서울대학교 SEOUL NATIONAL UNIVERSITY **보 도 자 료** http://www.snu.ac.kr

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국제학술지에 “황해생태계” 연구 특별호로 실려
‘한 · 중 과학자들의 10년간 연구노력의 결실’

☐ 내용

서울대학교 김종성 교수는 해양환경 분야에서 국제적으로 저명한 학술지(SCI)인 ‘Chemosphere’에 우리나라 서해갯벌을 포함한 “황해생태계”를 주제로 특별호를 출판하였다. Chemosphere에서 우리나라 해역과 생태계를 주 대상으로 하여 특별호로 출간한 것은 이번이 처음이다.

금번 ‘황해생태계’ 특별호는 지난해 3월 서울대 주최로 열린 ‘제2회 황해생태계(Yellow Sea Ecosystem Symposium, 이하 YES): 오염, 생태계 위협, 환경과 건강’이란 한·중 국제심포지움에서 발표된 총 60여편의 논문을 대상으로 리뷰 과정으로 거쳐 학술적으로 우수한 논문 30편을 선별하여 발행한 것이다.

김종성 서울대 교수가 특별호의 대표 편집인을 맡았고, 중국측 파트너인 중국과학원 왕테유 박사와 Chemosphere 총괄편집장인 미국 애리조나대 Snyder 교수가 공동편집인으로 참여했다. 한국측에서 신경훈(한양대), 최병주(군산대), 최경호(서울대), 류종성(안양대), 최성득(UNIST), 홍성진(충남대) 교수 등 국내 해양, 생태, 환경보건학 관련 전문가 다수가 주저자로 참여하여 15편을 게재하였다. 한편, 중국 측에서도 중국과학원, 난징대, 북경농림대, 홍콩대 등의 해양 및 생태환경 전문가가 참여하여 15편을 게재하였다.

총 30편의 논문이 수록된 황해생태계 특별호에는 지난 10년간 한·중 과학자들이 공동으로 연구해 온 황해 연안 및 하구역에서의 각종 육상기인 해양 오염물질의 기원, 분포, 및 거동 메카니즘에 대한 연구결과가 제시되었고,

특별히 해양생태계 피해 사례 및 연안복원 정책과 관리 등의 다양한 해양환경 현안에 대해서 자연과학 및 사회과학적 연구 결과가 포함되었다. 우리나라의 서해와 관련된 대부분의 연구논문은 해양수산부의 4개 R&D 과제(새만금, 하구, 태안유류, ERA 과제)의 지원을 받아 수행된 결과물로 해양수산부의 장기연구지원의 성과이기도 하다.

한·중 황해생태계 심포지움은 지난 10년간 황해생태계와 오염에 대한 연구를 주도해온 김종성 서울대 교수와 중국과학원 왕테유 박사가 양국간의 지속적인 황해연구의 필요성과 학문후속세대의 양성을 위해 지난 2015년부터 매년 1회 심포지움을 개최해오고 있다. 2017년 올해는 중국과학원 주최로 지난주 북경에서 성황리에 개최되었고 총 80여건의 발표 논문 중에 약 40편을 선별하여 세계적인 환경분야 학술지(SCI)인 Environmental Pollution에 내년에 출판될 예정이다.

김종성 교수는 “금번 황해생태계 특별호 연구 성과는 한·중간 공통의 관심과 대응이 요구되는 해양환경문제를 양국의 과학자들이 10년 여간 지속적인 연구교류를 통해 국제적으로 이슈화했다는 점에서 큰 의미가 있다”고 소감을 밝혔고, “황해 연안 및 하구역에 대한 양국간의 협력연구는 환경오염, 외래침입종, 어업자원 고갈 등 당면한 해양수산환경 문제를 해결하는 등 한·중 해양외교에 크게 기여할 수 있다는 측면에서 황해(Yellow Sea)에 대한 정부차원의 본격적인 후속 연구가 필요하다.”고 말했다.

[붙임] 1. 연구결과 2. 연구활동 3. 대표편집인 이력

연 구 결 과

황해 생태계: 오염, 생태계 위협, 환경과 건강

The Yellow Sea ecosystem: Pollution, ecosystem threats, and environmental health

Jong Seong Khim, Tieyu Wang, & Shane A. Snyder

Chemosphere (2017년)

<국문 요약>

○ 황해 연안 및 하구 생태계는 한국과 중국의 지속적인 연안역 개발압력(간척, 도시화, 공업화, 해양쓰레기 등)으로 인해 장기적인 누적피해영향을 받아왔으면, 이에 따라 해양생태계 서비스의 질적 저하를 초래하고 있음.

○ 황해의 지속가능성을 담보하기 위해서는 생태계를 위협하는 요인과 그로 인한 피해영향에 대한 정량적인 연구가 필요하고, 특히 한국과 중국의 공통적인 문제인식 기반의 공동연구가 활성화되어야 함. 최근 생태계위해성평가의 핵심적인 요소로 부각된 화학-독성-생태계반응의 세 요소의 통합적인 평가에 기반한 해양환경의 관리 및 정책이행이 절실히 요구됨.

○ 서울대 김종성 교수와 중국과학원의 왕테유 교수 주축으로 구성된 한·중 국제공동연구팀은 지난 2008년부터 약 10년간 황해 연안 및 하구 생태계에 대한 장기 모니터링을 수행해왔고, 본 특별호에는 그간 축적된 자료를 바탕으로 1) 환경화학, 2) 환경독성학, 3) 생태학 및 통합위해성평가의 세분야에 대해 총 30편의 연구논문이 수록되었음.

○ 구체적으로, 황해 연안 및 주요 하구역을 대상으로 주요 육상기인 오염원과 오염물질의 조성, 오염 수준, 생태계 영향 등에 대해 전반적인 평가가 이루어졌고, 즉각적인 관리가 요구되는 특별 관리구역 및 우선관리 대상물질 등을 제안하였음. 또한 생태계기반 위해성 평가에 대한 중요성과 이를 고려한 생태복원정책의 패러다임 쉬프트에 대해 토의하는 과학기반 정책논문도 포함됨.

YES 2016 심포지움


Symposium Overview


Keynote Speakers


Participant Group Photo


VIP Group Photo


Poster Section


Presentation Award Winners


Prof. Giesy Science Talk Concert

대표편집인 이력

1. 인적 사항

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2. 학력

○ 1994-1998: 서울대학교 자연과학대학 자연과학부(해양학) 이학사

○ 1998-2000: 서울대학교 자연과학대학 해양학과 이학석사

○ 2000-2006: 서울대학교 자연과학대학 지구환경과학부 이학박사

3. 경력 사항

○ 2007-2009: 캐나다 서스케처원대학 선임연구원

○ 2009-2012: 고려대학교 생명과학대학 환경생태공학부 조교수

○ 2012-2014: 서울대학교 자연과학대학 지구환경과학부 조교수

○ 2014-현재: 서울대학교 자연과학대학 지구환경과학부 부교수

4. 기타 정보

○ 학술연구논문 130여편 (SCI 120여편), 국내외 학술발표상 10회 수상

○ 서울대학교 자연과학대학 연구상(2014)

○ 중국과학원 국제공동연구상(2013)

○ 세계3대 인명사전 등재(2007년 이후, 총 18회)

- *Marquis Who's Who (USA)*
- *International Biographical Centre (England)*
- *American Biographical Institute (USA)*

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Editorial

The Yellow Sea ecosystem: Pollution, ecosystem threats, and environmental health

1. Socio-ecological importance of the Yellow Sea

Coastal ecosystems have been contaminated by various pollutants, mainly from human activities. In particular, during the past half century continuing heavy industrialization in burgeoning East Asian countries has resulted in increasing pollution of coastal and marine sediments. Concerns about contamination of the Yellow Sea between Korea and China are acute because of the restricted nature of circulation and flushing, very heavy development of industry and transportation that can adversely affect ecosystem services of economic importance provided in the region. More recently, multiple stressors through continuing coastal development including large scale reclamation projects, land-based coastal pollution, and sometimes accidental spills, including oil, have resulted in threats to ecosystems and potential negative effects on well-being of humans. Recent reports have also emphasized deterioration of ecosystem services due to over-exploitation, introduction of invasive species, and pollution of coastal environments by litter, primarily with micro and macro plastics. Despite the socio-ecological importance and marine ecosystem services being provided by coastal ecosystems of the Yellow Sea, efforts to control contamination were delayed and often limited to specific areas of concern, in general.

2. Brief history of the Yellow Sea study

Since the middle 2000s, there have been increasing scientific assessments of environmental pollution and health of Yellow Sea ecosystems. A first international survey along coastal areas of the Yellow Sea was conducted from April to May of 2008 by the joint program between two laboratories of Professors John P. Giesy from the University of Saskatchewan, Canada and Yonglong Lu from the Chinese Academy of Science, China. Twelve individuals from those laboratories participated in surveys conducted in Korea and China covering more than 50 sampling locations, along 8500 km of coastline during a 20 day period. Profs. Jong Seong Khim and Tieyu Wang led the first international survey of the Yellow Sea coast and further developed an international, joint program that has been continued annual monitoring of the region.

Since the early 2010s, former students of Profs. Giesy and Lu and additional collaborators in Korea and China have participated in the Yellow Sea Research Network and their support and contributions have resulted in strong, synergistic outcomes cross the integrated fields of marine pollution sciences. The major scientific fields involved in research on the Yellow Sea include environmental chemistry, environmental toxicology, terrestrial and marine ecology, and marine and environmental policy.

The integrated approach to solving issues of marine pollution around the Yellow Sea coastal areas have benefited government agencies and industries, and allowed them to address issues of pollution of ecosystems, including developing systems of valuation of the Yellow Sea, which has been instrumental in protecting valuable economic resources including natural aesthetic beauty. Cooperation between scientists, government agencies and the public of Korea and China have demonstrated what can be done toward solving pollution of the Yellow Sea region which both countries share geographically, but also have joint socio-economic interests and responsibilities.

3. Scientific platform for the Yellow Sea study

Due to increasing needs for integrated scientific information for use in understanding pollution around the Yellow Sea, in 2015, we initiated regular gatherings of professionals to provide a platform focusing on scientific investigations of the Yellow Sea ecosystem. The 1st Yellow Sea Ecosystem Symposium (YES), which was held at Nanjing University in 2015, was chaired by Prof. Xiaowei Zhang was attended by 50 persons. The 2nd symposium of YES 2016, which was held at Seoul National University in 2016 and chaired by Prof. Khim, was attended by 150 participants. The goal of the YES is to providing a platform for the next generation of researchers to share scientific knowledge and improvement of our understanding on the Yellow Sea ecosystem.

The present special issue entitled "The Yellow Sea Ecosystem: Pollution, Ecosystem Threats, and Environmental Health" is the result of the 2nd YES in March of 2016 (official title: 2nd Korea-China Symposium on Environmental Health and Ecotoxicology). The symposium was quite successful with a total of 150 participants including two excellent keynote presentations. First Prof. Giesy, the world's top environmental toxicologist, gave a keynote speech entitled "Status and trends of contaminants in the Yellow Sea: An international perspective", as an overview of our 15 years of studies of the Yellow Sea. The second keynote speech, which was given by the well-known marine ecologist, Prof. Shing Yip Lee from the Griffith University, Australia, was entitled: "The role of ecology in the era of restoration". To set the stage for the other papers in the special issue, those two keynote presentations are presented as review chapters.

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The set of other chapters included in the proceedings come from a total of 14 invited oral presentations from Korean and Chinese scientists that were presented in the contributed sessions. Topics relating to the Yellow Sea ecosystem were in four major scientific fields, including: 1) Environmental Chemistry, 2) Ecotoxicology, 3) Ecology, and 4) Integrated Assessment & Management. In addition, during the symposium, approximately 50 posters, with various topics or themes, were presented by graduate students, postdocs, or other researchers. The present special issue includes and post docs that we mentor. That has certainly been the case over the last 15 years, during which so many excellent students have been conducting joint studies between Korea and China. But beyond the science the YES program has resulted in more and more effective contacts between people in Korea and China and better social understanding through communication and deeper mutual understanding and respect, through which researchers and scholars have grown beyond collaborations to become friends.

30 selected, outstanding, original articles under the following three themes;

1) Environmental Chemistry,
2) Toxicology and Human Health, and
3) Ecology and Integrated Assessment.

During the 2nd YES, Prof. Giesy, not only gave a keynote presentation that provided an overview of the history of the program, but also through a less formal discussion, through a "Science Talk Concert for Prof. John P. Giesy" which was chaired by Profs. Khim and Kyungho Choi (Seoul National University), with students and faculty provided his vision of what can be accomplished when people come together to achieve a common goal. His vision of collaboration, sharing and mutual respect, have been the foundation upon which the YES has been based. No doubt these principles have been the reason for the extraordinary success of the program over the last 15 years. As Prof. Giesy is fond of saying: While we do socially relevant research, results of which hopefully have benefits to society, the real products of our collaborations are students

3.1. Environmental chemistry (13 chapters)

The articles in "Environmental Chemistry" mainly deal with occurrence, distribution and sources, behavior, transport, and fate of traditional and new persistent organic pollutants (POPs) as well as heavy metals. Target environments and media encompass surface water, sediments, soils and organisms of rivers, estuaries, and coastal areas in the Yellow Sea. In particular, the first chapter serves as an introductory review summarizing the long-term research efforts on contaminations of chlorinated, brominated, and fluorinated POPs in Bohai Bay and the greater Yellow Sea during the last 20 years. Based on that information areas of concern considered to be "hotspots" have been identified. This chapter sets the stage so that a discussion of status and trends of contamination can be assessed.

3.2. Toxicology and human health (8 chapters)

The section entitled "Toxicology and Human Health" includes original research articles relating to *in vitro* and *in vivo* toxic effects

and potential risk to human health associated with chemical contamination and/or marine oil spill. Several chapters document long-term monitoring and assessment of the *Hebei Spirit* oil spill which occurred on the west coast of Korea in 2007 and is the largest and longest lasting spill of oil. These papers present long-term ecological effects and potential remaining toxicities in coastal sediments contaminated by oil. Several chapters emphasized the importance and significant use of multiple lines of evidences to assess and integrate potential effects of multiple stressors.

3.3. Ecology and integrated assessment (9 chapters)

The section of "Ecology and Integrated Assessment" contains articles on various topics, including identification of priority pollutants in coastal ecosystem, benthic community responses against to the chemical contaminations, and current status of soil environmental quality and management strategies. The last chapter entitled "Hard science is essential to restoring soft-sediment intertidal habitats in burgeoning East Asia" serves as a conclusion chapter, that identifies gaps in current knowledge to facilitate science-based restoration of soft sediment habitats with four representative case studies in China (Mai Po, Hong Kong and Yunxiao wetlands, Fujian) and Korea (Lake Sihwa and Saemangeum tidal flats).

4. Contribution of the VSI to Korea and China cooperation for the Yellow Sea

Overall, the 30 research articles provide scientific advances in understanding of pollution of coastal environments, potential toxic effects, community responses, integrated assessment, and environmental management of the Yellow Sea. We believe that the international audience will find our long-term efforts and challenges towards sustainability of the Yellow Sea and its ecosystem services through compact review and various case studies in the field and laboratory. Built upon the success of YES 2016, we look forward to the next symposium, YES 2017 (official title: 3rd Sino-Korea Symposium on Environmental Health and Ecological Safety, co-chaired by Professors Wang and Khim), in the series to further improvement of ecosystem assessment and management through joint efforts between Korea and China, which will be held in China, in July of 2017.

Acknowledgements

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