The Second International Symposium
on Marine Microplastic Pollution and Control
(ISMP 2018)

HANDBOOK

Shanghai, China

April 24-25, 2018

Organized by

East China Normal University (ECNU)

State Key Laboratory of Estuarine and Coastal Research (SKLEC), ECNU

Plastic Marine Debris Research Center (PMDRC), ECNU

Co-organized by

IOC Sub-Commission for the Western Pacific (UNESCO IOC-WESTPAC)

State Oceanic Administration of China (SOA)

2nd ISMP 2018

The Second International Symposium

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ismp.ecnu.edu.cn

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Chairman of the Symposium

Dr. Daoji LI

State Key Laboratory of Estuarine and Coastal Research (SKLEC),
East China Normal University (ECNU), China
Director of the Plastic Marine Debris Research Center, ECNU

Steering Committee

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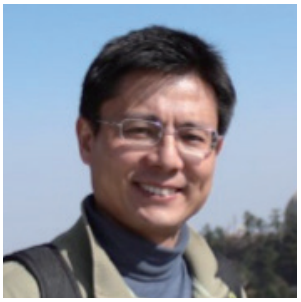
Dr. Daoji LI

State Key Laboratory of Estuarine and Coastal Research (SKLEC), East China Normal University (ECNU), China

Director of the Plastic Marine Debris Research Center, ECNU



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Organizers of the Symposium

East China Normal University (ECNU)

Founded in Shanghai in October 1951, East China Normal University (ECNU) is one of the most prestigious universities in China and is sponsored by the national programs “Project 211” and “Project 985”. Since China opened up to the world in 1978, ECNU has developed at a breathtaking pace into a comprehensive research university. ECNU attaches great importance to the internationalization of its development and enjoys a wide influence and an excellent reputation around the world. The university has established exchange and cooperative partnerships with more than 200 internationally renowned universities and academic institutions.

The conference gratefully acknowledges the support of East China Normal University.

For more information, please visit: http://english.ecnu.edu.cn/

State Key Laboratory of Estuarine and Coastal Research (SKLEC)

East China Normal University (ECNU), Shanghai, China hosts and treasures the well-known State Key Laboratory of Estuarine and Coastal Research (SKLEC). The laboratory was established by the State Planning Commission of China in 1989 and went into operation in December 1995. Presently, SKLEC employs 58 fulltime faculty and staff members in the laboratory. There are three main research streams of SKLEC: Estuarine Evolution and Estuarine Sediment Dynamics; Coastal Dynamic Geomorphology and Sediment Process; Estuarine and Coastal Ecology and Environment. Achievements of the laboratory were used to solve problems encountered in coastal development of China, especially many large engineering projects, such as national survey on coastal resources, construction for harbors and ports, navigation channel regulations projection of coastal wetlands and engineering structures. SKLEC has become a national site for high level research on estuarine and coastal environment and a high level training base in China.

For more information, please visit: http://english.sklec.ecnu.edu.cn/

Plastic Marine Debris Research Center (PMDRC)

The Plastic Marine Debris Research Center (PMDRC) of East China Normal University (ECNU) was founded in 2013 on the original Marine Microplastic Research Laboratory, and was officially granted title by the ECNU in 2016 as an affiliation of the State Key Laboratory of Estuarine and Coastal Research (SKLEC). The PMDRC is China's first research platform dedicated to fundamental research in the monitoring technology, Ecological Risk Assessment, management and control of marine plastic and microplastic pollution. With 11 Microscopic Observation Devices, SEM, FTIR Spectrometer, Microscopic RAMAN Spectrometer, GC, HPLC, IRMS, ICP-Ms and other equipment, the PMDRC is able to observe the morphology and conduct composition analysis of plastic debris and adhered contaminants. The Center is also equipped with complete biological culture chamber to conduct exposure experiments for marine crustaceans, bivalves and fishes. Besides, utilizing the many field hydrodynamics and environmental monitoring equipment of the SKLEC, such as the Multi-parameter Water Quality Monitoring Systems, the center is able to conduct monitoring on sea and shore, and onboard annual investigation voyages at sea.

Co-Organizers

The IOC Sub-Commission for the Western Pacific (WESTPAC)

The IOC Sub-Commission for the Western Pacific (WESTPAC), an Intergovernmental Scientific Organization, was established in 1989 by the Intergovernmental Oceanographic Commission of the United Nations Educational, Scientific and Cultural Organization (IOC/UNESCO) to promote international cooperation and to coordinate programmes in marine research, ocean observations and services, as well as capacity building in the Western Pacific and adjacent seas, in order to learn more about the nature and resources of the ocean and coastal areas and to apply that knowledge for the improvement of governance, sustainable development and protection of the marine environment.

WESTPAC currently consists of 22 Member States mainly in East Asia, Southeast Asia, South Pacific and the eastern Indian Ocean, with its membership open to all interested Member States of IOC/UNESCO willing to participate actively in the work of the Sub-Commission.

WESTPAC defines its strategic direction based on priority interests of the Member States in the region, and implements its programmes and activities through strong partnerships with national competent agencies, marine scientific institutes, universities and other international organizations or programmes in the region.

The conference gratefully acknowledges the support of The IOC Sub-Commission for the Western Pacific (WESTPAC).

For more information, please visit: http://iocwestpac.org/

State Oceanic Administration of China (SOA)

For more information, please visit: http://www.soa.gov.cn

Chairman's Welcome

Dr. Daoji LI

State Key Laboratory of Estuarine and Coastal Research (SKLEC),
East China Normal University (ECNU), China

Director of the Plastic Marine Debris Research Center, ECNU

On behalf of the organizing committee of the symposium and in my own name, I would like to extend sincere welcome to you all for joining this meeting!

As we all know, plastic is now everywhere in our normal life. World plastic production increased exponentially since 1950s. In the year of 2016, more than 335 million tons of plastic materials were produced. The wide use of plastic results in large quantities of mismanaged plastic waste input into the oceans, which will eventually turn our ocean into plastic soup.

Studies show that plastic marine debris has brought huge ecological threat to the marine environment. It may destroy important habitats, cause physical injury and even death to animals via entanglement or ingestion. From mammals to invertebrates, hundreds of marine species had been reported affected by plastic marine debris. In addition, plastic marine debris also associates with chemical pollution, transfers organisms to non-native habitats and has an impact on the tourism and fishery. Besides the direct influence on the marine environment, plastic waste could fragment due to physical and biological weathering. This is an important source of marine microplastics.

Microplastics have a ubiquitous distribution in the marine environment and has been successfully recovered throughout the world's oceans, from the Arctic to the Antarctic, from the sea surface to the seafloor. Due to their minute size, microplastics are more easily consumed by marine organisms. Although its ecological impact has been widely reported in the literature since the 70's, many questions still remain unknown.

Recently, UN Environment has put special attention to plastic pollution since the first United Nations Environment Assembly in 2014. Marine plastic pollution has become a major global marine environmental issue which needs to be addressed urgently.

The International Symposium on Marine Microplastic Pollution and Control originated from the 283rd Oriental Science and Technology Forum held in September 2016. The Forum was organized by the Shanghai Municipal People's government, the Chinese Academy of Sciences, the Chinese Academy of Engineering, and co-organized by East China Normal University. About 40 scientists from America and China attended that meeting.

As a continuation of the 1st symposium, we held this 2nd symposium today. The 2nd symposium is organized by the State Key Laboratory of Estuarine and Coastal Research (SKLEC) and the Plastic Marine Debris Research Center (PMDRC), East China Normal University, co-organized by Intergovernmental Oceanographic Commission Sub-Commission for the Western Pacific (UNESCO IOC/WESTPAC), and the State Oceanic Administration of China. This year we had more than 70 famous experts and scientists from 7 different countries.

This symposium aims to discuss four key topics of microplastic research:

1) Occurrence and fate of microplastics in the marine environment
2) Microplastics interacting with biological and chemical contaminants
3) Influences of microplastics on the marine biota
4) Citizens science and possible solutions/remediation measure for marine microplastics

I sincerely hope that all the participants could share your scientific views, share your experience, and contribute your ideas to better global management of plastics and microplastics through this meeting.

Finally, as this is the first time for some participants to come to China, we also planned some activities for participants to enjoy local food and culture. I wish you all enjoy this meeting, and enjoy your stay in Shanghai!

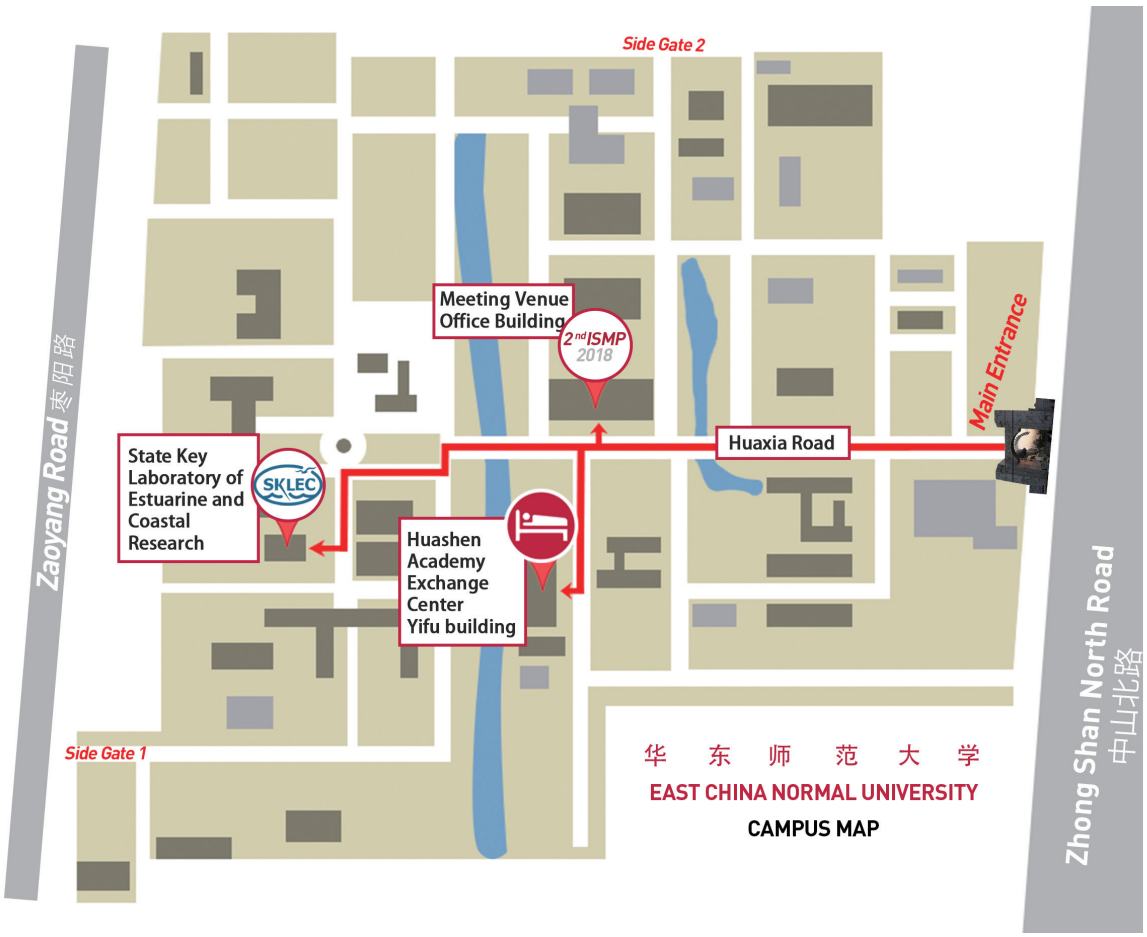
Thank you!

Practical Information

Getting to the Venue

Registration Address: Yifu Building, No. 3663 Zhongshan North Road, Putuo District, Shanghai
华东师范大学（中山北路校区）逸夫楼，上海市普陀区中山北路 3663 号

Conference Address: Office Building Auditorium, No. 3663 Zhongshan North Road, Putuo District, Shanghai
华东师范大学（中山北路校区）办公楼小礼堂，上海市普陀区中山北路 3663 号



Registration Counter

The Registration Counter for the symposium will be located at the Lobby of Huashen Academy Exchange Center Yifu Building on April 23rd and at the Office Building Auditorium in the morning of April 24th.

Badges & Security

For security reason and catering purposes, please make sure to wear your name Badge during the entire symposium. Those with pink Aluminum Badges are Staff or Volunteers of the symposium, who will help you throughout the conference.

We recommend you to write your name on the program booklet and not to leave personal belongings unattended at any time.

Please feel free to return the badge to the registration desk after the conference for recycling if you do not need it any more.

Dinner Reception

There are free buffet Dinners organized for guests of the symposium, located in the Yifu Building on 24-25 April 2018. Please put on your Name badge in the dining venue.

Tea Breaks

During Tea Breaks, Light Refreshments will be served in Room 1206, next to the meeting room. In order to reduce the use of single-use plastic products, bottled water is not provided at the conference. There are glasses and water is served at the lounge room. We appreciate your understanding.

Language

English is the working language of the Symposium.

File Sharing and Privacy Policies

In order to protect the intellectual property, all documents presented during the symposium will be protected by copyright. If you wish to get a copy of the PPT file from any specific speaker, please kindly contact the speaker him/herself directly. It is strictly forbidden to copy the files from the conference computers. Thank you for your understanding and cooperation with our copyright protection rules.
(为保护知识产权，与会者的报告文件将受到版权保护。未经允许请勿从会议电脑里拷贝他人报告文件，谢谢您的合作！)

Contacts

Ms. Lu WANG

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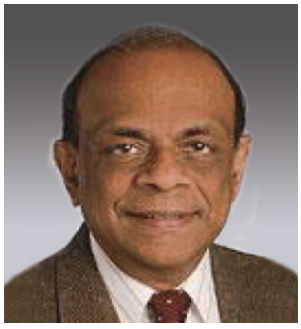
Email: ismp@ecnu.edu.cn

Invited Speakers

Andrés Cózar CABAÑAS, Professor
University of Cadiz, Spain

Dr. Andrés Cózar has a permanent position at the University of Cádiz where he works as Full Professor in the Department of Biology. His research is mainly focused on understanding the impacts of human activities on marine ecosystems within the context of Global Change, especially plastic pollution. He has published around 50 publications, including papers in journals with high impact factor such as *Plos One, Marine Drugs, PNAS, Science Advances* or *Nature Communications*. Furthermore, these studies have received a high attention, including "hot papers", as defined by WOS, with more than 200 citations in the last four years. His studies have transcended the scientific field, receiving international media coverage such as New York Times, Forbes or National Geographic. Andrés Cózar has three current projects in course dealing with the plastic pollution, including one funded by the European Space Agency (ESA). He is also part of scientific international committees such as those linked to G7 Action Plan against Marine Litter.

Presentation Title: Extracting information from the individualized and comprehensive analysis of microplastics



Anthony L. ANDRADY, Professor
Department of Chemical and Biomolecular Engineering, North Carolina State University, USA

Anthony L. Andrady, PhD, is an Adjunct Professor of Chemical and Biomolecular Engineering at the North Carolina State University. An accomplished Polymer Scientist, Dr. Andrady has published over a hundred original research papers and book chapters on Polymers. He is a Fellow of both the Royal Society of Chemistry and the National College of Rubber Technology (London, England). Dr. Andrady edited Plastics and the Environment (Wiley, 2003) and authored Science and Technology of Polymer Nanofibers (Wiley, 2007).

Presentation Title: Degradation-fragmentation aspect of microplastics

Bert VAN BAVEL,
Research Manager
Environmental Chemistry Section, Norwegian Institute for Water Research (NIVA), Norway

Professor Bert van Bavel is an international leading scientist in the field chemical analysis of environmental contaminants and quality control. He has headed the analytical lab at the MTM Research Center at the Örebro University since 2001. Under his guidance the lab gained UN reference status in 2008 and became a Center of Innovation in 2011 for the Waters Corporation. From 2008-2015 has been the head of the chemistry department at Örebro University leading the reorganization of the bachelor in chemistry program into the most popular chemistry program at candidate level in Sweden and started a master program in Environmental Forensics. He is the co-author of more than 300 publications in environmental chemistry, including several key papers on the discovery of brominated flame retardant and organic fluor compounds in the environment. He was honored by the Kyoto University for his contributions in research and teaching in 1996 and has won the prestigious Cancer and Allergy foundation in 2010 in Sweden. Furthermore, he has been given the Waters Corp innovation award for his work in the field of Environmental Analysis in Mass Spectrometry in both 2012 and 2016. He has managed numerous national and international projects and work packages within EU projects. He joined the Norwegian Institute for Water Research (NIVA) in 2015 as Research Director leading research on the integration of target contaminant analysis and non-target metabolomics using advance mass spectrometry. At NIVA he leads the cross sectional task force on micro plastics and the development of and the development analytical method and QA/QC of micro plastics in the aquatic environment.

Presentation Title: Occurrence and fate of microplastics in the marine environment. What do we know and what do we need to know.

Captain Charles J. MOORE, Research Director
Algalita Marine Research and Education, USA

A third generation resident of Long Beach, California, Captain Charles Moore grew up in and on the Pacific Ocean. His father was an industrial chemist and avid sailor who took young Charles and his siblings to remote Guadalupe Island in the Caribbean and many times to the family's second home in Hawaii. He founded the Algalita Marine Research Institute in 1994 "to protect and restore the marine environment." Captain Moore found his calling in 1997 on his return voyage after the Transpac yacht race, when he changed course from the usual sea route from Hawaii and saw an unrecognizable Pacific Ocean. "Every time I came on deck to survey the horizon, I saw a soap bottle, bottle cap or a shard of plastic waste bobbing by. Here I was in the middle of the ocean and there was nowhere I could go to avoid the plastic." Through Algalita Research Institute (now Algalita Marine Research and Education), he began to monitor conditions in what has become known as the Great Pacific Garbage Patch, a convergence zone of plastic pollution within the North Pacific Central Gyre. In collaboration with researchers at the Southern California Coastal Water Research Project, he developed the first protocols for monitoring marine plastic debris which are now used worldwide by oceanographic researchers and citizen scientists. Since then, Captain Moore has become a world-renowned expert on the issue, dedicating most of his time and resources to understanding the crisis and seeking to inspire solutions. As Algalita's Research Director, Captain Moore and his team have logged 15 voyages to the Garbage Patch since 1999.

His work has been published in many scientific journals and magazines, including *Marine Pollution Bulletin and Philosophical Transactions of The Royal Society*. His book, Plastic Ocean, was published in October 2011 and has been translated into Japanese and Italian with other languages in the works. In June 2012, Thompson Rivers University in Kamloops, Canada, bestowed on Captain Moore a well-earned Doctor of Laws *Honoris Causa*.

Presentation Title: Trends in the Quantity of North Pacific Gyre Debris—Two approaches, Two answers

Daoji LI (李道季), Professor
State Key Laboratory of Estuarine and Coastal Research, East China Normal University, China

Daoji Li is a senior professor of the Institute of the Estuarine and Coastal Research, and the director of Marine Plastic Debris Research Centre, at the East China Normal University. Over last three decades, he has been dedicated to marine environmental studies with a focus on estuarine & coastal ecosystems, which enables him to be one of most renowned scientists in China. Building on his high level of passion for ocean, he has developed and taken an active part in a number of national programs addressing marine environmental challenges. Serving as the chief scientist, he oversees and leads the Chinese National Key Research and Development Plan Project on Marine Microplastics Monitoring and Ecological Risk Assessment. Daoji is deeply committed to promoting cooperation among countries with his international leadership demonstrated through the initiation and development of a research and monitoring network for micro plastics in the Asia and Pacific.

Presentation Title: Progress of Microplastic Marine Debris Research in China

Hideshige TAKADA, Professor
Laboratory of Organic Geochemistry (LOG), Tokyo University of Agriculture and Technology, Japan

Shige Takada received Ph.D. from Tokyo Metropolitan University (Environmental Organic Geochemistry) in 1989. He has been working in Tokyo University of Agriculture and Technology as assistant professor, associate professor, and professor for 30 years. His speciality is trace analysis of organic micropollutants. The target compounds include persistent organic pollutants (POPs; e.g., PCBs, DDTs, PAHs), endocrine disrupting chemicals (e.g., nonylphenol, bisphenol A), pharmaceuticals (e.g., triclosan, sulfamethoxazole) as well as anthropogenic molecular markers (e.g., linear alkylbenzenes, coprostanol, artificial sweeteners, benzothiazoles, crotamition). His research field encompasses from Tokyo Bay and its vicinities to Southeast Asian to Africa. In 2005, Shige Takada started International Pellet Watch, global monitoring of POPs by using beached plastic resin pellets (http://www.pelletwatch.org/). He has been working with ~ 100 NGO and individuals who have concern about marine plastic pollution. International Pellet Watch tells us the risk associated with chemicals accumulated in microplastics in marine environments and their potential adverse effects on marine ecosystem which he has been tackling through related studies. He has been an official member of working group on microplastics (WG40) of GESAMP since 2012. Shige Takada is the authors more than 150 peer-reviewed papers in international journals with H-index of 43 and more than 25 invited speeches on international conferences.

Presentation Title: Occurrence of wide-range of additives in marine plastics and their exposure to marine organisms

Huahong SHI (施华宏), Professor
State Key Laboratory of Estuarine and Coastal Research, East China Normal University, China

Huahong is an aquatic ecotoxicologist studying microplastics pollution in marine environments and endocrine disrupting chemicals in aquatic organisms. He has ever studied imposex in snails, thyroid disrupting effects of chemicals on amphibian and teratogenicity of chemicals to veratebrate embryos. In recent 5 years, Huahong is focusing on studingmicroplastic pollution in different organisms including mussels, clams, snails and fish from the field. He also conducts some lab exposure experiments to study the toxicological effects of microplastics on organisms. Huahong's team has successfully got three national funds on microplastic research and published 8 peer-reviewed papers in this aspect. Huahong is very happy to cooperate with the international peers who are interested in microplastic research.

Presentation Title: Where do the microplastics go in the body of organisms?

Huanhuan WANG (王欢欢), Associate Professor
Law School, East China Normal University, China

Huanhuan Wang is an associate professor in law at Law School of East China University. Her main research interest is pollution law, energy law, law and economics. She has published many research articles both in Chinese Core Journal and English SSCI Journals. She has been PIs in several research grants and has participated in legislations at both national and provincial levels.

Presentation Title: Regulating Marine Plastics and Microplastics in China: Challenges, efforts and Suggestions

Irina CHUBARENKO, Professor
Shirshov Institute of Oceanology, Russian Academy of Sciences (RAS), Russia

Irina Chubarenko is Professor of Atlantic Branch of P.P. Shirshov Institute of Oceanology RAS. The topics of interest are Geophysical fluid dynamics, convective water exchange in natural basins, horizontal convection, deep ocean convection, mixing close to temperature of maximum density, cascading, upwelling, thermal bar, and day/night circulation.

Presentation Title: Transport of marine microplastics particles: why is it still unpredictable?

Jingli MU (穆景利), Researcher
National Marine Environmental Monitoring Center, China

Dr. Jingli Mu (Male), has a PhD in Marine Environmental Science, serves as a Research Scientist of the National Marine Environmental Monitoring Center. His research interests focus on the mechanisms of contaminant metabolism, adaptation and toxicity, fish toxicology, environmental risk assessment, and impact of climate change on marine ecosystems.

Presentation Title: Ingestion, egestion and effects of polystyrene microspheres on larvae and adults of marine medaka, Oryzias melastigma

Juying WANG (王菊英), Researcher
National Marine Environmental Monitoring Center, China

Dr. Juying Wang, has a PhD in Marine Chemistry, Environmental Science, serves as Senior Scientist and Deputy Director General the National Marine Environmental Monitoring Centre, State Oceanic Administration (SOA), China. Her scientific interests are focused on marine environmental quality criteria, and marine environmental monitoring and assessment methodology. Since 2004, Dr. Wang began to be involved in “Regular process for global reporting and assessment of the state of the marine environment, including socio-economic aspects” (“Regular Process”). As the assistant experts, Dr. Wang was one of the co-authors for “An Assessment of Assessments, Findings of the Group of Experts”, and was responsible for the drafting of AoA Region: East Asian Seas. As the member of Group of Expert for Regular Process, Dr. Wang worked actively in the first cycle of the Regular Process. As a convener, Dr. Wang was responsible for drafting the Chapter 25 Marine debris of WOA I.

Presentation Title: Microplastic in the Northern Hemisphere: from coast, East Asian Sea to the Arctic

Jonathan Evan WARD, Professor and Head
Department of Marine Sciences, University of Connecticut, USA

Dr. Ward is Professor and Head of the Department of Marine Sciences, University of Connecticut. Over his career, Dr. Ward has been the recipient of a United States, National Science Foundation CAREER Award and two Fulbright Foreign Scholarships. He has served as the director of the Interdisciplinary Research & Training Initiative on Coastal-Ecosystems & Human Health funded by the United States, National Oceanic and Atmospheric Administration. In 2013, he was selected to the Connecticut Academy of Science and Engineering. Dr. Ward has published over 77 scientific papers and book chapters, and has served on the Editorial Board of several scientific journals. He has taught courses on a range of topics including general biology, physiological ecology, aquaculture, invertebrate biology, benthic ecology, and coastal system sciences.

Dr. Ward's research focuses on environmental physiology of marine suspension feeders, including the impacts of microplastics and nanomaterials on commercially important species.

Presentation Title: Capture, ingestion, and egestion of plastic particles by suspension-feeding bivalves: implications for bioaccumulation and environmental fate

Kara Lavender LAW, Professor
Sea Education Association, USA

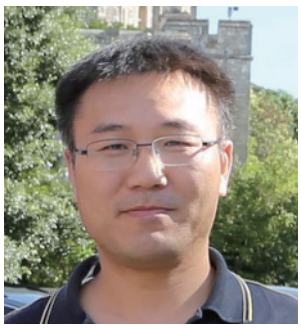
Kara received her PhD in physical oceanography from Scripps Institution of Oceanography, and developed an interest in marine debris while teaching and sailing with SEA. As a faculty oceanographer and chief scientist, Kara taught more than 200 students in 10 SEA Semester classes about the ins-and-outs of oceanography both onshore in Woods Hole, MA and at sea in the Atlantic and Pacific Oceans and Caribbean Sea. Now a research professor at SEA, Kara studies plastic marine debris using SEA's 25-year data set consisting of plastic counts from more than 7500 plankton net tows that were carried out by over 7000 SEA students and scientists. Her interests include understanding how ocean physics determines the distribution of plastic and other marine debris, and the behavior and ultimate fate of different plastics exposed to the harsh ocean environment.

Presentation Title: A framework to study plastics pollution in the marine environment

Mengyu BAI (白濛雨), Postgraduate Student
State Key Laboratory of Estuarine and Coastal Research, East China Normal University, China

Bai Mengyu is a graduate student at the State Key Laboratory of Estuarine and Coastal Research(SKLEC), East China Normal University in Shanghai, China. Majored in Environmental Sciences during her undergraduate study, she is now conducting research under the supervision of Professor Li Daoji as a graduate student. She has studied the microplastic characteristics in urban sewage treatment facilities in Shanghai, with her work published on China Environmental Science. She now focuses her work on the source analysis of the microplastic flux, as well as the general plastic waste generation in China. By comparing the amount of plastic waste generation in China and the microplastic flux data, she hopes to shed light on the process of microplastics from source to sink.

Presentation Title: Annual Amount of Plastic Waste Entering the Ocean from China



Rong JI (季荣),
Professor
Nanjing University, China

Dr. Rong Ji is a professor of environmental science in the School of the Environment at Nanjing University since February 2006, a PI in the State Key Laboratory of Pollution Control and Resource Reuse. He is a chemist by training and received his Ph.D. in Microbial Ecology (Konstanz, Germany, 2000). Between October 2000 and February 2006, he worked as Postdoc in RWTH Aachen University (Aachen) and Max-Planck Institute for Terrestrial Microbiology (Marburg), Germany. Since January 2015 he is an associate director of the National Engineering Research Centre for Organic Pollution Control and Resource Reuse, and since May 2016, the dean of Department of Environmental Science. His research interests focus on environmental processes and effects of pollutants, remediation of contaminated environments and synthesis of radioactive and stable isotope-labeled compounds for their application in environmental studies. Currently he is studying (1) the effects of microplastics on environmental behavior of organic pollutants in soil and water, including transformation, transport, and bioaccumulation; toxicity and accumulation of microplastics in the food chain; and biological transformation/degradation of microplastics; (2) fate of emerging pollutants (such as nonylphenol, steroid estrogens, bisphenols, sulfonamide antibiotics, and polybrominated biphenyl ethers) in environment, wastewater treatment plant, and organisms, particularly the formation of bound residues of pollutants in soil and organisms, the characterization and stability of soil-bound residues, and the roles of microorganisms, plants, and earthworms in the bound-residue formation; (3) application of siderophore-producing microorganisms in phytoremediation of soil contaminated with heavy metals. As a PI, Dr. Ji has completed and is carrying out about 20 projects granted by Chinese national funds (NSFC, China Ministry of Science and Technology) and international funds (European FP7, Sino-Swiss, Sino-German, and Sino-Czech projects). He has published 81 peer-reviewed papers in international journals.

Presentation Title: Effects of micro/nanoplastics on the fate of organic pollutants – bioaccumulation, degradation, and transportation

Ruizhi LIU (刘瑞志),
Associate Researcher
Chinese Research Academy of Environmental Sciences, China

Prof. Ruizhi Liu is Associate researcher at the Chinese Research Academy of Environmental Sciences(CRAES) and director of the Marine Environmental Protection Center. He graduated as a Doctor of Medicine from the School of Medicine at the Ocean University of China in 2009, and is currently engaged in researches on Marine Environmental Management, Environmental Microbiology, Aquatic Environmental Toxicology. He has over 20 Publications in Journals such as "Biochemical Engineering Journal", "Journal of Ocean University of China" and "China.Journal of Environmental Sciences", and has taken charge, undertaken major roles or participated in 13 various Environmental protection planning, Ecological Civilisation planning and Pollution Prevention planning projects including "National Science-Technology Support Program", "Public Welfare Environmental Protection", "Water Project", "Science and Technology basic investigation project", and so on.

Presentation Title: Plastic Pollution Management Problems and Future Policy Suggestions in China

Seung-Kyu KIM, Associate Professor
Incheon National University, Korea

Seung-Kyu Kim is an Associate Professor at the Incheon National University in Korea. He received his BS in Oceanography and his MS and PhD in Environmental Chemistry from the Seoul National University. Professor Kim conducted his postdoctoral research under the supervision of Dr. Krunthachalam Kannan at Wadsworth Center, New York State Department of Health, USA as a recipient of the Global Postdoctoral Fellowship nominated by Korea Research Foundation. For the past 15 years, his main focus as an environmental chemist has been on the environmental fate and transport of pollutants such as legacy and emerging POPs, and their human and ecological exposure assessment. Most recently, his research interests are expanding into the microplastic studies, and now carry out a variety of research projects (ca. 0.8 million USD/year) related to microplastics including sources (WWTPs), freshwater system, coastal and open ocean, and polar region: 1) vertical and horizontal transport mechanisms, 2) mass balance in each system, 3) fractionation mechanism, 4) degradation and weathering, 5) airborne and water-driven transport, 6) release of microplastic-associated chemicals, and 7) human exposure assessment. Most recently, he also leads a project on distribution mechanism of microplastics in the Arctic sea environment using Korean research ice breaker R/V Araon. His final goal is to link the mass flow of microplastics and its associated pollutants among coastal region, marginal seas (e.g., East China Sea and East Sea), open ocean (e.g., Pacific Ocean), and a polar region horizontally, and between surface and deep sea vertically.

Presentation Title: Global pattern of microplastics in commercial table salt products

Somkiat KHOKIATTIWONG, Professor
Department of Marine and Coastal Resources, Thailand

His training background is on fisheries, oceanography, and biogeochemistry for BSc., MSc. and PhD in Thailand, Canada and Denmark respectively. He started to work at Phuket Marine Biological Center since 1982 until 2017 before transfer to be the specialist at Department of Marine and Coastal Resources, Bangkok, Thailand. His last position at PMBC was Director of the Center. He has been working as the project leader of national and international cooperation between the country and also involve with several international and intergovernmental programs such as SEAGOOS, IOGOOS, GRA, SIBER, BOBLME, and GOA-ON, etc. Beside his work as the officer of the Government of Thailand, he has also been the Chairmanship of the IOC Sub-commission for the Western Pacific (WESTPAC) from 2012 to 2017 and being Vice Chairmanship of the UNESCO-IOC from 2015 to present.

Presentation Title: Occurrence and fate of microplastics: research and monitoring status in Thailand and the regional role

Xiaoxia SUN (孙晓霞), Researcher
Institute of Oceanology, Chinese Academy of Sciences, China

She obtained Ph.D. from Chinese Academy of Sciences in 2001, worked as a postdoctoral fellow at Inha University from 2001 to 2004, and as an associate and full researcher at Chinese Academy of Sciences. Serving as a chief scientist, she leads the one of the projects in the National Key Basic Research Development Plan (973 Plan). Over the past decade, she has published more than 40 peer-reviewed papers and four academic monographs.

Presentation Title: Ingestion of microplastics by zooplankton and fish from the Yellow Sea

Yanfang LI (李艳芳),
Assistant Researcher
Yantai Institute of Coastal Zone Research, Chinese Academy of Sciences, China

Her training background is physical oceanography and ocean science. She obtained Ph.D. from Ocean University of China in 2012, work as an assistant researcher at Key Laboratory of Coastal Zone Environmental Processes and Ecological Remediation, Yantai Institute of Coastal Zone Research (YIC).

Presentation Title: Numerical modelling of marine microplastics transportation in the Bohai Sea

Yonglong LIU (刘永龙),
Chairman
Shanghai Rendu Ocean NPO Development Center, China

Yonglong Liu is the founder and director of Shanghai Rendu Ocean NPO Development Center. As a law student who graduated from Fudan University, Yonglong Liu spent 11 years in state-owned enterprises stock-holding system reform and operation. Since June 2000, Mr. Liu has started engaging into public affairs. As a volunteer, he has launched GRASSROOTS COMMUNITY in Shanghai in 2000 and Shanghai Rendu Ocean NPO Development Center in 2007, played as the legal representative of the two organizations.

Presentation Title: Exploring the road of marine litter treatment

Conference Programme | 24 April 2018
Venue: Office Building Auditorium

Opening Ceremony Host: Vice Director of SKLEC, Associate Professor, Hui WU	
09:00-09:20	**Opening**
09:20-09:45	**Progress of Marine Microplastic Research in China** | Prof. Daoji LI
09:45-10:00	**Group Photo**
Session 1: Chair, Associate Professor, Hui WU Occurrence and Fate of Microplastics in the Marine Environment	
10:00-10:30	**Trends in the Quantity of North Pacific Gyre Debris - Two approaches, Two answers** | Capt. Charles MOORE
10:30-11:00	**Occurrence and fate of microplastics in the marine environment: What do we know and what do we need to know** | Prof. Bert VAN BAVEL
11:00-11:15	**Tea Break**
11:15-11:45	**Transport of marine microplastics particles: why is it still unpredictable?** | Prof. Irina CHUBARENKO
11:45-12:15	**Microplastic in the Northern Hemisphere: from coast, East Asian Sea to the Arctic** | Prof. Juying WANG
12:15-13:45	**Lunch**
13:45-14:00	**"Acta Oceanologica Sinica" Introduction** | Dr. Zhou JING
14:00-14:30	**Degradation-fragmentation aspect of microplastics** | Prof. Anthony ANDRADY
14:30-15:00	**Numerical modelling of marine microplastics transportation in the Bohai Sea** | Prof. Yanfang LI
Session 2: Chair, Prof. Somkiat Khokiattiwong Interaction of microplastics with Biological and Chemical Contaminants	
15:00-15:30	**Occurrence of wide-range of additives in marine plastics and their exposure to marine organisms** | Prof. Hideshige TAKADA
15:30-15:45	**Tea Break**
15:45-16:15	**Global Pattern of Microplastics in Commercial Table Salt Products** | Prof. Seung-kyu KIM
16:15-16:45	**Where do the microplastics go in the body of organisms?** | Prof. Huahong SHI
16:45-17:15	**Effects of micro/nanoplastics on the fate of organic pollutants - bioaccumulation, degradation, and transportation** | Prof. Rong JI
17:30-18:30	**Dinner time**

Conference Programme | 25 April 2018 Venue: Office Building Auditorium

Session 3: Chair, Prof. Bert van Bavel Influences of microplastics on the Marine Biota	
09:00-09:30	**Occurrence and Fate of Microplastics: Research and Monitoring Status in Thailand and the Regional Role** | Prof. Somkiat KHOKIATTIWONG
09:30-10:00	**Ingestion of microplastics by zooplankton and fish from the Yellow Sea** | Prof. Xiaoxia SUN
10:00-10:30	**Capture, ingestion, and egestion of plastic particles by suspension-feeding bivalves: implications for bioaccumulation and environmental fate** | Prof. J. Evan WARD
10:30-10:45	**Tea Break**
10:45-11:15	**Ingestion, egestion and effects of polystyrene microspheres on larvae and adults of marine medaka, Oryzias melastigma** | Prof. Jingli MU
Session 4: Chair, Dr. Wenxi Zhu Citizen science and possible solutions / remediation measures for marine microplastics	
11:15-11:45	**A Framework to Study Plastics Pollution in the Marine Environment** | Prof. Kara Lavender LAW
11:45-12:15	**Extracting information from the individualized and comprehensive analysis of microplastics** | Prof. Andrés CÓZAR
12:15-13:45	**Lunch**
13:45-14:15	**Annual amount of Plastic waste entering the ocean from China** | Ms. Mengyu BAI
14:15-14:45	**Plastic Pollution Management Problems and Future Policy Suggestions in China** | Prof. Ruizhi Liu, Prof. Yixiang DENG
14:45-15:00	**Tea Break**
15:00-15:20	**Regulating Marine Plastics and Microplastics in China: Challenges, efforts and Suggestions** | Prof. Huanhuan WANG
15:20-15:40	**Exploring the road of marine litter treatment** | Mr. Yonglong LIU
Plenary Discussion	
15:40-17:20	**Discussion of Meeting Outcomes and Action Plan**
17:30-18:30	**Dinner time**

Book of Abstract

Andrés Cózar

Extracting information from the individualized and comprehensive analysis of microplastics

Andrés Cózar[1]

[1] University of Cadiz, Spain

While studying microplastic pollution, researchers usually analyze samples as a whole or using wide size intervals (e.g. smaller and larger than 5 mm) to derive measurements of total abundance, weight, or percentages of any plastic typology in the sample. Studies using the microplastic item as analysis unit are little common, especially those relating multiple features. Size is the key variable characterizing the microplastics at individual level, but other properties such as shape, color, or chemical composition may be associated to the size. Undoubtedly, this sample processing is more time-consuming; in contrast it provides high-quality information able to undertake, from a different perspective, unresolved questions such as the fragmentation process, the biological ballasting or the ingestion by organisms. In this talk, we show methods and workflow to optimize the sample processing time, as well as examples illustrating the potential of the individualized and comprehensive analysis of microplastics.

Bert van Bavel

Occurrence and fate of microplastics in the marine environment: What do we know and what do we need to know

Bert van Bavel[1]

[1] Norwegian Institute for Water Research (NIVA), Oslo, Norway

An estimated number of 5 trillion are present in the marine environment and 5 to 13 tonnes are entering the marine environment every year. Although microplastics only account for less than 10% of the mass, counted as particles more than 90% of marine debris consist of particles smaller than 5 mm. The behaviour and distribution of microplastics entering the marine environment is largely unknown. What do we need to know to better estimate the risk of microplastics for the marine environment? Are currently used analytical techniques and methods sufficient to routinely monitor and measure microplastics?

Charles Moore

Trends in the Quantity of North Pacific Gyre Debris—Two approaches, Two answers

Charles J. Moore[a], Gwendolyn Lattin[a], Shelly Moore[b], Nikolai Maximenko[c], Jan Hafner[c], Steve Weisberg[b], Nikhil Davé[a]

[a] Algalita Marine Research and Education, USA
[b] Southern California Coastal Water Research Project, USA
[c] International Pacific Research Center, University of Hawaii, Honolulu, Hi, USA

Quantifying trends in oceanic concentration of plastics is challenging because the distribution of sources is not well known and factors like oceanographic circulation and wind can lead to substantial spatial and temporal variability. Here we examine trends in neustonic plastic in the eastern North Pacific Central Gyre using two approaches. In one approach, we revisited eleven sampling sites five times over a 15-year period, using a manta trawl. In the other we applied a model of oceanic circulation to reference observed debris density to the location of sampling stations relative to the modelled center of accumulation of the gyre, which changes substantially among sampling years. We used data from 316 random sites collected during the same 15 year period to validate the model. Both approaches indicated that debris concentration was increasing, but the magnitude of estimated increase differed substantially between the two approaches. In the revisit site approach, there was a 28-fold increase by weight, and 12-fold increase by count/km2 between 1999 and 2014. Using the modeling approach, the increase during that period by weight was xx%*, and the increase by count was xx%*. The most important factor in this difference was position of the sample site with respect to the variable debris accumulation center of the Gyre; we found a strong correlation between distance of the sample site from the center of the Gyre at the time of sampling and the amount of plastics sampled. These results indicate the need for enhanced coordination between observers and modelers to more precisely quantify the amount of, and trends in, ocean plastics.

** Indicates calculations still in progress to be supplied during presentation*

Daoji Li

Progress of Microplastic Marine Debris Research in China

Daoji Li[1,2]

[1] State Key Laboratory of Estuarine and Coastal Research, East China Normal University, Shanghai, China

[2] Plastic Marine Debris Research Center, East China Normal University, Shanghai, China

Over the past decade, the academia and the public have witnessed a tremendous growth in the discussion of marine debris and research of microplastic pollution. It is not surprising to know that global production of plastic materials has reached 335 million tons in 2016. However, what surprise us is the lack of understanding of source, fate and ecological effects, as well as the regional difference in research efforts of this new environmental threat. In China, although research on small plastic debris only began since 2013, significant research progress has been made. The research team in the East China Normal University pioneered to report the spatial distribution of microplastics in the Yangtze Estuary and the East China Sea, after which the concentration of microplastics in several estuaries and beaches in southern China was reported. Hitherto, Chinese microplastic related researches have covered every aspect of possible research area, including the abundance in various habitats, analytical methods, bioaccumulation and toxicity effects, microplastics as vector for transferring POPs, and microbial community attached to microplastics, and so on. The Ministry of Science and Technology of China and the National Natural Science Foundation of China have supported more than 20 projects on microplastic related research during 2015-2017, among which the National Key Research Program entitled Monitoring and Ecological Risk Assessment of Microplastic Marine Debris supported by the Ministry of Science and Technology in 2016, had the greatest domestic and international impact. The first institute for microplastic research and regulation in China, Plastic Marine Debris Research Center, was founded in the East China Normal University in 2015. Since 2016, the State Oceanic Administration initiated the monitoring of microplastics in coastal area in China. Experts from other scientific institutions have collected microplastic samples on cruises in the Pacific, the Indian Ocean, the North and South Poles. Meanwhile, China has been actively engaged in the research capacity and action plans under UN Environment, UNESCO, PICES, other organizations and frameworks.

Hideshige Takada

Occurrence of wide-range of additives in marine plastics and their exposure to marine organisms

Hideshige Takada[1]

[1] Tokyo University of Agriculture and Technology, Tokyo, Japan

Plastics carry various hazardous chemicals in marine environments. The chemicals include polychlorinated biphenyls (PCBs), dichlorodiphenyl trichloroethane and its metabolites (DDTs), polycyclic aromatic hydrocarbons (PAHs), polybrominated diphenyl ethers (PBDEs), nonylphenols (NP), octylphenol (OP), and bisphenol A (BPA). Their concentrations in marine plastics range from 1 ng/g to 10000 ng/g. They are derived from two origins. One group of chemicals consists of hydrophobic compounds such as PCBs and DDTs that are sorbed from surrounding seawater. Another group of chemicals consists of additives such as BPA that are originally compounded into consumer plastic products. Additives are essential components of plastic products. Some of them are hazardous to marine organisms and human. They can be also utilized as indicators of plastic-mediated chemical exposure to marine organisms. We measured wide range of additives including plasticizers (phthalates), UV absorbers (benzotriazoles and benzophenones), flame retardants (PBDEs, DBDPE, HBCDs, and tetrabromo bisphenol A) in large plastic fragments. The additives were also measured for preen gland oil from seabirds globally collected. Among 164 seabirds examined, 83 contained any of the additives (BDE209, DBDPE, DEHP, BP12 or UV324). This means that the additives could be transferred from ingested plastics to the tissue of seabirds for the 83 individuals among 164. In other words, ~ 50 % of seabirds are chemically impacted by marine plastics. Some of the seabirds such as Laysan Albatross from Hawaii and Cory's shearwater from Azores Islands had higher concentrations of PCBs in the preen gland oil in addition to the additives. These seabirds are suspected to be a high-risk species. We also analyzed BDE209 and DBDPE in microplastic fragments and pellets on sandy beaches, and buoyant microplastics in coastal and open ocean water. In beached and buoyant microplastics, BDE-209 was sporadically detected. This means that hydrophobic additives, i.e., BDE-209, is retained in microplastics even after fragmentation and suspension in seawater. These hydrophobic additives could be source of chemical exposure to small marine organisms in remote ecosystem, similarly to the seabirds mentioned above. Because microplastic fragments were detected in bivalves, e.g., mussels, in coastal waters, transfer and accumulation of the additives from ingested microplastics to the bivalve tissues should be studied in near future efforts.

Huahong Shi

Where do the microplastics go in the body of organisms?

Huahong Shi[1]

[1] State Key Laboratory of Estuarine and Coastal Research, East China Normal University, Shanghai, China

The presence of microplastics in organisms is of concern because of their ecological risks and the potential hazard to human health. It is important to understand where microplastics go in the body of organisms because they can readily affect the target organs and transport to humans via consumption. In the present study, we collected mussels from the fishery farms, conducted exposure/clearance experiments and analyzed the accumulation of microplastics in specific organ of mussels. Our results strongly suggest that adherence rather than ingestion led to the accumulation of microplastics in those organs which are not involved in ingestion process. In addition, microbeads even fused into the byssus of mussels. To our best knowledge, it is the first time to propose that adherence is a novel way for animals to take up microplastics beyond ingestion. This new finding makes us rethink about the bioavailability, accumulation and toxicity of microplastics to aquatic animals. The plastics (>20μm) in guts and gills of 13 species of fishes from coastal areas of China were also examined for the presence of microplastics. Our results suggest that microplastics> 20 μm do not readily translocate from the intestinal tract or gills to liver and muscles.

Huanhuan Wang

Regulating Marine Plastics and Mircoplastics in China: Challenges, efforts and Suggestions

Huanhuan Wang[1]

[1] Law School, East China Normal University, Shanghai, China

Concerns over the harmful environmental impacts and potential health impacts of marine microplastics have pushed both national and international actions in policy and law making. Challenges induced by governing those emerging contaminants arise especially considering their features, source, fates, and effects as well as considering identical regulatory demands of primary and secondary microplastics. As for China, even if laws targeting on prohibiting intentionally added plastic microbeads in rinse-off costmetics and personal care products has not been proposed, varied regulatory efforts have been made to tackle marine plastic wastes and those eventually fragmented and degraded into “secondary microplastics”, which actually account for much larger proportion of marine microplastics in environment. We study laws relating to better management of marine plastic wastes and microplastics within a background of gradually tightening rule of environmental law in China. In addition, most recent developments and endeavors in legislature and enforcement of law such as new round environmental inspections, ban on importing plastic wastes, ban on thin plastic bags, mandatory waste sorting and recycling among others are evaluated for their impacts on microplastics prevention and control. Suggestions including domestic actions and international involvement are given in the last part of the article for effective regulatory tools that can be considered to address challenges brought by microplastics.

Irina Chubarenko

Transport of marine microplastics particles: why is it still unpredictable?

Irina Chubarenko[1]

[1] Shirshov Institute of Oceanology, Russian Academy of Sciences, Kaliningrad, the Russian Federation

Microplastics particles (MPs, < 5 mm) are found nowadays in all the marine environments, from pole to pole, from water surface to deep bottom sediments. They have various densities, shapes and sizes, and all of these properties are changeable with time due to biofouling, weathering, mechanical degradation and other external forcings. As a result, physical transport properties of MPs are largely unknown, and MPs spreading under sea conditions is difficult to predict.

Along with the results of field observations worldwide, we report data of a series of laboratory experiments, targeted at understanding of basic physical characteristics and transport properties of some types of MPs particles. First, types of particles are examined, which are mechanically generated in the sea swash zone with coarse bottom sediment from larger objects made of polyethylene (PE), solid polystyrene (PS), foamed PS, and polypropylene (PP). Plastic samples were placed in laboratory mixer with inclined axis of rotation, filled with water and marine pebbles, and were rotated for 24 hours. Every 3 h, plastics were sieved out of mixture to examine the type of the generated MP particles and their size distribution. Solid PS appears to produce the largest number of MPs, and relatively quickly. Foamed PS samples break with time into individual spherules, which are difficult to disintegrate further. PE films get folded 4-8 times very quickly and remain as such afterwards for a long time, with a very small fraction of fibre-like particles generated. PP samples are the hardest: they stay practically the same after 24 h of mixing with pebbles, with practically no MPs generated.

In the second set of experiments, the settling velocity of various plastic particles was addressed. Artificially made polycaprolactone particles of various shapes, fishing line cuts, and synthetic fibres were put in the laboratory glass column, and their free fall in fresh water was monitored. The shape of a particle is shown to play the key role in the particle' behaviour.

The third set of tests aims at understanding of magnitude of critical shear velocity of MPs of various shapes. Classical Shields experiments are first reproduced in the 10-m long laboratory channel, and then modified in order to get re-suspension velocity of 3d, 2d and 1d plastic particles (of similar densities of about 1.05 g/cm3 and similar size of about 3 - 4 mm) from the bottom covered with natural coarse sand (1 - 1.5 mm), granules (3 -4 mm), and cobbles (1 - 2 cm). The results indicate that, again, the particle shape is of primary importance for its re-suspension. The results indicate that understanding and modelling of transport and fate of MPs particles in marine environment require quite a specific parameterisation of the MP particles' properties.

Jingli Mu

Ingestion, egestion and effects of polystyrene microspheres on larvae and adults of marine medaka, *Oryzias melastigma*

Jingli Mu[1], Fei Jin[1], Yi Cong[1], Shoufeng Zhang[1], Ying Wang[1], Juying Wang[1]

[1] Key Laboratory for Ecological Environment in Coastal Areas, State Oceanic Administration, National Marine Environmental Monitoring Center, China

Microplastics are of environmental concern as their small size makes them available to a wide range of marine biota. Ingested microplastics might cause a lot of adverse effects upon marine biota. However, there is little information available concerning the long-term impacts on marine fish resulting from microplastic ingestion after short-term exposure. In this study, we firstly investigated the ingestion and egestion of fluorescent polystyrene (PS) microspheres (10 μm) by both larvae and adults of marine medaka (*Oryzias melastigma*) after a 48 h-exposure and a subsequent 7 d of recovery in PS free medium, with or without food supply during exposure and recovery processes. The presence and quantity of fluorescent microspheres in each individual was observed and counted under fluorescence inversion microscope system. The effect of non-fluorescent PS on the growth of medaka larvae and adults was measured after a 48 h-exposure followed by a subsequent 30 d of growth experiment in clean medium without PS. Results showed that the 10 μm PS microspheres were bioavailable for medaka larvae and adults and only found in their alimentary tracts. Time-dependent microsphere accumulation was found in adult fishes during the 48 h of exposure. The maximum concentrations of microspheres in fishes were 119.4 ± 18.1 (non-feeding) and 152.1 ± 19.7 (feeding) particles/individual at 24 h for the larvae, and 2094.7 ± 243.3 (non-feeding, 24 h) and 502.6 ± 198.3 (feeding, 20 h) particles/individual for the adults, respectively. During the recovery stage, the depuration rate of ingested microspheres in adults was more than 90 %. As a comparison, more than 25% of ingested microspheres were still remained inside the larvae for at least 7 days, though they were egested quickly during the first day of depuration, which indicates that the early life-history stage of fish is particularly vulnerable to microplastics. In the growth experiment, the highest mortality of around 22 % was observed in the non-feeding larvae, which was significantly higher than the feeding larvae. No death was found in the feeding adults. The average lengths of both non-feeding and feeding larvae were significantly shorter than that of the control, indicating that the latter larval growth was affected by pre-exposure with the PS, especially those without food supply. However, no effect of PS pre-exposure on either latter individual length or weight of adults was observed. Overall, these results suggested that although ingested microspheres can be eliminated by both medaka larvae and adults, the negative impact of ingested microspheres on the latter growth and development of the larvae, as well as the role of food supply, should not be ignored. Our findings also highlight the ecological impact of microplastics entering marine ecosystems and emphasize the urgency for new management strategies to control the release of microplastics, directly or indirectly.

Keywords: Microplastic, Early-life exposure, Marine medaka, Accumulation, Later-life consequence

Juying Wang

Microplastic in the Northern Hemisphere: from coast, East Asian Sea to the Arctic

Jingli Mu,[†] Ling Qu,[†] Fei Jin,[†] Shoufeng Zhang,[†] Chao Fang,[‡] Weiwei Zhang,[†,§] Xindong Ma,[†] Qian Zhao,[†] Puqing Song,[‡] Daoming Guan,[*,†] and Juying Wang[*,†]

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The Arctic region is opening up to increasing commercial activity as sea ice melts and will become increasingly influenced due to the detrimental effects caused by trillions of pieces of plastic floating in our world's oceans today. Although growing evidence suggests the ubiquity of microplastics across the world's oceans, little is known about the state of microplastics in the Arctic in comparison to other major ocean basins. To assess microplastic pollution levels and spatial distribution in the Arctic Ocean, here, we analyzed the distribution and abundance of microplastics in the surface waters and subsurface waters of the Arctic along a transect ranging from the West Pacific and Bering Sea through the Chukchi Sea and Central Arctic Ocean to Greenland. Two independent techniques were used to sample microplastics from the surface and subsurface waters. Potential microplastic compositions were identified by μFTIR spectroscopy. Our analyses indicate widespread high levels of microplastics in the Arctic. Of all the microplastics, fiber is predominant (93.78% in surface and 88.66% in subsurface waters) in amount, and polyester accounts for the largest proportion (76.37% in surface and 69.27% in subsurface waters) in composition. The average microplastic abundances in surface and subsurface waters are 0.12 ± 0.10 items/m3 and 3.35 ± 2.09 items/m3, respectively, which are higher than those found in the other regions of the North Pacific and the Atlantic and are of the same order of magnitude as those reported in the North Pacific Subtropical Gyre. The greater abundances are found in the Chukchi Sea and the Central Arctic Ocean. The present data suggest that a significant fraction of these microplastics likely originated from the Northeastern Pacific sector and the Northeastern Atlantic sector of the Arctic Ocean. This study provides new evidence to support the hypothesis that there is a sixth gyre within the Arctic.

J. Evan Ward

Capture, ingestion, and egestion of plastic particles by suspension-feeding bivalves: implications for bioaccumulation and environmental fate

J. Evan Ward[1], Vena Haynes[1], Kayla Mladinich[1], Bridget Holohan[1]

[1] Department of Marine Sciences, University of Connecticut, USA

In aquatic environments, suspension-feeding bivalves are exposed to a manifold of natural and anthropogenically-derived particles. Through degradation processes, microplastic (MPP) and nanoplastic particles (NPP) are produced and interact with the feeding organs of these animals, causing negative effects at an organ and cellular level. Despite the potential for exposure and toxicological effects, the capture, ingestion, egestion and potential bioaccumulation of MPP and NPP by bivalves, is largely unexplored. In a series of experiments with the blue mussel (*Mytilus edulis*) and eastern oyster (*Crassostrea virginica*), feeding on different types of plastic particles with varying shapes, sizes, and surface properties (wettability, surface charge) was explored. Additionally, the blue mussel was exposed to polystyrene MPP and NPP for two weeks at a concentration of 0.1 mg/L/hr, and uptake and accumulation examined. Following exposure, mussels were allowed to depurate for one week to quantify elimination. Results demonstrate that particles < 2 µm are captured at a low efficiency unless they are incorporated into marine aggregations. Large particles (> 100 µm spheres and fibers) are captured at a high efficiency but are more likely rejected in pseudofeces and thus ingested in low proportions. Particles between 10 and 20 µm are more likely ingested if they have hydrophobic surfaces or possess surfaces with a lower charge (Zeta potential < ca. -8 mV). In exposure experiments, mussels ingested a higher mass of MPP than NPP, and both plastic particles were rapidly depurated over several days (MPP > 80% and NPP > 60% after 1 day). No bioaccumulation of plastic was detected after 14 days of exposure, which corroborates results from short-term studies (hours). These results advance our understanding of the types of microplastics that are ingested and egested by bivalves, and have important implications for assessing internal exposure, toxic effects, and trophic transfer.

Kara Lavender Law

A Framework to Study Plastics Pollution in the Marine Environment

Kara Lavender Law[1]

[1] SEA Education Association, USA

Microplastics have recently become the focus of attention in the scientific community because of their documented prevalence in the environment (primarily marine and freshwater, but also terrestrial and as airborne particles). This apparent ubiquity, especially of plastic fibers, drives concern about the risks of microplastics to animals that encounter them through ingestion and/or inhalation or gill uptake. However – fictitious islands of floating trash aside – larger plastic items are also of concern, not least because they are the origin of most microplastics, which are generated through chemical and physical degradation upon environmental exposure. A framework is proposed to consider the global budget of plastic marine debris, including its sources, distribution, and fate, that may be used to evaluate current scientific understanding and identify important knowledge gaps, and to link process studies into a broader context.

Mengyu Bai

Annual Amount of Plastic Waste Entering the Ocean from China

Mengyu Bai[1]

[1] State Key Laboratory of Estuarine and Coastal Research, East China Normal University, Shanghai, China

The study of marine plastic debris pollution has drawn increasing attention in recent years. Due to the durability, low density and poor management of plastic waste, plastic debris has become ubiquitous in the marine environment. Plastic debris can transport persistent organic pollutants, invading species and cause ingestion for marine organisms. The global amount of plastic waste entering the ocean has been well-studied, while those entering the ocean from China is still not sufficiently studied.

To calculate the annual amount of plastic waste entering the ocean from China, a framework using the Material Flow Analysis (MFA) with national statistics data was constructed. Based on data from the China Plastics Processing Industry Association and national statistics, the model divided plastic products into five groups: plastic film, plastic foam, synthetic plastic leather, plastic commodities and other plastics. The model can predict the annual amount of plastic waste generated in China with reasonable accuracy, with the difference between model results and the statistics being less than 8%. The amount of plastic waste entering the ocean from China is then calculated based on the model predicted amount of China's plastic waste generation. According to the model, an average of 0.46 million metric tons of plastic waste enter the ocean from China in 2011, and the amount on average grows by 0.03 million tons each year until 2016. After conducting regional analysis, it can be concluded that the Eastern parts of China contributes the most plastic waste to the ocean in China. The result of this study may help to improve the understanding of China's contribution to plastic waste in the ocean, and establish control and reduction measures.

Rong Ji

Effects of micro/ nanoplastics on the fate of organic pollutants – bioaccumulation, degradation, and transportation

Yini Ma[1], Jin Liu[2,1], Lili Tian[1], Xiangtao Jiang[1], Wei Chen[2], Rong Ji[1]*

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Micro-especially nanoplastics may strongly adsorb organic pollutants, thus act as vectors of organic pollutants in organisms and the environment. However, most recent studies have only focused on the toxicity and bioaccumulation of plastic particles. Very rare have investigated the interactions of micro-/nanoplastics and organic pollutants in the environment. In this presentation, we will give a brief summary of our recent works on the effects of micro/ nanoplastics on the bioaccumulation, degradation and transportations of organic pollutants.

Due to the strong adsorption affinity, micro-/nanoplastics affected bioaccumulation of hydrophobic organic pollutants in both zooplankton (*Daphia magna*) and fish (*Oryzias Melatigma*), but the effects depend on the feeding behavior of the animals. The plastic particles increased the bioaccumulation of organic compounds in daphnia due to the retention of plastics on the filtering and swimming organs, while for fishes, which take up plastic particles mainly through ingestion and excrete through defecation, most organic pollutants adsorbed on plastic particles was excreted without being accumulated in the fish body.

The presence of nanoplastics also strongly affected the degradation of both highly hydrophobic pollutants, like polyaromatic hydrocarbons (PAHs), and less hydrophobic pollutants, like bisphenol-A (BPA) in fresh water systems. Due to the strong adsorption of PAHs on plastic particles, the biodegradation process was strongly inhibited. The presence of nanoplastics also inhibited the biodegradation of weakly adsorbed compound BPA, possibly due to adsorption of hydrophobic metabolites of BPA and thus altered the biodegradation pathway of BPA.

the presence of low concentrations of nanoplastics significantly enhanced the transport of nonpolar (pyrene) and weakly polar (BDE47) compounds but had essentially no effects on the transport of three polar compounds (BPA, Bisphenol-F, and 4-nonylphenol) in soil column. This strikingly different effects could not be explained solely with difference in adsorption affinities but instead was more consistent with the polarity-dependent extents of desorption hysteresis.

In summary, micro-/nanoplastics particles in the environment could significantly affect the bioaccumulation, degradation, and transportation of organic pollutants, but the effects highly depend on the type of plastics and organisms and the chemical properties of pollutants. The mechanisms for the interactions between different types of plastics and organic pollutants in the environment or the body of organisms needs to be further investigated.

Seung-Kyu Kim

Global Pattern of Microplastics in Commercial Table Salt Products

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Microplastic pollution is becoming a global issue in marine environment pollution. Some recent studies have identified microplastic contamination that remains in commercial salts. Since salt is an essential consumer food, the presence of microplastics in salt products means that salt intake is a pathway of exposure to human exposure to microplastics. In addition, since sea-salt is produced through the evaporation of seawater (in case of sea-salt), there is a possibility to represent the degree of contamination of microplastic remaining in seawaters. The purposes of this study are 1) to identify the contamination of microplastic in commercial table salts and to estimate human exposure of microplastic through salt intake, and 2) to determine if salt can reflect the degree of contamination of microplastic in the seawaters. To do this, we purchased and analyzed the salt products on the markets of 17 countries (8 countries in Asia, 7 in Europe, 1 in Africa and 1 in North America) from four continents. Total 39 samples (28 of sea-salt, 9 of rock salt, and 2 of lake salt) were identified as final samples. Target sea salts were produced from 16 countries of six continents (7 in Asia, 5 in Europe, 1 in North America, 1 in South America, 1 in Oceania, 1 in Africa), rock salts from 7 countries of 3 continents (3 in Asia, 4 in Europe, and 1 in North America), and lake salt from 1 country of 1 continent (Africa). Qualitative quantitative analysis of size, color, polymer, and shape of each microplastic was performed through microscopic analysis and Fourier-transform infrared spectroscopy. Abundance of microplastic were in order of sea salt (774 ± 2,938 n/kg), lake slat (245 ± 307 n/kg), and rock salt (38 ± 55 n/kg), being in similar range with or slightly higher than those observed in previous studies. Distinctly higher concentrations were found in sea salts produced from Asian countries than other countries, implicating higher microplastic contamination level in Asian seawater and being similar with global pattern in its riverine discharge. PP and PE were predominant source polymers in general except for PET in some production location, and fragment was dominant shape in general except for sheet in one country and fiber in some countries. Estimated human exposure of microplastics via salt intake was 509 ± 594 n/person/year with greater exposure of Asian people. Further study is necessary to clear which of seawater and production process is main contamination source.

Somkiat Khokiattiwong

Occurrence and Fate of Microplastics: Research and Monitoring Status in Thailand and the Regional Role

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Thailand has been giving high priority to United Nation framework on the Sustainable Development Goal (SDG), especially on the SDG-14, which its target is to maintain ocean to be healthy and sustainable use. Reducing an impact of anthropogenic pollution is one of the main target under the SDG-14 target and needs immediately action. The marine plastic debris and microplastic pollution is highly concern among the Asian countries and urging more action to be done in the region after the global report on high contribution of plastic into the marine environment was from countries in this region. Thailand has been paying attention on status and impacts of marine debris and microplastic in marine environment as well as has been establishing long term management through the national policy, which expects outcome to reduce its contamination. Since plastic pollutant could be transported through ocean circulation. It could therefore be wildly distributed in the region. The cooperative study and management among the countries in the region is therefore very importance. The establishment of the marine plastic pollution network in the region is highly required. Thai government gives a high priority on plastic debris and microplastic and has been organized the Marine Debris and Microplastic Conference under the framework of ASEAN in October 2017, Phuket, Thailand. The marine microplastic research session was organized during the Conference under the lead of WESTPAC. The results indicate that there is still lack of information and appropriate method/technique to operate monitoring and carry out research of microplastic. Department of Marine and Coastal Resources (DMCR), Thailand, is one of government agency take an action to monitor and study on the marine plastic debris and microplastic including its impacts on marine organisms in the country. The microplastic is in an attention of researcher in Thailand. Several studies have been carried out. But there are still uncertainty of the results as due to the uncertainty of methodology and technique. DMCR is therefore closely cooperation with the group of WESTPAC's expert of Marine Microplastic project to harmonize the appropriate and acceptable method to be used under the WESTPAC project and expect to be wildly use in the region. Under the cooperation which the WESTPAC project, DMCR have been setting up the monitoring sites for microplastic both in the Gulf of Thailand and Andaman Sea. The samples are sediment, seawater, and marine organisms. With strongly support from the Thai's government, DMCR will active participate and work closely with the countries in the region, especially through the network of marine microplastic project of the WESTPAC.

Xiaoxia Sun

Ingestion of microplastics by zooplankton and fish from the Yellow Sea

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Microplastics in the ocean is the plastic fragments less than 5 mm in diameter, which entered into the ocean through a variety of ways. In the past 60 years, the global plastic production increased by 560 times, and the accumulation of microplastics in the marine environment is increasing. The potential risks of microplastics to marine ecosystems caused widespread concern. However, the data on the in-situ ingestion of microplastics by natural zooplankton and fish are very rare. In this research, the ingestion of microplastics by different natural zooplankton and fish groups was studied in the Yellow Sea. The microplastics were detected in zooplankton and fish sampled from almost all stations, with the fibrous microplastics accounting for the largest proportion. The average length of the microplastics in zooplankton and fish was 259 μm and 1 mm, respectively. The encounter rates of microplastics/zooplankton and microplastics/fish varied with taxa. The encounter rate was affected by the size, abundance, feeding habit, and environmental microplastics pollution.

Keywords: Microplastics, zooplankton, fish, ingestion

Yanfang Li

Numerical modelling of marine microplastics transportation in the Bohai Sea

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Microplastics is an ever-increasing issue in the marine pollution science. Its sources, ways of propagation and final destiny pose a lot of questions to the modern oceanographers. Hence, a numerical model is an optimal tool for reconstructions of microplastics pathways and fate. Our model deals with two major transport process of microplastics such as surface floating and settlement. Water samples from the surface and sediment samples from the bottom were collected, processed, and analysed. In the simulation, surface floating process was mainly driven by wind, current and waves. And in the water, microplastics transport was influenced by turbulence, biofilm and absorption. In coastal seas microplastics are widely dispersed, particularly in semi-enclosed, where a strong correlation between local sources and local beaching was suggested, implying local trapping. Like in the Bohai Sea, the distribution of microplastic in the surface varies seasonally has spatial variation. The floating process controls the fate of microplastics in the surface. Wind, wave, current and tide have effects to influence the movement of microplastics. Its distribution was also influenced by the location of source input.

Microplastics also exist in each layer of the water, experiment results showed that vertical mixing could influence the vertical distribution of microplastics, and turbulence was the dominated factor. During transportation of microplastics, chemical absorption and biofouling effect can increase its density, making suspended microplastics to be settled down. And due to biofouling effect, it would take only a few days for floating microplastics to settle down. Our model showed that the size of microplastics influence directly the settling rate. Biofouling controlled the settlement of microplastics.

The local abundance of microplastic both in the water column and at bottom was dependent on a complex interaction between source locations, shoreline geometry, prevailing hydrodynamic conditions, the settling and resuspension rates. Further field studies are warranted to enable the models to better parameterize the trapping processes of microplastics in poorly flushed semi-enclosed seas, such as the Adriatic Sea, the Seto Inland Sea and the Japan Sea, where microplastics should be classified as a persistent pollutant.

Yonglong Liu

Exploring the road of marine litter treatment

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The thought and action of Ren Du ocean in marine litter governance is introduced. Rendu ocean choices Zero waste society as ultimate goal, determines that the reduction of litter into the sea is an operable path to the vision, envisages the overall system of marine litter governance, and puts forward and continuously popularize the classification concept of out-of-control and in-controlled garbage. Then, we introduced the various actions and current progress of Ren Du ocean, and introduced some other NPO.

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