Technologies

Microchips Australia

AgResearch

Gene Target Solutions

Abbreviations

FRDC Fisheries Research and Development Corporation

ISGA International Symposium for Genetics in Aquaculture

AGRF Australian Genome Research Facility

Introduction

1. Background

The International Symposium for Genetics in Aquaculture (ISGA) is a triennial premier aquaculture event that brings together globally leading researchers, industry, and students who are interested in the application of genetics to the improvement of aquaculture production and sustainability. The conference is held on a different continent every 3 years and in 2018 the event was held in Cairns, Queensland 15-20th July. In 2018, the focal theme of the conference was based around industry implementation and practice of genetics into industrial aquaculture.

The conference showcased to industry not only the frontiers of genetic research when applied to aquaculture, but also how the global aquaculture industry is adopting genetics to improve productivity and some of the challenges they have faced and overcome. It provided an opportunity for the Australian industry to be exposed to genetics and how it is being used in aquaculture will raise awareness of its potential use in Australian industries.

Objectives

Funding was requested from the FRDC towards

1. Gold sponsorship for the conference
2. Delegate field trip to see a best practice Australian barramundi aquaculture farm
3. Five bursaries to Australian industry to support attendance at the conference
4. Plenary by international expert on the use of biotechnology and synthetic biology to improve aquaculture production and sustainability.

Conference Outcomes

ISGA XIII was successfully hosted with 230+ delegates registering from 28 countries. FRDC was acknowledged throughout as a gold sponsor of the event and also the sponsor of Dr Lene Kleppe, from the Institute of Marine Research, Norway . Dr Kleppe gave the opening plenary on “Gene editing by CRISPR as a research tool and possible applications in aquaculture.

The FRDC also provided funding for five industry bursaries that went to Dr Shannon Loughran (Mainstream Aquaculture), Brett Smith (Coral Coast Barramundi), Aaron Wingrove (SALTAS), Erica Giardina (Seafarms), Ian Charles (Murray Cod Australia).

Finally, funding also supported a site visit to the Daintree Saltwater Barramundi Fish Farm, Wonga Beach, where delegates were shown around the farm and educated on how Australian barramundi is produced.

Feedback from bursary recipients:

Ian Charles (Murray cod Australia).

“I was one of the FRDC bursary recipients attending the International Symposium on Genetics in Aquaculture in Cairns July 2018.

I was very glad to have been able to attend the symposium and found it to be informative and inspiring. I came away with a clearer view of where our company can focus attention in the future as far as genetic selection programs are concerned. I found it very useful to listen to presentations particularly those describing historic selection programs and their success and also modern advances in DNA mapping.

Genetics in aquaculture is a fast-moving research area and it is good to be exposed to the most up to date research worldwide.

I am thankful to the FRDC for the bursary which helped to fund my attendance at the symposium.”

Brett Smith (Coral Coast Barramundi):

“We found our attendance to the ISGA XIII 2018, highly beneficial. It was interesting to learn of the advancement of genetic tools in the past 3-5 years and how the technology is becoming more applicable and affordable to aquaculture. Many relevant research studies and tools were presented and real world applications of genetic tools in many significant commercial species were demonstrated. We met industry specialists offering services in nutrition, genetics and disease, and established contacts with several researchers and industry professionals. We would like to thank the committee and organisers for hosting a high quality event in such a professional manner.”

Dr Shannon Laughran (Mainstream Aquaculture Group Pty Ltd):

“The ISGA conference held in Cairns this year was very well organised, easy to register and it was nice not having to rush between sessions because they were all in the same room. The application of genetics is very important to our industry and this was accentuated at the conference. Many topics were very relevant to our current work and provided some great insight into future developments in the field. It was good to meet others in the industry and make some important contacts that provided insights into our current interests. I appreciate the assistance received to attend the event with an FRDC Industry bursary.”

Erika Giardina (Seafarms):

“The conference was helpful for me to understand the new technologies and approaches across different countries to implement breeding programs on farms. The ethics and patents involved for the use of these technologies were also an additional information that I wasn't very familiar with until then.

I was happy to see that not only pure analytical genetics were discussed at the conference but also other biological aspects were included such as physiological/molecular biology processes.

It was a really good experience, getting to know researchers from all over the world and discussing how breeding programs were or weren't successful and which species appeared to be more resilient than others. Also how the economy and the market of each country influences which species get privileged for aquaculture purposes."

Appendix 1 – Conference Program

SUNDAY 15 JULY 2018

1630– 1830 Registration Desk Opens + Poster Setup

1830 – 2030 Welcome Function Pullman - Daintree's Pooldeck

MONDAY 16 JULY 2018

0700- Registration Desk Opens

0700-0900 Poster Set-up

0830-0900 Welcoming Ceremony -

Henrietta Marrie AM - Welcome to Country

Warren Entsch MP, Federal Member for Leichardt - Opening Delegate

0900-0930 Conference Plenary - Gene editing by CRISPR as a research tool and possible applications in aquaculture by Dr Lene Kleppe, Institute of Marine Research, Norway

BIOTECHNOLOGY AND FUNCTIONAL GENOMICS - Session Chair: Prof Zhanjiang (John) Liu

0930-0945 - UNDERSTANDING GENETIC RESISTANCE TO VIRAL INFECTION IN ATLANTIC SALMON USING PRIMARY AND IMMORTILISED CELL CULTURE MODELS by Remi Gratacap, Roslin Institute, UK

0945-1000 NEXT GENERATION SEQUENCING AND QUANTIFICATION OF MAJOR HISTOCOMPATIBILITY COMPLEX GENOTYPES ENABLES SEMI-QUANTITATIVE EVALUATION OF GERM CELL TRANSPLANTATION EFFICACY IN JAPANESE FLOUNDER by Jun Kawai, RIKEN, Japan

1000-1015 THE MYSTIFYING DIVERSITY OF IMMUNOGLOBULIN M HEAVY CHAIN GENES AND ITS REPERTOIRE IN BIGHEAD CATFISH (CLARIAS MACROCEPHALUS) by Prapansak Srisapomee, Kasetsart University, Thailand

1015-1030 THE OSSIFICATION MODE AND GENETIC REGULATION OF INTERMUSCULAR BONES IN TELEOST by Zexia Gao, Huazhong Agricultural University, China

1030-1045 CORTISOL ACTING THROUGH THE GLUCOCORTICOID RECEPTOR IS NOT RESPONSIBLE FOR EXERCISE-ENHANCED GROWTH BUT DOES AFFECT THE WHITE SKELETAL MUSCLE TRANSCRIPTOME by Arjan Palstra, Wageningen University, Netherlands

1045-1100 GENE EDITING OF CANDIDATE GENE FOR PARASITE DISEASE RESISTANCE IN YELLOWTAIL SERIOLA QUINQUERADIATA AND ARTIFICIAL INFECTION TEST OF BENEDENIA SERIOLAE by Hiroyuki Okamoto, NRA/ FRA, Japan

Morning tea – 30 mins

1130-1145 UNDERSTANDING THE MACRO- AND MICRO-EVOLUTION OF BIVALVES: INSIGHTS FROM TWO SCALLOP GENOMES by Shi Wang, Ocean University of China, China

1145-1200 APPLICATION OF GENOME EDITING IN AQUACULTURE by Gen Hua Yue, Temasek Life Sciences Laboratory, National University of Singapore and Nanyang Technological University, Singapore

1200-1215 DE NOVO ASSEMBLY, CHARACTERIZATION, FUNCTIONAL ANNOTATION AND EXPRESSION PATTERNS OF THE BLACK TIGER SHRIMP (*PENAEUS MONODON*) TRANSCRIPTOME by Roger Huerlimann, James Cook University, Australia

Lunch – 60 minutes

SEX CONTROL Session Chair: Prof Francesc Piferrer

1315-1330 GENETIC ARCHITECTURE OF SEX DETERMINATION IN TURBOT (*SCOPHTHALMUS MAXIMUS*) by Paulino Martinez, Universidade de Santiago de Compostela, Spain

1330-1345 THE FIRST NON-MAMMALIAN Y CHROMOSOME SEQUENCE REVEALS BCAR1 AS THE CANDIDATE SEX DETERMINATION GENE IN CHANNEL CATFISH by John Liu, Syracuse University, USA

1345-14:00 EVIDENCE FOR MULTIPLE MECHANISMS CAPABLE OF CONFERRING MALENESS IN ATLANTIC SALMON by James Kijas, CSIRO, Australia

1400-1415 GENETIC ARCHITECTURE OF SEX REVERSAL IN HALF-SMOOTH TONGUE SOLE (*CYNOGLOSSUS SEMILAEVIS*) by Hengde Li, Chinese Academy of Fishery Sciences, China

1415-1430 MOLECULAR ANALYSIS OF HEAT-INDUCED MASCULINIZATION IN TELEOST by Woei Chang Liew, Temasek Life Science Laboratory, Singapore

TUESDAY 17 JULY 2018

0845 Good Morning and Welcome

GENOMIC PREDICTION

0845-0915 Plenary Speaker: Prof Ben Hayes - Genomic selection and its revolutionary application to aquaculture genetic improvement - Session Chair: Dr Anna Sonneson

0915-0930 DEVELOPMENT OF COST-EFFICIENT AND HIGH-THROUGHPUT GENOTYPING PLATFORMS FOR GENOMIC SELECTION IN SCALLOP BREEDING by Qifan Zeng, Ocean University of China, China

0930-0945 LESSONS FROM THE APPLICATION OF GENOMIC SELECTION TO RAINBOW TROUT AQUACULTURE by Yniv Palti, NCCCWA-ARS-US Department of Agriculture, United States

0945-1000 GENOMIC PREDICTION FOR A PRECOCIOUS PHENOTYPE IN THE TIGER PUFFERFISH *TAKIFUGU RUBRIPES* by Sho Hosoya, University of Tokyo, Japan

1000-1015 IMPLEMENTATION OF MODERN BREEDING TECHNIQUES IN ATLANTIC SALMON by Tiago Hori, The Center for Aquaculture Technologies, Canada

1015-1030 USE OF DNA POOLING IN GENOMIC SELECTION FOR A DISEASE RESISTANCE TRAIT IN ATLANTIC SALMON (*SALMO SALAR*) by Binyam Sime Dagnachew, Nofima, Norway

Morning Tea – 30 minutes

1100-1115 GENOMIC APPROACHES TO SELECTIVE BREEDING FOR DISEASE RESISTANCE IN PACIFIC OYSTERS (*CRASSOSTREA GIGAS*) by Ross Houston, The Roslin Institute, University of Edinburgh, United Kingdom

1115-1130 GENOME-WIDE ASSOCIATION STUDY (GWAS) REVEALS GENES ASSOCIATED WITH THE ABSENCE OF INTERMUSCULAR BONES IN TAMBAQUI (*COLOSSOMA MACROPOMUM*) by Alexandre Hilsdorf, University of Mogi das Cruzes, Brazil

1130-1145 HERITABILITY OF TOLERANCE TO GILL-ASSOCIATED VIRUS UNDER EXPERIMENTAL CHALLENGE IN THE BLACK TIGER SHRIMP (PENAEUS MONODON) by Tansyn Noble, James Cook University, Australia

SELECTIVE BREEDING AND QUANTITATIVE GENETICS Session Chair: Dr Marc Vandeputte

1145-1200 GENETIC PARAMETERS OF CAVIAR PRODUCTION IN DNA-PEDIGREED OCTOPLOID SIBERIAN STURGEON ACIPENSER BAERII by Anastasia Bestin, SYSAAF, France

1200-1215 HERITABILITY OF GROWTH, AND IMMUNE TRAITS OF BIGHEAD CATFISH, CLARIAS MACROCEPHALUS GÜNTHER, 1864 by Satid Chatchaiphan, Kasetsart University, Thailand

1215-1230 GENOTYPE BY ENVIRONMENT INTRACTIONS IN SHRIMP PRODUCTION: PRESENT SCENARIO, CONSTRAINTS, POTENTIAL AND IMPLICATION IN GENETIC IMPROVEMENT PROGRAMS by MD Mehedi Hasan, The University of Sydney, Australia

Lunch – 60 minutes

1330-1345 ESTIMATION OF GENETIC PARAMETERS OF GROWTH, MORPHOLOGIC, IMMUNE AND BEHAVIORAL TRAITS IN A MIXED-FAMILY COHORT OF THE EUROPEAN ABALONE HALIOTIS TUBERCULATA by Pierre Boudry, Ifremer, France

1345-1400 A CLOSER LOOK AT TURBOT GENOME REVEALS A GENETIC COMPONENT OF PARASITE RESISTANCE: NEW TOOLS FOR SELECTION by Paulino Martinez, Universidade de Santiago de Compostela, Spain

1400-1415 GENOTYPING AND GENOMIC SELECTION IN ATLANTIC SALMON SALMON SALAR USING GENOTYPING-IN-THOUSANDS BY SEQUENCING (GT-SEQ) AND GENOTYPING-BY-SEQUENCING by Rayna Anderson, AgResearch, New Zealand

1415-1430 ESTIMATION OF THE GENETIC PARAMETERS OF FEED EFFICIENCY IN JUVENILE NILE TILAPIA OREOCHROMIS NILOTICUS USING VIDEO ANALYSES by Hugues de Verdal, CIRAD, France

1430-1445 IMPACT ON GENOMIC PREDICTION OF MIXING BETWEEN PARALLEL YEAR GROUPS IN ATLANTIC SALMON BREEDING PROGRAMS by Panagiotis Kokkinias, University of Edinburgh, United Kingdom

Afternoon Tea – 30 minutes

1530-1545 SELECTIVE BREEDING OF A FAST-GROWING VARIETY AND GENETIC DISSECTION OF ECONOMICALLY IMPORTANT PRODUCTION TRAITS IN THE PACIFIC OYSTER CRASSOSTREA GIGAS by Shikai Liu, Ocean University of China, China

1545-1600 DELIVERY OF GENOMIC SOLUTIONS TO THE NEW ZEALAND AQUACULTURE INDUSTRY by Shannon Clarke, AgResearch, New Zealand

1600-1615 GENOME EDITING TO INTRODUCE NEW TRAITS IN AQUACULTURE BREEDING POPULATIONS by John Bastiaansen, Wageningen University, Netherlands

INDUSTRY USE OF GENETICS Session Chair: Dr Jane Symonds

1615-1630 GENETIC IMPROVEMENT IN TASMANIAN ATLANTIC SALMON SALMO SALAR AFTER 14 YEARS OF SELECTIVE BREEDING by Peter Kube, CSIRO, Australia

1630-1645 IMPLEMENTATION OF GENOMIC SELECTION IN TASMANIAN ATLANTIC SALMON by Klara Verbyla, CSIRO, Australia

1645-1700 PIPETTE AND PAPER: COMBINING MOLECULAR AND GENEALOGICAL METHODS TO ASSESS A NILE TILAPIA OREOCHROMIS NILOTICUS BREEDING PROGRAM by Maria Nayfa, James Cook University, Australia

1700-1715 NEW ZEALAND AQUACULTURE SELECTIVE BREEDING AND INDUSTRY APPLICATION by Jane E Symonds, Cawthron Institute, New Zealand

1715-1730 Pitch for next ISGA Conference

1730-1830 Poster Sessions

WEDNESDAY 18 JULY 2018

0845 Good Morning and Welcome

GENOMIC TECHNOLOGY

0845-0915 Plenary Speaker: Seumas Walker - Application of Genomics to enhance New Zealand Chinook Salmon breeding - Session Chair: Dr Nick Robinson

0915-0930 SINGLE NUCLEOTIDE POLYMORPHISM (SNP) DISCOVERY USING WHOLE-GENOME SEQUENCING OF HUNDREDS OF ANIMALS AND DEVELOPMENT OF A 50K SNP ARRAY FOR NILE TILAPIA by Jose Manuel Yanez, University of Chile, Chile

0930-0945 EXPERIENCES OF USING GENE TRANSCRIPTION DATA FOR eQTL ANALYSIS AND GEBV ESTIMATION by Anna Sonesson, Nofima, Norway

0945-1000 APIS: A NEW AUTO-ADAPTIVE PARENTAGE INFERENCE SOFTWARE TOLERANT TO MISSING PARENTS by Ronan Griot, SYSAAF, France

1000-1015 CRUSTACEAN NUCLEAR LOCALIZATION SIGNALS HELP FACILITATING THE DELIVERY OF DNA INTO AUSTRALIAN RED-CLAW CRAYFISH CELLS by Chan Nguyen, University of the Sunshine Coast, Australia

1015-1030 HYBRID ASSEMBLY OF THE BLACK TIGER SHRIMP GENOME (PENAEUS MONODON) by Juan Montenegro, Australian Genome Research Facility, Australia

Morning Tea – 30 minutes

GENETICS OF DISEASE AND STRESS

1100-1130 Plenary Speaker: Dr Lior David - The complex genetic basis of disease resistance – insights from KHV in carp - Session Chair: Prof Paulino Martinez

1130-1145 COULD GENOMICS PREDICT RESISTANCE TO VIRAL NERVOUS NECROSIS IN WILD POPULATIONS OF EUROPEAN SEA BASS by Francois Allal, Ifremer, France

1145-1200 RESPONSE OF THE SALMON TRANSCRIPTOME TO PANCREATIC DISEASE: COMPARISON OF HIGH AND LOW-RANKING FAMILIES FOR RESISTANCE by Nick Robinson, Nofima, Norway and The University of Melbourne, Australia

1200-1215 IDENTIFICATION AND EVALUATION OF LONG NON-CODING RNAs RESPONSE TO HANDLING STRESS IN RED CUSK-EEL (GENYPTERUS CHILENSIS) THROUGH RNA-SEQ by Phillip Dettleff, Andres Bello University, Chile

1215-1230 HERITABILITY ESTIMATES AND SELECTION RESPONSE FOR RESISTANCE TO STREPTOCOCCUS AGALACTIAE IN RED TILAPIA by Sila Sukhavachana, Kasetsart University, Thailand

Lunch – 60 minutes

1330-1345 MARKER-ASSISTED SELECTION FOR RESISTANCE TO BACTERIAL COLD WATER DISEASE IN A COMMERCIAL RAINBOW TROUT POPULATION by Sixin Liu, National Center for Cool and Cold Water Aquaculture, United States

1345-1400 ATLANTIC SALMON miRNAs RESPONDING DIFFERENTLY TO INFECTIOUS PANCREATIC NECROSIS VIRUS (IPNV) INFECTION IN FISH SELECTED FOR RESISTANCE OR SUSCEPTIBILITY TO IPNV INFECTION by Nardos Tesfaye Woldemariam, Oslo Metropolitan University, Norway

1400-1415 FUNCTIONAL CHARACTERIZATION OF KAZAL TYPE PROTEASE INHIBITORS FROM SEBASTES, SCHLEGELII AND HIPPOCAMPUS ABDOMINALIS: MOLECULAR INSIGHT INTO HEPATIC IMMUNE DEFENSE IN TELEOST by Hyukjae Kwon, Jeju National University, South Korea

1415-1430 RESISTANCE TO FLAVOBACTERIUM PSYCHROPHILUM IN RAINBOW TROUT: QTL DETECTION REVEALS EFFECT OF INFECTION ROUTE AND EPISTATIC INTERACTIONS by Clemence Fraslin, INRA / SYSAAF, France

1430-1445 GENOMIC APPROACHES TO UNDERSTANDING AND IMPROVING RESISTANCE TO SALMONID RICKETTSIAL SYNDROME IN ATLANTIC SALMON by Diego Robledo, The Roslin Institute, University of Edinburgh, United Kingdom

1445-1500 HYPOXIA-TOLERANT PERFORMANCE IN SELECTED BREEDING F4 STRAIN OF BLUNT SNOUT BREAM (MEGALOBrama AMBLYCEPHALA) UNDER HYPOXIA STRESS by Shuming Zhou, Shanghai Ocean University, China

Afternoon Tea – 30 minutes

GENETICS OF NUTRITION

3:30-4:00 Plenary Speaker: Antti Kause - Phenotyping for genetic improvement of feed efficiency in fish: lessons from pig breeding - Session Chair: Dr Nick Wade

1600-1615 GENETIC IMPROVEMENT OF FEED CONVERSION RATIO IN SEA BASS USING NOVEL PHENOTYPES AND GENOMIC DATA by Marc Vandeputte, INRA, France

1615-1630 CYSTEAMINE PATHWAY: A MAJOR TAURINE SYNTHESIZING PATHWAY IN COMMON CARP CYPRINUS CARPIO by Maria Mojena Gonzales-Plasus, Western Philippines University - Puerto Princesa City, Philippines

1630-1645 ADAPTATION OF RAINBOW TROUT GENOTYPES TO SIMULTANEOUS CHANGES IN MULTIPLE PLANTBASED DIET INGREDIENTS by Antti Kause, Natural Resources Institute Finland, Finland

1645-1700 COMPARATIVE GENOMICS STUDY IN CHINESE PERCH AND GRASS CARP by Xu-Fang Liang, Huazhong Agricultural University, China

1700-1715 DIETARY CARBOHYDRATE PROMOTES HEPATIC DE NOVO LIPOGENESIS IN BARRAMUNDI (LATES CALCARIFER) by Nick Wade, CSIRO Agriculture and Food, Australia

Day End

1830-0000 CONFERENCE DINNER

THURSDAY 19 JULY 2018

0845 Good Morning and Welcome

EPIGENETICS

0845-0915 Plenary Speaker: Prof Francesc Piferrer - Development of essential epigenetic markers: Application to the predication of gonadal sex and the identification of the early signs of domestication. -
Session Chair: Prof Dean Jerry

0915-0930 GROWTH-ASSOCIATED DNA METHYLATION AND HYDROXYMETHYLATION MARKS IN NILE TILAPIA MUSCLE by Jorge Fernandes, Nord University, Norway

0930-0945 ANALYSIS OF GENETIC VARIABILITY OF DNA METHYLATION IN RESPONSE TO AN EARLY TEMPERATURE STRESS IN RAINBOW TROUT by Delphine Lallias, INRA, France

0945-1000 IS TEMPERATURE DRIVING SEX CHANGE IN BARRAMUNDI (LATES CALCARIFER)?
By Alyssa Budd, James Cook University, Australia

Morning Tea – 30 minutes

GENOMICS AND METABIOMES Session Chair: Dr Gen Hua Yue

1030-1045 CAN CHANGES IN POND YIELD IN THE BLACK TIGER SHRIMP PENAEUS MONODON BE DETECTED BY STUDYING THE BACTERIAL MICROBIOTA? By Sandra Infante Villamil, James Cook University, Australia

1045-1100 METAGENOMIC ASSESSMENT OF THE BODY SURFACE MICROBIAL COMMUNITIES OF THE SEA URCHIN, TRIPNEUSTES GRATILLA by Marissa Brink, Stellenbosch University, South Africa

1100-1115 GENETICS, GENOMICS AND MICROBIOMICS, UNDERLYING COLD TOLERANCE IN THE BLUE TILAPIA (OREOCHROMIS AUREUS) by Avner Cnaani, Agricultural Research Organization, Israel

1130-1800 SOCIAL EVENT – TOUR

Departs at 11:30am from Pullman

Anticipated return to Pullman is 6:00pm

FRIDAY 20 JULY 2018

0845 Good Morning and Welcome

POPULATION GENETICS Session Chair: Dr Catarina Silva

0900-0915 THE STATE OF THE WORLD'S AQUATIC GENETIC RESOURCES by Graham Mair, FAO, Italy

0915-0930 LACK OF INTROGRESSIVE HYBRIDIZATION BY NORTH AFRICAN CATFISH (CLARIAS GARIEPINUS) IN NATIVE VIETNAMESE BIGHEAD CATFISH (CLARIAS MACROCEPHALUS) POPULATIONS by Thuy-Yen Duong, Can Tho University, Viet Nam

0930-0945 BROODSTOCK CONTRIBUTION AND GENETIC DIVERSITY FROM WEANING TO MARKETABLE SIZE IN A COMMERCIAL COHORT OF DUSKY KOB by Clint Rhode, Stellenbosch University, South Africa

0945-1000 USE OF GENOTYPING-BY-SEQUENCING FOR STUDYING THE GENETIC CHARACTERISTICS OF A POPULATION by Ken Dodds, AgResearch, New Zealand

Morning Tea – 30 minutes

1030-1045 POPULATION GENOMICS OF COHO SALMON FROM CHILE AND NORTH AMERICA by Victor Martinez, University of Chile, Chile

1045-1100 POPULATION GENOMICS AND ADAPTIVE EVOLUTION STUDIES OF CHINESE SEA BASS (*LATEOLABRAX MACULATUS*) by Peng Xu, Xiamen University, China

1100-1115 HIGH RATE OF DE NOVO MUTATIONS IN A BIVALVE SPECIES by Carolina Penaloza, Roslin Institute, Chile

1115-1130 GROWTH AND MICROSATELLITE DNA MARKER ANALYSIS OF PHILIPPINE DONKEY'S EAR ABALONE *HALIOTIS ASININA* STOCKS FOR USE IN BROODSTOCK DEVELOPMENT by Maria Rowena R. Romana-Eguia, Southeast Asian Fisheries Development Center, Aquaculture Department (SEAFDEC/AQD), Philippines

1130-1145 DEVELOPMENT AND APPLICATION OF GENOMIC TOOLS FOR CLEANERFISH FARMING by David Penman, University of Stirling, United Kingdom

Lunch – 60 minutes

ETHICS, FOOD SAFETY AND ENVIRONMENTAL RISK Session Chair: Dr Ingrid Oleson

1245-1300 GENERATION OF GENE-EDITED BLUEGILL *LEPOMIS MACROCHIRUS* FOR CONTROL AND ERADICATION OF INVASIVE SPECIES BY GENE INDUCED SUPPRESSION FOR ALIEN POPULATION (GISAP) by Hiroyuki Okamoto, NRIA/ FRA, Japan

1315-1330 FITNESS EFFECTS OF INTROGRESSION OF ESCAPED FARMED SALMON INTO WILD POPULATIONS by Marie Lillehammer, Nofima, Norway

1330-1345 NATIONAL TRACING SYSTEM FOR ESCAPED ATLANTIC SALMON by Trina Galloway, AquaGen, Norway

1300-1315 THE UNACKNOWLEDGED UNCERTAINTY OF BIOPATENTING; A CASE STUDY OF THE AQUABOUNTY PATENT IN THE EUROPEAN PATENT SYSTEM by Ingrid Olesen, Nofima, Norway

1345-1445 Closing Ceremony