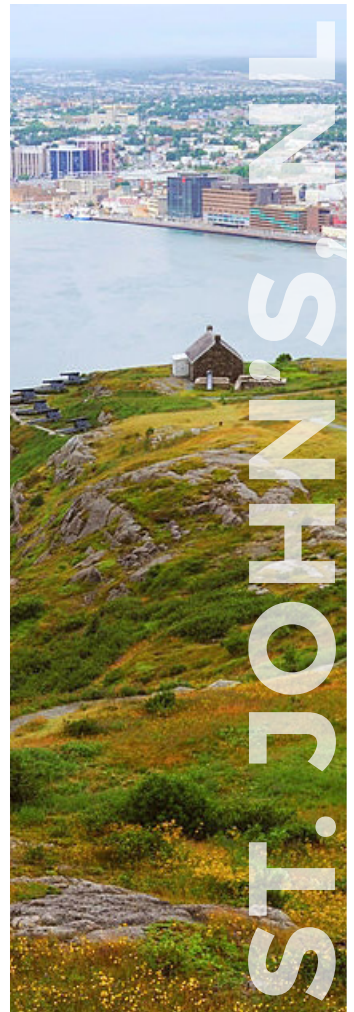




IFISH 5

The Fifth International Fishing Industry Safety & Health Conference



June 10-13, 2018

Conference Program

Our Sponsors

IFISH would not be possible without the effort and support of our sponsors:



**Food and Agriculture
Organization of the
United Nations**

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IFISH 5 Participants,

June 2018

Welcome to the Fifth International Fishing Industry Safety & Health Conference (IFISH 5). After a hiatus of nine years, we are happy to say IFISH is back and better than ever. IFISH remains the only conference dedicated to improving safety and health in the fishing industry, and for the first time, aquaculture and seafood processing industries as well. With four days of activities, over a hundred participants from twenty-five countries, thirty-one sessions, and two additional workshops, this will be the largest IFISH to date. We are very proud of this year's expanded offerings with both cutting-edge research and worker safety best practices, not to mention some of the most respected scientists and policy-makers in their fields.

This year's program encompasses research and dialogue around many themes related to the successes and continued challenges associated with occupational health and safety for the fishing, aquaculture, and seafood processing industries. Presentation subjects range from global conventions to local interventions designed to improve safety. They reflect the many changes that have taken place in these maritime industries over the past decade ranging from the exponential growth of aquaculture and seafood processing due to the world's increased demand for protein, to changes in fishing industry regulations and fisheries management policies.

IFISH 5 would not be possible without the collaboration of our co-sponsors: the NIOSH Center for Maritime Safety and Health Studies, the SafetyNet Centre for Occupational Health and Safety Research at Memorial University of Newfoundland, and the Food and Agriculture Organization (FAO) of the United Nations. NIOSH, SafetyNet, and Memorial have managed logistics and scheduling for the conference and are hosting us in beautiful St. John's, Newfoundland and Labrador. Funding from the FAO has ensured that participants from developing nations are able to join us. We would also like to thank our Scientific Committee and all of our presenters for helping to create an amazing program – your dedication to excellence is evident. Finally, we would like to thank the following sponsors for their support of events and activities over the next four days: Fishing Partnership Support Services, the Ocean Frontier Institute, and WorkplaceNL.

We offer our best wishes for a productive exchange of science, best practices, intervention strategies, and worker training, as well as the development of new partnerships, as we work toward our common goal to prevent workplace injury and illness in fishing, aquaculture and seafood processing around the world.

Enjoy the conference,

The IFISH Planning Committee

Dr. Jennifer Lincoln, Dr. Barbara Neis, and Dr. Julie Sorensen

Acknowledgments

Special acknowledgements are made to the following for their dedication to the planning and support of IFISH 5:

Planning Committee

Jennifer Lincoln, Barbara Neis, Julie Sorensen

Scientific Committee

Jennifer Lincoln [Co-Chair], Barbara Neis [Co-Chair], Jerry Dzugan, Marion Edwin, Ari Gudmundsson, Judith Read Guernsey, Ingunn Marie Holmen, Mohamed Jeebhay, Olaf Jensen, Laurel Kincl, Julie Sorensen, Andrew Watterson

Support Services

Elizabeth Andres, Angela Drake, KC Elliott, Dee Kloczko, Ann Miller

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Scientific Committee

CO-CHAIRS:



Jennifer Lincoln — Center for Maritime Safety and Health Studies, National Institute for Occupational Safety and Health (NIOSH), USA

As a dedicated Injury Epidemiologist with the National Institute for Occupational Safety Health (NIOSH), Dr. Lincoln serves as both the Director of the Center for Maritime Safety and Health Studies and Associate Director for Science for the NIOSH Western States Division. For the last twenty-five years, she has continually worked to provide scientific research and leadership to develop tailored risk-reduction interventions for high-risk work, especially in the prevention of traumatic injuries among workers in the commercial fishing industry. Her efforts, in partnership with the U.S. Coast Guard, have led to a substantial decline in commercial fishing deaths. Dr. Lincoln received her Ph.D. from Johns Hopkins University School of Public Health, is a Certified Safety Professional (CSP), and serves as a Captain in the U.S. Public Health Service.



Barbara Neis — SafetyNet Centre for Occupational Health and Safety Research, Memorial University, Canada

Barbara Neis (Ph.D.) is a John Paton Lewis Distinguished University Professor at Memorial University of Newfoundland. Based in the Department of Sociology, she is also the Co-Director of the SafetyNet Centre for Occupational Health and Safety Research, a Fellow of the Royal Society of Canada and Past President of the Canadian Association for Research on Work and Health. Professor Neis received her Ph.D. in Sociology from the University of Toronto in 1988. Her research focuses broadly on interactions between work, environment, health and communities in rural and remote contexts. Professor Neis has worked for more than two decades in multi-disciplinary teams carrying out research on occupational health and safety in marine and coastal contexts. Her past and ongoing research initiatives include research on seafood processing occupational health, fishing safety and aquaculture safety.

MEMBERS:



Jerry Dzugan — Alaska Marine Safety Education Association (AMSEA), USA

Jerry Dzugan has been the Executive Director of the Alaska Marine Safety Education Association (AMSEA) since 1987. He has been an educator since 1971 and commercially fishes in the Alaska salmon troll, seine, and halibut longline fisheries. He has operated a wilderness tour charter vessel, and has owned and operated many types of vessels: sail, paddle and power. He is a marine safety instructor-trainer, develops marine safety curriculum, teaches many marine safety topics, and works to support a national marine safety instructor network. He has worked as an emergency medicine instructor-trainer and has conducted research on education and marine safety. He earned a graduate degree in marine education & training in Malmo, Sweden, at World Maritime University. He is a member of the U.S. Coast Guard's Fishing Safety Advisory Committee, and is involved with marine safety policy, especially in commercial fishing. He foolishly still owns and maintains a classic sixty-year-old year old wooden sailboat while living in the world's largest temperate rain forest.



Marion Edwin — Optimise, Ltd., New Zealand

Marion Edwin is a Certified New Zealand Ergonomist (CNZHFE) providing workplace consultancy services around New Zealand through her business, Optimise Ltd. She is the current Chairperson of the Human Factors and Ergonomics Society of New Zealand and is on the leadership team of the Health and Safety Association of New Zealand. Marion's skills include the prevention of musculoskeletal disorders in workplaces and includes incident investigation and optimising the design of workplaces, equipment and work systems for improved business productivity. She has experience across many industries – hospitality, food manufacturing, agriculture, forestry, health services, heavy manufacturing, office, corporate, science and research, through to working with New Zealand's off-shore fishing fleet and assisting government agencies to develop resources for industry injury prevention. She hails from the sunny climes of Motueka at the top of the South Island and enjoys many aspects of the great outdoors and a good belly laugh.

Scientific Committee

MEMBERS (CONTINUED):



Ari Gudmundsson — Fishing Operations and Technology Branch, Food and Agriculture Organization, United Nations (FAO), Italy

Ari Gudmundsson is the head of the Fishing Operations and Technology Branch at FAO Headquarters in Rome. Since he joined FAO in 2004, Gudmundsson has been responsible for fishing vessel development and technology, which includes safety at sea in the fisheries sector. Since 1990, Mr. Gudmundsson has been actively participating in the work of the three international organizations dealing with issues related to the safety of fishing vessels and fishermen, namely IMO, ILO, and FAO. He has also served as Vice-Chairman of the IMO Sub-Committee on Stability and Load Lines and on Fishing Vessels Safety (SLF). Before coming to FAO, Ari had held various positions of high responsibility at the Icelandic Maritime Administration for 18 years. Before becoming a naval architect, Ari also spent some years at sea on both German and Icelandic ships, rising to the rank of 2nd officer.



Judith Read Guernsey, Community Health and Epidemiology, Dalhousie University, Canada

Dr. Judith Read Guernsey is Professor in the Department of Community Health and Epidemiology at Dalhousie University Faculty of Medicine in Halifax, Nova Scotia, Canada. Dr. Guernsey's research has focused on the hazardous working and living conditions, particularly agriculture, which are present in rural and remote areas in Canada, the US and globally. Her research has contributed to the theoretical conceptualization of physical environments as a social determinant of health. She has been active in the Canadian Agricultural Safety Association, the National Collaborating Centre on Environmental Health of the Public Health Agency of Canada, the Canadian Population Health Council of the Canadian Institute for Health Information, the US Institute of Medicine Scientific Advisory Panel on Damp Indoor Spaces and Health and the American Industrial Hygiene Association. Dr. Guernsey received her MSc and Ph.D. as a NIOSH Fellow from the University of Iowa Department of Preventive Medicine and Environmental Health (College of Public Health) after graduating with Honours in Biology at Carleton University in Ottawa, Ontario.



Ingunn Marie Holmen — SINTEF Ocean, Norway

Ingunn Marie Holmen is a senior scientist with SINTEF Ocean, as well as a Ph.D. candidate at the Norwegian University of Science and Technology (NTNU). Holmen has been with SINTEF for the last twenty-five years focusing on occupational safety and health for workers in extreme environments, with the last six years specializing in safety and risk management for both fisheries and aquaculture. Her current work centers on the topic of "Safety and risk management in exposed aquaculture operations." Holmen has published numerous papers and presented on fatal and non-fatal injury, risk assessments, reducing risk through automation, fatigue and sleep disturbances, and other topics in aquaculture and commercial fishing. She won the Norwegian Design Council's Award for Design Excellence in 2007 for the Regatta Fisherman, outerwear created for commercial fishermen, with built-in buoyancy and a sleek design to help mitigate the chance of gear entanglement. Holmen holds a degree from the Norwegian Institute of Technology (NTH) in Biophysics and medical technology.



Mohamed Jeebhay — Centre for Environmental and Occupational Health Research, University of Cape Town, South Africa

Professor Mohamed Jeebhay is an Occupational Medicine specialist, and holds joint appointments as Head of the Occupational Medicine Division in the School of Public Health and Family Medicine as well as the Department of Medicine at the University of Cape Town (UCT). He is a fellow of the Collegium Ramazzini, an international academy of internationally renowned fellows in occupational and environmental health. The National Research Foundation of South Africa has rated him as an internationally acclaimed research scientist. He leads the research programme in the Centre for Environmental and Occupational Health Research at UCT on occupational allergens and asthma with a major focus on environmental risk factors and preventive approaches for work-related allergy and asthma. He serves as editorial board member of the Journal of Current Allergy and Clinical Immunology and the African Journal of Thoracic and Critical Care Medicine.

Scientific Committee

MEMBERS (CONTINUED):



Olaf Jensen — Center for Maritime Health and Society, Department of Public Health, University of Southern Denmark, Denmark

Olaf Jensen, is a medical doctor and specialist in occupational and community medicine with a Master of Public Health (MPH) from the University of Aarhus. Since 1992, he has been a researcher at the Center for Maritime Health and Society (CMSS), Department of Public Health, University of Southern Denmark. He has over the years headed and collaborated on several epidemiological studies of occupational health and safety among fishermen and seafarers and is the author of numerous scientific articles and reports from these studies. He is located in the Republic of Panama, affiliated with the Panama National University, as well as the Cadiz University in Spain, and the Southern Danish University, Denmark.



Laurel Kincl — College of Public Health and Human Sciences, Oregon State University, USA

Laurel Kincl is an Associate Professor of Environmental and Occupational Health in the College of Public Health and Human Sciences at Oregon State University, USA. She has a MS in Industrial Hygiene and Ph.D. in Occupational Safety and Ergonomics. Her research focuses on quantifying, communicating and controlling the risk to occupational health and safety hazards. She has currently funded research to improve surveillance and safety in the commercial fishing industry in the Pacific Northwest of the United States.



Julie Sorensen — Northeast Center for Occupational Health and Safety, Agriculture, Forestry, and Fishing, USA

Julie Sorensen is the Director of the Northeast Center for Occupational Health and Safety: Agriculture, Forestry and Fishing, a program of the Bassett Healthcare Network in Cooperstown, NY. Julie received her Ph.D. in Epidemiology from Umea University, in Umea, Sweden, holds a Masters in Medical Anthropology and a Bachelor's Degree in Communications. Julie's research interests include qualitative research methods, social marketing, intervention development, intervention dissemination and human behavior research.



Andrew Watterson — Occupational and Environmental Health Research Group, University of Stirling, Scotland, United Kingdom

Professor Andrew Watterson Ph.D., Chartered Fellow of the Institute of Occupational Safety and Health, Fellow Collegium Ramazzini is Head of the Occupational and Environmental Health Research Group & Director of the Centre for Public Health and Population Health Research at the University of Stirling, Scotland. He has also led Visiting Professorships at the University of New South Wales, Sydney, Australia and the University of British Columbia, Canada. His research interests include risk assessment, risk management and risk regulation particularly in the agriculture, fisheries and aquaculture, and energy sectors. He has acted as a WHO and FAO consultant on these topics. He uses health impact assessments and participatory action research among other methods to explore science-policy-civil society interfaces. He has published widely in peer reviewed journals on occupational and environmental health and safety, public health and toxicology journals. He has also published a Financial Times guide to occupational health and safety management and various books on occupational health and safety/public health.

Information for Participants & Presenters



Oral Presentations

In order to run the sessions as efficiently as possible, we have provided two opportunities for presenters to submit their presentations in advance.

- You can submit files by emailing them to ifish@mun.ca, or
- You can bring electronic files to the Conference Information Desk, 1st Floor Atrium, Bruneau Centre where someone will transfer them onto our system.

Poster Presentations

A dedicated poster session has been scheduled for Sunday, June 10, 2018, from 5:00 pm to 7:00 pm to provide participants with an opportunity to visit the displays. Presenters are expected to be at their displays at all times during the poster session to respond to questions. All poster exhibitors will be responsible for setting up their own posters before 2:00 pm and taking them down after the poster reception ends at 7:00pm. The Bruneau Centre will be open at 7:00 am on Sunday morning for set-up.

Registration

Registration is open daily in the 1st Floor Atrium, Bruneau Centre.

- | | |
|----------------------------|-------------------|
| • Sunday, June 10, 2018 | 8:00 am – 7:00 pm |
| • Monday, June 11, 2018 | 7:00 am – 5:30 pm |
| • Tuesday, June 12, 2018 | 7:00 am – 5:30 pm |
| • Wednesday, June 13, 2018 | 7:00 am – 5:00 pm |

Information Desk

The Conference Information Desk is located on the 1st Floor Atrium of the Bruneau Centre. Please see our staff for any queries you may have regarding the conference and the city. The staff can assist you with making reservations for dining and leisure activities.

Telephone for the Conference Information Desk: (709) 325-0180.

Badges

Admission to all conference activities is by name badge (received at registration); **be sure to wear your badge at all times.**

WiFi Access

The @Memorial-Guest network provides daily access to an open WiFi network for guests and visitors.

To access this service, guests and visitors should:

- Select @Memorial-Guest in their wireless settings
- Accept the "terms of use" agreement

Messages

There is a message board located at the Conference Information Desk.

Smoking Policy

All public buildings in Newfoundland and Labrador are designated non-smoking. Smoking is also prohibited on the grounds of Memorial University.

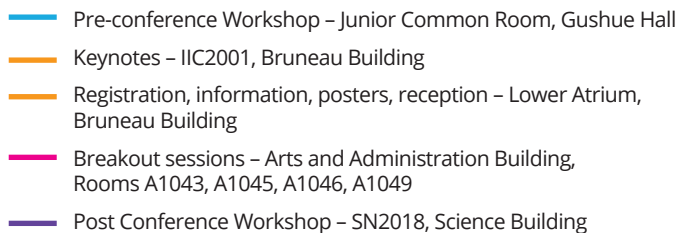
Emergency Telephone Numbers

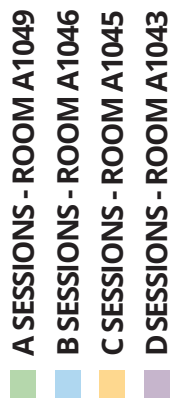
Campus Security: (709) 864-8561
 24-hour Mental Health Crisis Line: 1-888-737-4668
 Emergency (Police/Fire/Ambulance): 911
 Conference Coordinator: (709) 730-1307

University Counselling Centre: (709) 864-8874
 Emergency on Campus: (709) 864-4100
 Conference Information Desk: (709) 325-0180

Campus Map

For maps of the Memorial University campus and breakout session rooms, see page 10 of the conference program. For more detailed maps, go to https://www.mun.ca/campus_map/.





PROGRAM AT A GLANCE

Room Listings

Keynote/Plenary/Workshops	Health and Safety - The Changing Landscape
New Horizons in Fishing	Aquaculture/Seafood Processing/Quick Takes
Offsite	Worker Safety Interventions and Training

Sunday, June 10th, 2018

8:00am–7:00pm	Registration/Information Desk Open
9:00am–4:30pm	Recent Global Conventions and Resolutions Targeting Improved Safety, Health and Sustainability at Sea in the Fisheries Sector – Strategies for Moving Forward (Junior Common Room, Gushue Hall)
5:00pm–7:00pm	Opening Reception and Poster Session

Monday, June 11th, 2018

7:00am–5:30pm	Registration/Information Desk Open				
7:15am–8:00am	Continental Breakfast				
8:00am–8:45am	Morning keynote speakers: Jennifer Lincoln and Sandra Allnutt				
9:00am–10:30am	Session 1	Weather and Fishing Safety	Understanding Injury in the Fishing Sector	Quick Takes: Short Talks on a Variety of Topics	Medicine at Sea
10:45am–12:15pm	Session 2	Evaluating the Effects of Fisheries Management Measures on Risk-taking and Safety in Commercial Fishing	Tracking Injury in the Fishing Sector: Trends and Opportunities	Regional Approaches to Aquaculture and Seafood Processing	What's Working (and Not Working) in Commercial Fishing
12:30pm–1:30pm	Lunch				
1:45pm–3:15pm	Session 3	Policy and Regulation - Best Practices & Initiating Change	Regional Approaches to Commercial Fishing Safety 1	Seafood Processing: Hazards and Interventions	Utilizing an Industry-Led Integrated Approach to Advancing Safety, and Reducing Injuries, Illness & Fatalities in Commercial Fishing
3:30pm–5:00pm	Session 4	Open Session	Commercial Fishing and Processing Health and Safety Surveillance Informing Intervention Development	Safety and Health in Aquaculture: Policy and Practice	Prevention of Chronic Injury and Illness
5:15pm–6:00pm	Afternoon Keynote Speakers: Mohamed Jeebhay and Ingunn Marie Holmen				

PROGRAM AT A GLANCE

Tuesday, June 12th, 2018

7:00am–5:30pm	Registration/Information Desk Open				
7:15am–8:00am	Continental Breakfast				
8:00am–8:45am	Morning Keynote Speakers: Mel Myers and Andrew Watterson				
9:00am–10:30am	Session 5	Obstacles to Performing OSH Research in Commercial Fishing	Overboard Falls of Crew Members on Québec Lobster Boats: Risk Analysis and Tested Prevention Solutions for Crews and their Boats	Exposure Assessment and Health Effects of Seafood Bioaerosols in the Fishing and Seafood Processing Industries	Health and Safety Interventions
10:45am–12:15pm	Session 6	The Need for a Public Health Program in Commerical Fishing	Regional Approaches to Commercial Fishing Safety 2		Evaluating Fishing Safety Interventions
12:30pm–1:30pm	Lunch / Lunchtime Talk: Daryl Attwood, Lloyd’s Register Foundation				
1:30pm–4:30pm	Visit to the Offshore Safety and Survival Centre, Foxtrap				
7:00pm–9:00pm	Networking/Social Event at The Gathering Place				

Wednesday, June 13th, 2018

7:00am–12:00pm	Registration/Information Desk Open				
7:15am–8:00am	Continental Breakfast				
8:00am–8:45am	Morning Keynote Speakers: Jim Wellman and Christina Stringer				
9:00am–10:30am	Session 7	Latent and Active Causes of Vessel Losses	Changing Commercial Fishing Personal Flotation Use Behavior	Safer, Healthier Work-places in Aquaculture	Workplace Injuries, Let's Tackle Them Together
10:45am–12:15pm	Session 8	The Danish Story: Health and Safety, Education, Social Contract with collective financing in the Danish Fishery			Safety and Survival Training in New England: Program Design, Research, and Evaluation
12:30pm–1:30pm	Lunch / Closing Remarks				
1:30pm–4:30pm	Global Aquaculture Occupational Health and Safety: National and International Perspectives (Check Announcements for Building and Room Number)				

Day One: Sunday, June 10th, 2018

9:00-4:30, R. Gushue Dining Hall

Recent Global Conventions and Resolutions Targeting Improved Safety, Health and Sustainability at Sea in the Fisheries Sector – Strategies for Moving Forward

This pre-conference workshop is co-sponsored by the Ocean Frontier Institute (OFI, Memorial), the Food and Agriculture Organization (FAO), International Labour Organization (ILO) and International Maritime Organization (IMO) of the United Nations, and the U.S. National Institute for Occupational Safety and Health (NIOSH). It will feature presentations and dialogue about recent global initiatives related to fishing vessel design, fishing safety, sustainable fishing practices and fisheries management and their relationship to safety and working conditions in fisheries from different regions of the world.

Since the last IFISH Conference in 2009, several international milestones related to safety and health in the fisheries sector have been or are going to be reached in the very near future. These include:

1. The completion of the FAO/ILO/IMO Safety Recommendations in 2010 and the FAO/ILO/IMO Implementation Guidelines in 2011; and
2. The entry into force of the International Convention on Standards of Training, Certification and Watchkeeping for Fishing Vessel Personnel, 1995 (STCW-F 1995) on 29 September 2012
3. The adoption of the Cape Town Agreement on the safety of fishing vessels in 2012 and the following regional seminars on its implementation and ratification;
4. The adoption of instruments to support the implementation of the ILO Work in Fishing Convention, such as guidelines for port and flag State inspectors;
5. The entry into force of the ILO Work in Fishing Convention on 16 November 2017;
6. The International Commercial Fishing Management Regimes Safety Study (FAO).

There is also growing recognition within international organizations and among researchers of the link between safety at sea in the fisheries sector, forced labour and illegal, unreported and unregulated (IUU) fishing. In this regard, the Cape Town Agreement and the ILO Work in Fishing Convention are seen to be not only instruments to improve safety and health at sea in the fisheries sector but also tools that will contribute to the fight against IUU fishing, together with the FAO Port State Measures Agreement that entered into force in 2016. This is further reflected in the recent convention adopted by the UN Agenda 2030 supporting the new SDG #14 "Life Below Water" which advocates for improvement of the socioeconomic situation of fishers and fish workers and for capacity building and technical assistance and promotion of sustainable ocean-based economies, particularly in small island and developing states.

Workshop Overview

(9:00-10:15) - In the first part of the morning session, workshop participants will have an opportunity to listen to presentations about particular instruments, tools, and guidelines given by Sandra Allnutt from the IMO, Brandt Wagner from the ILO, and Raymon VanAnrooy and Ari Gudmundsson on behalf of the FAO.

(10:15-10:30) - Break

(10:30-11:45) - Panel presentations focused on experiences from the field with issues relevant to these international instruments and agreements. These will include presentations by industry experts from the UK and Europe related to the implementation of ILO C188 including:

1. Cor Blonk of PFA/Fish Platform – Guidelines on Medical Examination of Fishers – Protection of false hope?
2. Robert Greenwood National Federation of Fishermen's Organizations U.K. Safetyfolder.co.uk and Work in Fishing Convention
3. Yugraj Singh, Bay of Bengal Programme Inter-governmental organization – the 2007 Work in Fishing Convention – a Status Report on the Bay of Bengal
4. Davey Hill ANIFPO/HRAS – Human Rights at Sea, Assessment of Migrant Crew and Modern Slavery Act
5. Peter Vandergeest (York University) and Melissa Marschke (University of Ottawa) - Forced Labour and Working Conditions in the Fisheries Sector in Thailand.

(11:45-12:30) - Small group discussions to reflect on lessons learned as well as questions or concerns. Each group will select a recorder who will identify key points from the discussion and feed these back to the larger group and to presenters in synthesis session at the end of the day.

(12:30-1:30) - Lunch

Part 2: Fisheries management and safety in fisheries:

The afternoon session will focus on the results of recent research on fisheries management and fishing safety.

(1:30-1:50) - Jennifer Lincoln (NIOSH) will present an overview of the results of an FAO Initiative that she worked on with G. Knapp and A. Gudmundsson. The report from this initiative synthesized case studies from 16 countries (<http://www.fao.org/3/a-i5552e.pdf>).

(1:50-3:00) - Panel presentations

1. Douglas Christel, NMFS, U.S. "Last but not least: integrating safety considerations and analysis into U.S. fishery management actions"
2. Akbar Marvasti, NOAA, U.S. "Effect of safety regulations on severity of injuries in the Gulf of Mexico commercial fisheries"
3. David Decker, Fish Food and Allied Workers Union, NL
4. Jacqueline Perry, Department of Fisheries and Oceans (Canada) TBC

(3:00-3:15) - Break

(3:15-4:00) - Small group discussion for afternoon session

(4:00-4:30) - Plenary/feedback.

Day One: Sunday, June 10th, 2018

5:00-7:00, Bruneau Centre

OPENING RECEPTION/POSTER SESSION

The opening reception/poster session event will be held in the Lower Atrium of the Bruneau Building from 5:00pm-7:00pm. Poster presenters will be available for discussion and questions during this time. The reception is sponsored by Fishing Partnership Support Services.

POSTER ABSTRACTS

P1. Survey on hygiene inspection policies — *Despena Andrioti, University of Southern Denmark; Mouchtouri Barbara and Christos Hadjichristodoulou, University of Thessaly, Larissa, Greece; Anastasia Barbouni, Nikolaos Bitsolas, Johanna Maria Broekhuijsen, Miguel Davila-Cornejo, Martin Dirksen-Fischer, Rita Maria Ferrelli, Andreas Gilsdorf, Irene Goverse, Brigita Kairiene, Antonis Kantonis, Galina Kokosharova, Elina Kostara, Jenny Kourea-Kremastinou, Leonidas Kourentis, Angel Kunchev, Audrone Lavruvianec, Peter Otorepec, Rimantas Jonas Pilipavicius, Martina Pilkova, George Rachiotis, Persa Tserkezou, Carmen Varela Martinez, Natalja Vözelevskaja, the SHIPSAN ACT Partnership*

The SHIPSAN ACT is a European Joint Action funded by the European Commission under the Health Programme (2008-2013) where 32 partners from 24 European countries participate. The aim is to strengthen an integrated strategy and sustainable mechanisms for safeguarding the health of travelers and crew of passenger and cargo ships and prevent the cross-border spread of diseases.

Methods & Materials: A range of methods were used, including: literature review, table top and operational exercises, surveys and questionnaires, site visits, training, inspections, working group meetings and development of guidance documents.

Results: A state of the art report was composed including the results of: literature review for describing scientific evidence on communicable diseases affecting people on any type of ships or at ports; a survey on hygiene inspection practices regarding fishing vessels; survey on training needs related to core capacities at the points of entry-ports; and survey on the practices and responsibilities of port health authorities along inland waterways. Guidelines for dealing with chemical and radiological incidents on ships and training material, risk assessment guidelines as well as a risk assessment tool for occupational health risks per cargo ship type in place. A pool of 83 trainers from 20 countries was created. The web-based Communication Network <http://www.shipsan.eu/comnet/>, since its developments, it has been used by competent authorities in EUMS to follow up 19 public health events on ships involving 1677 cases of communicable diseases (gastroenteritis, varicella, legionellosis, measles, dengue,

meningitis and tuberculosis). The Information System for recording/issuing IHR Ship Sanitation Certificates <http://ssc.shipsan.eu> has been used to issue more than 5,000 certificates.

Conclusions: EU SHIPSAN ACT helps countries to preparedness planning and to develop IHR core capacities. Furthermore, it strengthens the EU's capacity to monitor and respond to health threats by facilitating rapid information exchange using web-based tools, while the risk assessment guidelines and tool contribute to the health and safety of the seafarers and the environment.

P2. Navigating Health Insurance and Services with Members of the Fishing Community — *Gretchen Biesecker and Lauren King, Fishing Partnership Support Services*

Fishing Partnership Support Services (FPSS) serves commercial fishing workers and their families. Our innovative community-health-worker model employs Navigators, who live in the community and come from fishing families. In 2016, we received the Community Health Worker Program of the Year award from the Massachusetts Association of Community Health Workers. Our Navigators integrate services that are meaningful and relevant to the fishing industry, including assistance with health insurance and access to care, safety and survival trainings, as well as financial planning and wellness workshops, with the goal of enhancing the health of fishermen and their families. Our Navigators partner with health centers and healthcare providers, trauma counselors, universities, boat captains, the Coast Guard, and community leaders to develop and evolve programming and leverage community assets. In this presentation, we will focus on best practices in our community health work, highlighting:

1. Combining trust and training, including some of the key skills for Navigators;
2. Creative methods to engage hard-to-reach members of the fishing community.

FPSS has supported over 19,000 fishing families throughout New England with health insurance. Because many fishermen lack a regular source of care, FPSS helps consumers shop for and maintain coverage, access a primary care doctor, and understand their health coverage. Trained and trusted, they provide peer listening, social support, and linkages to mental health services. For instance, in New Bedford, MA, a Navigator serves as a trained peer recovery coach, helping to address the opioid crisis.

FPSS's outreach strategy depends on repeated contacts with consumers, who often carry suspicions of government requirements. Because of this challenge,

Day One: Sunday, June 10th, 2018

our Navigators deliver much of their outreach where fishermen live and work: on the docks, at trade shows, at industry meetings, at other fishing events they attend, such as safety trainings. We look forward to learning more about other organizations' approaches.

P3. Acceptance and use of mobile apps — *Maria Bulzacchelli and Chris Nelson, Johns Hopkins Bloomberg School of Public Health; Jennifer Whitehill, University of Massachusetts Amherst; Leigh McCue, naval engineer and app developer; Jerry Dzugan, Alaska Marine Safety Education Association*

Commercial fishing workers face numerous hazards. Smartphone technology provides opportunities for developing innovative safety interventions to prevent commercial fishing fatalities from vessel disasters and falls overboard. Two mobile apps have been developed to bring potentially life-saving tools into the hands of any fishing vessel operator with a suitable smartphone or tablet. The Small Craft Motion Program (SCraMP) app provides real-time vessel motion monitoring data, giving the captain early warning of vessel instability and allowing corrective actions to be taken before capsizing occurs. The Fishing Vessel Drills (FVdrills) app is designed to facilitate conducting safety drills by providing drill checklists, dynamic drill scenarios, electronic logs, and reminders. While such apps hold enormous potential, they will only improve safety if they are accepted and used by fishing vessel operators. Little is known about mobile technology use in this population. An assessment of the SCraMP and FVdrills apps is being conducted among commercial fishing vessel captains operating out of ports in the Northeastern United States to determine their acceptability, utility, and effect on safety practices during actual commercial fishing operations. This presentation will introduce the SCraMP and FVdrills apps and discuss the methodological challenges encountered in designing and carrying out this study.

P4. Short-term and Long-term Methods and Procedures for the Reduction of Hazardous Noise Exposures on Newfoundland and Labrador Small Fishing Vessels — *Giorgio Burella, Lorenzo Moro, and Barbara Neis, Memorial University of Newfoundland*

Fish harvesting has always been one of the main sources of employment in the province of Newfoundland and Labrador, counting more than 9,200 registered fish harvesters in recent years. This profession exposes the workers to several health and safety hazards, one of which is noise-induced hearing loss and other forms of impairment caused by ongoing noise exposure. High noise levels can also make it difficult to recover from

fatigue when fish harvesters are not able to rest in quiet quarters onboard. Memorial University of Newfoundland and the Newfoundland and Labrador Fish Harvesting Safety Association (NL-FHSA) are undertaking a joint research project funded by MITACS aiming to assess noise exposures and develop short and long term solutions to reduce noise exposures among fish harvesters engaged in different fisheries. This poster will report on findings from the first phase of this initiative. In this phase, we are seeking to develop short term solutions by first conducting surveys on-board at least 20 vessels as the basis for a cross-sectional study on noise exposures for different fisheries and vessel sizes. To date, we have sampled noise exposures associated with the cod, lobster, crab and whelk fisheries. The noise exposure of the fish harvesters has been measured, and the influence of the tasks, vessel size, and equipment on noise levels has been characterized. Results show that fisheries that use pots have higher noise levels, compared to those that use types of gear. The researchers plan to sample noise associated with shrimp, mackerel, crab, herring, capelin and possibly squid fisheries this coming spring. Following up the measurements, some of the participants will be asked to try different kind of hearing protection to identify which one is the best for the use during fishing activities. A second phase will involve the development of engineering short-term (for existing vessels) and long-term (design practice on new vessels) solutions to mitigate the noise exposure on-board the fishing vessels. One of these vessels will be selected as case-study, on which the noise transmission will be studied. This will highlight flaws in the noise insulation and provide effective means to reduce noise. Preliminary results on the development of the noise transmission model and preliminary noise mitigation means will also be presented in the poster.

P5. Online survey on occupational hazards from Brazilian Aquaculture — *Lissandra Souto Cavalli and Flavielle Blanco Marquesa, Department of Agricultural Diagnosis and Research, Secretary of Agriculture and Livestock of the State of Rio Grande do Sul, Brazil*

An online research survey was conducted to identify occupational hazards, risk assessment and prevention measures used in aquaculture in Brazil. Data were collected through an online questionnaire with 25 questions that could be answered voluntarily and anonymously. The study covered 108 professionals including students, workers, researchers and farmers. The profile of respondents was 72% men and 40% of people were between 25-35 years old. The results showed that 52% of the participants never received any type of training. Even so, 71.3% of respondents reported that they never suffered any type of accident during aquaculture activities. Similarly, 89% of professionals said they were aware of occupation-

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al hazards in work activities. Thus, 54% of respondents reported that they use good safety practices to protect their health or their team. The study pointed out that 50.5% of the interviewees use PPE, but 33.9% only use sometimes. Regarding hazard signaling, 77% said that there is no hazard map or risk signage in the workplace. The survey showed that 57.4% of the interviewees work in places where risk assessment programs were not implemented. Half of those interviewed reported that their workplaces dispose of waste appropriately and 64.8% stated that they discard cutting material in suitable containers. Research has shown that 42.8% of staff are not trained in emergency or first aid situations. In this study it was possible to identify situations such as the lack of signaling of hazards in the workplace and lack of training and training in OHS. The results point out that risk management can be a fragile point in development countries. Aquaculture farmers should be encouraged to adopt measures and technologies to eliminate risks in Brazilian aquaculture.

P6. Put Down the Pen and Pick up the Tablet: Using App based Auditing and Data Collection to Increase Awareness and Accountability — *R. Alan Davis, American Seafoods Company; John Dunn, Glacier Fish Company*

Traditionally Safety Professionals and Scientists head into the field with a checklist and a pen to observe and collect data. We follow our checklists and generate piles of paper to be entered into some usable format at a later date. Safety Researchers have long encouraged organizations to make more frequent audits and regular observations of people's behavior with the idea that these efforts will result in earlier detection and correction of situations that could result in accidents but we are faced with the challenge that vessels operating at sea are not going to do a lot of data entry and getting piles of paper delivered to our desks months late minimizes the ability to detect issues and trends. What IF there was a way for vessel operators or researchers to conduct audits at sea or in remote locations using a mobile device? What IF there were a way that each Audit could be uploaded into a cloud based system that could not only upload the data, but could also help track action items AND track who is... and is not... doing their Audits?

The process has evolved into a much more intricate system now that ties in leading and lagging indicators, injury reporting, risk assessment levels, position, and annual inspection requirements as well as flagging repeat high risk items. Such systems exist in normal industry today and several commercial fishing companies operating in Alaska have set out to take their Safety Audits out of the file box and into the cloud. As access to technology expands and

the world gets smaller and smaller, how might we all be able to use Mobile Devices to conduct Audits, Collect Data, Provide Training, and increase efficiency?

P7. All-Cause Mortality of Commercial Fishermen in Massachusetts — *Scott Fulmer and Shruti Jain, University of Massachusetts Lowell*

As commercial fishing in the US has been the subject of study to better understand occupationally-related fatality rates for the development of surveillance to track geographical and fishery-specific differences in fatality rates, most prior occupational health studies in commercial fishing in the US have focused on occupational events, rather than on all causes mortality. There have been a few studies that examined occupational disease causality among fishermen, but these have tended to be European or Canadian, and have not used data from the US fisheries.

More recently, in the United States, there has been attention to opioids in the general population, and the fishing industry, in particular. In Massachusetts, for example, naloxone use has been introduced into commercial fishing safety trainings, as well as a few community-based prevention projects aimed to understand and reduce opioid and other drug abuse among commercial fishing industry workers in Massachusetts. Some researchers have attempted to quantify the contribution of occupational exposures to opioid-related fatalities, a very important pathway that assumes exposure to risk for non-fatal injury leading to use of prescription opioids, then to addiction and death by overdose.

This study examined all-cause mortality of commercial fishermen in two Massachusetts communities, 2000-2014, to determine whether there are diseases or causes, including suicide, liver disease, overdose to opioids, or specific cancers, that occur at a higher-than-expected rate in this occupational group. Death certificate data, obtained from the Massachusetts Department of Public Health, listing deaths from the fishing ports of Gloucester and New Bedford, Massachusetts, were grouped into fishermen and non-fishermen, and matched by place or residence of death, month of death, and age at death. Proportional mortality rates were examined to determine whether specific causes were higher among fishermen than expected from the non-fishermen data.

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P8. Gaps of maritime health research in Latin America — a literature review — *Olaf Jensen, University of Southern Denmark & IMHA-Research; Elpidia Frantzeskou, University of Athens, Greece; M. Luisa Canals, University of Cadiz, Spain and IMHA-Research; Despina Andrioti, University of Southern Denmark and IMHA-Research*

Background: So far the maritime health and safety research for seafarers and fishermen mainly comes from the industrial developed countries with sparse contributions from the developing countries. The aim was to give an overview of the peer reviewed research in Latin America to point out the needs for maritime health research in this part of the world.

Methods & Materials: PubMed, Google Scholar, SciELO - Scientific Electronic Library Online, Pan American Journal of Public Health, Medicina Maritima and other relevant journals in Latin America in the Spanish and English languages were searched.

Results: 57 peer-reviewed articles only on fishermen's health and safety were eligible and included. There were none for seafarers and none for fatal accidents in fishing and seafaring Brazil counted for the main part $n=39$, while each of the other countries had 0-4 studies. The study objectives include occupational injuries, divers disease, skin diseases, hearing loss and other issues. The cross-sectional studies include especially ergonomic problems and environmental pollution. Studies on fatal accidents are absent in fishing and seafaring as well

Conclusions: Most of the studies are concern with health problems, like in other parts of the world, while some health problems are specifically related to the tropic areas. More studies are needed on seafaring and fishing for the prevention of health risks among fishermen and seafarers in Latin America.

P9. Establishing Standards for Observer Safety — *Dale Jones, U.S. National Marine Fisheries Service*

Fisheries observers face a very challenging set of work place conditions. While working alongside people engaged in commercial fishing, one of the world's most hazardous occupations, they are subject to the same or comparable threats to their health, safety and welfare. Observers may also work within somewhat isolated or hostile environments. Maintaining a comprehensive, credible and reliable set of standards for observer safety is paramount to assuring that everything that can be done is being done to promote the highest possible level of safety for and by them.

The National Marine Fisheries Service (NMFS) works in collaboration with a number of observer service providers

to assure adequate coverage needed to meet the regulatory requirements for approximately 40 domestic commercial fisheries. NMFS observer coverage requirements generate the staffing need for as many as 900 fisheries observers and nearly 74,000 annual observer sea days. In addition to staffing for U.S. domestic fisheries, NMFS is party to at least 6 international conventions and treaties with international observers deployed in non-U.S. fisheries in the international forum.

NMFS is very concerned about assuring that we identify and implement viable approaches to enhancing and establishing the highest level of standards for observer health and safety. To assure that we are able to meet these expectations, NMFS has taken on the challenge of updating and improving the established national observer safety practices and guidelines. The result will be the creation of a more comprehensive and standardized set of safety measures within the parameters of observer training, communications, equipping, reporting, fitness (medical and physical), staffing and other related areas.

The management related areas of planning, policy development, regulatory actions and contracted service provisions may also greatly and positively influence the actions that contribute to assuring the delivery of a safer outcome for observers. The assessment of other factors associated with each fishery, in terms of its international, national and regional characteristics, such as cultural influences or unique fishery specific practices and conditions, are also important factors that will be considered.

This presentation will provide an overview of the various safety considerations and categories that NMFS has identified and is incorporating into its set of Observer Safety Standards. It will also include comment on the approach to "self-assessment" that NMFS is implementing for its various observer programs and on some of the approaches taken to get to this point.

P10. Seafood Worker Health and Safety Surveillance in Gulf Coast Communities — *Andrew Kane, Southeastern Coastal Center for Agricultural Health and Safety and University of Florida; Robert Durbin, Kentucky State University; Melvin Myers, Emory University*

Surveillance studies with Gulf coast fishers, crabbers, shrimpers, and oyster and clam harvesters are underway to identify risk factors associated with fatal and non-fatal injuries where the majority of workers are self-employed and uninsured. Community partnerships highlight the importance of engaging with seafood workers to implement an in-person questionnaire tool supplemented with workplace observations on harvesting and fishing vessels. Falls overboard and winch injuries are associated with many of the fatalities and severe injuries reported.

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Musculoskeletal injuries, cuts and lacerations, bites, spine punctures, and heat and sun exposure are also concerns for these workers. Conditions associated with unstable work platforms in harsh settings, coupled with declining fisheries – related in part to climate and environmental change – appear to increase risk of onboard incidents, drug use and mental health issues. Surveillance data will guide the development of interventions and outreach tools to support Gulf coast seafood worker health and safety.

P11. Safety Effects of Property Rights Contract Changes: Evidence from Field Experience in Fisheries —

Akbar Marvasti, U.S. National Oceanic and Atmospheric Administration

I measure the effect of contract changes on selected fishery resources in the Gulf of Mexico (GOM). I apply the difference-in-difference approach to commercial fishery panel data. My cross-sectional units use the red snapper and grouper-tilefish fisheries as treatment groups and the shrimp fishery as the control group. The results show that the grouper-tilefish individual fishing quota has improved commercial fishing safety in the GOM. The lack of an effect from the red snapper individual fishing quota program seems to be due to interrelatedness and economies of scope stemming from the multispecies nature of reef fish fishery in the GOM.

P12. Stakeholders to the quality of future accident reporting from fisheries and aquaculture —

Edgar McGuinness, Norwegian University of Science and Technology

Fisheries and aquaculture are dangerous professional callings, yet despite almost ubiquitous recognition of this, we still actively learn, know or understand very little regarding their accident occurrences. The majority of current injury statistics arising from sparse details recorded in self-completed reporting forms. These basic formats ultimately determine the extent of our accident understanding; the parameters to be probed; and the extent of preventative learning. These question formats having been adopted some time distant, have failed to progress with time or investigative methodologies, are ineffectual, insufficiently detailed orientated, and incapable of capturing the range of conditions for recording knowledge for posterity. Leaving international maritime accident learning rooted in a traditional, poorly conceived approach to minimal recording and management of data.

As such, the paucity of current knowledge and accident understandings, presents a significant barrier to the prevention of accident reoccurrences. This knowledge

purports the development of a future orientated, format for fisheries accidents application, rationalization of content, and promotion of additional research topics, to extend learning potential. However, such an approach must balance the requirements of the various stakeholders to the reporting system from governmental outputs to fisher's input requirements. It must also balance the desires of researchers for supporting information about the content, context and influences affecting fisheries accidents with the knowledge, skills and abilities of those reporting to provide it. This work therefore looks to identify the specific requirements of each party and to temper that which is required from that which could be beneficial to know moving forward.

P13. Commercial Fishermen Safety in Uncertain Times: Insights from Interviews of the Northeast Multi-Species Groundfish Fishermen —

Tammy Murphy and Maria Vasta, U.S. National Marine Fisheries Service

Commercial fishing is among the most dangerous occupations in the US; its annual fatality rate consistently exceeds the national average. The Northeast Groundfish Trawl fleet suffered the highest fatality rate from 2005-2014 of all federally managed fleets in the region. Marked changes have occurred in the groundfish fishery since the implementation of Amendment 16 to the fishery's Federal Management Plan (FMP) in May 2010. The 2006 reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act required the implementation of Annual Catch Limits and Accountability Measures in the fishery. At the same time, the primary management framework for the fishery moved from the effort control based Days at Sea system to catch share management, which allocates fishing quota to entities called sectors. Sectors are groups of fishing vessels that receive Annual Catch Entitlements (quota) for 10 of 13 groundfish species in the FMP and are exempt from many of the traditional effort controls. Vessels that are not enrolled in sectors are in the "common pool" and each is constrained by traditional effort measures designated in the FMP.

The transition to sector management and quota changes for key groundfish species have coincided with a number of compositional changes and decreasing socio-economic performance for the fishery. Some groundfish permits holders have stopped actively fishing and instead lease out their harvest shares, some have switched target species, some have expanded their portfolios to include other fisheries, and some have exited the fishery industry altogether.

From June 2013-September 2014, sixty-three interviews were conducted in person with groundfish fishery partici-

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pants in several New England ports to better understand the factors influencing the decision to cease or continue actively fishing for groundfish. This poster presents some findings from these interviews, focusing on safety-related factors that contributed to fishermen's decision to transition out of the active groundfish fishery.

P14. Unintended consequences of observer coverage on fishing safety on the West Coast —

Lisa Pfeiffer, U.S. National Marine Fisheries Service

Policy not directly intended to affect fishing safety can have unforeseen consequences. One example is in the West Coast Groundfish Trawl fishery, where a catch share program implemented in 2011 required 100% observer coverage. The companies providing the observers bill on a 24-hour time clock, starting at midnight. This incentivized midnight departures, especially as a subsidy intended to ease the transition to 100% observer coverage decreased. We demonstrate that there are some West Coast ports where departing port at ideal tide conditions is important, and that the billing policies of the observer companies have increased the propensity for fishermen to leave port at less-than-ideal port conditions. We find that smaller vessels, which pay a larger percentage of their revenue for observer coverage, are more affected than larger vessels. These smaller vessels are also expected to be more vulnerable to dangerous tide conditions and bar crossings.

P15. Women-guardians of Health and Wellness: Scenes from Haiyan in the Philippines —

Marieta Bañez Sumagaysay, University of the Philippines Visayas and UPV Tacloban College

The study locale is the coastal municipality of Tanauan, province of Leyte, Philippines which was worst hit by supertyphoon Haiyan on November 2013. It identified the health-related roles of women fishers; determined the constraints and facilitators in the access to and delivery of health and wellness services during the rescue and relief phases after disaster; and heard/documented the voices of women fishers who took care of the family's and community's health needs. It also generated elements of a disaster-readiness and response plan of action for health wellness based on the women fishers' lived Haiyan experiences. Key Informant Interviews, Focus Group Discussions, and Psychological First Aid Sessions were conducted. Data was analyzed from the standpoint of women fishers who survived Haiyan. Various women fishers' roles were identified: nursing mothers feeding others' babies, mother substitutes for dead/missing

parents, women leaders in the village (barangay), community women health workers, women prayer leaders, single moms in extended families, and others. Medical/health concerns attended to by the women fishers included the lack of safe drinking water, deteriorating environmental sanitation, mental health problems, and poor state of evacuation centers. Access and delivery of health and wellness services faced constraints such as unpassable roads, absence of electricity, damaged health facilities, and poor coordination of response units. There were, however, facilitators like early response, presence of international organizations, strong leadership in fishing villages, and cooperation led by women fisher-leaders. Based on evidences generated from the fishing communities, the elements of a community-based health service disaster management plan are identified. These included: accurate and timely information, responsive evacuation center, pre-arranged pooling of resources or agreements for resource sharing, enhanced skills of fishers, and coordination among preselected food hubs/health stations/relief centers. Moreover, it was observed that Haiyan strengthened the voluntarism, altruism, and others-centeredness among survivors, as displayed by the women fishers.

END OF POSTER ABSTRACTS

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KEYNOTE SPEAKERS (MORNING)

Jennifer Lincoln — *"What I've learned about safety from listening to fishermen"*



As a dedicated Injury Epidemiologist with the National Institute for Occupational Safety Health (NIOSH), Dr. Lincoln serves as both the Director of the Center for Maritime Safety and Health Studies and Associate Director for Science for the NIOSH Western States Division. For the last twenty-five years, she has continually worked to provide scientific research and leadership to develop tailored risk-reduction interventions for high-risk work, especially in the prevention of traumatic injuries among workers in the commercial fishing industry. Her efforts, in partnership with the U.S. Coast Guard, have led to a substantial decline in commercial fishing deaths. Dr. Lincoln received her Ph.D. from Johns Hopkins University School of Public Health, is a Certified Safety Professional (CSP), and serves as a Captain in the U.S. Public Health Service.

Sandra Alnutt — *"The Cape Town Agreement of 2012: Raising the standards for fishing vessel safety"*



Mrs. Sandra Rita Alnutt graduated from the Polytechnic School of the University of São Paulo (Brazil) in 1993, as a Naval Architect and Marine Engineer. Upon graduation, she started further studies to obtain a Master of Science degree on Ship Hull Structures at the aforementioned university, and at the same time started her career as an Assistant Professor at the College of Technology of Jahu, in the State of São Paulo. In 1996, she completed a specialization course in Japan (Yokohama), on Ship Safety and Marine Pollution Prevention, granted by the Japan International Co-operation Agency (JICA). In 1998, after conclusion of her Master of Science degree on Ship Hull Structure, she went to Sweden, where she studied for a new Master's degree on Maritime Safety and Environmental Protection, at the World Maritime University (WMU). In 1999, after receiving her second Master's degree, she started working for Lloyd's Register of Shipping, in Denmark (Copenhagen), as a Structural Plan Approval Surveyor. In 2001, Mrs. Alnutt moved to Germany (Hamburg), where she worked for Germanischer Lloyd, first in Ship Hull Structure plan approval, and later on Tonnage and Load Lines plan approval, until her appointment to the International Maritime Organization (IMO) as the Secretary of the Sub Committee on Fire Protection in 2005. After working for 5 years serving the FP Sub-Committee, she took over the Sub-Committee on Stability and Load Lines and on Fishing Vessels Safety (SLF) until the restructuring of the sub-committees, when she became the Secretary of the Sub-Committee on Ship Design and Construction (SDC). Currently, she supervises the work of the Ship Systems and Equipment (SSE) and SDC Sub-Committees and GBS matters.

KEYNOTE SPEAKERS (AFTERNOON)

Mohamed Jeebhay — *"Occupational health and safety in the South African seafood industry – a developing country perspective"*



Professor Mohamed Jeebhay is an Occupational Medicine specialist, and holds joint appointments as Head of the Occupational Medicine Division in the School of Public Health and Family Medicine as well as the Department of Medicine at the University of Cape Town (UCT). He is a fellow of the Collegium Ramazzini, an international academy of internationally renowned fellows in occupational and environmental health. The National Research Foundation of South Africa has rated him as an internationally acclaimed research scientist. He leads the research programme in the Centre for Environmental and Occupational Health Research at UCT on occupational allergens and asthma with a major focus on environmental risk factors and preventive approaches for work-related allergy and asthma. He serves as editorial board member of the Journal of Current Allergy and Clinical Immunology and the African Journal of Thoracic and Critical Care Medicine.

Ingunn Marie Holmen — *"Health and safety measures in the Norwegian fishing fleet"*



Ingunn Marie Holmen is a senior scientist with SINTEF Ocean, as well as a Ph.D. candidate at the Norwegian University of Science and Technology (NTNU). Holmen has been with SINTEF for the last twenty-five years focusing on occupational safety and health for workers in extreme environments, with the last six years specializing in safety and risk management for both fisheries and aquaculture. Her current work centers on the topic of "Safety and risk management in exposed aquaculture operations." Holmen has published numerous papers and presented on fatal and non-fatal injury, risk assessments, reducing risk through automation, fatigue and sleep disturbances, and other topics in aquaculture and commercial fishing. She won the Norwegian Design Council's Award for Design Excellence in 2007 for the Regatta Fisherman, outerwear created for commercial fishermen, with built-in buoyancy and a sleek design to help mitigate the chance of gear entanglement. Holmen holds a degree from the Norwegian Institute of Technology (NTH) in Biophysics and medical technology.

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SESSION 1A — WEATHER AND FISHING SAFETY

Fishing is globally recognized as a highly dangerous occupation. Many studies allude to the role of weather as an important hazard in fishing safety. However, few studies have systematically examined the relationship between weather, weather forecasting and fishing safety and ways to mitigate risk. This session will present findings from two multidisciplinary initiatives focused on studying the relationship between weather and fishing safety including one that is seeking to also develop strategies to reduce weather-related risk.

1A.1 Studying weather and fishing safety using mixed methods — *James Shewmake, Barbara Neis and Joel Finnis, Memorial University; Ronald Pelot, Dalhousie University*

This presentation outlines a mixed methods research design developed to address this gap in the literature. This research is being done in collaboration with, and with partial support from, the Newfoundland and Labrador Fish Harvesting Safety Association. One method uses gridded vessel traffic data and an array of available and modelled weather data to explore the potential for developing a climatology of weather and traffic based on the spatial and temporal variability of weather hazards, seasonality of fishing effort, and how the two interact. We are looking for “thresholds of behaviour”, i.e. indicators of relationships between fishing vessel traffic activity and weather conditions relative to current forecast warning criteria in Canada. The second part of the study uses qualitative techniques (interviews, participatory mapping and direct observation) with skippers in the small-scale fleet to deepen our understanding of how they navigate weather-related risks. The third part uses interviews with forecast producers and an additional set of interviews with users to contrast current practices of forecast production, communication, and application in a hazard-rich cold-ocean environment with harvester needs.

1A.2 A climatology of marine weather hazards and fishing traffic — *James Shewmake and Joel Finnis, Memorial University; Ronald Pelot, Dalhousie University*

Recent research on extreme marine weather events and vessel traffic suggests that, for the most part, fishing activity decreases relative to the worst of weather conditions. This research refines these general findings by mapping weather conditions based on the forecast warning system onto forecast and fishing activity zones and seasons in order to evaluate 1) how suitable the current weather watch and warning thresholds are at deterring fish harvesters from fishing in hazardous weather condition; and 2) how this might vary spatially across the study area, both near

and away from shore, and temporally across the fishing season.

1A.3 Navigating risk — *James Shewmake, Barbara Neis, Memorial University*

We will present findings from interviews with fish harvesters indicating that fishing activity is highly sensitive to particular weather hazards, notably wind and sea state, with thresholds varying by vessel size and frequency of events varying by season. We document the expertise held by fish harvesters and the challenges they navigate to practice their trade including those related to forecasting.

1A.4 Marine forecast production and application in Atlantic Canada — *Joel Finnis, Barbara Neis, and Memorial University*

We will look at ways practitioners and end-users think about marine forecasting, balance observations and predictions, and adjust behavior in response to critical events. Marine forecasts remain a key tool for mitigating the impact of weather hazards, while informing risk-based decision-making. It is not clear that marine forecast production and use are always evolving together, particularly in sectors with limited direct contact with meteorological service providers. The presentation draws on findings from roundtable discussions and a dozen semi-structured interviews with forecast producers and fish harvesters. We look at ways practitioners and end-users think about marine forecasting, balance observations and predictions, and adjust behavior in response to critical events. James Shewmake will round out this part of the session by talking about the benefits of this mixed methods approach and discussing strategies and tools developed to mobilize lessons learned from this research among key stakeholder groups including particularly fish harvesters.

1A.5 Impact-based indices: Dangerous seas, initial work to develop a Dangerous Sea Index — *Devon Telford, Environment and Climate Change Canada*

This presentation describe a graphical index combining atmospheric and oceanic factors to identify areas that are favorable, uncomfortable and dangerous dependent on the vessel class and gear type/vertical center of gravity. Fishing vessels will be subdivided by class (A, B, C and D) which correspond to their maximum lengths and also subdivided by vessel activity, steaming vs fishing. The author will then survey contributing factors that create an unsafe and dangerous environment for Mariners for each class and activity, such as: breaking wave height, wave steepness with respect to vessel length, angle of maxi-

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mum heel with respect to wave height and period, and this may be expanded to include wind speed, vessel icing, type and presence of sea ice and visibility restrictions. This project is part of the ECCC-NOAA Bilateral Marine Services Collaborations 2016-18 Work Plan.

9:00-10:30, A1046

SESSION 1B — UNDERSTANDING INJURY IN THE FISHING SECTOR

1B.1 Injury and injury treatment in US west coast Dungeness crab fishing — *Viktor Bovbjerg, Laurel Kincl, Kaety Jacobson, Amelia Vaughan, and Sabrina Pillai, Oregon State University; Devin Lucas, U.S. National Institute for Occupational Safety and Health*

Background: Historically, injury surveillance in US fisheries has relied heavily on vessel casualty and disaster reports from the US Coast Guard. These reports are invaluable, but are likely to preferentially identify more serious injuries.

Methods: To describe the range of commercial fishing injuries, we conducted a pre-season survey of Dungeness crab fishermen in the US states of Washington, Oregon, and California. We characterized injuries and injury treatment, and contrasted treatment by whether or not injuries limited work. Treatments were classified as none, first aid (i.e. self- or crew-care only), clinical care (any clinical care short of emergency care), and emergency care (e.g. Coast Guard medical evacuation).

Results: Of 426 respondents, 91 (21.3%) reported a fishing-related injury during the previous 12 months; 50 of the 91 injuries (54.9%) were reported as limiting work activity (i.e. modification or cessation of work). Injuries included 38 sprains/strains/bruises, 26 lacerations/puncture wounds, 9 fractures, 2 burns, 2 hernias, and 11 "other" injuries; incidents with multiple injuries (e.g. fracture with puncture wound) were classified in every category that applied. Injury treatment was classified as "none" for 35 injuries (38.5%), 1st aid for 32 (35.2%), clinical care for 17 (18.7%), and emergency care for 3 (3.3%). Unsurprisingly, injuries classified as receiving no care were less likely to be limiting (14, 40.0%) than those receiving care (34, 66.7%; $\chi^2=6.0$, $p=0.014$).

Conclusions: On our survey, approximately 1 in 5 Dungeness crab fishermen reported an injury during the previous year. Consistent with findings in other occupations, the majority of injuries were of relatively low acuity and required no more than first aid. Over half, however, resulted in at least temporary work limitation, and 1 in 5 received clinical care. Injury surveillance systems that capture multiple sources of data are likely to paint the most representative picture of commercial fishing injuries.

1B.2 Factors associated with crewmember survival of cold water immersion due to commercial fishing vessel sinkings in Alaska — *Samantha Case, Devin Lucas, Jennifer Lincoln, and Joanna Watson, U.S. National Institute for Occupational Safety and Health (NIOSH)*

Background: While policies and targeted safety initiatives have contributed to improved safety in the US fishing industry, occupational fatality surveillance has identified that fishing vessel disasters, such as sinkings and capsizings, continue to result in the most deaths among crewmembers. When a fishing vessel sinks at sea, crewmembers are at risk of immersion in water and subsequent drowning.

Methods: This study examined survival factors for crewmembers following cold water immersion after the sinking of decked commercial fishing vessels in Alaskan waters during 2000–2014. Victim and survivor data were obtained from the Commercial Fishing Incident Database (CFID). Two immersion scenarios were considered separately: immersion for any length of time, and long-term immersion lasting over 30 minutes. Logistic regression was used to predict the odds of crewmember survival.

Results: Of the 617 crewmembers onboard 187 fishing vessels that sank in Alaska during 2000–2014, 557 (90.3%) survived and 60 died. Nearly half of crewmembers with known immersion data were able to avoid immersion completely by abandoning to land or rescue platforms (e.g., helicopter, other vessel), and all but one survived. For crewmembers immersed for any length of time, the significant adjusted predictors of survival were: entering a life-raft, sinking within three miles of shore, the sinking not being weather-related, and working as a deckhand. For crewmembers immersed for over 30 minutes, the significant adjusted predictors of survival were: wearing an immersion suit, entering a life-raft, working as a deckhand, and the sinking not being weather-related.

Conclusions: Primary prevention efforts should focus on vessel stability, watertight integrity, and safety management systems. However, in the event of a vessel sinking, the results of this analysis demonstrate that in situations where cold water immersion becomes inevitable, having access to well-maintained, serviceable lifesaving equipment and the knowledge and skills to use it properly are critical.

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1B.3 Health and safety in crab fishing — *Leonore Olsen, SINTEF Nord; Trine Thorvaldsen, SINTEF Ocean; Ingunn Marie Holmen, SINTEF Ocean; Ingeborg Ratvik, SINTEF Ocean; Leif Grimsmo, SINTEF Ocean*

Background and objective: The snow crab fisheries has for many years been important in Russia, USA and Canada. In recent years, some Norwegian vessels have started fishing for snow crab in the Barents Sea. The fishery for snow crab involves using pots, which historically is not a common fishing gear in the Norwegian deep-sea fishing fleet. In a research project aimed at developing new methods of production and new technological concepts, one objective is the elimination of unacceptable risk for crewmembers related to direct injuries as well as long term. Based on this, the presentation focuses on health and safety challenges as well as suggested improvements.

Methods: Two surveys were conducted amongst crewmembers on one crab vessel with a factory on board. Researchers also participated and observed work at sea, analyzed film material, interviewed the skipper and got input from a physical therapist in order to gain knowledge of potential risks and areas in need of improvement.

Results: The crew on board is young, with a high interest for fishing. They enjoy themselves at work and are positive to recommending crab fishing to others. Both in the factory and on deck several challenges related to safety and ergonomics were identified. Crew perform dangerous work operations and injuries involving fingers are common. Sufficient training has not been given to all crew members. Fishers in the factory perform physically straining work, with heavy lifting, pushing and pulling. For fishers on deck, the work is also straining and involves repetitive motions. The presentation will elaborate on these findings, as well as suggestions for improvements.

Conclusions: Due to high risk operations and work strain, there is need for several improvements to make Norwegian crab fishing safer for workers.

1B.4 Dive into the dangerous for a prosperous life : A case study from the sea cucumber fishing industry of Sri Lanka — *Ganeshan Nishanthan and D.C.T. Dissanayke, University of Sri Jayawardenepura, Gangodawila, Nugegoda, Sri Lanka*

The sea cucumber fishery has been practiced for several centuries in Sri Lanka. This study evaluates the different methods used to collect sea cucumbers and health issues faced by fishers in northern Sri Lanka using the data collected from September 2015 to October 2016 through direct observations, questionnaires and interviews. Sea cucumbers are collected primarily by SCUBA

diving (56.72%), Snorkeling (34.33%) and Gleaning (4.48%). Gleaning is entirely carried out by fisherwomen and their average monthly income is US\$ 50.00 ± 20.50. Normally 2 to 3 divers are onboard when SCUBA diving is carried out, but 5-7 divers are onboard when they do snorkeling. An average daily income of a snorkeling diver is US\$ 11.90±7.61. 4-5 cylinders are used by each SCUBA diver during a fishing trip and true fishing time varies from 30 to 45 minutes per tank. Both day and night diving are carried out by SCUBA divers and there are differences in fishing depth. Night fishing generates higher daily income (US\$ 23.74±11.90) than day diving (US\$ 21.50±10.34). Although, there are training facilities available for SCUBA divers, only 10.5% have professional training and paddy license. As a result of deep diving (20.18±8.90m) SCUBA divers are facing severe health related issues than gleaning and snorkeling fishers. It was found that 10.5% of SCUBA divers have experienced in decompression sickness (bends) which affects the central nervous system make them disabled and even death at least once in their lifetime. According to fishers interviewed only 10-20% chance is there to recover in such cases if proper treatment is given on time. However, due to lack of training and knowledge, most of the fishers got paralyzed or lost their lives. Therefore, it is a timely need to train sea cucumber fisher through several programs in order to act properly during health-related issues.

9:00-10:30, A1045

SESSION 1C — QUICK TAKES: SHORT TALKS ON A VARIETY OF TOPICS

1C.1 Navigating Health Insurance and Services with Members of the Fishing Community — *Gretchen Biesecker and Lauren King, Fishing Partnership Support Services*

Fishing Partnership Support Services (FPSS) serves commercial fishing workers and their families. Our innovative community-health-worker model employs Navigators, who live in the community and come from fishing families. In 2016, we received the Community Health Worker Program of the Year award from the Massachusetts Association of Community Health Workers. Our Navigators integrate services that are meaningful and relevant to the fishing industry, including assistance with health insurance and access to care, safety and survival trainings, as well as financial planning and wellness workshops, with the goal of enhancing the health of fishermen and their families. Our Navigators partner with health centers and healthcare providers, trauma counselors, universities, boat captains, the Coast Guard, and community leaders to develop and evolve programming and leverage community assets.

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In this presentation, we will focus on best practices in our community health work, highlighting:

1. Combining trust and training, including some of the key skills for Navigators;
2. Creative methods to engage hard-to-reach members of the fishing community.

FPSS has supported over 19,000 fishing families throughout New England with health insurance. Because many fishermen lack a regular source of care, FPSS helps consumers shop for and maintain coverage, access a primary care doctor, and understand their health coverage. Trained and trusted, they provide peer listening, social support, and linkages to mental health services. For instance, in New Bedford, MA, a Navigator serves as a trained peer recovery coach, helping to address the opioid crisis.

FPSS's outreach strategy depends on repeated contacts with consumers, who often carry suspicions of government requirements. Because of this challenge, our Navigators deliver much of their outreach where fishermen live and work: on the docks, at trade shows, at industry meetings, at other fishing events they attend, such as safety trainings. We look forward to learning more about other organizations' approaches.

1C.2 Clam Mariculture Safety in South Carolina: A Case Study — *Robert Durborow, Kentucky State University; Melvin Myers, Emory University; Andrew Kane, University of Florida, Gainesville*

In 2008, an investigation of clam mariculture safety practices was carried out at the onshore facility and onboard the harvest vessel of a coastal South Carolina clam mariculturist. Clam juveniles are stocked in polyester mesh bags and staked in a shallow estuarine area (about 10 miles off shore, leased from the state of South Carolina) for about one or two years (longer in northerly climates) while they reach harvestable size. The owner relayed an incident about another clam harvester who was stung in the knee by a stingray. The injury was serious and caused the victim to miss work for 2 to 3 months. After this incident, most of the workers began wearing reef boots (heavy rubber boots that go above the knee). The owner identified the following as the most dangerous tasks in his clam mariculture work:

- working around grading tumblers used for size-grading and cleaning clams;
- working around water, even though the water tends to be shallow (around 4 feet deep) and their boats are self-bailing; and

- driving boats at high speeds to and from the estuarine grow-out areas avoiding multiple sand bars enroute.

A neoprene wet suit and gloves are worn by workers who go in the water to prevent scrapes and cuts from clams and barnacles that grow on PVC markers. A water pump (that gets very hot) is used to spray water over bags to clean mud from the clams. This cleaning procedure is more efficient than the older strenuous technique of moving the clam bag to flush out the mud and helps to prevent fatigue and muscle strain. Use of a pulley on a metal boom provides leverage when lifting clam bags from the water and suspending them during the spray cleaning, which also avoids muscle fatigue and strain.

1C.3 All-Cause Mortality of Commercial Fishermen in Massachusetts — *Scott Fulmer and Shruti Jain, University of Massachusetts Lowell*

As commercial fishing in the US has been the subject of study to better understand occupationally-related fatality rates for the development of surveillance to track geographical and fishery-specific differences in fatality rates, most prior occupational health studies in commercial fishing in the US have focused on occupational events, rather than on all causes mortality. There have been a few studies that examined occupational disease causality among fishermen, but these have tended to be European or Canadian, and have not used data from the US fisheries.

More recently, in the United States, there has been attention to opioids in the general population, and the fishing industry, in particular. In Massachusetts, for example, naloxone use has been introduced into commercial fishing safety trainings, as well as a few community-based prevention projects aimed to understand and reduce opioid and other drug abuse among commercial fishing industry workers in Massachusetts. Some researchers have attempted to quantify the contribution of occupational exposures to opioid-related fatalities, a very important pathway that assumes exposure to risk for non-fatal injury leading to use of prescription opioids, then to addiction and death by overdose.

This study examined all-cause mortality of commercial fishermen in two Massachusetts communities, 2000-2014, to determine whether there are diseases or causes, including suicide, liver disease, overdose to opioids, or specific cancers, that occur at a higher-than-expected rate in this occupational group. Death certificate data, obtained from the Massachusetts Department of Public Health, listing deaths from

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the fishing ports of Gloucester and New Bedford, Massachusetts, were grouped into fishermen and non-fishermen, and matched by place or residence of death, month of death, and age at death. Proportional mortality rates were examined to determine whether specific causes were higher among fishermen than expected from the non-fishermen data.

1C.4 Gaps of maritime health research in Latin America — a literature review — *Olaf Jensen, University of Southern Denmark & IMHA-Research; Elpida Frantzeskou, University of Athens, Greece; M. Luisa Canals, University of Cadiz, Spain and IMHA-Research; Despina Andrioti, University of Southern Denmark and IMHA-Research*

Background: So far the maritime health and safety research for seafarers and fishermen mainly comes from the industrial developed countries with sparse contributions from the developing countries. The aim was to give an overview of the peer reviewed research in Latin America to point out the needs for maritime health research in this part of the world.

Materials and Methods: PubMed, Google Scholar, SciELO - Scientific Electronic Library Online, Pan American Journal of Public Health, Medicina Maritima and other relevant journals in Latin America in the Spanish and English languages were searched.

Results: 57 peer-reviewed articles only on fishermen's health and safety were eligible and included. There were none for seafarers and none for fatal accidents in fishing and seafaring Brazil counted for the main part $n=39$, while each of the other countries had 0-4 studies. The study objectives include occupational injuries, divers disease, skin diseases, hearing loss and other issues. The cross-sectional studies include especially ergonomic problems and environmental pollution. Studies on fatal accidents are absent in fishing and seafaring as well.

Conclusions: Most of the studies are concern with health problems, like in other parts of the world, while some health problems are specifically related to the tropic areas. More studies are needed on seafaring and fishing for the prevention of health risks among fishermen and seafarers in Latin America.

1C.5 Establishing Standards for Observer Safety — *Dale Jones, U.S. National Marine Fisheries Service*

Fisheries observers face a very challenging set of work place conditions. While working alongside people engaged in commercial fishing, one of the world's most hazardous occupations, they are subject to the same or comparable threats to their health, safety and welfare. Observers may also work within somewhat isolated or hostile environments. Maintaining a comprehensive, credible and reliable set of standards for observer safety is paramount to assuring that everything that can be done is being done to promote the highest possible level of safety for and by them.

The National Marine Fisheries Service (NMFS) works in collaboration with a number of observer service providers to assure adequate coverage needed to meet the regulatory requirements for approximately 40 domestic commercial fisheries. NMFS observer coverage requirements generate the staffing need for as many as 900 fisheries observers and nearly 74,000 annual observer sea days. In addition to staffing for U.S. domestic fisheries, NMFS is party to at least 6 international conventions and treaties with international observers deployed in non-U.S. fisheries in the international forum.

NMFS is very concerned about assuring that we identify and implement viable approaches to enhancing and establishing the highest level of standards for observer health and safety. To assure that we are able to meet these expectations, NMFS has taken on the challenge of updating and improving the established national observer safety practices and guidelines. The result will be the creation of a more comprehensive and standardized set of safety measures within the parameters of observer training, communications, equipping, reporting, fitness (medical and physical), staffing and other related areas.

The management related areas of planning, policy development, regulatory actions and contracted service provisions may also greatly and positively influence the actions that contribute to assuring the delivery of a safer outcome for observers. The assessment of other factors associated with each fishery, in terms of its international, national and regional characteristics, such as cultural influences or unique fishery specific practices and conditions, are also important factors that will be considered.

This presentation will provide an overview of the various safety considerations and categories that NMFS has identified and is incorporating into its set of Observer Safety Standards. It will also include comment on the approach to "self-assessment" that NMFS is implementing for its various observer programs and on some of the approaches taken to get to this point.

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1C.6 Seafood Worker Health and Safety Surveillance in Gulf Coast Communities — *Andrew Kane, Southeastern Coastal Center for Agricultural Health and Safety and University of Florida; Robert Durborow, Kentucky State University; Melvin Myers, Emory University*

Surveillance studies with Gulf coast fishers, crabbers, shrimpers, and oyster and clam harvesters are underway to identify risk factors associated with fatal and non-fatal injuries where the majority of workers are self-employed and uninsured. Community partnerships highlight the importance of engaging with seafood workers to implement an in-person questionnaire tool supplemented with workplace observations on harvesting and fishing vessels. Falls overboard and winch injuries are associated with many of the fatalities and severe injuries reported.

Musculoskeletal injuries, cuts and lacerations, bites, spine punctures, and heat and sun exposure are also concerns for these workers. Conditions associated with unstable work platforms in harsh settings, coupled with declining fisheries – related in part to climate and environmental change – appear to increase risk of onboard incidents, drug use and mental health issues. Surveillance data will guide the development of interventions and outreach tools to support Gulf coast seafood worker health and safety.

1C.7 Gear Modification to Prevent Injuries of Dungeness Crab Fishermen — *Laurel Kincl, Viktor Bovbjerg, Kaety Jacobson, Amelia Vaughan, and Melissa Myers, Oregon State University*

The Fishermen Led Injury Prevention Program (FLIPP) includes public health researchers, Oregon Sea Grant Extension and FLIPP community researchers in partnership with NIOSH. FLIPP is engaging fishermen in research to understand high risk tasks, safety perceptions, and injury prevention opportunities. The FLIPP survey of crabbing-related injuries and fishermen's insights on safety was administered in person along the West Coast just before the 2015-16 crab season. Just before the 2016-17 crab season, FLIPP had conversations with fishermen about survey results to solicit ideas for injury prevention. With 436 fishermen surveyed, the majority of limiting injuries (88%) occurred with deckhands. The most common were sprains and strains (36%) and most were associated with handling, hauling, and setting crab pots (72%). Feedback from fishermen provided an idea for an engineering control related to handling crab pots. A gear modification referred to as a "banger bar" adds padding and a stop bar to the sorting table that a retrieved pot can be tipped

and banged against to release the crab. Potential benefits include reduction of awkward postures, forceful exertions and repetitive motions, but the system might affect production and introduce pinch point hazards. After exploring the idea with our community researchers, we learned more information about the use, purpose, and limitations of such a system. We identified factors related to designing for broader use since all vessels, decks and sorting tables vary. In addition, FLIPP conducted a poll through the Oregon Sea Grant Facebook page to solicit input from stakeholders. Sixty people responded to the poll with 78% saying they have used a banger bar. Of 43 comments received, 60% said bars helped dumping pots and/or improved safety. FLIPP would like to learn from others with experience with crab fishing about gear modifications or other solutions that could prevent injuries to deckhands.

1C.8 Safety Effects of Property Rights Contract Changes: Evidence from Field Experience in Fisheries — *Akbar Marvasti, U.S. National Oceanic and Atmospheric Administration*

I measure the effect of contract changes on selected fishery resources in the Gulf of Mexico (GOM). I apply the difference-in-difference approach to commercial fishery panel data. My cross-sectional units use the red snapper and grouper-tilefish fisheries as treatment groups and the shrimp fishery as the control group. The results show that the grouper-tilefish individual fishing quota has improved commercial fishing safety in the GOM. The lack of an effect from the red snapper individual fishing quota program seems to be due to interrelatedness and economies of scope stemming from the multispecies nature of reef fish fishery in the GOM.

1C.9 Stakeholders to the quality of future accident reporting from fisheries and aquaculture — *Edgar McGuinness, Norwegian University of Science and Technology*

Fisheries and aquaculture are dangerous professional callings, yet despite almost ubiquitous recognition of this, we still actively learn, know or understand very little regarding their accident occurrences. The majority of current injury statistics arising from sparse details recorded in self-completed reporting forms. These basic formats ultimately determine the extent of our accident understanding; the parameters to be probed; and the extent of preventative learning. These question formats having been adopted some time distant, have failed to progress with time or investigative methodologies, are ineffectual, insufficiently detailed orientated, and incapable of capturing

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ing the range of conditions for recording knowledge for posterity. Leaving international maritime accident learning rooted in a traditional, poorly conceived approach to minimal recording and management of data.

As such, the paucity of current knowledge and accident understandings, presents a significant barrier to the prevention of accident reoccurrences. This knowledge purports the development of a future orientated, format for fisheries accidents application, rationalization of content, and promotion of additional research topics, to extend learning potential. However, such an approach must balance the requirements of the various stakeholders to the reporting system from governmental outputs to fisher's input requirements. It must also balance the desires of researchers for supporting information about the content, context and influences affecting fisheries accidents with the knowledge, skills and abilities of those reporting to provide it. This work therefore looks to identify the specific requirements of each party and to temper that which is required from that which could be beneficial to know moving forward.

1C.10 Commercial Fishermen Safety in Uncertain Times: Insights from Interviews of the Northeast Multi-Species Groundfish Fishermen — *Tammy Murphy and Maria Vasta, U.S. National Marine Fisheries Service*

Commercial fishing is among the most dangerous occupations in the US; its annual fatality rate consistently exceeds the national average. The Northeast Groundfish Trawl fleet suffered the highest fatality rate from 2005-2014 of all federally managed fleets in the region. Marked changes have occurred in the groundfish fishery since the implementation of Amendment 16 to the fishery's Federal Management Plan (FMP) in May 2010. The 2006 reauthorization of the Magnuson-Stevens Fishery Conservation and Management Act required the implementation of Annual Catch Limits and Accountability Measures in the fishery. At the same time, the primary management framework for the fishery moved from the effort control based Days at Sea system to catch share management, which allocates fishing quota to entities called sectors. Sectors are groups of fishing vessels that receive Annual Catch Entitlements (quota) for 10 of 13 groundfish species in the FMP and are exempt from many of the traditional effort controls. Vessels that are not enrolled in sectors are in the "common pool" and each is constrained by traditional effort measures designated in the FMP.

The transition to sector management and quota changes for key groundfish species have coincided with a number of compositional changes and decreasing socio-economic performance for the fishery. Some groundfish permits holders have stopped actively fishing and instead lease

out their harvest shares, some have switched target species, some have expanded their portfolios to include other fisheries, and some have exited the fishery industry altogether.

From June 2013-September 2014, sixty-three interviews were conducted in person with groundfish fishery participants in several New England ports to better understand the factors influencing the decision to cease or continue actively fishing for groundfish. This poster presents some findings from these interviews, focusing on safety-related factors that contributed to fishermen's decision to transition out of the active groundfish fishery.

1C.11 Unintended consequences of observer coverage on fishing safety on the West Coast — *Lisa Pfeiffer, U.S. National Marine Fisheries Service*

Policy not directly intended to affect fishing safety can have unforeseen consequences. One example is in the West Coast Groundfish Trawl fishery, where a catch share program implemented in 2011 required 100% observer coverage. The companies providing the observers bill on a 24-hour time clock, starting at midnight. This incentivized midnight departures, especially as a subsidy intended to ease the transition to 100% observer coverage decreased. We demonstrate that there are some West Coast ports where departing port at ideal tide conditions is important, and that the billing policies of the observer companies have increase the propensity for fishermen to leave port at less-than-ideal port conditions. We find that smaller vessels, which pay a larger percentage of their revenue for observer coverage, are more affected than larger vessels. These smaller vessels are also expected to be more vulnerable to dangerous tide conditions and bar crossings.

1C.12 Increasing Adoption of Safety Technologies in Commercial Fishing — *Ted Teske, Tristan Victoroff, and Chelsea Woodward – U.S. National Institute for Occupational Safety and Health*

During 2000-2014, 81 commercial fishing deaths in the U.S. were from onboard injuries. 36% of those were the result of a winch entanglement. From 2000 to 2012, 9 of 36 winch entanglements were fatal in the Southern shrimp fleet (25%). The Alaska Fishermen's Fund shows the Northwest salmon seine fleet experienced fewer fatalities but high rates of winch-related injuries. Nonfatal entanglements can be severe and often career-ending. Such injuries can result in permanent disability, incur large medical expenses, and can affect a fisherman's lifelong earning capability.

NIOSH has developed engineering interventions to pre-

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vent or reduce the severity of winch entanglement injuries on specific vessels such as purse seine vessels in the Pacific Northwest and Alaska and on side-trawl shrimp vessels in the Gulf of Mexico. The Emergency Stop system for purse seine capstan winches has been commercialized for 10 years with minimal adoption by industry. NIOSH is also just concluding field work on static winch guards for drum winches and an auxiliary stop system for try-net winches on Gulf of Mexico shrimp vessels.

A new 4-year study will look at increasing the rate of adoption of these technologies by using the Diffusion of Innovation model and Grounded Theory methodology to identify barriers and facilitators to adoption among the target audiences for each technology. The research will then shift to developing, testing, and evaluating targeted interventions to address the barriers and leverage the facilitators with the goal of increasing the rate of adoption among the target audiences.

This presentation will discuss the state of adoption for these interventions and the development of the study design and methodology with a goal of gaining feedback from participants on similar studies and interventions in other fisheries or with other technologies in the global fishing industry.

9:00-10:30, A1043

SESSION 1D – MEDICINE AT SEA

1D.1 Safety, medical preparedness and response at sea and on shore — *Raymond Jarris MD and Ann Jarris MD, Discovery Health, LLC*

Fishing and fish processing is inherently dangerous work. The remoteness of being at sea or an isolated fish processing plant adds risk to the worker and owner of the vessel or plant. The maritime and food processing industries have made great strides in improving the risk of injury in the past decade. However, work remains to be done especially considering that illness constitutes a significant proportion of medical claims at sea.

Dr. Ray Jarris will present strategies for:

- Comprehensive Medical Risk Management for Employers
- Keeping fishers, processors and employees healthy!
- Screening of crew and employees to detect high-risk disease such as diabetes and hypertension and to ensure the worksite is prepared to manage known chronic disease.
- Design and supply of medical and first aid supplies
- Controlled substances management
- Access to AEDs and training for Sudden Cardiac Arrest

- Training of medical officers and first-responders
- Decreasing OSHA Recordables and Lost Time Incidents
- Reaching Maximum Medical Improvement
- The evolving legal landscape for US employers

Dr. Ann Jarris will present:

- Rationale and benefits of engaging a physician advisory service
- Importance of lowering barriers to utilization of physician advisory services and strategies to accomplish this
- Integrating physician case management with existing practices
- Selected cases demonstrating ROI for a comprehensive risk management service
- Retrospective review of injury and illness at sea
- Collaboration with NIOSH – new sources of data for research
 - Access to Ship's Medical Logs
 - Blinded medical consultation reports and case outcomes
- The unrealized present and future:
 - Onsite Testing (in addition to standard vital signs)
 - Dipstick Urinalysis
 - Fecal Occult Blood Testing
 - Glucose Monitoring
 - Pulse oximetry
 - Coumadin (Warfarin) monitoring
 - Email photographs
 - VideoTelemedicine when bandwidth allows

Questions to Audience – “what would you like to see if you have remote medical consultation available?; How do you see more benefit beyond what we have described?” The session leaders highly encourage audience participation and sharing of their challenges and success stories.

1D.2 When Bad Things Happen, What Medicines and Equipment do you NEED? — *R. Alan Davis, American Seafoods Company; Michael Lafferty, Lafferty EMS*

While everyone strives to avoid injuries and illnesses at sea, it is inevitable that crew members will get injured or become ill while far from assistance. While it would be nice to carry a Doctor and a Hospital full of medical supplies on our voyages, there are economic and space limitations that affect how broadly fishermen can prepare for Medical and Trauma Emergencies.

Worldwide much of the emphasis on Commercial Fishing Safety has been placed on the prevention of vessel losses and crew survival when such losses occur, but how

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many of our fishermen know how to help an injured or ill crewman and are equipped to do so? If the plan is simply to call for help when far from assistance, emergency care may arrive too late. We often operate hours OR DAYS from the nearest definitive medical assistance and sometimes simple, early interventions are the difference between life and death.

Given the broad range of fishing vessels and fisheries around the globe, our goal is to provide IFISH5 Attendees with the tools and resources they need to help determine reasonable levels of training and suggested medical supplies for fishing vessel owners and operators to maintain.

- Emergency Medical Training
- Medical References
- Medical supply Recommendations for vessels with:
 - 1&2 Crew
 - <5 Crew
 - <20 Crew
 - +100 Crew

10:45-12:15, A1049

SESSION 2A – EVALUATING THE EFFECTS OF FISHERIES MANAGEMENT MEASURES ON RISK-TAKING AND SAFETY IN COMMERCIAL FISHING: EFFORTS BY THE NATIONAL MARINE FISHERIES SERVICE

Commercial fishing is a dangerous occupation despite many regulatory initiatives aimed at making it safer. National Standard 10 of the Magnuson Stevens Act (MSA, the act governing fisheries management in the US) requires that conservation and management measures shall, to the extent practicable, promote the safety of human life at sea (MSA section 301(a)(10)). The fisheries management process can more explicitly address and promote safety through empirical research on the effects of management actions on safety. Research can be used to inform and evaluate proposed management measures, as well as develop additional guidance on ways to evaluate National Standard 10.

This session will describe a number of these empirical studies by researchers at the National Marine Fisheries Service (NOAA Fisheries). The individual studies are part of a national collaborative working group to contribute to the empirical evaluation of management actions on fishing safety. Catch shares management, or the individual allocation of tradeable fishing quota, is a key focus of this research. Catch shares fisheries are particularly relevant to this discussion because catch shares can improve safety by mitigating many of the problems associated with the competitive “race to fish” experienced in fisheries around the world. The competitive nature of such fisheries results in risky behavior such as fishing in poor weather, overloading

vessels with fishing gear, and neglecting maintenance. While not necessarily intended to address safety issues, catch shares can reduce many of the economic incentives to fish as rapidly as possible. However, many other types of regulations that affect the flexibility of fishing are also relevant and informative.

The presentations in this session will provide some examples of how researchers at the U.S. National Oceanic and Atmospheric Administration (NOAA) Fisheries evaluate past and proposed management actions on fishing safety, taking into consideration the economic decision-making that drives the choices that fishermen make.

2A.1 Risk assessments of fisheries to inform policy — *Deb Lambert*, NOAA Fisheries, Office of Sustainable Fisheries, and *Maria Vasta*, NOAA Fisheries, Northeast Fisheries Science Center

Commercial fishing remains a dangerous occupation despite many regulatory initiatives aimed at making it safer. There are a number of economic, environmental, regulatory, and cultural conditions that can influence fishermen's safety. One way to identify the major hazards and safety patterns present within a fishery is to conduct a risk assessment of that fishery. The results of this assessment can then be used to inform the development of tools and programs designed to reduce fishermen's level of risk exposure in that fishery. This presentation will begin with an overview of guidance that NMFS developed for conducting risk assessments, and will be followed by a case study risk assessment of the U.S. northeastern multispecies (groundfish) fishery.

2A.2 Towards a meta-analysis of the effects of catch share management on risk-taking in commercial fisheries — *Lisa Pfeiffer*, NOAA Fisheries, Northwest Fisheries Science Center

When fisheries management creates the incentive to “race for fish”, a fishing season can be reduced to only a few days and involve around-the-clock fishing in life-threatening weather conditions. Catch shares management, or the individual allocation of tradeable fishing quota, can improve safety by reducing economic incentives to fish as rapidly as possible. This presentation will discuss the modeling framework and established research that will serve as the basis for a series of case studies and a meta-analysis. The framework relies on identifying behavior that is “risky”, and modeling the effects that the policy has on risk-taking. In this case, we use the propensity to fish in poor weather conditions as a proxy for risk. One published case study shows that catch shares reduced fishing in poor weather by 79%.

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2A.3 Case studies on the transition to catch shares management in three fisheries — *Tess Petesch, NOAA Fisheries*

This presentation will describe the impact of transitions from derby fisheries to catch share management on risk-taking among commercial fishermen in three fisheries. One of the many results of catch share management has been a significant decrease in the speed and intensity of fishing and a lengthening of the fishing season. This is expected to increase safety in fisheries. We find supporting evidence in the Gulf of Mexico red snapper (2007) and grouper-tilefish (2010) fisheries, as well as the Northeast Atlantic sea scallop fishery (2010), although there are many management details fishery characteristics that influence the outcomes.

2A.4 Commercial Fishing Vessel Safety in the Northeastern U.S. Multispecies (Groundfish) Fishery: exploring whether catch share management makes a difference — *Tammy B. Murphy, NOAA Fisheries, Northeast Fisheries Science Center*

Safety outcomes are one measure of the performance of a commercial fishery. Catch share management, which allocates fishing quota to individual vessels or entities, may reduce economic incentives to engage in risky behavior in the “race to fish”. The Multispecies (Groundfish) fishery in the Northeast region of U.S. is considered one of the region’s most dangerous commercial fisheries and transitioned to partial catch share management in 2010. This presentation discusses a framework and ongoing empirical work to apply an established direct measure for risk-taking behavior and vessel safety to the Northeast Multispecies fishery. The objectives are to allow for empirical comparison across federally managed commercial fisheries within a region and throughout the U.S., and to identify factors that may contribute to sustained risk-taking behavior, regardless of management approach.

10:45-12:15, A1046

SESSION 2B – TRACKING INJURY IN THE FISHING SECTOR: TRENDS AND OPPORTUNITIES

2B.1 Work-related mortality in the US fishing industry — *Samantha Case, U.S. National Institute for Occupational Safety and Health (NIOSH); Devin Lucas, NIOSH*

Background: Commercial fishing continues to be one of the most hazardous occupations in the United States. However, published information on the burden and characteristics of fatal injuries has not been updated since 2009. The purpose of this study was to use updated fatality data to: 1) identify regional and fleet-specific hazards;

2) measure risk between fishing fleets; and 3) describe trends over the study period.

Methods: The National Institute for Occupational Safety and Health (NIOSH) developed the Commercial Fishing Incident Database (CFID) to collect data describing all fatal injuries in the US fishing industry. Fatalities that occurred during 2000–2014 were extracted from CFID (results including more recent years will be presented). A descriptive analysis was completed to explore the patterns and characteristics of fatalities. Fatality rates were calculated for fleets with available workforce estimates.

Results: During 2000-2014, 693 commercial fishing fatalities occurred in the United States. Vessel disasters (50%) and falls overboard (30%) were leading contributors to commercial fishing deaths. The East Coast experienced the most deaths (n=225), followed by Alaska (n=179), the Gulf of Mexico (n=164), and the West Coast (n=115). The highest number of fatalities occurred in the Gulf of Mexico shrimp fleet (n=83). The Atlantic scallop fleet achieved substantial declines in the risk of fatalities over the study period. However, fleet-specific fatality rates ranged from 26 to 549 deaths per 100 000 FTEs, many times higher than the rate for all US workers.

Conclusions: Although the number of fatalities among commercial fishermen in the United States has generally declined since 2000, commercial fishing continues to have one of the highest occupational fatality rates in the United States. The use of detailed surveillance data is critical in identifying priority hazards for specific fishing fleets to be addressed in order to reduce the number and rate of work-related deaths.

2B.2 Occupational accidents in the Norwegian fishing fleet 2000-2017 — *Ingunn Marie Holmen, SINTEF Ocean; Trine Thorvaldsen, SINTEF Ocean; Halvard Aasjord, SINTEF Ocean*

Working in fisheries is still the most risk exposed occupation in Norway, as well as globally (Jensen et al 2014). The number of injuries and fatalities are high in fishing compared to other occupations, and previous studies show that approximately 70% of all injuries occur on deck during fishing or production (Aasjord et al. 2012; McGuinness et al. 2013a&b). Furthermore, fishers are exposed to a combination of unfavorable exposures, including ship motions, cold and noise, heavy lifting, inconvenient working hours, long workdays and excessive strain (Thorvaldsen et al. 2016). Fatigue is also a challenge which may contribute to an increased risk level during fishing operations (Høvdanum et al 2014).

There are two main sources for detailed information on occupational accidents in the Norwegian fishing fleet. 1. The personal injuries statistics which is based on the acci-

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dents reported from the fishers to the Norwegian Maritime Authority. 2. A database of fatal accidents which is maintained by SINTEF Ocean, based on input from public media and public sources.

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Based on these two sources, an updated version of the occupational accident statistic in Norwegian fisheries during the years 2000-2017 will be presented. Accidents have been analyzed to update the annual trends, and the presentation will give some examples of the most recent occupational accidents in Norwegian fisheries. Direct and contributing causes for accidents will also be discussed. Thorough knowledge about causes for occupational accidents is valuable for the prioritization of preventive measures as well as development of safety barriers that may reduce the risk for accidents on board.

References:

Asjord HL, Holmen IM, Thorvaldsen T (2012). Occupational accidents and casualties in the Norwegian fishing fleet (In Norwegian). SINTEF report A23369. ISBN 978-82-14-05451-4.

Høvdanum AS, Jensen OC, Petursdóttir G, Holmen IM (2014). A review of fatigue in fishermen: a complicated and underprioritised area of research. *Int Marit Health* 65(3): 1-7.

Jensen OC, Petursdottir G, Holmen IM, Abrahamsen A, Lincoln J (2014). A review of fatal accident incidence rate trends in fishing. *Int Marit Health* 65(2): 47-52.

McGuinness E, Aasjord HL, Utne IB, Holmen IM (2013a). Injuries in the Commercial Fishing fleet of Norway 2000-2011. *Safety Science* 57: 82-99.

McGuinness E, Aasjord HL, Utne IB, Holmen IM (2013b). Fatalities in the Norwegian Fishing Fleet 1990-2011. *Safety Science* 57: 335-351.

Thorvaldsen T, Sørnvisen SA, Holmen IM, Øren A (2016). A study of Norwegian fishers' perception of the interaction between work, working environment and working health. (In Norwegian: Fiskerhelseundersøkelsen). SINTEF report A27653. ISBN 978-82-14-06079-9.

2B.3 Occupational safety issues of artisanal Hilsa (*Tenualosa ilisha*) fishermen in Southern Bangladesh — *Md. Sazedul Hoque, Patuakhali Science and Technology University; Martin Brakel, WorldFish Bangladesh and South Asia Office; Biplob Dey Mithun, Patuakhali Science and Technology University*

Bangladesh operates one of the largest single-species hilsa shad (*Tenualosa ilisha*) fishery in the world, especially in the southern Patuakhali and Barguna coastal districts and adjacent Bay of Bengal. The hilsa shad is predominantly artisanal gillnet and seine net fishery that

provides employment, income and livelihood to almost half million full-time fishers, who are regularly exposed to hazardous conditions at sea. Therefore, a study was conducted based on survey and available secondary data to identify different occupational hazards and safety issues faced by hilsa fishermen and potential interventions for improvement of safety at sea are suggested. The study identified cyclonic storms in high seas as the major natural hazards due to which large numbers of fishermen perish at sea every year. Overloaded fishing vessels, slipping/accidentally being swept into the sea and entanglement while hauling nets are also amongst safety concerns identified. In 2015, 35 hilsa fishing boats were lost and 300 fishermen stranded at sea and at least 21 fishermen died from a single village. Furthermore, fishermen attacks by pirates who engage in robbery and sequestration of fishermen for ransom, often killing their victims if the ransom is not paid. To ensure the sustainable hilsa production, the government of Bangladesh enforces seasonal hilsa fishing bans in designated hilsa sanctuaries and a blanket ban on catching juvenile hilsa. During the banning period, due to lack of alternative income and governmental support (Vulnerable Group Feeding), fishermen illegally do fishing for their living. In consequence, thousands of fishermen are arrested by police every year and punished, with gross violations of human rights and social safety being commonplace. Adequate governmental subsidies, maintenance of security by coast guard and navy, GPS, life jackets, navigating instruments and social awareness creation by NGOs could be possible interventions to improve occupational safety of hilsa fishermen in Bangladesh.

2B.4 Rates of fatalities and non-fatal occupational injuries in lobstering — *Scott Fulmer and Brian Buchholz, University of Massachusetts Lowell*

The objective of this study was to compile data for descriptive and analytic epidemiology of occupationally-related injury and mortality associated with lobstering in the Northeast United States. To accomplish this objective, information was collected from lobstermen in Maine and Massachusetts to estimate denominators (i.e. total occupational exposure to lobstering) and numerators (i.e. the frequency of non-fatal injury associated with lobstering) for the total Northeastern workforce and for important subgroups.

A survey sample of lobstermen was identified to collect data on occupational exposure. These survey data were used in conjunction with state licensing registries to estimate the total occupational exposure for the vessels in the region, and its seasonal, annual and geographic

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variation. The leading types of occupationally-related morbidity and mortality for the New England lobstering industry was also analyzed. The count of fatalities was obtained from the NIOSH database of U.S. Coast Guard reportable fatality data for the region to calculate the occupationally-related mortality rate. A modified Nordic Musculoskeletal Questionnaire was used to measure the prevalence and to indicate duration and severity of musculoskeletal disorders due to cumulative trauma or chronic pain. An additional questionnaire was used to identify the incidence of acute injuries.

The data show that the lobstering industry characteristically has high rates of injury, high prevalence of pain, and low rates of occupational fatalities compared to other commercial fisheries. The cohort suffered high rates of acute injury that varied little over the course of 4 years. The high prevalence of non-acute pain was similar in profile to the body locations of acute injuries, but not an exact reflection. Summer and fall were the most active seasons, while spring and summer had statistically higher prevalence of pain than fall. Injury rates were not significantly different between the states.

Methods: Two surveys were conducted amongst crewmembers on one crab vessel with a factory on board. Researchers also participated and observed work at sea, analyzed film material, interviewed the skipper and got input from a physical therapist in order to gain knowledge of potential risks and areas in need of improvement.

10:45-12:15, A1045

SESSION 2C – REGIONAL APPROACHES TO AQUACULTURE AND SEAFOOD PROCESSING

2C.1 Aquaculture occupational safety and health in Canada — *Barbara Neis, Memorial University; Christine Knott, Memorial University; J. Finnis, Memorial University; Zhiwei Gao, Memorial University; Lorenzo Moro, Memorial University; J. Santander, Memorial University; F. Kahn, Memorial University*

Occupational health and safety (OHS) issues within aquaculture encompass potential hazards within aquaculture from hatchery work through grow-out, processing and transport of fish and shellfish, as well as hazards associated with spatial and other overlaps between commercial fisheries and aquaculture. Finfish and shellfish aquaculture typically takes place in relatively remote coastal regions where OHS expertise is very limited, as is regulatory oversight. Neglect of safety and health can erode fishing and aquaculture enterprise profitability through the costs of compensation, insurance and fines. Injury and illness can also contribute

to labour turnover and shortages that, in turn, can affect the social license of operations within rural and remote communities where, as has been shown in the mining sector, local job opportunities are a key factor in local support. In extreme cases, failure to identify and eliminate or mitigate health and safety hazards can lead to increased risk of injury and occupational diseases that can result in plant closure. Currently available data on injury, illness and fatality rates associated with aquaculture production in Canada are limited; where they exist these indicate the industry is one of the most dangerous. This presentation will provide an overview of a 5-year program of research on aquaculture OHS in Atlantic Canada recently funded by the Ocean Frontier Institute as part of a larger program of research on social license in marine aquaculture. It will also present preliminary findings from the first phase of that research program including background data on the distribution and types of aquaculture operations in Atlantic Canada and a profile of hazards, injuries, illnesses and fatalities and their proximate causes in the sector in Atlantic Canada derived from a literature review contextualized for the Atlantic Canada aquaculture sector and from compensation and inspection report data and key informant interviews conducted in 2017-2018.

2C.2 Occupational safety in the Nigerian aquaculture industry — *Ayodeji Adeyinka Adeoye, Federal University of Agriculture, Abeokuta, Nigeria; Yemi Akegbejo-Samsons, Federal University of Agriculture, Abeokuta, Nigeria*

Aquaculture is widely recognised and promoted as a source of income, employment and food supply in developing nations including Nigeria. A mapping study of operators in Lagos and Ogun States aquaculture industry was conducted. A total of 5,103 operators (hatchers and farmers) were enumerated and characterised. The industry is dominated by the production of African catfish, and mainly operated by men (not less than 81.6%). The majority of the operators in Nigeria's aquaculture industry are either unaware of occupational safety or just indifferent about its importance. The sites of operations are often located in residential areas thereby constituting a level of risk to neighbours. Boreholes and rivers/ streams are the main sources of water for operations and farms are often prone to flooding on an annual basis. Cheap labour with poor welfare packages are often utilised for aquaculture operations and subsequently there is very low staff retention in the aquaculture industry. The majority of operators in the industry (more than 60%) operate based on guesswork and personal experiences rather than scientific advice (from empirical studies) from govern-

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ment agencies. The type of chemicals used and dosages are based on personal experiences (62.2%) irrespective of adverse effects of such chemicals on public health and the environment. None of the farmers in this study utilised protective and safety gears (such as waders when harvesting in ponds, safety boots, helmet, hand gloves, nose cover, etc.) in their operations. Some of the reasons for the poor awareness or indifferent attitude to occupational safety in the industry are mainly attributed to extra cost and economic impacts of occupational safety and health. It is hereby recommended that the government embark on an awareness programme on the importance of occupational safety in Nigeria aquaculture industry in addition to providing an enabling environment to implement health and safety measures in the industry.

2C.3 Safety and health programs in Alaska's seafood processing industry: Interviews with corporate and upper management stakeholders — *Laura Syron, Oregon State University; Laurel Kincl, Oregon State University; Viktor Bovbjerg, Oregon State University*

Background: Although the seafood processing industry is vital to Alaska's economy, limited research has addressed workers' safety and health. Safety and health program management is a decisive factor in preventing worker injuries and illnesses. This study investigated safety and health program characteristics through stakeholder interviews.

Methods: Semi-structured interviews were conducted with 14 corporate and upper-level directors/managers who oversaw safety and health programs for Alaskan seafood processing worksites. Interviews were audio-recorded and transcribed, with responses validated by participants. Quantitative content analysis was utilized to describe participant, worksite, and workforce characteristics. Qualitative techniques, including inductive coding, were utilized to explore participants' experiences and views regarding: management and workers' roles in the program; systems for identifying, analyzing, and controlling hazards; safety training; as well as program challenges and successes.

Results: The 14 participants reported directing/managing programs for 68% of the 25,000 workers in this Alaskan industry. Participants represented 13 companies that operated 32 onshore plants and 30 vessels, employing 17,000 workers at peak season. Participants noted varying degrees of program buy-in and engagement from management and workers, ranging from basic compliance with standards to full partnerships for carrying out best practices. While some participants reported that fostering a proactive safety culture and "prevention mindset"

were among their greatest successes, others discussed the challenges of overcoming an "old guard mentality" that did not prioritize safety. Participants frequently reported language barriers, ergonomic hazards, and long work hours as areas of concern.

Conclusions: Based on participants' responses, we identified workplace factors that could be modified to improve safety and health: worksite manager training; worker training; adoption of ergonomics; work hours; and knowledge sharing within the industry. Future research could explore workers' experiences and needs. Occupational safety and health practitioners and researchers could support the development and evaluation of ergonomic solutions, fatigue prevention, and training for limited-English-speaking-workers.

2C.4 Institutional strengthening and sustainability: Outcomes of OSH training and awareness initiatives by UNIDO and ILO across the shrimp processing sector in Bangladesh — *Mohammad Nuruzzaman, University of Dhaka, Bangladesh; Niaz Ahmed Khan, University of Dhaka, Bangladesh; Nusrat Zaman Nishat, Dhaka Medical College & Hospital, Bangladesh*

Occupational Safety and Health (OSH) services for industrial workers are still in the developmental stage in Bangladesh. The Department of Inspection for Factories and Establishment (DIFE) is the legal enforcement agency according to country's Factory Act 1965 and Factory Rules 1979. The shrimp and seafood processing sector plays a significant role to the economy through earning valuable foreign exchange, employment generation, food and income security for millions of fishers and fishworkers across the coastal zone.

In response to the emerging needs of OSH from international buyers and consumers, the shrimp and seafood processing sector undertook collaborative programs with United Nations Industrial Development Organization (UNIDO) and International Labor Organization (ILO) to facilitate better social compliance including OSH matters for the first time in Bangladesh. Recent evaluation of training, workers' education and awareness programs run by UNIDO and ILO revealed changed attitudes among the DIFE officials offering better workers training and inspection support emphasizing the safety and health issues for the export oriented shrimp processing sector. Ethnographic study under a research program from the Department of Development Studies, University of Dhaka across southwestern coastal districts suggest that shrimp and seafood processing workers are better aware about industrial accidents, proper use of Personal Protective Equipment (PPE), occupational hygiene, occupational

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diseases, protection need of women and young workers from dangerous occupation including condition of works, working hours, welfare facilities, holidays and leaves.

In spite of institutional strengthening, capacity building, post upgradation and administrative reorganization of DIFE influenced by this collaboration, the factory owners and managers are still hesitant about the cost of better compliance apprehending reduced profit from the business in highly competitive seafood market. The study recommends extensive R&D to reap higher production of raw shrimp, minimizing yield-gap, control of shrimp disease and environment, improve shrimp supply chain, develop value added items and expand local & international market towards sustainability of the shrimp sector including better OSH services.

10:45-12:15, A1043

SESSION 2D – WHAT'S WORKING (AND NOT WORKING) IN FISHING SAFETY?

2D.1 Fishing Safety: what we know, what we are seeing, is it progressing? — *Joseph Hincke and Glenn Budden, Transportation Safety Board of Canada*

Since the Transportation Safety Board of Canada (TSB) released its landmark 2012 study of fishing safety in Canada, a lot has changed, including:

- new Fishing Vessel Safety Regulations;
- new, expanded and continued safety initiatives across the country;
- the ongoing evolution of regional fishing-safety associations; and
- increased provincial fishing safety oversight.
- However, there continue to be fatal accidents nationwide involving fishing vessels, which the TSB continues to investigate.

The presentation will consist of a look at progress that has been made and behavioral changes among fishermen since the 2012 study across the fishing industry, as well as an examination of those safety issues that continue to be of concern. The presentation would also feature a statistical review of data gained since the TSB's 2012 study.

2D.2 Prevention of accidents at work in Nordic fisheries – What has worked? — *Annbjörg á Høvdanum, The Faroese Hospital System; Jørgen Møller Christensen, and Helle Østergaard, University of Southern Denmark; Trine Thorvaldsen, Ingunn M. Holmen, and Signe Sønvisen, SINTEF Ocean; Kim O. Kaustell, Tiina E.A. Mattila, and Risto H. Rautiainen, Natural Resources Institute Finland; Hilmar Snorrason, Maritime Safety and Survival Training Centre, Iceland; Kristin Tómasson, Administration for Occupational Health and Safety, Reykjavík, Iceland*

In the Nordic countries, analysis show a decline or stagnation in accidents in fisheries. However, the knowledge about what works is limited. Furthermore, the fishermen's own perceptions of regulation and prevention measures has not been studied. This presentation is based on a joint Nordic study. The aim of the study was to give an overview and describe which strategies have been applied in five Nordic countries for preventing accidents, and to get the fishermen's views on what has worked and been of the highest importance in reducing and preventing occupational accidents. A survey was designed and conducted in Norway, Denmark, Finland, the Faroe Islands and Iceland. Participants rated a list of safety measures on a scale of 1 to 10, where 1 meant not very important/little or no effect and 10 meant very important/high effect. A total of 47 fishers rated safety equipment, safety culture, construction of the vessel, and work organisation on board the highest. These factors are closely related to the everyday work reality at sea. Fishers also suggested that training, education on-board, safety equipment, design of the vessel, layout of the deck as a workplace, organisation of the work and good work routines, attitudes, better safety culture and communication may improve safety in the future. Challenges related to fatigue were especially expressed by fishers in Iceland and Faroe Islands. Better economy that permits the introduction of modern vessels was pointed out as a path to better safety in general. This study indicates that measures that correspond well with fishers perceptions of what works, are also more likely to be followed up on – and thus more likely to have an effect on safety. Therefore, involving fishers in the development of safety measures and valuing their experiences and opinions is an approach that is a recommended approach.

2D.3 It all starts with risk: Understanding risk and risk-taking behaviors — *Eric Holliday, FISH Safety Foundation*

There is an element of risk in all we do. We know that workplaces, especially those at sea, are dynamic and risks constantly change in shape, probabilities and exposure. And while the ILO Work in Fishing Convention actively

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promotes a risk-based approach to managing safety in the fishing industry, it's clear from the evidence that the current safety measures alone aren't managing risk effectively and delivering the required outcomes. So, how do we tackle the risk issue? This short presentation will look at the importance of risk management practice, and will further examine the internal and external factors that make this such a difficult process! And while the standard risk models, matrices, bow-ties, etc., are helpful, by themselves, they're not really enough. We need to factor in people. People's behaviour is often hard to understand – especially when analysed after an accident – so we will briefly explore the interface between human factors and risk management by examining perception, and the cognitive and behavioural processes behind risk-taking behaviour. It's been said that fishermen (and women) are by nature risk-takers. And that's not necessarily a bad thing – but by teaching people to correctly SEE and UNDERSTAND risk, we can develop competent risk-takers. And by doing this, we can promote sustained safety behaviour improvement, and also change attitudes towards safety in the industry. It's about a new way of thinking. It all starts with RISK!

2D.4 Online Safety Training for Fishermen — Getting training “Out of the Lecture Box” and into the Cloud — *R. Alan Davis, American Seafoods Company*

How do we deliver Safety & Health knowledge to Commercial Fishermen? The tried and true gold standard is of course small groups of Fishers being trained in face to face, hands on training delivered by knowledgeable peers and experts. However, from Artisanal Fishers to the 100+ Meter Factory Trawlers we all face the shortage of time and opportunity to deliver Safety & Health Knowledge that goes beyond the immediacy of life safety at sea. Even large companies with big crews struggle to create the time and opportunity to provide quality small group training on topics such as: Respiratory Protection, Chemical Safety, Back & Lifting Safety, First Aid, Personal Protective Equipment, etc. The topics needing to be covered are seemingly endless and several companies in the US have taken a “step out of the box” in their efforts to push Safety & Health training out of the crowded lecture rooms and galleys full of distractions... and into people's HOMES by providing interactive online content that crew members can take in their off time between seasons. Can't be done? Think people are not computer literate enough? Over one billion people on the planet use Facebook... over 100,000,000 people worldwide use Instagram.... Safety & Health Professionals get training through webinars every day. Why not believe that our Fishers can receive Safety & Health Training through computers, tablets, and other mobiles devices? Our company employs over 900 people

from approximately 85 countries around the world and in 2017 we delivered over 17,000 separate courses to 1,100 individual crew members from all over the world. This program has both broadened and deepened our crew's knowledge while helping assure that we all have a common foundation in safety rules and best practices. With a little effort, training can now be delivered virtually anywhere in the world, outside of the “Classroom box”.

1:45-3:15, A1049

SESSION 3A – POLICY AND REGULATION: BEST PRACTICES AND INITIATING CHANGE

3A.1 An anthropological study of safety, regulation and fishermen's work practice — *Trine Thorvaldsen, SINTEF Ocean*

Due to a high number of accidents compared to other occupations, fishing is considered a dangerous profession. In the period 1990-2015, more than 300 Norwegian fishermen have lost their lives.

Based on anthropological fieldwork, including participant observation on board fishing vessels and interviews with fishermen and authorities, different understandings of safety are explored. Both the authorities' strategies to reduce risk and the fishermen's perceptions of risk and efforts to stay safe are studied. Theoretical perspectives on risk, knowledge and practice constitute the analytical framework.

Historically, sustainable management of fishery resources has been a main objective for the regulation of fisheries. In recent years however, regulation of fishermen's personal safety has also increased. The regulation introduced by the Norwegian Maritime Authority is seen in light of international legislation and the development of health, environment and safety (HES) in other industries. Laws, rules, inspections, requirements for training, and informational campaigns stand out as important strategies to reduce the number of accidents. Regulation and compliance thus appear prominent in the authorities understanding of safety.

Fishermen commonly say they do not worry about accidents. Previous studies have argued that they minimize, deny or under communicate the dangers they face as a coping strategy. Observation of everyday life on board fishing vessels show that fishers do many things to stay safe at sea. They underline the importance of common sense and taking precautions as important safety measures. Through experience and participation, fishermen learn how to work safely. Fishermen's understanding of safety is thus related to their work experience, and feeling safe.

Based on these findings, the presentation argues that a

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one-sided focus on safety as compliance to regulations may end up overlooking what fishermen actually do to feel safe.

3A.2 Nudges to improve the take-up of voluntary training amongst fishers — *Simon Potten, Sea Fish Industry Authority*

Fishing is a dangerous occupation. The fatality rate in the UK fishing industry is 190 times higher than the UK all-industry average and six times higher than the next most dangerous industry (waste and recycling). The UK's Fishing Industry Safety Group recognises that training has a key role to play in its strategy to improve fishing safety, yet most fishers require little more than basic safety training. Only skippers of fishing vessels 16.5m (54ft) in length and above are required to undertake additional training to gain the competencies required for the safe management and operation of their vessel and its crew. Almost 90% of the UK's commercial fishing fleet is less than 16.5m (almost 5,000 fishing vessels). We believe that anyone in charge of a commercial fishing vessel should be trained (to an appropriate level) in its safe operation, even if working single-handed. So in 2008 we launched a voluntary qualification (the Seafish Under 16.5m Skipper Certificate) comprising short courses in navigation, engineering, stability and radio operation. We knew that persuading fishers to voluntarily give up their time (and earnings) to attend training would be challenging. Funding was secured to enable us to offer the training free-of-charge, but we knew from experience that this would not be enough. Unable to support our initiative with new regulation, the UK's Maritime & Coastguard Agency instead recognised our qualification as equivalent to what it requires for small commercial vessel operations, giving holders the opportunity to supplement their income from fishing by undertaking other activities. It was this nudge that persuaded fishers to come forward in large numbers. Ten years on more than 4,500 have attended training and more than 2,500 have completed the full qualification. Not only has this initiative improved safety in this sector, but it has also professionalized its workforce.

3A.3 Gender mainstreaming and issues of occupational health and safety: Learnings from developing the FAO Handbook on Gender-equitable Small-scale Fisheries and Governance and Development — *Nilanjana Biswas, International Collective in Support of Fishworkers*

This presentation draws upon the substantial experience of the International Collective in Support of Fishworkers (ICSF) with women in small-scale fisheries in developing countries. It discusses the health and safety challenges

that women in the sector face and consequently, demonstrates how the definition of occupational health and safety must go beyond being merely an operations-driven one to one that includes issues such as lack of hygiene, sexual harassment and violence, theft, and safety risks that are not only intrinsic to women's post-harvest work but also carry long-term health impacts. It argues that conventional definitions of occupational health and safety tend to be narrow and restrictive, and consequently gender-related health and safety concerns of women in fisheries fail to receive adequate attention from both policy makers and fishing communities. In particular, conditions in fish trade, where large numbers of women are employed, are often left out of discussions on health and safety.

The adoption of the historic VGSSSF (Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries in the Context of Food Security and Poverty Eradication) Guidelines, which notably addressed issues of gender mainstreaming in small-scale fisheries, followed by implementation-related efforts such as the development by the ICSF of the FAO Handbook for Gender-equitable Small-scale Fisheries and Governance and Development, highlight how discussions among women, and between women and other stakeholders, act as significantly empowering tools to address health and safety issues. Women's individual and collective control over their lives is crucial to their long-term health.

Today, communities are recognised as important guardians of sustainable coastal and inland fishing practices, and women are often at the forefront. Women's efforts to safeguard their health, local economy and ecology ensure sustainable fishing at the household and community level, as well as broader climate sustainability. These require support at multiple levels by all stakeholders in the fisheries.

3A.4 Supporting Behavioural change for ILO C188 — *Robert Greenwood, National Federation of Fishermen's Organisations*

The Work in Fishing Convention is now a ratified convention of the ILO, and has been being prepared by the UK administration for a number of years, with the implementation in to UK law due around May 2018. I have worked within the UK's working group on developing this legislation and have been impressed by the approach taken by Government in listening to industry and trying to prepare good law that isn't a burden on industry and actively supports improving behaviours in Safety and Welfare.

More often than not laws are introduced without any meaningful preparation or understanding on how to comply with them, which often leaves a messy period post implementation as the accepted compliance is de-

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veloped often following accidents and incidents. This reactive approach to compliance to legislation is not desirable and is something I have worked hard to avoid.

In 2009 I started development of a website for managing fishing vessels called SafetyFolder.co.uk, with the theory that there should be a free means by which to comply with legislation without the need for training. The site launched as a personal hobby project in 2012 and to date has had over 650 vessels registered. The main point of the site was to measure safety, by setting key performance indicators that are visible to the users are encouraged to complete measured activities. These activities include recording the Crew and their certificates, writing risk assessments and adding life saving equipment to the site. There are currently (Nov 2017): 665 vessels registered, 5947 Life Saving Appliances (LSA), 16,135 risks assessed, and approx. 12% of UK fleet registered.

Most important to the sites success is that it has no incentives to use it, no reward for use and no legal requirement either, so that when a fishing vessel is added or data is input, it is that of a positive behaviour towards safety and welfare management. This approach has to be carefully fostered and whilst it is easy to replicate the website in other countries its success is partly due to it being specific to the needs of the user. To support behavioural change the users must be involved to avoid confusion and ensure that their lives are made easier and potentially more profitable.

With the Work in Fishing Convention we have started to add new features so that every owner of a fishing vessel will be able to be compliant with the legislation prior to implementation. From Crew lists to Safety Committees, Risk assessments to Safe Operating Procedures, the site manages it all and makes it very easy for everyone to comply. By being an online resource it works on all computers and devices and can be updated instantly for all users.

To underpin the Safety Folder the UK has produced a Fishing Safety Management Code. The Code allows for any Safety Management System to be compared and give support to first, second and third party audits.

1:45-3:15, A1046

SESSION 3B – REGIONAL APPROACHES TO FISHING SAFETY 1

3B.1 Occupational injuries and disease in commercial fishing in Finland — *Kim Kaustell, Natural Resources Institute Finland (Luke); Tiina Mattila, Natural Resources Institute Finland (Luke); Risto Rautiainen, University of Nebraska Medical Center; Timo Hurme, Natural Resources Institute Finland (Luke); Pekka Salmi, Natural Resources Institute Finland (Luke)*

Fishing is a small industry sector in Finland with special characteristics involving use of small vessels, fishing on ice during winter months, and complementing household income from multiple sources. Most (93 %) coastal fishing vessels are less than 10 meters in length. Regulations and certifications of the skipper and personnel apply primarily to larger vessels.

Fishers are covered by workers compensation insurance. Claims data for self-employed fishers during 1996-2015 were analyzed to identify occupational injury and disease characteristics and risk factors. A total of 1954 fishers (full- or part time) had 1188 compensated occupational injury and disease claims during this period. The injury rate for commercial fishers was 2.5 times higher than the mean of all salaried workers. 40 % of the injuries happened on fishing vessels, including boarding and exiting. 11% happened on sea or lake ice. Actual fishing accounted for 42% of the injury incidents while other tasks included maintenance and repair of equipment as well as fish handling, transport, and storage. Common incident types included slips, trips and falls and falls to lower level. The median disability duration resulting from injury was 21 days. Most occupational diseases were caused by repetitive work, resulting in epicondylitis, bursitis, or tenosynovitis.

Male gender, Finnish mother tongue (vs. Swedish; both official languages in Finland), and higher income levels from fishing increased the odds of occupational injury and disease claims. Age, fishery location, career length, or participation in the voluntary occupational health service, were not significantly associated with compensated occupational insurance claims. Fisher interviews ranked regulations and inspections among least effective measures to promote occupational safety, while safety culture, work organization, and use of safety equipment were viewed as more effective measures. Awareness of these background factors, along with knowledge of typical injury causes, give guidance for further work on injury prevention.

3B.2 Analysis of injuries of fishing workers in the Faroe Islands 1972-2014 — *Annbjörg á Høvdanum, Department of Occupational Medicine and Public Health, The Faroese Hospital System; Olaf Chresen Jensen, Center for Maritime Health and Society, University of Southern Denmark*

Background: The fishing industry is over 90% of the Faroese export. In the period of 1972 – 2014, 4163 (33%) accidents at sea, out of 12.619 accidents in total were registered with the Faroese Accident Insurance Council (FAIC). All incidences that have caused physical or material injuries for workers are included. Of these, 3407 (27%) were from the fishing fleet.

Aim: The goal was to elucidate the scope of occupa-

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tional injury to Faroese fishermen from 1972 to 2014; To describe the incidence rates and the main characteristics of the injuries, to compare risks at different levels, type of fishing, job titles, and ages and to suggest and discuss the possible prevention impact of the safety programs over the latest decennia. Because of large changes within fisheries, only preliminary analysis will be presented from data older than 1997, while the data from 1997 – 2014 will be used for preventive purposes.

Methods: Injury data was collected through the FAIC. All employers in the Faroe Islands are obligated by law to insure their workers. The data from accidents in fisheries was entered into Excel. Variables were re-coded and exported into SPSS for statistical analysis.

The number of man-days at sea was obtained from the fishermen's security found, divided by ship-groups and occupation. Incident rates were calculated by dividing the number of injuries with the number of man-days at sea.

Results: The most prominent injury mechanisms were, hit by object and slip and fall accidents. The most prominent injured parts of the body were teeth and fingers.

Conclusions: The incidence rates of the non-fatal injuries were only slightly reduced from 1997-2014. When including the incidence rate per 1000 person-years, the accident number has stagnated since 2003. There is a need for continuing with the safety programs and monitoring the injuries in order to reduce numbers further.

3B.3 Health issues and difficulties for women in small-scale fishing activity in cities from the North Fluminense in Brazil — *Luceni Hellebrandt and Silvia Alicia Martinez, Universidade Estadual do Norte Fluminense Darcy Ribeiro*

This text presents an ongoing study held in the Baixadas Litorâneas from the north of the state of Rio de Janeiro, Brazil, being part of the issues investigated within the research project "Women in fishing: map of social-environmental conflicts in cities from the North Fluminense and Baixadas Litorâneas". The study applies a gender lens in the fishing communities of the region so that the people investigated are women who work in small-scale fishing activity, developing diversified productive activities throughout the productive chain of fishing, such as harvesting, processing and marketing of fish. In the interviews conducted so far, when the health issue is addressed, we can see the recurrence of two matters: 1) there is no specific health program and/or guide to approach regarding fishing work-related diseases (such as spinal problems or repetitive strain injuries from improper posture to execute processing activities) and 2) the women's difficulty in accessing health-related social security benefits, even when they present problems due

to fishery activities, once there is a deep issue of invisibility and, consequently, a non-recognition of women in Brazilian fisheries legislation, especially those who execute processing activities. In spite of direct consequences on the body and health of these women, many of them continue to engage in fishing activities because, on many occasions, it is the only income possibility where they live. This situation reflects the precariousness of public policies targeted to populations whose way of life is based on small-scale fishing and, when the gender lens is applied in the investigation of occupational health, the result is even more worrying.

3B.4 Fishing activities biomechanical risks assessment — *Francesco Draicchio, Alessio Silvetti, and Alberto Ranavolo, INAIL, Italy; Elio Munafò, ITAL UIL, Italy*

The aim of this study was upper limb repetitive movements, posture and manual material handling (MMH) risk assessment during some fishing activities.

Dynamic REBA and OCRA checklists were used to assess fish sorting on stern and on tables respectively. Filling crates was assessed by OCRA checklist and extensor and flexor carpi radialis surface electromyography (sEMG) for choosing OCRA strength values. NIOSH equation was utilized to assess unloading crates (12 or 16Kg), from the boat to a van and from the refrigerator to a slipway. Unloading crates from the boat to the van was investigated by 3D Static Strength Prediction Program (3DSSPP). Heart rate monitors were used to estimate relative cardiac cost (CCr) of handling crates inside refrigerators.

In regards to fish sorting on the stern, we obtained mean REBA scores of 10 on the right side and of 8.8 on the left one. OCRA checklist reported values of 14.95 on the right and 12.35 on the left side. OCRA checklist scores, using sEMG values, were 13.5 on left and 11.5 on the right. Handling fish crates from the boat to the van reported lifting indexes (LI) between 2.55 and 6.34 and Recommended Weight Limits (RWL) ranging between 2.52Kg and 4.69Kg. 3DSSPP analysis reported L4/L5 compression force ranging between 2752N and 3946N and low strength capabilities at wrist, shoulder, trunk and hip joints. Unloading crates from refrigerator to slipway showed LIs ranging from 1.63 to 5.83 and RWL values ranging from 2.74Kg to 7.36Kg. MMH inside refrigerator reported CCr values between 40.5% and 42.7%.

In many tasks REBA and OCRA Check list scores fell in risk or high risk levels. As regards MMH all obtained values were largely over the safety limits. All these data confirm the relevance of biomechanical risks in fishing activities.

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SESSION 3C – SEAFOOD PROCESSING, HAZARDS AND INTERVENTIONS

3C.1 Injury and Illness in Alaska's Onshore Seafood Processing Industry: An Analysis of Workers' Compensation Claims, 2014-2015 — *Laura Syron, U.S. National Institute for Occupational Safety and Health (NIOSH); Laurel Kincl, Oregon State University (OSU); Viktor Bovbjerg, OSU; Devin Lucas, NIOSH*

Background: Globally, seafood processors are at high risk for musculoskeletal injuries and allergic reactions. Despite the seafood processing industry's importance in Alaska, limited research has investigated occupational safety and health in Alaskan worksites. This study's objectives were to use Alaska worker's compensation claims to estimate the risk of nonfatal injuries and illnesses, determine patterns of incident characteristics and circumstances, and identify modifiable hazards for onshore workers.

Methods: Accepted claims data from 2014–2015 were manually reviewed and coded with the Occupational Injury and Illness Classification System and work activity resulting in the incident. Workforce data were utilized to calculate claim rates per 1,000 workers.

Results: During the two-year study period, 2,889 claims were accepted for nonfatal injuries and illnesses in Alaska's onshore seafood processing industry. The average annual claim rate was 63 per 1,000 workers. This rate was significantly higher than the all-industry rate of 44 claims per 1,000 workers (rate ratio = 1.42, 95% CI = 1.37 – 1.48). In the seafood processing industry, the most frequently occurring injuries and illnesses, were: by nature, sprains/strains/tears (993, 36%), contusions (490, 18%), and lacerations/punctures/amputations (349, 13%); by body part, upper extremities (1,212, 43%) and trunk (578, 20%); and by event/exposure, contact with objects and equipment (1,020, 37%) and overexertion and bodily reaction (933, 34%). Incidents resulting from line production activities (n=818) frequently involved: repetitive motion; overexertion while handling pans, fish, and buckets; and coming into contact with fish, pans, and processing machinery. Incidents resulting from material handling activities (n=495) frequently involved: overexertion while handling boxes/cartons/bags; repetitive motion; and slips/trips/falls.

Conclusions: Hazard control measures should target: (a) repetitive motion, overexertion, and contact with equipment during line production; (b) overexertion due to manual material handling; and (c) slips/trips/falls. Implementing ergonomic solutions to prevent musculoskeletal injuries – especially to workers' upper extremities – is vital for improving health.

3C.2 A study about the work conditions of the seafood workers in Mundaú Lagoon – Maceió, Brazil — *Bianca Farias and Roberto Bartholo, Universidade Federal do Rio de Janeiro*

The project studied the work situation of the sururu (*Mytella falcata*) productive chain located in Mundaú Lagoon, Maceió – Alagoas.

The sururu extraction is the main source of income around the Mundaú, about 80% of the people in the region are related to the extraction and processing activities of the seafood. The average income is 520 real (163 dollars) per month. These are the most vulnerable and poor people of the city surrounded by natural, social and technological risks. Precarious housing, lack of basic services, informal employment, drug trafficking and consumption, violence, prostitution and child labor are common aspects of the community daily life.

The tasks involving the sururu's extraction and processing are very exhausting and unhealthy. Their catch time is very early, usually between 2 and 4 in the morning, because of the competition: who arrives first can extract more. The working day can be from 14 to 16 hours, without weekends or holidays.

Because of the very intense and tiring routine, which mixes heavy activities with minimum moments of rest and precarious and unhealthy working conditions, health problems are constant, in average 67% of workers have already gotten a license due to illness or work accident, averaging 2.17 days without work.

Based on the Ergonomic Analysis of Work there were identified failures in the productive process and proposed improvements. In addition, an ergonomic indicator was built based on the EWA (Ergonomics workplace analysis).

There are 10 phases of work: extraction, first washing, despinicagem (kind of cleaning), boiling in the iron gallon, sieving, second washing, packing, direct sale, stocking and transportation. The results showed that the improvements should be thought from inside and done collectively. It has been identified that the sururu extraction, the despinicagem and the boiling are the biggest problems to the worker's health.

3C.3 Safety & health interventions on factory trawlers — *R. Alan Davis, American Seafoods Company*

While Factory Trawlers are perhaps safer than smaller fishing vessels in many ways, they also come with extra complications. Bigger vessels mean bigger machinery, more power, more moving parts, and more crew, creating additional hazards and variables than smaller operations.

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Processing Machinery needs to be guarded. Maintenance needs to be managed and power sources controlled to prevent accidental activation. Illnesses need to be mitigated and managed. Tons and Tons of product must be moved safely and of course, if you have 145 crew that means you HOPEFULLY have 1450 fingers to keep out of hazardous places!

In a quick photo montage, we hope to share some of the hazards we face onboard Bering Sea Factory Trawlers and some of the ways we have used ideas from other industries and/or our vessel crew to enhance the safety & welfare of our crew members.

- Lockout Tagout
- Emergency Stops
- Protective Gloves
- Man Overboard Alarms
- Crew Safety Meetings
- Helper Winches
- Sanitation Stations

All these varied things are individually small pieces, but each plays a vital role in keeping our crew safe & healthy and each plays a role in perhaps the most important aspect of all, our Safety Culture.

3C.4 New Zealand industry safety and solutions — *Darren Guard, Guard Safety Limited and Marion Edwin, Optimise Ltd.*

In New Zealand fishing plays a significant role in the economy – it is our fifth largest export commodity by value, with 3.2% of total exports, whilst employing only 0.7% of the population (Williams, 2017). It is also one of our most dangerous occupations – it has a high average injury and fatality rate relative to our population and other sectors. As in other countries, the factors contributing to fishing injuries include the working conditions on a moving vessel, long hours and time away at sea, drug and alcohol issues and a high tolerance for risk. The New Zealand fishing industry is led by 5 main fishing companies, collectively owning approximately 70% of the New Zealand's fish quota.

Maritime New Zealand, our maritime regulator, has developed legislative tools aimed at bringing fatality and injury rates down. Thus we have some recent and significant changes in the safety management systems applying to vessel operators. This, along with the introduction of new health and safety legislation (the Health and Safety at Work Act, 2015) has put greater compliance requirements on commercial vessels.

An overview of New Zealand's safety management and compliance systems for vessel operators – targeting reduced harm for the workforce – will be presented and discussed. While those in the industry do accept they need

to be safer, the associated documentation and processes may be daunting. Our challenge is to present manageable solutions to complex maritime safety problems to enable all fishers to return healthy and well from every trip.

Reference:

Williams, J. (2017). Commercial Fishing a Significant Contributor to New Zealand Economy. <http://www.berl.co.nz> accessed 15 November 2017.

1:45-3:15, A1043

SESSION 3D – UTILIZING AN INDUSTRY-LED INTEGRATED APPROACH TO ADVANCING SAFETY, AND REDUCING INJURIES, ILLNESS & FATALITIES IN COMMERCIAL FISHING

David Decker, Newfoundland and Labrador Fish Harvesting Safety Association (NL-FHSA); Charles Coady, Workplace NL; Loyola Power, Service NL; Sharon Walsh, Fish Food and Allied Workers Union (FFAW/UNIFOR); Mark Dolomount, Newfoundland and Labrador Professional Fish Harvesters Certification Board (PFHCB); Gail Hickey, NL-FHSA

In the past two decades, Newfoundland and Labrador (NL) has witnessed significant progress in the area of fishing industry safety – particularly in terms of fish harvesters' ability to survive accidents at sea. Crews are better trained, vessels are better equipped, and there is more safety information available than ever before. Despite these improvements, the number of injuries and fatalities remains alarmingly high.

This session will look at the successes of utilizing an industry-led, integrated holistic approach to advancing safety in the fish harvesting sector in NL. The Newfoundland and Labrador Fish Harvesting Safety Association (NL-FHSA) was established in 2013 as a joint venture of the Government of Newfoundland and Labrador, Workplace NL, and the Professional Fish Harvesters' Certification Board (PFHCB). The NL-FHSA represents the co-operative effort of the fish harvesting sector leading the promotion of safety education and awareness initiatives, and working to reduce workplace injuries, illness and fatalities. It has a sole mandate of improving fishing vessel safety, with a primary focus on prevention; promoting and developing a positive industry-wide safety culture through the identification and coordination of relevant, accessible, timely and cost-effective safety education and resources.

To this end, the NL-FHSA regularly engages with its primary stakeholders, owner/operators and crewmembers in each of the three fleet sectors. Most notably, since its inception the NL-FHSA has established contact with thousands of fish harvesters in the province as survey respondents and attendees at over 80 fish harvesting

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committee meetings, as well as two safety symposiums. Additionally, the NL-FHSA collaborates with its industry partners, including: the PFHCB; the Occupational Health and Safety Branch of Service NL; Workplace NL; Department of Fisheries and Land Resource; Transport Canada; Fish, Food and Allied Workers Union; Fisheries and Oceans Canada; Canadian Coast Guard; Marine Institute; and SafetyNet. Support is also provided by the NL Federation of Labour and the NL Employers' Council, as partners in the sector safety approach.

Based on its collaborative, partnership approach and unique understanding of the sector, the NL-FHSA is well-positioned to lead the strategy necessary to achieve enhanced safety in the fish harvesting industry.

The presenters include:

NL-FHSA – David Decker will introduce the session, providing a brief introduction of the NL-FHSA and the concept and impetus of an industry-led integrated approach to advancing safety in commercial fishing.

Workplace NL – Charles Coady will present provincial injury statistics for the fishing sector, including the significant “cost” of lost time injuries and fatalities, Workplace NL’s strategy of supporting Sector Safety Councils/Associations as part of their injury prevention strategy, and the opportunity to improve safety and prevent injuries and fatalities through this collaborative approach.

Service NL, OH&S Division – Loyola Power will present on the uniqueness and challenges of implementing an OH&S strategy and regulatory regime in the fishing industry, and the opportunities to make great progress in this area utilizing an integrated collaborative approach as a complement to their ongoing regulatory enforcement efforts.

FFAW/UNIFOR – Sharon Walsh will present on the long-standing commitment of fish harvesters to safety, and given that harvesters know their industry best, the importance of incorporating an industry-led approach. She will address some of the geo-social challenges of addressing safety in the industry, and how through fish harvester engagement, rapport and buy-in many of these challenges can be overcome.

PFHCB – Mark Dolomount will present on the critical role of education, training and awareness in improving safety. He will address some of the challenges with the OHS requirements of the new federal Fishing Vessel Safety Regulations, how a regulatory framework alone is not enough, and how the NL-FHSA can play a major role in supporting regulatory compliance and implementing real change onboard vessels.

NL-FHSA – Gail Hickey will present on the priorities of the NL-FHSA to advance fishing industry safety. The association works collaboratively with industry partners and is established as the leading organization in fish harvesting

safety in the province. The associations Fish Harvester Safety Training Program will highlight one strategy utilized by the NL-FHSA to address the challenges of fish harvesting safety by utilizing a holistic industry-led approach to safety promotion and injury prevention.

3:30-5:00, A1049

SESSION 4A – OPEN SESSION

Open session

3:30-5:00, A1045

SESSION 4B – COMMERCIAL FISHING AND PROCESSING HEALTH AND SAFETY SURVEILLANCE INFORMING INTERVENTION DEVELOPMENT

Samantha Case, U.S. National Institute for Occupational Safety and Health (NIOSH); Erika Scott, Northeast Center for Occupational Health and Safety; Laurel Kincl, Viktor Bovbjerg, and Jasmine Nahorniak, Oregon State University; Laura Syron and David Sweet, NIOSH

Commercial fishing is one of the most dangerous industries in the United States, yet nonfatal injuries, health outcomes and vessel casualties are not adequately monitored. Likewise, injury surveillance of offshore seafood processors has not been conducted. The lack of complete data is an impediment to prioritizing safety and health interventions. Complementary National Institute for Occupational Safety and Health (NIOSH) and NIOSH-supported efforts are currently underway around the United States to address this gap in surveillance and to translate findings into practice.

This panel will discuss approaches and coordination by different research teams to include additional data sources to determine injury and illness patterns used to inform targeted prevention development. The panel will culminate with examples of engineering and administrative interventions based on hazards identified through the surveillance.

Knowledge of fatalities in the U.S. fishing industry used to be largely limited to counts and rates of crewmember deaths. The need to understand hazards and risk factors prompted NIOSH to develop the Commercial Fishing Incident Database (CFID) in 2007. CFID tracks all work-related fatalities due to traumatic injury nationwide, detailing characteristics about the event, as well as the fishermen and vessels involved. Surveillance is conducted through manual review and abstraction of various source documents. As a robust fatality surveillance system, CFID has

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been used successfully to identify fishery-specific hazards and solutions to protect fishermen. However, given the time-intensive process required to conduct surveillance activities, CFID currently lacks information on nonfatal injuries and illnesses.

In the US Northeast, researchers at the Northeast Center for Occupational Health and Safety: Agriculture, Forestry, and Fishing (NEC) are piloting the capture of nonfatal fishing injury data using pre-hospital care reports (PCR). NEC researchers have developed a keyword search algorithm that scans and selects cases based on narrative text. These cases are manually reviewed to make a final determination. The dataset that results from this review will be used to streamline the identification and coding process using Bayesian methodology. These techniques have broad application for extracting data from other narrative text sources.

In the Pacific Northwest, we are expanding surveillance by incorporating multiple sources of data. From our research on non-fatal injuries in commercial fishing, we found different hazards than with fatal injuries. Data from NIOSH CFID, other US Coast Guard reports, marine insurance claims, and state trauma registries are being combined in a relational database to characterize commercial fishing and vessel safety and health information. The development of an advanced database using SQL server allows for web-based entry and data downloads for all commercial fishing incident types and improves accuracy and consistency. The design and variables are a collaborative effort with NIOSH and promote the sustainability of the system. The goal is to provide flexible and scalable approaches to surveillance, which will inform and evaluate risk mitigation efforts.

In Alaska, NIOSH researchers are evaluating the utility of three data sources for conducting surveillance of nonfatal injuries and illnesses among commercial fishermen, including: US Coast Guard reports, Alaska Fishermen's Fund claims, and Alaska Trauma Registry cases. Probabilistic linkage methods will be used to identify any overlapping cases between data sources. Following linking, incidence rates by fleet will be calculated, patterns of incident characteristics and circumstances described, and modifiable hazards identified. As part of this surveillance effort, a project investigating traumatic injuries among offshore seafood processors identified that injury to their upper extremities was an area of concern. Many injuries among processors were caused by contact with processing equipment and boxes of frozen product, including while handling the product in the freezer hold and during offload.

NIOSH engineers are working to translate research findings into practice for the Alaskan commercial fishing and seafood processing industries. Based on analyses of non-

fatal injury surveillance data and company claims data, the most hazardous areas to workers were identified as handling frozen fish in the freezer hold and while offloading. Further results from the nonfatal injury analyses, and how they guide the development of safety interventions will be shown. Preliminary safety interventions will be presented, focusing on engineering and administrative controls.

These projects address gaps in both surveillance outcomes and methods, and provide flexible, scalable approaches to injury surveillance, which can be used by companies, vessel owners, Coast Guard and marine safety advocates to implement and evaluate injury prevention efforts.

3:30-5:00, A1046

SESSION 4C – SAFETY AND HEALTH IN AQUACULTURE: POLICY AND PRACTICE

4C.1 Improving safety and risk management in exposed aquaculture operations — *Ingunn Marie Holmen, Ingrid Utne, and Stein Haugen, NTNU Dept for Marine Technology*

The aquaculture industry has since the 70's grown to become one of the most important industries in Norway. The Norwegian aquaculture production has the potential for fivefold increase within 2050 (Olafsen et al. 2012). To be able to grow, and at the same time safeguard fish welfare and the environment, companies are exploring the possibilities for moving the production to sites further from shore.

Fish farmers at today's exposed locations, report considerable difficulties in maintaining safe production (Sandberg et al. 2012). During the winter months, harsh weather conditions are already causing downtime at several sites. The operational challenges are expected to increase due to extreme weather. The overall management of daily operation is more unpredictable, and this raises new safety challenges at the fish farms (Utne et al. 2017). The probability of fish escapes may increase due to less opportunities for maintenance and daily inspections. Furthermore, fish farming is the second most risk-exposed occupation in Norway after being a fisherman (Aasjord and Holmen 2009, Holen et al. 2017a & 2017b). The harsher operating conditions set stricter requirements to maintenance and safety management strategies.

This is the background for a Ph.D. project starting in 2016, aiming to develop improved risk management strategies and systems in fish farming, integrating technical, human and organizational factors. This will contribute to reducing the risk of fish escapes, uncontrolled spreading

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of parasites ("salmon lice") and other diseases, as well as occupational accident risk.

The presentation will focus on findings during from the first two years of the project, and give a brief introduction to the status of safety management in the Norwegian fish farming industry.

References:

Aasjord H & Holmen IM (2009). Accidents in the Norwegian fisheries and some other comparable Norwegian industries. The 4th International Fishing Industry Safety and Health Conference, Iceland.

Holen SM, Utne IB, Holmen IM, Aasjord HL (2017a). Occupational safety in aquaculture – Part 1: Injuries in Norway (accepted for publication in Marine Policy).

Holen SM, Utne IB, Holmen IM, Aasjord HL (2017b). Occupational safety in aquaculture – Part 2: Fatalities in Norway (accepted for publication in Marine Policy).

Olafsen T, Winther U, Olsen Y, Skjermo J (2012). Value created from productive oceans in 2050. SINTEF report A23299.

Sandberg MG, Lien AM, Sunde LM, Størkersen K, Stien LH, Kristiansen T (2012). Experiences and analyses from operation of fish farms in exposed locations (in Norwegian). SINTEF report A22528.

Utne IB, Schjølberg I, Holmen IM, Bar EMS (2017). Risk management in aquaculture – integrating sustainability perspectives. Proceedings of the ASME 2017 36th International Conference on Ocean, Offshore and Arctic Engineering OMAE2017 (Trondheim, Norway, 25-30 June 2017).

4C.2 Compliance to global aquaculture standards on human resources: A case study of selected shrimp farms in Thailand — *Arlene Nietes Satapornvanit, Kasetsart University, Thailand; David Little, Institute of Aquaculture, University of Stirling, UK; Kriengkrai Satapornvanit, Kasetsart University, Thailand*

This paper presents a case study of selected shrimp farms regarding their compliance to aquaculture standards on human resources. These global standards in aquaculture ensure that workers are treated well and provided with enough compensation and good living and working conditions as befits a human being. They therefore cover worker welfare, which shows that the emerging consensus is that labor conditions and employee welfare on farms are being considered at the same level as environmental management, animal welfare and food safety for sustainable and ethical production of seafood. The main areas covered by these standards include workers' safety and occupational health, worker welfare and living conditions, legal aspects and documentation including labor laws, knowledge and training. A sequential mixed methods approach was applied to obtain information from the field. In-depth or face to face surveys were conducted among shrimp farm owners, managers, workers and key informants from government and non-government groups. A gender lens was also applied to some aspects.

The majority of the farms were aware of these standards and guidelines which promote worker safety and occupational health and safety as well as employee relations, in shrimp farms. The standards require that farms should comply with local and national labor laws in order that workers are adequately safe in the working environment, not exposed to health issues, compensated properly, and provided with good on-site living conditions including training to perform their tasks related to chemical handling and hygiene standards. Farm owners should ensure safety in the work place, to ensure that workers do not face risk of injury and sickness from equipment, substances, infrastructure, and human forces. The management measures to ensure safety at work for workers and non-workers in the farms and how they are complying with the standards are described, including areas where there is poor compliance.

4C.3 Keeping workers safe in the emerging U.S. offshore aquaculture industry — *Jillian Fry, Johns Hopkins Center for a Livable Future*

NOAA and other federal agencies are working to develop an offshore aquaculture industry in federal waters. Offshore aquaculture combines elements of commercial fishing and agriculture, two industries with serious occupational hazards. Almost all marine aquaculture in the United States currently takes place in state waters; siting production further offshore potentially involves additional hazards and uncertainties regarding regulatory oversight. Based on research in other developed countries with established marine aquaculture industries, I will summarize current knowledge of occupational safety risks among marine aquaculture workers including injury and death rates, causal factors, and injury severity. I will also describe the current occupational safety regulatory landscape in the United States, with a focus on production settings in federal waters. If the vision of an offshore aquaculture industry comes to fruition, a robust, transparent, and collaborative effort is needed to ensure that workers are kept safe in this challenging setting.

4C.4 Occupational health in aquaculture – a review of the literature — *Dorothy Ngajilo and Mohamed Jeebhay, University of Cape Town, South Africa*

Background: Aquaculture is one of the fastest growing food-producing sectors. While the nature of occupational diseases have been described in certain settings, very little is known about the nature of occupational exposures, risk factors and their associated diseases

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among aquaculture workers, particularly from developing countries.

Aim: The aim of this review was to describe the occupational exposures and associated occupational diseases among aquaculture workers.

Methods: Relevant articles, Google Scholar, MEDLINE and SCOPUS literature searches were undertaken to identify studies (1960-2017) on occupational exposure and adverse outcomes among aquaculture workers.

Results: Very few studies (3%) were reported from developing countries. Most studies focused on fish and crustaceans, less so molluscs and aquatic plants. Occupational exposure characterisation studies were mainly on levels of noise (43.2-77.5dB) and formaldehyde in hatcheries (<0.045->2.0ppm) and E. coli bacteria in fish ponds (7.0×10²-5.3×10⁶CFU/100ml). The most common occupational diseases included musculoskeletal (MSS) disorders (prevalence: 21-63%); allergic respiratory disease and asthma (4-65%); skin infections (2.2-15.7%), dermatitis (6%) and urticaria (0.7%); infections affecting other body systems (leptospirosis incidence: 33/100000PYS); and decompression illness in divers (incidence: 0.57-26.19/10,000PYS). Among crawfish farmers, tractor use was associated with wrist (OR=2.89) and lower backache (OR=2.41), while increased employment duration was associated with upper back MSS disorders (OR=3.07). In fish farming, skin ailments were strongly associated with waste-water exposure (OR=2.74); female gender (OR=2.48); fish farming-related jobs (OR=3.47); lack of protective measures (OR=2.24) and work in wet seasons (OR=2.8).

Conclusions: This review confirms that aquaculture workers are at increased risk of developing occupational diseases attributed to various occupational hazards, and that these risks are infrequently published from developing countries. Future studies should explore the interaction between these environmental exposures and host risk factors in causing occupational disease and to evaluate interventions to reduce these risks in aquaculture workers.

Noise exposure is a relevant concern among fish harvesters because of the high levels of noise on board fishing vessels, causing an unsafe work environment. Prolonged noise exposure causes hearing loss, and decreases the performance and vigilance of fish harvesters during fishing operations. In order to mitigate noise and vibration generated by on board sources, a proper design of the insulation system and ship structural dynamics has to be carried out. This can be performed considering both paths of transmission of acoustic energy on ships: airborne noise and structure borne noise. Application of viscoelastic materials (VEM) to the ship structures is one of the most effective measures to reduce structure borne noise. Damping properties (such as loss factor and damping ratio) and location of the VEM application are important design parameters, because of the influence on the level of mitigation. In this presentation, examples of the applications of VEM will be discussed. The recent results of an ongoing research activity on the characterization of VEM for marine applications will be presented. An experimental analysis of vibration damping characteristics of a set of composite aluminum beams on where VEM are applied is performed, considering free layer damping (FLD) and constrained layer damping (CLD) configurations and different thickness values. Two different experimental procedures will be compared. The outcome of this experimental activity can be used to identify a proper vibration damping model to simulate the damping effect of the VEM applied to the ship structures. This model allows the designers to identify critical situations and develop effective solutions in the early design phase of a fishing vessel, by optimizing the VEM application to the ship structures.

4D.2 Noise exposures of fish harvesters in Newfoundland and Labrador — *Giorgio Burella, Lorenzo Moro, and Barbara Neis, Memorial University*

In the Newfoundland and Labrador fishing industry in Atlantic Canada, one of the main sources of employment in rural areas of the province, an important current concern within the workers' compensation system, among regulators and within the industry is the relatively large proportion of compensation claims for noise-induced hearing loss in the sector and some preliminary evidence that noise levels on fishing vessels may exceed regulatory limits. The Newfoundland and Labrador Fish Harvesting Safety Association (NL-FHSA), which includes representatives from these and other groups is partnering with Memorial University's Faculty of Engineering through the SafetyNet Centre for Occupational Health and Safety Research to assess noise exposures on board small scale (<65 foot) fishing vessels and to identify short and long-term strategies to reduce exposures where these exceed regulatory limits. The research design includes assess-

3:30-5:00, A1043

SESSION 4D – PREVENTION OF CHRONIC INJURY AND ILLNESS

4D.1 An innovative design solution to mitigate noise levels on fishing vessels — *Md. Mahmudul Hassan, Jacopo Fragasso, Lorenzo Moro, Memorial University of Newfoundland*

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ing noise exposures during fishing trips on a sample of at least 20 vessels of different lengths and designs and engaged in different fisheries and to use these samples to assess cumulative exposures. Measurements of sound pressure noise levels are being taken by using noise dosimeters and hand-held microphones to register the time signal of sound pressure in various vessel spaces. These findings, coupled with observations of fishing activities are the basis for two studies: one studying the influence of the activities and fishing operations on the overall noise exposures of workers and a second of the noise sources, their frequency domain content in order to generate insights into the noise transmission patterns through the vessel's structure, using the signal processing of the time signals. The latter study will allow the researchers to identify design solutions to mitigate noise levels on the next generation of fishing vessels. This presentation will provide 2017-2018 findings from these two studies and provide an outline of work remaining to be done and the relevance of the findings for wider knowledge about noise and NIHL in similar small scale fisheries.

4D.3 Chronic health risks in a sample of commercial fishermen in Alaska: A cross-sectional analysis — *Debra Cherry and Carly Miller University of Washington School of Public Health; Torie Baker, Alaska Sea Grant, University of Alaska Fairbanks*

Background: Fishermen are exposed to many chronic health risks including noise, ultraviolet (UV) radiation, long and irregular work hours, and physical strain. In addition, the workforce is aging, with a growing percentage of fishermen age 55 or older.

Objectives: The purpose of this study is to evaluate chronic health risks before and during fishing season in a sample of drift gillnet commercial fishermen, which addresses the NIOSH priority of Total Worker Health™.

Methods: Gillnet license holders in Cordova, Alaska (n=607) were contacted and asked to participate in a preseason survey during March to mid-May assessing health behaviors. A mid-season survey during mid-May to September was also conducted. Physical exams and additional assessments were performed on a subset of these fishermen during July (mid-season).

Results: Sixty-six fishermen participated in the preseason survey and 38 participated in the midseason survey. The study population was overwhelmingly white males with an average age of 49. The average BMI was 27 with 70% of the participants overweight or obese. Nearly 80% of the sample considered their health good or better. Participants reported longer working hours, less sleep, and less aerobic exercise during the fishing season (p<.05). FitBit™ monitoring (n=8) confirmed less sleep and fewer

steps during fishing season. On exam (n=20), 80% of participants showed measured hearing loss at 4kHz (conversation range), and 70% had one or more upper extremity disorders, including 40% with rotator cuff tendonitis.

Conclusions: The prevalence of hearing loss, upper extremity disorders, and sleep apnea risk factors were higher than in the general population both before and during fishing season. Occupational factors including exposure to noise, the upper extremity demands of gillnetting, and long working hours while fishing exacerbate these chronic health conditions. Health promotion programs targeted towards these conditions may present opportunities for improving total worker health.

4D.4 Fishing for information: Scoping for opportunities to prevent musculoskeletal disorders on New Zealand's large fishing vessels — *Marion Edwin, Optimise Ltd. and Darren Guard, Guard Safety Limited*

New Zealand's fishing industry has consistently high rates of work-related injury and is one of five 'top priority' industry sectors targeted for health and safety improvement. New Zealand fishing has an established industry health and safety forum and an increasing commitment by key fishing companies to health and safety.

Kahler and Chau (2012) identified human and gravitational energy as cause for 58% of injuries sustained on <24 metre (New Zealand) fishing vessels, suggesting the need to address manual handling/ergonomics issues. Further review showed that vessels of >24 metres (just 7% of the national fleet) were responsible for a disproportionate 68% of serious harm injuries.

An ergonomist was engaged by ACC (New Zealand's accident compensation and rehabilitation agency) in 2013 to determine opportunities to address the high musculoskeletal injury rate. The 'ergonomics scoping assessment' occurred on >24 metre factory and fresher vessels to gain an understanding of the difficult-to-access work environment and the work demands for fishers. Key findings from the 'ergonomics scoping assessment' included injury contributors including poor workplace design, shift-work and related fatigue, vessel motion, dehydration, psychosocial factors, poor fitness, task training, and fishing companies with poor knowledge of the nature of these hazards. A number of research and intervention opportunities were identified to address the high injury toll in the New Zealand fishing industry with some promising initial feedback.

Practitioner Summary: A range of factors contribute to musculoskeletal injury risks on fishing vessels. Fishing companies may have poor understanding of the nature of the hazards and the strategies to address these, though the rewards may be considerable. There is opportunity to more effectively prevent and manage musculoskeletal health risks for fishers.

Day Two: Monday, June 11th, 2018

END OF DAY TWO PRESENTATIONS



Day Three: Tuesday, June 12th, 2018

KEYNOTE SPEAKERS (MORNING)

Melvin Myers — *"Aquacultural Safety and Health"*



Melvin L. Myers served for 30 years in the US Public Health Service as an engineer, 10 years at the Environmental Protection Agency and 20 years at the National Institute for Occupational Safety and Health, establishing its office in Alaska in 1992. He taught Occupational and Environmental Health Policy at Emory University for 25 years, was the principle investigator at the University of Kentucky for research on safety and health in aquaculture, and currently has a courtesy appointment at the University of Florida Southeastern Coastal Center for Agricultural Health and Safety as a consultant regarding research on safety and health among seafood harvesters in the Gulf of Mexico.

Andrew Watterson — *"Scoping aspects of global aquaculture occupational health and safety"*



Professor Andrew Watterson Ph.D., Chartered Fellow of the Institute of Occupational Safety and Health, Fellow Collegium Ramazzini is Head of the Occupational and Environmental Health Research Group & Director of the Centre for Public Health and Population Health Research at the University of Stirling, Scotland. He has also led Visiting Professorships at the University of New South Wales, Sydney, Australia and the University of British Columbia, Canada. His research interests include risk assessment, risk management and risk regulation particularly in the agriculture, fisheries and aquaculture, and energy sectors. He has acted as a WHO and FAO consultant on these topics. He uses health impact assessments and participatory action research among other methods to explore science- policy-civil society interfaces. He has published widely in peer reviewed journals on occupational and environmental health and safety, public health and toxicology journals. He has also published a Financial Times guide to occupational health and safety management and various books on occupational health and safety and public health.

LUNCH TIME TALK:

Daryl Attwood, Lloyd's Register Foundation — *"Initiative to Improve Safety in the Fishing Industry"*

The Lloyd's Register Foundation is a global charity which has active grants in excess of £100 million. One of The Foundation's missions is enhancement of the safety of life at sea. In its recent Insight Report on Global Safety Challenges, safety in the fishing industry was identified as one of the 12 main challenges facing mankind, alongside such fundamental issues as safety of the world's food and water supplies. It is often stated that the annual death toll in the fishing industry is around 24,000.

A key driver in the Foundation's grant awarding decisions is maximizing impact to society, regardless of location or method. In this case, impact will be measured in the number of fishers' lives saved. A workshop was held 19-20 March 2018, during which industry experts confirmed the locations where the largest numbers of fishers have lost, and without intervention will continue to lose, their lives; debated the causal factors which have costed the most lives (for example: inadequate access to affordable

weather forecasting, unstable or otherwise unsuitable fishing boats, lack of crew-awareness of vessel stability, cultural aspects, human factors); and proposed specific solutions for further development and subsequent implementation.

The development and implementation of the proposed solutions will benefit from guidance and other participation by several organizations with whom the Foundation has recently discussed the related issues, including: FISH Safety Foundation, CHIRP, The Nautical Institute, The International Maritime Organization, Memorial University of Newfoundland (MUN), The Fisheries and Marine Institute, MUN and The Pew Trust.

In addition, the Foundation can also utilize the expertise resident in its fee-earning branch, the Lloyd's Register Group, which has more than 257 years of Marine-related experience.

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9:00-10:30, A1049

SESSION 5A – OBSTACLES TO PERFORMING OCCUPATIONAL SAFETY AND HEALTH RESEARCH IN COMMERCIAL FISHING

Jeffrey Levin, University of Texas Health Science Center at Tyler; Ann Carruth, Southeastern Louisiana University; Thu Bui, Louisiana Sea Grant; Robert Perkins, U.S. Coast Guard

Researchers involved in community-based participatory research often face challenges due to numerous dynamic factors, including the physical location of the study population, willingness to participate, politics, language barriers, cultural norms, social stigmas, immigration issues and unpredictable weather and other disasters. Investigators who work with commercial fishermen are all too familiar with these confounding elements. For over a decade, researchers with the Southwest Center for Agricultural Health, Injury Prevention and Education (SW Ag Center) have faced these challenges head on to improve the health and safety of commercial fishermen in the Gulf of Mexico. The lead presenter in this panel is Jeffrey Levin, MD, MSPH, Senior Vice President for Academic Affairs and Provost at the University of Texas Health Science Center at Tyler. Dr. Levin has over 25 years of experience in occupational medicine and research and he has served as the Center Director for the SW Ag Center since 2002. Dr. Levin will draw from his twelve years of experience with commercial fishing research to discuss obstacles in planning research activities amidst natural and man-made disasters, e.g. hurricanes and the Deepwater Horizon oil spill. Dr. Levin has four publications related to his project, Innovative Approaches to Worker Health Protection among Shrimp Fishermen of the Gulf Coast.

Ann Carruth, DNS, RN, another seasoned commercial fishing researcher, will discuss the cultural factors that determine how commercial fishermen respond to a disaster. Dr. Carruth is a Professor and Dean of the College of Nursing and Health Sciences at Southeastern Louisiana University. In the Gulf of Mexico, commercial fishermen are culturally diverse with large cohorts of Vietnamese and Hispanic owners, captains and deck hands. In 2014, Dr. Carruth and Dr. Levin published “Cultural Influences on Safety Training among Vietnamese Shrimp Fishermen” in the Journal of Agromedicine. Dr. Carruth was a key partner to Dr. Levin’s project and she recently completed a five-year study entitled, Marketing Safety and Health among Vietnamese Commercial Fishermen. In 2016, Dr. Carruth was funded for another five years by the National Institute for Occupational Safety and Health to investigate the thermal load on PFD use among shrimp fishermen.

The SW Ag Center works closely with Sea Grant to access fishing populations and identify opinion leaders who can communicate with fishermen in their primary language. Thu Bui, a Marine Agent from Louisiana Sea Grant, will discuss her role as a research collaborator and community liaison. She will also expand upon the cultural influences that impact research participation.

Research with commercial fishermen would be practically impossible without support and cooperation from the United States Coast Guard (USCG). The SW Ag Center has a long working relationship with the Fishing Vessel Safety Examiners along the Gulf Coast. Robert Perkins, USCG District 8 Commercial Fishing Vessel Safety Coordinator will complete the panel and offer insights into the USCG’s role in safety training and research.

The panel session will conclude with a discussion of challenges to research within commercial fishing populations. Creative solutions will be shared to overcome barriers and build trust in culturally diverse communities.

9:00-10:30, A1046

SESSION 5B – OVERBOARD FALLS OF CREW MEMBERS ON QUÉBEC LOBSTER BOATS: RISK ANALYSIS AND TESTED PREVENTION SOLUTIONS FOR CREWS AND THEIR BOATS

Fishing is one of the most dangerous occupations; the work is performed under difficult conditions, on a slippery, moving surface exposed to the elements. Onboard fishing vessels using traps, overboard falls occur every fishing season, usually with serious, or even fatal consequences. Highly risks of entanglement and fall overboard often happen when resetting traps. Hauling heavy pots is a challenging and demanding MSD task as well as repetitive motion.

This session will be presenting results summary of a recent research program conducted in Canada (Quebec) since 2011 about occupational safety and ergonomics in lobster fisheries, putting together risk analysis, real work activity, ergonomics and criteria for improving vessels used in lobster fishery with the main concern to prevent falls overboard. Improvements have been tested at-sea aboard three various lobster fishing vessels categories. Major research projects financed by IRSST (Québec, Canada) are now completed. Communication #1 presents the results of these issued from interviews, observations on board, self-confrontation and validation by fishermen of the risks, their causes and main possible ideas or solutions to improve the safety of the fleet. Results are presented considering safety and ergonomics criteria. Communication #2 will emphasize on the development and testing at-sea of solutions, which have been explored

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during a fishing season. Communication #3 will present a point of view of a stakeholder about what could be applied for a better prevention in this industry.

5B.1 Overboard Falls of Crew Members on Québec Lobster Boats: Risk Analysis and Most Promising Risk Reduction Scenarios Emerging Solutions — *Sylvie Montreuil, Université Laval, Québec City*

Presentation of the methods and results of an applied research project aiming to understand work activities taking place aboard lobster boats and the risk factors associated with falls overboard. Interviews with fishermen, work observations aboard 7 boats and group validation with nearly all the participating crew members (11) lead to the identification of the most promising avenues for reducing risks (human & technical).

To identify what could be reasonably improved on lobster boats and the real means that are available to fishing vessel owners, a better understanding of the fleet characteristics, their equipment and the technical design resources support has been done to prepare the test benches.

5B.2 Safety and Ergonomics Risks Analysis to Choose and Assess Lobster Boats Improvements from Safety Design Criteria at the Hauling Station and the Trap Rack (Test Benches Results) — *Jean-Guy Richard, Université Laval, Québec City*

Determining which improvements should be tested has been done with the contribution of the sectorial follow-up committee and an expert committee including fishermen. The research team have presented real work situations observed on 20 lobster fishing vessels through 16 typical actions done by fishermen onboard. The risks and difficulties to perform these actions has been discussed by these committees and some avenues were proposed to resolve them. This process have resulted in the statement of "safety, efficiency and ergonomics objectives" for every typical actions. Once done, it was possible to work with the engineers to design the new equipment adapted to 3 representative lobster fishing vessels.

Three test benches will be presented either, the design process, manufacturing and at-sea trials at the hauler and lobster trap rack working stations. These trials were made during the regular fishing season under usual conditions. The results show that it is possible to optimize equipment at these two workplaces by reducing the risk of falling overboard while improving ergonomics.

5B.3. Ten years after fatal accidents and many prevention and research activities in the lobster fishing industry, what have we learned for a better future? — *Michel Castonguay, CNESST GASPÉ, Commission des normes, de l'équité, de la santé et de la sécurité du travail*

One of the difficulties that external stakeholders in prevention meet in the fisheries are that, fishers tend to believe that their safety is their responsibility alone. After all, "the captain is the only master on board, after God." Furthermore, many governmental agencies are devoted to ocean and fishery activity. How can we work together for a better safety in this sector? This conference will present what has been learned and could be applied for the future. *Conference followed by 15 minutes discussion.*

9:00-10:30, A1045

SESSION 5C – EXPOSURE ASSESSMENT AND HEALTH EFFECTS OF SEAFOOD BIOAEROSOLS IN THE FISHING AND SEAFOOD PROCESSING INDUSTRIES

This is the first half of a double session. Please see Session 6C for part two.

This session follows on from the first international symposium on the topic organized by SafetyNet in Canada (2006) and subsequent symposia held at ICOH South Africa (2009), ODTs in Norway (2011) and ICOH Mexico (2012). It brings together researchers from various countries focusing their research on allergens and respiratory health among fishermen, seafarers and workers in the fishing and seafood processing industry.

Special areas of focus include: a) global trends in the fishing and seafood processing environment, work organisation and relevance to occupational exposures and health; b) epidemiology of occupational seafood associated allergy and asthma; c) characterisation of exposures to respiratory sensitizers in various occupational and geographical contexts; d) techniques for the identification of putative allergens; e) pathophysiological mechanisms involved; f) elucidation of exposure-response relationships.

The aim of the session is to share insights into investigations on the various aspects as outlined above, to deepen the understanding of the state of knowledge since the last symposium so as to develop better intervention strategies, identify new challenges and formulate future research directions.

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5C.1 Exposure to bioaerosols during fish processing on board fishing trawlers — *CT Heidelberg, Berit Bang, Sandip Kamath, Andreas Lopata, AM Madsen, EU Høye, M Sandsund, Lisbeth Aasmoe*

Aasmoe Lisbeth and colleagues will present data on their study of exposure to bioaerosols during fish processing among production workers on board fishing trawlers. Production workers processing fish on board deep-sea fishing trawlers were exposed to proteins, including trypsin and the major allergen parvalbumin. The bioaerosol levels varied between vessels, and were influenced by different processing techniques, catch type and size of production area, season, age of the trawlers, ventilation systems as well as work load.

5C.2 Snow Crab and Northern Shrimp Aeroallergens and Toxic Gases in Holds and on Decks of Newfoundland Coastal Fleet Fishing Vessels — *Judith Read Guernsey, Matthew Seaboyer, Robert Helleur, Anas Abdel Rahman*

Shellfish aeroallergens and toxic gases in enclosed spaces of smaller North Atlantic maritime fishing vessels (< 20 meters length) represent under-characterized workplace hazards. While scientists have shown that repeated exposures to workplace-related aerosolized shellfish proteinaceous allergens in seafood processing plants and on board larger seafood factory vessels increase the risk for allergic rhinitis and asthma, studies of these airborne exposures and air quality of smaller vessels have not been reported. This pilot investigation provides quantification of seafood-related proteinaceous aeroallergens and toxic gases concentrations in manually-ventilated holds and on decks from a small sample of Newfoundland and Labrador Coastal Fleet (NLCF) fishing vessels. Structured interviews of captains elucidated details about vessels, workforce characteristics (3-6 men), reported respiratory symptoms, and voyage length (9-151 hours). Snow crab (SC) and northern shrimp (NS) tropomyosin (TM) and arginine kinase (AK) allergens, toxic gases (H₂S, NH₃, CO, %O₂) and temperature and humidity were measured. Highest SCTM levels were 111.41 and 1.27 ng/m³ in holds and decks of SC vessels respectively; in contrast to NSTM concentrations of 250 and 150 pg/m³ observed in these locations on NS vessels. AK levels were below the limit of quantification in all vessels. Elevated H₂S (~8 ppm) levels in two SC vessel holds and a decreased %O₂ (17%)-elevated CO (4 ppm) event in one NS vessel hold were observed. These findings support the need for more comprehensive investigations of aeroallergens and other respiratory exposures in relation to vessel ventilation and design that would serve to strengthen workplace prevention strategies for this vulnerable yet global industry.

5C.3 Exposure and health among Norwegian crab processing workers — *Sandip Kamath, Andreas Lopata, Berit Bang, Lisbeth Aasmoe, Marte Thomassen*

Marte Thomassen and colleagues will report on their study of exposure and health effects among Norwegian crab processing workers. This study investigated occupational exposure, the prevalence of respiratory symptoms and characterised allergic sensitisation in workers processing king crab (*Paralithodes camtschaticus*) and edible crab (*Cancer pagurus*) in Norwegian processing plants. Workers were found to be exposed to bioaerosols with levels varying between processing procedures, crab types and processing plants, indicating a plant effect. With sensitisation and increased prevalence of respiratory symptoms but little reduction in lung function and less asthma than non-exposed controls, the investigators suggest a healthy worker effect among the crab processing workers investigated.

5C.4 High prevalences of allergy, asthma, and accidents in the seafood industry in Greenland — *Sigsgaard, Torben, Ebbehøj, Niels, Carstensen, Ole, Rasmussen, Kurt, Jakob Hjort Bønlokke*

Jakob Bønlokke and colleagues investigated allergic reactions, lung function, respiratory symptoms, and assessed the prevalence of work injuries in Greenland. The study found a high prevalence of allergy, asthma and accidents in the seafood industry. This study also indicated that prawn processing appears to cause less disease than crab processing, although it is not negligible. A very high prevalence of work-related injuries was also observed.

9:00-10:30, A1043

SESSION 5D – HEALTH AND SAFETY INTERVENTIONS

5D.1 Use of an Ergometer to teach lifting — *Jerry Dzugan, Alaska Marine Safety Education Association*

This presentation will highlight the use of an Ergometer to teach the principles of lifting and moving to commercial fishermen, fish processing and aquaculture workers.

Commercial fish workers are at high risk for Muscular-Skeletal Disorders (MSDs) and the problem is endemic in this industry. Alaska Fishermen's Fund and other studies have demonstrated that MSDs are by far the leading chronic medical problem that fishermen face.

One of the problems with teaching better ergonomic lifting and moving practices is that many commercial fish workers come from non-English speaking populations. It is complicated by the fact that the location of many of

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these work sites are remote and hard to access. It is also difficult to break the lifelong lifting and moving habits of adults, so an effective teaching methodology has to be employed in order to change behavior.

Don Bloswick, Ph.D., an engineering professor emeritus at the University of Utah, has been using an ergometer for years in his engineering classes to demonstrate the negative effect on muscles and tendons when using force and poor posture. We have worked with Prof. Bloswick to modify his curriculum to be appropriate for commercial fish workers and have brought this training to over 3,500 commercial fish workers on all coasts of the U.S. This presentation will focus on a demonstration of how the ergometer can be used with fish workers to demonstrate the force on the muscles when using the hand and arm as well as the back to do common repetitive motion tasks that are common in fisheries. It will also demonstrate the effectiveness of this teaching method to workers that do not have a common language.

5D.2 Building better flotation: Moving research to practice in the PFD industry — *Ted Teske, Devin Lucas, Jennifer Lincoln, and Christy Forrester, U.S. National Institute for Occupational Safety and Health (NIOSH)*

Most work-related fatalities in the United States fishing industry are caused by drowning after a vessel disaster or a fall overboard. Although the risk of drowning is high, most deckhands do not wear personal flotation devices (PFDs) while working on the deck. There are currently no mandates by regulatory agencies in the United States for these workers to wear PFDs.

NIOSH conducted a study among fishermen in four different fishing fleets to determine which type of commercially available PFD resulted in the highest satisfaction in actual fishing industry working conditions. Six PFD models were selected to provide a variety of features to test for comfort and functionality. The study revealed that workers on different types of fishing vessels had varying preferences for PFDs. This study also looked at predictors of PFD use based on perceptions and attitudes related to PFDs. Major barriers included concerns about comfort and risk of entanglement. Because no regulations mandating the use of PFDs exist, manufacturers may have more success in supplying PFDs if they engage workers in the design and promotion of newer, more comfortable PFDs.

Based on the results of the NIOSH PFD study, a U.S. PFD manufacturer realized there was a need for innovative PFD designs to improve comfort for workers in the fishing industry. They extended the NIOSH study and took a variety of commercially available PFDs to test on several boats where crewmembers gave feedback on the mobility of each PFD. Based on their market research, the

company developed a prototype designed to be worn under bibs and raingear with 12 lbs. (50N) of flotation, the optimal amount to maintain a low profile while still providing buoyancy.

This Presentation will discuss the relevant findings on PFD perceptions among commercial fishermen from the NIOSH study as well as how these barriers were addressed in developing a novel PFD specifically for commercial fishermen.

5D.3 RESCUES: Responding to emergencies at sea and to communities under extreme stress — *Ann Backus, Harvard TH Chan School of Public Health and NIOSH Education and Research Center*

Background: As in other parts of the world, fishing families and communities in the United States have struggled for hundreds of years to respond to the high number of fatalities associated with a historically hazardous industry. Individual fishermen have sought ways to reduce their own risk, and communities have developed organizations such as Fishermen's Wives and infrastructure to support grieving families and communities.

Methodology: With funding from the Massachusetts Fishing Partnership Support Services, three researchers implemented a descriptive study to capture how individual fishermen and entire communities respond to the stress of loss. Researchers and community stakeholders interviewed fishermen, family members, city government and US Coast Guard personnel, local agency staff and others in the fishing communities of Gloucester, MA, New Bedford, MA, and Point Judith, Rhode Island. The transcribed interviews were analyzed using NVivo™ software. The information was compiled into a handbook – a template for communities seeking to reduce the risk of fatality or disability and help ensure a community-wide, comprehensive response in the face of loss or disaster.

Approach: The presentation will elaborate on the handbook chapters, covering risk reduction strategies for fishermen and resilience-increasing strategies for families and communities. The initial handbook, based on information from Massachusetts communities, has been adapted for the states of Maine and New Hampshire. Discussion about potential additional adaptations will be encouraged.

In addition the presenter will discuss expansion of the utility of this handbook beyond the losses related to fishing to include the losses that communities vulnerable in the face of climate variability (increasing frequency and severity of storms) may experience in the future.

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5D.4 Fixed guard designs for deck winches used on side-trawl shrimping boats — *Chelsea Woodward, David Sweet, and Grant King, U.S. National Institute for Occupational Safety and Health (NIOSH)*

Workers in the United States commercial fishing industry has one of the highest occupational fatality rates. It is nearly 25 times higher in 2014 than the rate for all U.S. During 2000–2014, 694 fishermen were killed in the U.S. fishing industry, where 12% of fatalities (82 deaths) were caused by injuries sustained onboard vessels, such as entanglement in machinery. Additionally, NIOSH has shown that most (67%) severe nonfatal injuries occur on deck during the deployment and retrieval of fishing gear. Entanglement fatalities of deckhands in the U.S. occurred most often in the Gulf of Mexico, where the Southern shrimping fleet operates off the Southern and Atlantic coasts from North Carolina to Florida and on throughout Texas waters.

The Southern shrimping side-trawl fleet deck machinery includes large open winches. The fleet is established with few new boats, and with few new winches in use. The use of older and sometimes antiquated deck winches is common throughout the fishery. The ubiquitous use of these legacy winches offer challenges to improving their safe operation, and to prevent or to reduce the severity of winch entanglement injuries of the workers. Working towards this goal, NIOSH engineers have designed retrofit fixed-guarding, standardized to fit three of the most common winch types and models in use.

This presentation will discuss a brief history of these designs and the development challenges of standardizing fixed-guards to models of deck winches that have changed dimensions over time.

10:45-12:15, A1049

SESSION 6A – THE NEED FOR A PUBLIC HEALTH PROGRAM IN COMMERCIAL FISHING

Olaf Jensen, Center for Maritime Health and Society, University of Southern Denmark & International Maritime Health Association (IMHA) -Research; Ilona Denisenko, IMHA; Luisa Canals, University of Cadiz, Spain and IMHA-Research; Despena Andrioti, IMHA-Research and Center for Maritime Health and Society, University of Southern Denmark

The conditions of work in the fisheries sector are arduous with high rates of occupational non-fatal and fatal accidents. Logically, the prevention activities up till now mainly focused on accident prevention with little attention to the emerging chronic diseases, especially diabetes and cardiovascular diseases related to the specific risk factors.

Several studies have shown that fishermen have a higher morbidity and mortality from cardiovascular disease, diabetes, cancer than other occupations. The results are consistent with the causal explanations in studies about obesity and related health conditions also called the metabolic syndrome. The main risk factors include alcohol, fatty food consumption, smoking and lack of physical exercise. And the negative health effects are causally related the mentioned risk which in turn relate to the specific working conditions and culture in small-scale fishing. This needs to be taken into consideration in the prevention programs.

According to the Luxembourg Declaration of June 2005, health promotion at the workplace is “the combined effect of employers, employees and society’s efforts”. From the international side, the WHO announced in February 2007 that health promotion is an integral part of the work environment work. The International Labor Organization (ILO) included health promotion as part of the work environment some 10 years ago. It is obvious to apply the land-based initiatives, for example, such as the Danish KRAM (Food, Smoking, Alcohol and Physical movement) model to the fishing industry, based on the special conditions of the fishing industry.

Aims: The overall goal of incorporating good habits in everyday life with regard to diet, smoking and physical activity applies to all areas of fishing like in the other areas of society. The general multifactorial causal model used as the theoretical model for health promotion needs to be adapted to the special working conditions in fishing to be effective.

Conclusion: International collaboration in research and development of health promotion programs in fishing seems to be highly needed. Especially as fishery is a relatively small commercial area in the countries, it’s important to have international collaboration.

A good start could be to bring together the initiatives that are currently taking place in some countries, for mutual inspiration between many other countries to establish a program.

10:45-12:15, A1046

SESSION 6B – REGIONAL APPROACHES TO FISHING SAFETY 2

6B.1 Practical and strategic gender needs in tuna fisheries in the Philippines: Focus on women’s occupational and health hazards — *Marieta Bañez Sumagaysay, University of the Philippines Visayas and UPV Tacloban College*

The 2017 gender analysis of the tuna fisheries value chain in General Santos City, Philippines showed that gender differentials exist and these impact heavily on women

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who are marginalized in a male-dominated fishing industry. Traditional gender roles and a patriarchal society's expectations/beliefs make women vulnerable to occupational and health hazards which further lessen their productivity and efficiency, diminish their capacity to earn, and reduce their self-esteem as a woman and as man's co-worker.

Data were gathered from focus group discussions, key informant interviews, surveys, and secondary sources from three sectors: municipal small-scale fisheries, large-scale (purse seine and handline) fisheries, and tuna value-added processors. The researchers used gender tools/principles and the USAID six domains of gender analysis, i.e., access to assets, beliefs/knowledge, practices/participation, time and space, legal rights/status, and power/decision making.

Practical gender needs (PGNs) include women's vulnerability to sexual harassment in the workplace, absence of gender-responsive facilities, inadequate social security/insurance, and poor working conditions such as long hours of standing, night shifts, lack of protective gears/clothing, poor ventilation. The strategic gender needs (SGNs) include the lack of women-friendly equipment/fishing paraphernalia that limit women's work participation, just as it poses as occupational and safety hazards to women. Addressing PGNs can improve women's quality of life in terms of health care, protection, and safety, while addressing SGNs can minimize her subordinate status.

Men have PGNs and SGNs, too, but these are generally ignored and muted because society dictates that men are physically strong, and have been prepared to take dominant/manly roles regardless of the hazards it may take.

The study recommends that policy making and program development should embrace a gender lens at all value chain nodes. Policy measures, research initiatives, and action interventions cannot be gender-blind if fisheries have to be inclusive by taking care of women partners in the industry.

6B.2 A review of fishing safety and occupational health on Lake Malawi: Technical and policy issues — *Njaya Friday, Malawi Department of Fisheries*

This paper seeks to review progress made on fishing safety and occupational health on Lake Malawi over a decade ago. The aim is to examine whether there have been any changes on technical and policy aspects. Both primary and secondary data are used in this assessment. Primary data was collected in fishing communities and focused mainly on fishing technologies. The annual frame survey data done every year in September and the latest being September 2017 provides such data. Secondary data is used to review policy at both national and interna-

tional levels. There are changes in terms of type of fishing vessels as there is an increase in the use of powered vessels to enable the small-scale fishers access offshore fishing grounds; mainly to target usipa (*Engraulicypris sardella*) and utaka (*Copadichromis spp.*). Vessels powered by 25hp engines have increased by 44% from 794 in 2008 to 1,793 in 2018. However, this is risky as the fishers do not use life-saving facilities like life jackets hence lake accidents occur every year. Occupational health issues are still common as workers spend the whole day trawling throughout the day while exposed to direct sun. However, on policy issues, the revised National Fisheries and Aquaculture Policy of 2016 recognises the need for promoting decent employment as stipulated in the Social Development and Decent Work as one of the policy priority areas. This is in line with the FAO Voluntary Guidelines for Securing Sustainable Small-Scale Fisheries of 2015 which calls States to promote decent work for small-scale fisheries workers, including both the formal and informal sectors. A key recommendation is to amend the fishing legislation to govern the decent employment by formulating rules on fishing safety. In addition, capacity building among the fishers on fishing safety and decent work is recommended.

6B.3 Safety conditions on smaller vessels in the Norwegian fishing fleet — *Halvord Aasjord and Ingunn Marie Holmen SINTEF Ocean*

Background: The smaller coastal fishing fleet are the most risky with respect to fatal accidents. Accidents data over long periods like a 28 year period from 1990 – 2017, where so far 67 % of all fatal accidents are related to fishing vessels, length; $Loa < 15$ meter. Of these fatal losses, 62 % were fishers on so-called one-man boats. That gives 42 % of all fatal accidents in the Norwegian fishing fleet happens on board on one-man boats.

Main causes of fatal accidents on smaller vessels:

- Vessel casualty incl. capsizing
- Overboard accidents – drowning
- Harbour accidents – drowning
- Stroke and crush in fishing operations

Statistics of fatal accidents for the smaller fishing fleet are presented for 5-year periods.

There has been a decrease in number of fishing boats in the smaller length groups, $Loa < 15$ meters and quota are often transferred from the smaller length groups to larger length groups.

That means that many fishermen, especially older ones, have sold out their quotas from group I and ends up to fish their quota in group II, then mostly as an one-man fishermen. This seems to give much higher risky operations in respect to fatal accidents.

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Then the Norwegian Maritime Authorities (NMA) have now introduced full safety standard and periodic control for all the smaller fishing fleet from 8.0 to 15 meter. Consequences will be that many older vessels still in operation will get same safety control than newer vessels and many of them will therefore be phased out of "The register of fishing vessels". This because the owners find it too expensive upgrade his vessel to a higher standard.

The next step is the introduction of safety management also on smaller fishing vessels, and this regulation was implemented by NMA on 1 January 2017. In 2018 the NMA will focus on safety management on smaller vessels, with an emphasis on operational issues. Lacking procedures for operations and weaknesses in organizational, leadership and communication issues are often a factor in vessel accidents. The expected safety effect and any other outcomes of these new safety regulations will be discussed in this presentation, not least from the users' point of view.

References:

Aasjord HL, Holmen IM, Thorvaldsen T (2012). Occupational accidents and casualties in the Norwegian fishing fleet (In Norwegian). SINTEF report A23369. ISBN 978-82-14-05451-4.

McGuinness E, Aasjord HL, Utne IB, Holmen IM (2013b). Fatalities in the Norwegian Fishing Fleet 1990-2011. Safety Science 57: 335-351.

Aasjord, HL, Enerhaug, B. (2013). Stability and stability margins on smaller fishing vessels. (In Norwegian). SINTEF-report A24663, ISBN 978-82-14-05638-9.

Aasjord, H L., Holmen, IM. (2016): Fisherman on small fishing vessels lives a very risky life. (In Norwegian). Ramazzini (Norwegian Journal of Occupational and Environmental Medicine). Year 23. 2016 – No. 1.

NMA (2017). Documents included in the control scheme for fishing vessels below 15 meters: <https://www.sjofartsdir.no/sjofart/fartoy/tilsyn/kontroll-av-fartoy-under-15-meter/dokumentliste-kontrollordning-for-fiskefartoy/>

6B.4 Dehydration in New Zealand fishing vessel crews — *Marion Edwin, Optimise Ltd.; Dave Moore, AUT University, New Zealand; Darren Guard, Guard Safety*

High musculoskeletal injury rates in crew on large (>28 m) New Zealand fishing vessels lead to an exploratory investigation of ergonomics risk factors. Initial findings indicated that hypo-hydration appeared to be both significant and common, and was of concern as crew work rotating shifts for up to 6 week periods.

Review of the international (English language) literature reveals that no hydration evaluation specific to crew on fishing vessels has been published to date. Dehydration research has however occurred in forestry, mining and manual labour industries with knowledge that can be applied to the maritime work environment. This includes an understanding of the problems that may develop

in relation to dehydration, and relevant research and intervention methodologies. Further, the health effects of consuming the desalinated water that is typically provided on large fishing vessels appears to be little understood by fishing operators.

This paper describes the hydration findings of an exploratory ergonomics assessment of crew on NZ fishing vessels, and reviews the relevant literature.

Practitioner Summary: Dehydration impacts on physical and cognitive aspects of worker performance and long term health. Hypo-hydration of crew on working fishing vessels may lead to performance decrements and productivity losses. Assessing hydration of crew on-vessel poses some challenges to researchers but offers a powerful learning environment for participating crew members.

10:45-12:15, A1045

SESSION 6C – EXPOSURE ASSESSMENT AND HEALTH EFFECTS OF SEAFOOD BIOAEROSOLS IN THE FISHING AND SEAFOOD PROCESSING INDUSTRIES (CONTINUED)

This is the second half of a double session. Please see Session 5C for part one.

This session follows on from the first international symposium on the topic organized by SafetyNet in Canada (2006) and subsequent symposia held at ICOH South Africa (2009), ODTs in Norway (2011) and ICOH Mexico (2012). It brings together researchers from various countries focusing their research on allergens and respiratory health among fishermen, seafarers and workers in the fishing and seafood processing industry.

Special areas of focus include: a) global trends in the fishing and seafood processing environment, work organisation and relevance to occupational exposures and health; b) epidemiology of occupational seafood associated allergy and asthma; c) characterisation of exposures to respiratory sensitisers in various occupational and geographical contexts; d) techniques for the identification of putative allergens; e) pathophysiological mechanisms involved; f) elucidation of exposure-response relationships.

The aim of the session is to share insights into investigations on the various aspects as outlined above, to deepen the understanding of the state of knowledge since the last symposium so as to develop better intervention strategies, identify new challenges and formulate future research directions.

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6C.1 Sources and exposure to aerosolized marine biomolecules in Norwegian seafood industry — *Berit Bang, Lisbeth Aasmoe, Malla Nabin, Marte Thomas-sen*

Berit Bang and colleagues report on sources and exposure to aerosolized marine biomolecules producing inflammatory and immunological responses drawing from their studies in the Norwegian seafood industry. In vitro and structural molecular results will illustrate aspects of importance. The relevance of proteases in exposure mixtures will be emphasized. A sensitive assay for proteases in bioaerosol samples, based on protease activity, will be presented.

6C.2 The work environment in the Swedish fish processing industry and among fishermen — *Anna Dahlman-Höglund, and E. Andersson*

Anna Dahlman-Höglund and colleagues characterize the work environment in Swedish fish processing, and fishing by baseline Questionnaire sent to 1866 individuals, and measuring the exposure.

6C.3 Component Resolved Diagnosis in the detection and quantification of allergens at the workplace — *Sandip Kamath, Mohamed Jeebhay, Thimo Ruether, Roni Nuagraha, Andreas Lopata*

Andreas Lopata and colleagues report on the usefulness of component resolved diagnosis in the detection and quantification of allergens at the workplace to optimize interventions. The presentation will expand on the use of biotechnological tools to detect single allergen components to increase test sensitivity, analytical specificity and identification of health risk associated molecules.

6C.4 Exposure-response relationships for allergy and asthma associated with seafood exposures — *Mohamed Jeebhay, Roslynn Baatjies, Andreas Lopata*

Mohamed Jeebhay and colleagues present exposure-response models for seafood processing environments with specific reference to their investigations into the association between inhalation of pelagic fish (pilchard and anchovy) aerosols and work-related allergy and asthma in processors, and report on the extent to which host factors (atopy and smoking) modify this risk.

10:45-12:15, A1043

SESSION 6D – EVALUATING FISHING SAFETY INTERVENTIONS

6D.1 Have you met Angus? Developing “Live to be Salty”, a Multi-channel campaign to improve personal flotation device use among commercial fishermen — *Ted Teske, Samantha Case, Christy Forrester, Devin Lucas, and Jennifer Lincoln, U.S. National Institute for Occupational Safety and Health*

Personal flotation devices (PFDs) have been shown to effectively prevent deaths from falls overboard; however, there is no regulation requiring PFD use in the United States. From 2000-2014 there were 210 man overboard fatalities in the U.S. and none of the victims were wearing a PFD when they drowned. 85% of fishermen surveyed say PFDs are fairly or very effective at preventing fatalities from falls overboard, yet only 33% report frequently or always wearing a PFD on deck. Reported barriers to use included concerns of discomfort and entanglement with fishing gear.

In 2012, NIOSH engaged community partners and a strategic communication firm to develop an intervention to overcome existing barriers and encourage PFD use among fishermen. Campaign strategy focused on common touchpoints—coordinating concentrated community, point-of-sale, and digital channels to reach the target audience where they live, work, eat, and shop. The resulting intervention, Live to be Salty, was a 2-year multi-channel campaign featuring a developed spokesman, Angus, designed to be culturally relevant, memorable, and different from typical safety messages targeted at these audiences.

A robust evaluation program was implemented to answer questions about PFD use, attitudes about man overboard risk, recognition and recall of the campaign spokesman and his message, and behavioral intention or change. Results showed an increase of 48 and 22 percentage points in message awareness among the target audiences. Nearly three-quarters of respondents felt the spokesman seemed, “like a seasoned fisherman.” 22%-40% of respondents reported taking some level of action as a result of the campaign’s message.

Attendees will learn about NIOSH’s process of conducting epidemiologic and formative research to understand the problem, developing targeted interventions in collaboration with partners, and demonstrating the effectiveness of these efforts in improving worker safety and health—what NIOSH calls “Research to Practice.”

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6D.2 Evaluation of community-based health supports for fishing families: Tools and approaches —

Gretchen Biesecker, Fishing Partnership Support Services

Fishing Partnership Support Services (FPSS) integrates program design and evaluation to serve the most critical needs of the fishing community in New England. Our model employs trusted women from the fishing community as insurance Navigators, provides health interventions (e.g., vaccines and dental screenings), safety trainings, and financial planning and stress-reduction workshops. Program activities are located harborside, where fishing workers and families are. This presentation will share examples of our evaluation tools and strategies and how they have evolved.

Our developmental, participatory design of evaluation tools and integration of data into practice is innovative and challenging, with applications for other programs. Navigators enter data close to real-time in a Salesforce database, while providing direct service to families. Tensions between attention to data quality and focusing on direct service to families, while governmental reporting systems and regulations change, can be difficult. We engage our Navigators and staff as thought partners in our evaluation design. We incorporate empathy and journey mapping when we plan our measurement strategies and use a variety of techniques to foster a culture of learning with data. Internal evaluation staff conduct weekly data pulls, reviewing data monthly with Navigators and non-profit leadership to monitor progress toward goals. We conduct surveys at safety trainings, opioid awareness, and other learning events to measure increases in knowledge, changes in attitudes, and participant feedback. Focus groups and other qualitative data help us learn from pilots and share our story. Partnerships with local universities round out our research portfolio and help enhance their understanding of the fishing community and inspire new research. Evaluators work with program staff to analyze these multiple types of data to address the FPSS learning agenda, set meaningful goals, and communicate findings. We hope examples from our evaluation practices will help other programs and evaluators maximize their learning and impact.

6D.3 Relearning performance of two Marine Emergency Duties tasks: Implications for fisheries —

Elizabeth Sanli, Matthew Ray, Robert Brown, Kerri Ann Ennis, and Heather Carnahan, Offshore Safety and Survival Centre, Fisheries and Marine Institute of Memorial University

Training courses, designed to prepare seafarers to respond should a critical situation arise, include a range of knowledge and skill competencies. Due to infrequent

requirements to perform these skills outside of training, and the importance of correct execution in critical situations, understanding the forgetting of such skills is important. For example, in fisheries, the donning of an immersion suit or properly responding to a shipboard fire are important sets of skills. Factors influencing forgetting include task difficulty, type of skill, and the specificity of training to the work domain as well as skill level attained during training, the amount of practice received and subsequent on-the-job exposure to specific skills. There are also indications that for some tasks, forgetting takes place after 6 months following initial training. To understand the process of forgetting, relearning performance (reflective of forgetting) of two equipment preparation and donning tasks within the Marine Emergency Duties refresher course context were examined. The first cohort of trainees enrolled in refresher training ranged in age from 23 to 72 years and had completed their prerequisite training 1 to 43 years prior to the refresher training. While less than 1% of trainees produced errors during the preparation and donning of an immersion suit, 58% percent of trainees produced errors during the preparation and donning of a self-contained breathing apparatus during training. It is encouraging that the mean number of errors per person was low for both tasks, however, measurement of current performance should not be interpreted as an indicator for long-term retention of the skills. Next steps should focus on understanding additional skills relevant to a fisheries context.

6D.4 Effective methods for reduction of noise and vibration in fishing vessel Design —

Mohamed Auf and Lorenzo Moro, Memorial University Newfoundland

Regarded as one of the most dangerous industries to work in, commercial fishing is an area of utmost importance to analyze and obtain effective measures of risk reduction. The need to quantify and analyze the risk areas on-board fishing vessels has been pressed by authorities world-wide from the increasing number of injuries and fatalities in this industry. Fishing vessels are particularly known for their high levels of noise and vibrations due to their layout and relatively small size. Noise and vibration mitigation on fishing vessels impact both vessel equipment and on-board crew. Benefits of reduction include: protection of sensitive ship equipment and hydro-acoustic apparatus, low noise emitted to the water so as not to scare fish schools, low ship self-noise so as not to affect hydro-acoustic devices such as sonars and echo sounders, and increased safety of on-board crew. Fish harvesters working in these vessels are in constant prolonged exposure causing a high risk of hearing impairment and decreased comfort levels leading to an unsafe work environment.

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For this reason, it is important to study ways to decrease noise and vibration levels in the design phase of a new fishing vessel. It is typical in this industry, to a certain degree, to neglect the reduction of noise and vibration from the main sources which are the propellers, main diesel engines, and various auxiliary plants. In this presentation, we will talk about effective design methods used to mitigate noise and vibration on ships that can be applied to fishing vessels. We will focus then on numerical simulations of noise and vibration on fishing vessels, as a design tool, to evaluate mitigation and optimization methods for the design of fishing vessels.

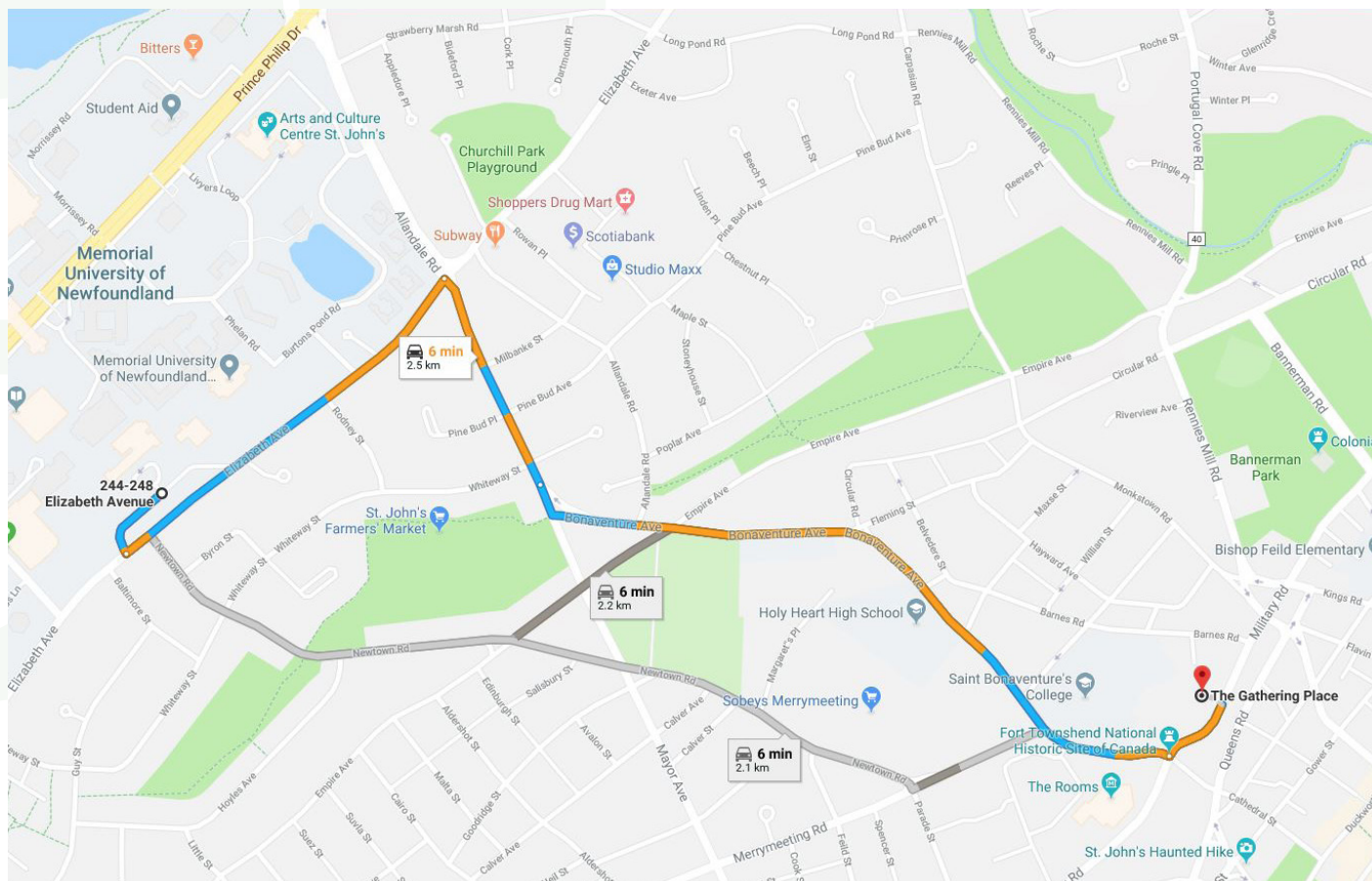
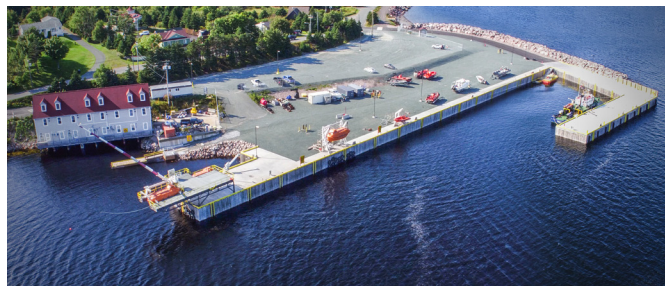
END OF DAY THREE PRESENTATIONS

EVENING NETWORKING EVENT:

The offsite Social/Networking Event will be held at **The Gathering Place (172 Military Road)** from 7:00pm–11:00pm. There will be live, local entertainment and refreshments available for purchase. *Note: This event is offsite and transportation is not provided.*

AFTERNOON MARINE INSTITUTE TOUR:

Tuesday, June 12th, 1:30pm–4:30pm: Outing to the **Off-shore Safety and Survival Centre**, Foxtrap at the Marine Institute. Tours of the facility will be given for IFISH participants. *(Transportation provided – gather at 1:30pm in the 1st Floor Atrium of the Bruneau Centre).*



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KEYNOTE SPEAKERS

Jim Wellman — *"Sea stories: When people go to sea and don't come home"*



Jim Wellman grew up in Port Anson, a small fishing and logging community on Newfoundland's northeast coast. The son of a schooner captain, Jim never strayed far from his marine roots despite choosing a career in journalism. For fifteen years, Jim was host of the popular radio program The Fisheries Broadcast on CBC Radio in Newfoundland. After taking an early retirement from the radio business in 1997, he turned off the microphone and picked up a pen. He has written numerous books with marine connections and continues to write the very popular column Final Voyages for the marine and fishing industries magazine, *Navigator*.

Christina Stringer — *"Slavery in New Zealand's offshore fisheries: A multi-stakeholder response"*



Dr. Stringer is an Associate Professor in the Department of Management and International Business. In 2008, she undertook a project for New Zealand's Ministry of Fisheries (now Ministry of Primary Industries) which looked at the extent that New Zealand caught fish was being processed in China and exported to key markets. This project led in 2010, to Christina and colleagues investigating the use of forced labour on board New Zealand foreign chartered fishing vessels. This research, in turn, led to a Ministerial Inquiry, a major shift in government policy, and the enactment of a law requiring all foreign charter vessels to be reflagged to New Zealand by 1 May 2016. In 2012, Christina and her two co-researchers (Dr Glenn Simmons and Professor Hugh Whittaker) received the Dean's Award: a special award recognising the impact of research concerned with human rights issues on-board foreign charter vessels fishing in New Zealand's waters. In 2017, the fisheries team (Dr Glenn Simmons, Professor Hugh Whittaker, Associate Professor Christina Stringer, Associate Professor Manuka Henare and Professor Nigel Haworth) received a Research Excellence Award for Strategic Impact in Research.



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9:00-10:30, A1049

SESSION 7A – LATENT AND ACTIVE CAUSES OF VESSEL LOSSES

7A.1 Vessel losses and stability — *Kenneth Smith, Hook Marine, Ltd.*

It is acknowledged in the United Kingdom that commercial fishing is the most dangerous of all occupations. Data published by the Marine Accident Investigation Branch show that accident rates in merchant shipping are declining, yet statistics for fishing vessel losses remain stubbornly high. In this presentation, latent and active causes of accidents are considered, and the detail of one of the worst accidents in the Scottish fleet is examined by way of practical illustration. Finally, deteriorating stability has been identified as the most significant factor in losses of vessels and lives in the fishing fleet, and current stability monitoring work by Hook Marine is described and suggested as a solution to this problem.

7A.2 Reducing fishing vessel capsizing — *Bryan Davis, Memorial University*

This presentation outlines our project's approach to reducing fishing vessel capsizing in Newfoundland. Capsizing is a serious concern amongst members of the fishing community in Newfoundland. These events are rare but are often fatal, result in large economic losses, and are highly publicized. It is important to determine the primary causes of vessels capsizings in order to put preventative measures in place. Investigation reports of capsizing events were analyzed and will be supplemented by interviews with fish harvesters who have had a "near miss" capsizing event. In addition to this data collection, roundtable discussions with fish harvesters focusing on their perceived risk of capsizing will be performed. From these assessments, an outline of a program focusing on education and awareness will be prepared. This program will equip operators with the knowledge that will allow them to make informed decisions regarding the stability of their vessel.

7A.3 Evaluation of policy measures to prevent collision of fishing boats with merchant ships in the Indian Exclusive Economic Zone —

Rajdeep Murkherjee and Yugraj Singh Yadava, Bay of Bengal Programme Inter-Governmental Organisation

Port-led development policies in the region and promotion of offshore fishing by the coastal States/Union Territories and Union Governments of India have increased both the shipping and fishing traffic in the Indian Exclusive Economic Zone (EEZ). Along with this increase in traf-

fic, the number of reported incidents of collision between fishing boats and merchant ships have also increased. In 2017, there were four major incidents involving fishing vessels and merchant ships, which caused loss of lives and destruction of fishing vessels. The situation is further aggravated by engagement of migrant labour from the hinterland of India, who have no prior experience in 'Rules of the Road'. While the Merchant Shipping Act of 1958 guides the registration of both the merchant ships and the fishing vessels, regulations concerning qualification of fishing crew and fitness of fishing vessels have been diluted considering their size, area and scale of operation and in general marginal economic status. However, with the fishing vessels moving increasingly offshore and Indian waters attracting more shipping traffic, the situation is likely to worsen in the coming period. The issue is now getting increased policy focus and agencies involved in shipping and fishing regulations are coming together to find possible options to address the problem. A standard Operating Practice has also been developed by the Directorate General of Shipping for consideration of the marine fisheries agencies in the country. The paper evaluates the policy development so far and options for developing a suitable mechanism as fishers usually undermine the navigational risks of fishing.

9:00-10:30, A1046

SESSION 7B – CHANGING COMMERCIAL FISHING PERSONAL FLOTATION USE BEHAVIOR: WHAT CAN WE LEARN FROM EFFORTS TO ADDRESS THE MOST IMPORTANT SAFETY TECHNOLOGY ADOPTION CHALLENGE OF OUR TIME?

This is the first half of a double session. Please see Session 8B for part two.

Julie Sorensen, Northeast Center for Occupational Health and Safety (NEC); Rebecca Weil, NEC; Ann Carruth, Southwest Center for Agricultural Health, Injury Prevention and Education (SWAG Center); Jeffrey Levin, SWAG Center; Jennifer Lincoln, U.S. National Institute for Occupational Safety and Health (NIOSH); Frankie Horne, The Royal National Lifeboat Institute (RNLI); JoJo Mains, RNLI; Derek Cardno, Scottish Fishermen's Federation; Ted Teske, NIOSH; Mark Dolomount, Newfoundland and Labrador Professional Fish Harvesters Certification Board; Amanda Dedrick, The Fisheries Safety Association of Nova Scotia

In this double panel session, researchers from various coastal regions will discuss their efforts to increase the use of personal flotation devices (PFDs) in commercial fishing populations. Falls overboard and vessel sinkings have been the primary cause of commercial fishing

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deaths since humans have taken to the water to harvest fish. Although PFD designs have greatly improved over the past decade, regular use of these life-saving devices by the commercial fishing population, have remained frustratingly low. Panelists will address the following questions in their presentations:

- PFD Intervention Objective and Target Population
- Research Methods-if applicable
- Barriers to Adoption
- Motivators to Adoption
- Intervention Approach
 - Intervention Framework
 - Efforts to Address Barriers
 - Efforts to Provide Motivators
- Stakeholder Engagement
- Three key observations which are vitally important to increasing PFD use.

Following each 15-minute presentation (2 hours total with a 15 minute break halfway through the session), presenters and those in attendance will be asked to use the last 45 minutes of this session to collectively brainstorm five collective action steps for commercial fishing safety researchers and industry groups to address in the next year. These action steps will focus on advancing PFD adoption in commercial fishing sectors and could include: developing better PFD designs, developing improved PFD distribution channels, bridging gaps in behavior change research, developing better methods for objectively tracking PFD use or finding opportunities for industry and health and safety researchers to regularly interact and collectively address barriers to change. These action steps will be reviewed at the next IFISH conference.

9:00-10:30, A1045

SESSION 7C – SAFER AND HEALTHIER WORKPLACES IN AQUACULTURE

This is the first half of a double session. Please see Session 8C for part two.

Trine Thorvaldsen, SINTEF Ocean; Trond Kongsvik, NTNU Samfunnsforskning; Kristine Størkersen, NTNU Samfunnsforskning; Ingunn Marie Holmen, SINTEF Ocean; Mariann Sandsund, SINTEF Technology and Society

Aim of the workshop: In relation to the ongoing research project “Safer operations and workplaces in fish farming” we will arrange a workshop aimed at discussing findings from the Norwegian context with conference participants from other institutions and countries.

The Norwegian context: The aquaculture industry has grown to become one of the most important industries in Norway. Atlantic salmon is produced and exported worldwide and the production has a potential to increase in the years to come. Employees at the fish farms have the 2nd most risk exposed occupation in Norway according to accident statistics. Research aimed at providing means to reduce risks and improving workers' health and safety is therefore needed.

The project: Key findings from the Norwegian context will be used as a starting point for discussing the following topics: Workers perceptions of working environment, environmental conditions and workload and organizing safety (OHS management systems). During the workshop, we will discuss how these findings may benefit not only workers in Norwegian aquaculture, but other countries as well: How can we utilize this knowledge to provide safer and healthier workplaces for workers in aquaculture worldwide?

Short introductions for each topic (presenters):

Workers' perceptions of working environment ([Trine Thorvaldsen](#) & [Ingunn M. Holmen](#))

A survey amongst workers in Norwegian aquaculture as well as personal interviews has targeted the interaction between work and health. Findings related to workers' perceptions on exposures, health complaints, reasons for sick-leave, self-reported health status are presented.

Environmental conditions and workload ([Mariann Sandsund](#))

Workplace field studies have measured work intensity and thermal stress during fish farmers work sessions including several physiological sensors. Results from these field studies are presented.

Organizing safety/OHS management systems ([Trond Kongsvik](#) & [Kristine Størkersen](#))

Organizational conditions influencing safety in fish farming, have been identified based on survey and interview data. The respondents are fish farm and office personnel from several localities and companies in Norway. The study shows large differences in working conditions, safety management systems and to some extent also safety climate. Important conditions and differences and implications for organizing and managing for safe working conditions are presented. Finally, we will end the workshop with all participants discussing the following questions:

- What are the main challenges for improving working environment and safety in aquaculture in different national contexts?
- Which measures may improve conditions for aquaculture workers?
- In what areas do we need more research and knowledge?

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9:00-10:30, A1043

SESSION 7D – WORKPLACE INJURIES – LET’S TACKLE THEM TOGETHER

Michelle Bennett and Jane Eustace, WorkplaceNL

Serving approximately 13,000 injured workers and more than 19,000 employers, WorkplaceNL is an employer-funded, no fault insurance system that promotes safe and healthy workplaces, provides return-to-work programs and offers fair compensation to injured workers and their dependents.

Workshop provides information on the Top 3 Sources of Injury for the Fishing Industry in the Province of Newfoundland and Labrador:

1. Hearing Conservation – Fish Harvesting, Fish Processing and Aquaculture are among the top 5 industries in Newfoundland and Labrador with hearing loss-related claims. Consequently, it is important for employers and employees working in our fishing industries to learn how to recognize noise hazards in the workplace and take appropriate precautions to protect their hearing – Presented by Jane Eustace
2. WHMIS 2015 and Chemical Inventories – Operation of a Fish Processing Plant involves the use of a variety of hazardous chemicals, such as ammonia, chlorine, acids and various cleaning agents, sanitizers and disinfectants. Improper use, handling, storage or disposal of chemicals has the potential to cause serious injury or illness. Learn how WHMIS training, in combination with a chemical inventory, helps to reduce the risks associated with workplace chemicals, ensures that employees are informed of the potential hazards, and how to protect from exposure – Presented by Jane Eustace
3. Musculoskeletal Injuries (MSIs) – Musculoskeletal injuries account for almost 70% of the lost-time injury claims at WorkplaceNL over the past five years. Learn about MSIs and specific stepping, handling, and lifting techniques to prevent injury in the Fish Harvesting, Processing and Aquaculture industry – presented by Michelle Bennett

10:45-12:15, A1049

SESSION 8A – THE DANISH STORY: HEALTH AND SAFETY, EDUCATION, SOCIAL CONTRACT WITH COLLECTIVE FINANCING IN THE DANISH FISHERY

Niels Wichmann, Danish Fishermen’s Producer Organisation; Flemming Christensen, Danish Fisheries Health and Occupational Board; Karsten Kristensen, Danish General Workers Union; Flemming Smidt, Danish General Workers Union

The presenters will cover the following topics followed by a Q&A session:

1. **Introduction to the Danish Fishery** (Fleet structure, Fishery – types, areas, turnover). The Danish fishery is among the largest in Europe, engaging in demersal, pelagic and industrial (for reduction into meal and oil) fishing. Vessels cover the range from coastal boats to large pelagic boats. The last 15 years have seen a concentration brought about primarily by the introduction of ITQ management systems. New, better and safer boats have been built and older ones modernized
2. **Requirements for entry into the fishery** – safety course (Anyone who wishes to enter fisheries has to complete a 3 week safety course, irrespective of whether he is 16 or 46.)
3. **Fishery education** (Apprentice Scheme – two year education leading to “The Blue Diploma”, Background, development, Collective financing through a national fisheries levy, Vocational and compulsory training for adults, Various courses also organised by the social partners.) Put together in 1995 by the social partners (Danish Fishermen’s PO – DFPO – and the General Workers Union (3F) the Blue Diploma education has educated hundreds of young fishermen through practical training onboard fishing vessels alternating with periods at the Fishery School. The DFPO is formal employer for all the apprentices (currently 80) and organise the practical training period at the Danish fishing vessels. Because of the element of collective financing the apprentices receive a good pay plus bonus at the same time as it is relatively cheap to have an apprentice on board.
4. **Fisheries Health and Occupational Board (HOB):** The HOB was established by the social partners in 1995. The work of the HOB has resulted in the fishing industry going from one of the most dangerous occupation to one of the safest. Its administrative board has members from DFPO and 3F. The HOB works in three main areas:
 - General work in prevention of accidents and improvement of conditions for fishing vessels (noise, stability etc.) through leaflets, videos, courses.
 - Free consultation work for individual vessels in connection with official inspections, modernization project, and new building
 - Accident “follow-up” through a network of regional accident committees examining accidents in order to improve future advice.
5. **The work around ILO Convention 188** nationally and at EU level

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6. The Social Contract between DFPO and 3F. We have had a social contract since the beginning of the 1970s. This contract regulates the pay principles (not the pay), working conditions, pension scheme, etc. The contract is renewed every 2 or 3 years, normally without big fights.

10:45-12:15, A1046

SESSION 8B – CHANGING COMMERCIAL FISHING PERSONAL FLOTATION USE BEHAVIOR: WHAT CAN WE LEARN FROM EFFORTS TO ADDRESS THE MOST IMPORTANT SAFETY TECHNOLOGY ADOPTION CHALLENGE OF OUR TIME? (CONTINUED)

This is the second half of a double session. Please see Session 7B for part one.

Julie Sorensen, Northeast Center for Occupational Health and Safety (NEC); Rebecca Weil, NEC; Ann Carruth, Southwest Center for Agricultural Health, Injury Prevention and Education (SWAG Center); Jeffrey Levin, SWAG Center; Jennifer Lincoln, U.S. National Institute for Occupational Safety and Health (NIOSH); Frankie Horne, The Royal National Lifeboat Institute (RNLI); Jojo Mains, RNLI; Derek Cardno, Scottish Fishermen's Federation; Ted Teske, NIOSH; Mark Dolomount, Newfoundland and Labrador Professional Fish Harvesters Certification Board; Amanda Dedrick, The Fisheries Safety Association of Nova Scotia

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- Stakeholder Engagement
- Three key observations which are vitally important to increasing PFD use.

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presenters and those in attendance will be asked to use the last 45 minutes of this session to collectively brainstorm five collective action steps for commercial fishing safety researchers and industry groups to address in the next year. These action steps will focus on advancing PFD adoption in commercial fishing sectors and could include: developing better PFD designs, developing improved PFD distribution channels, bridging gaps in behavior change research, developing better methods for objectively tracking PFD use or finding opportunities for industry and health and safety researchers to regularly interact and collectively address barriers to change. These action steps will be reviewed at the next IFISH conference.

10:45-12:15, A1045

SESSION 8C – SAFER AND HEALTHIER WORKPLACES IN AQUACULTURE

This is the second half of a double session. Please see Session 7C for part one.

Trine Thorvaldsen, SINTEF Ocean; Trond Kongsvik, NTNU Samfunnsforskning; Kristine Størkersen, NTNU Samfunnsforskning; Ingunn Marie Holmen, SINTEF Ocean; Mariann Sandsund, SINTEF Technology and Society

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The Norwegian context: The aquaculture industry has grown to become one of the most important industries in Norway. Atlantic salmon is produced and exported worldwide and the production has a potential to increase in the years to come. Employees at the fish farms have the 2nd most risk exposed occupation in Norway according to accident statistics. Research aimed at providing means to reduce risks and improving workers' health and safety is therefore needed.

The project: Key findings from the Norwegian context will be used as a starting point for discussing the following topics: Workers perceptions of working environment, environmental conditions and workload and organizing safety (OHS management systems). During the workshop, we will discuss how these findings may benefit not only workers in Norwegian aquaculture, but other countries as well: How can we utilize this knowledge to provide safer and healthier workplaces for workers in aquaculture worldwide?

Short introductions for each topic (presenters):

Workers' perceptions of working environment (Trine Thorvaldsen & Ingunn M. Holmen)

A survey amongst workers in Norwegian aquaculture as well

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as personal interviews has targeted the interaction between work and health. Findings related to workers' perceptions on exposures, health complaints, reasons for sick-leave, self-reported health status are presented.

Environmental conditions and workload (Mariann Sand-sund) — Workplace field studies have measured work intensity and thermal stress during fish farmers work sessions including several physiological sensors. Results from these field studies are presented.

Organizing safety/OHS management systems (Trond Kongsvik & Kristine Størkersen) — Organizational conditions influencing safety in fish farming, have been identified based on survey and interview data. The respondents are fish farm and office personnel from several localities and companies in Norway. The study shows large differences in working conditions, safety management systems and to some extent also safety climate. Important conditions and differences and implications for organizing and managing for safe working conditions are presented. Finally, we will end the workshop with all participants discussing the following questions:

- What are the main challenges for improving working environment and safety in aquaculture in different national contexts?
- Which measures may improve conditions for aquaculture workers?
- In what areas do we need more research and knowledge?

10:45-12:15, A1043

SESSION 8D – SAFETY AND SURVIVAL TRAINING IN NEW ENGLAND: PROGRAM DESIGN, RESEARCH, AND EVALUATION

Ed Dennehy, Luis Catala, Gretchen Biesecker, and J.J. Bartlett, Fishing Partnership Support Services (FPSS)

Ground fishermen are 37 times more likely to die on the job than policemen, and New England's waters are among the most dangerous in the country. Safety and Survival Training can be life- saving for everyone on a boat; research from Alaska shows that their fishing industry became significantly safer over the past decade following the implementation of a safety training program (Lincoln, 1999). Fishing Partnership Support Services (FPSS) offers free one-day survival training programs and gives fishermen the chance to learn from Coast Guard-Certified Fishing Vessel Safety Instructors in these vital modules: Man-Overboard Procedures; Fire Fighting; Flooding & Pump Operation; Flares & EPIRBS; Survival Suits; Life Raft Equipment; Helicopter Hoist Procedures; and Opioid Awareness and Basic First Aid. Increasing safety, thus reducing accidents and deaths, improves the economic stability of fishing families. This reduces the burden on the health safety net; families are more likely to avoid

financial ruin when a member of their household is not subject to a serious injury or death.

This panel will share how Safety and Survival Training are conducted by FPSS in New England, as well as the program evaluation we are conducting in partnership with external researchers, to learn and improve this program and its impact. Four presentations will provide a holistic window into our work.

8D.1 BACKGROUND, CURRICULUM, AND IMPLEMENTATION

Ed Dennehy and Luis Catala, who lead our training programs, will provide historical background and an overview of how safety training is conducted by FPSS. Their presentation will include the origins of safety training in New England, how we approach recruitment, partnerships, curriculum, and innovations to our trainings.

8D.2 PROGRAM EVALUATION AND RESEARCH

Gretchen Biesecker, Ph.D., who leads our Evaluation and Research, will share how FPSS evaluates these trainings, including an overview of methods and findings from the past several years of course surveys. Her presentation will spotlight some of our success stories in research, training, and industry collaboration. For instance, she will describe how partnerships with universities and the Northeast Center for Occupational Health and Safety, the University of Massachusetts-Lowell, and Tufts University, are helping FPSS learn more about safety concerns and preferences among fishermen. For instance, Maggie Brown, a graduate student in Urban and Environmental Policy at Tufts University, is conducting research with FPSS for her masters thesis. Maggie's thesis includes exploratory case studies of other safety training programs for fishermen with views into outreach strategy, geographic range, and training components. Her investigation will examine the extent to which the most at-risk fishermen and sectors are attending safety trainings or if there are groups of fishermen who are under-represented. An aim of this research is to help FPSS and other groups concerned about the well-being of fishermen enhance and improve targeted outreach

8D.3 WHAT'S NEXT? HOW FPSS AND POLICY ARE EVOLVING

Last, J.J. Bartlett, FPSS's President will share what's next for FPSS and emerging conversations and opportunities at the federal level to address the safety and survival training needs of commercial fishermen. He'll engage attendees in a Q&A and conversation for us to learn more about the questions and work of others in this area.

Day Four: Wednesday, June 13th, 2018

1:30-4:30, SN2018

GLOBAL AQUACULTURE OCCUPATIONAL HEALTH AND SAFETY: NATIONAL AND INTERNATIONAL PERSPECTIVES

After a round of brief introductions, this ½ day post-conference workshop will open with a series of short presentations of findings from an FAO-funded scan of the global, regional and national terrain of aquaculture/ fish farming occupational health and safety and related social and welfare impacts. Panel presenters will draw on regional and national profiles of aquaculture OHS completed in 2017 outlining documented physical, biological, ergonomic, chemical and psychosocial hazards, related injury and disease profiles, and examining how OHS issues are managed across a range of countries and companies engaged in the production of different species and products. These will be explored along the supply chain from diving and construction work through work on ponds, racks and cages to harvest, grading, primary processing and transport of products to market. Particular attention will be paid to OHS challenges associated with vulnerably situated groups including women and children and the precariously employed and some of the major constraints and drivers for good aquaculture OHS. Presentations will place findings in the context of international codes produced by bodies such as the ILO and FAO, civil society codes like those from the Aquaculture Stewardship Council, good labour and industry practice, industry/company guidance and training programmes, national and regional OHS regulations such as those existing in Europe, their uptake and effectiveness. The role of safety policies that work or specific tripartite structures and codes for example in Norway and Scotland involving industry, trade unions and regulators on land and sea will also be explored.

Part One of the Workshop Programme

1. Overview of the FAO Aquaculture OHS report and main findings
2. Brief highlights from each of the regional and country reports
 - a. Asia, European Union and U.K.
 - b. Norway
 - c. Canada and the U.S.
 - d. Latin America and the Caribbean and Brazil
 - e. Africa
 - f. Australia and New Zealand

In the second part of the workshop, attention will shift to dialogue and small group discussion around what is known and gaps in current knowledge, as well as evidence for things that work. There will be an open discussion of improvements that can be made. Opportunities and costs and other constraints as these relate to as-

essment, communication, mitigation and, in particular, protection from and prevention of OSH hazards and risks in aquaculture will be explored. Critical underlying issues include: who bears the costs of poor OHS; the feasibility of adapting existing general OSH guidance documentation (e.g. as developed for other agricultural and food producing sectors) to aquaculture; particular opportunities and constraints faced by small-scale (rural) aquaculture farmers and related workers.

Part Two of the Workshop Programme

3. Dialogue and small group discussion: what is known, not known, future priorities for research and action in the field of aquaculture OHS? (50 minutes)
4. Feedback to plenary and closing (30 minutes)

END OF DAY FOUR PRESENTATIONS

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