

Shiye Zhao, Ph.D.
Associate Scientist (tenured)



**Japan Agency for Marine-Earth
Science and Technology**

Research Institute of Global Change,
2-15, Natsushima, Yokosuka,
Kanagawa 237-0061, JAPAN
Email: szhao@jamstec.go.jp
Cell: (81) 080-3174-7602

Google Scholar Link:
<https://scholar.google.com/citations?user=2E3zsQAAAAJ&hl=en&oi=ao>

IN BRIEF

As an environmental oceanographer with training in marine chemistry/microbiology, I am interested in the dispersal and consequences of the anthropogenic/natural emissions of oceanic particulate matter. Since 2013, my research principally focuses on scientific questions derived from plastic marine pollution, such as achieving a mechanistic understanding of different sized plastic particles into the ocean's interior at a global scale and its impacts on biological processes, exploring the interactions between marine microbes and plastics/related leaching chemicals, investigating the role of estuary (i.e., estuarine fronts) and Polar Seas in the global plastics problem. In this context, I am committed to integrate my research findings into policy-making and management process by working with the regional and local networks.

EDUCATION

2013-2017 East China Normal University (ECNU), Shanghai, China [2014-2016, Woods Hole Oceanographic Institution (WHOI), Woods Hole, USA, Guest PhD student]

- Doctor of Philosophy in Estuarine and Coastal Sciences
- Dissertation: *Microplastics in the estuarine waters of the South China and Quantification of plastics in marine snow and its trophic transfer*, PhD advisors Dr. Daoji Li (ECNU) and Dr. Tracy J. Mincer (WHOI)
- Excellent Doctoral Dissertation Award in Geoscience at ECNU (2017)
- National Scholarship for Postgraduates, 2015 & 2017

2007-2010 East China Normal University, Shanghai, China

- Master of Zoology in Avian Evolution

Updated March, 2025

- Dissertation: *Comparison of home ranges in winter and spring of Lanius schach and preliminary study on their MC1R gene sequences*, advisor Prof. Sixian Tang, College of Life Science, ECNU, Shanghai
- Outstanding Graduate Student at ECNU, 2008

2003-2007 Henan Normal University, Henan, China

- Bachelor of Life Science
- Senior Thesis: *Chromosome Numbers and Karyotype Analysis of Dugesia sp. from Xinyang, China*

RESEARCH & TEACHING EXPERIENCE

2024-Present Tenured Associate Scientist, JAMSTEC

2020-2024 Tenure-track Researcher, Marine Biodiversity and Environmental Assessment

Research Centre (BioEnv), Japan Agency for Marine-Earth Science and Technology:

Profiling microplastic in the water column of the world's ocean, investigating the response of microbiome to plastic particles and related chemicals released during its life cycle and leading an international project in the quantification of the effects of estuarine fronts on microplastics.

2020- 2022 Guest Scientist, Harbor Branch Oceanographic Institute, FAU: By working with the Ocean Cleanup, quantified microplastics throughout the water column of the eastern North Pacific Subtropical Gyre (a.k.a. the Great Pacific Garbage Patch) and its impacts on the oceanic biogeochemistry.

2018- 2020 Research Associate, Harbor Branch Oceanographic Institute, FAU:

Appraised the abundance and distribution of microplastic throughout the ocean's interior using high-volume pumps in the South Atlantic Gyre; Developed an automate analysis approach for FTIR chemical imaging datasets based on Python; Aided in advising a doctoral student on a daily basis.

2017- 2018 Postdoctoral Researcher, Woods Hole Oceanographic Institute: Worked on a

NOAA Plastic Debris project to assess plastic marine debris export mechanisms and risk to sea scallop fisheries of the Mid-Atlantic Bight and Georges Bank. My job in this project has optimize the approach of microplastic extraction from scallop tissues and found a lower microplastic concentrations in scallop samples from the Mid-Atlantic Bight and Georges.

Jun.&Jul. 2018 Guest Postdoctoral Researcher, University of Connecticut:

Demonstrated the utility and implications for using bivalves as bioindicators of microplastic pollution via selective ingestion and egestion of plastic particles, and observing the particle selecting behaviors.

Jan. 2017 Visiting PhD student, Skidaway Institute of Oceanography, University of

Georgia: Collaborate with Dr. Aron Stubbins in the photodegradation of microplastics from diverse origins and quantify the missing plastics in the molecular level.

2014-2016 Guest PhD student, Woods Hole Oceanographic Institution: Performed US NSF Microbes Interacting with Plastic Debris project. Employed the confocal laser scanning microscope to quantify the dynamics of biofilms development on various plastic and glass substrates; Verified, for the first time, microplastic in the natural marine aggregates by developing a systematic methodology and documented a potential pathway for vertical transportation of microplastic in water column; Found the potential transfer of microplastic from marine aggregates to mussels by analyzing the field samples and detected significantly microplastic abundances in the biodeposits and digestive glands of mussels implying the particle selection.

2010-2013 Zoology Assistant Lecture, College of Life Science, East China Normal

University: Used premade lecture materials to lecture and assist students in zoology laboratory course. I was also responsible for creating aliquoting laboratory reagents and grading student work; maintained the algae, cyanobacteria, rotifers and daphnia in the laboratory and performed experiments to test the responses of rotifers and daphnia population to toxic and non-toxic cyanobacteria.

MEMBERSHIP

- A member of the Pool of Experts (PoE) of the **United Nations** Regular Process for Global Reporting and Assessment of the State of the Marine Environment, including Socioeconomic Aspects
- Editorial committee of APN Science Bulletin

ASSISANT MENTORING

- D. Xu, Ph.D. candidate, Ocean University of China, 2023-present
- R. P. Bos, Ph.D. candidate, FAU-Harbor Branch Oceanographic Institute, 2018-2021
- P. Lin, master student, East China Normal University, 2015-2018

- P. Xu, master student, East China Normal University, 2016-2019

RESEARCH PROJECT

- Title of Project: Impacts of stratification on microplastic dynamics
Agency: Grants-in-Aid for Scientific Research (type B), Japan Society for the Promotion of Science (JSPS)
Total Dollar Amount: Japanese Yen 13,500 K
Role: Leading PI
Period of contract: 2025-2029
- Title of Project: UV-328 in marine plastic debris in typical Southeast Asia countries
Agency: Asia Pacific Network for Global Change Research, Kobe, Japan
Total Dollar Amount: ~USD 90K,
Role: Co-PI
Period of contract: 2023-2025
- Title of Project: The 3-D distribution of microplastics in the Southern Ocean and its origin indicated by microorganisms
Agency: PONANT Science, France
- Supports: Ship time onboard *Le Commandant Charcot* and logistic costs
Role: Leading PI
Period of contract: 2023-2024
- Title of Project: Impacts of River Plume Fronts on the Distribution and the Fate of Plastic Debris based on High-Resolution Observations, and Implications for Waste Recovery
Agency: Asia Pacific Network for Global Change Research, Kobe, Japan
Total Dollar Amount: ~USD 75K,
Role: Leading PI
Period of contract: 2020-2023
Project website: <https://www.apn-gcr.org/project/impacts-of-river-plume-fronts-on-the-distribution-and-the-fate-of-plastic-debris-based-on-high-resolution-observations-and-implications-for-waste-recovery/>
- Title of Project: The Temporal-spatial Characteristics of Microplastic associated Bacterial Community and its Ecological Impacts
Agency: National Science Foundation-China,
Total Dollar Amount: ~USD 40K,
Role: PI
Period of contract: 2018-2020

COLLABORATIVE RESEARCH

- UN Ocean Decade Project: No.68.4. Global Plastic Ingestion Bioindicators
Role: assessing the potential of using Bivalves as bioindicators of microplastics

Period of contract: 2023-2026

ARTICLES UNDER REVIEW

31. **Zhao S.**, Bos R.P., et al., Microbiomes on Floating Inert Controls: Novel Insights into the Plastisphere. **In Preparation.**
30. Jong M., Tong X., Gao Y., Chen M., Sun Y. **Zhao S.** et al., Strong convergence of floating microplastics at small-scale coastal surface fronts in the East Johor Strait. **Submitted.**
29. **Zhao S.**, Amin R.M., Wang T., Paramasivan T., Xu D. et al., Fronts converging plastic waste in the Asia-Pacific river plumes. **Submitted.**

PUBLISHED ARTICLES

28. **Zhao S.** (*Corresponding author*), Kvale K.F., Zhu L., Zettler E.R., Egger M., Mincer T.J., Amaral-Zettler L.A., Lebreton L., Niemann H., Nakajima R., Thiel M., Bos R.P., Galgani L., Stubbins A., 2025. The Distribution of Subsurface Microplastics in the Ocean. *Nature* (**Accepted**).
27. **Zhao S.** (*Corresponding author*), Zhu L., 2025. Plastics carbon in the ocean. *Current Opinion in Chemical Engineering* 101101, doi.org/10.1016/j.coche.2025.101101.
26. Paramasivan T., Amin R.M., **Zhao S.**, Wang T., Roseli N., Li D., Khalil I., Mohamad Y., 2025. Microplastics abundance in the surface water of tropical estuarine fronts. *Environmental Science and Pollution Research* 32, 587–602.
25. Stubbins A., Zhu L., **Zhao S.**, Spencer R.G.M. and Podgorski D.C., 2023. Molecular signatures of dissolved organic matter generated from the photo-dissolution of microplastics in sunlit seawater. *Environmental Science & Technology* (https://pubs.acs.org/doi/10.1021/acs.est.1c03592).
24. Mincer J. T., Bos R. P., Zettler E. R., **Zhao S.**, Asbun A. A., Orsi W. D., Guzzetta V. S., Amaral-Zettler L. A., 2023. Sargasso Sea Vibrio bacteria: underexplored potential pathogens in a perturbed habitat. *Water Research*, 242, 120033.
23. Bos R., **Zhao S.**, Sutton T. and Frank T., 2023. Microplastic Ingestion by Deep-Pelagic Crustaceans and Fishes in the Gulf of Mexico. *Limnology and Oceanography*, 9999, 1-16.
22. **Zhao S.** (*Corresponding author*), Mincer J. T., Lebreton L. and Egger M., 2023. Pelagic microplastics in the North Pacific subtropical gyre: a prevalent anthropogenic component of the particulate organic carbon pool. *PNAS Nexus*, 2, 1-15. <https://doi.org/10.1093/pnasnexus/pgad070>, [**Selected by PNAS Highlights**].

21. Kappel E.S., Costello M.J., Galgani L., Gordo-Vilaseca C., Govindarajan A., Kouhi S., Lavin C., McCartin L., Muller J.D., Pirenne B., Tanhua T., Zhao Q., and **Zhao S.**, eds, 2023. Introduction to Frontiers in Ocean Observing. *Oceanography* 36 (Supplement 1), <https://doi.org/10.5670/oceanog.2023.s1>.
20. Wang T., **Zhao S.** (*Co-first author and Corresponding author*), Zhu L., McWilliams J. C., Lin P., Galgani L., Amin R. M., Nakajima R., Jiang W., Chen M., 2022. Accumulation, transformation and transport of microplastics in estuarine fronts. *Nature Reviews Earth & Environment* 3, 795-805.
19. **Zhao S.** (*Corresponding author*), Zettler E. R., Bos R., Lin P., Amaral-Zettler L. A., Mincer T. J., 2022. Large quantities of small microplastics permeate the surface ocean to abyssal depths in the South Atlantic Gyre. *Global Change Biology* 28, 2991-3006. [**Selected by the editor for commentary. Pls refer to the paper doi.org/10.1111/gcb.16129**].
18. **Zhao S.**, Zettler E. R., Amaral-Zettler L. A., Mincer T. J., 2021. Microbial carrying capacity of plastic marine debris. *The ISME Journal* 15, 67-77.
17. Zhu L., **Zhao S.** (*Co-first author*), Bittar T., Stubbins A., Li D., 2019. Photochemical dissolution of buoyant microplastics to dissolved organic carbon: rates and microbial impacts. *Journal of Hazardous Materials* 383, 121065.
16. Ward J. E., **Zhao S.**, Holohan B., Mladinich K. M., Griffin T. W., Wozniak J., Shumway S. E., 2019. Selective ingestion and egestion of plastic particles by the blue mussel (*Mytilus edulis*) and eastern oyster (*Crassostrea virginica*): implications for using bivalves as bioindicators of microplastic pollution. *Environmental Science & Technology* 53, 8776-8784.
15. **Zhao S.** (*Corresponding author*), Wang T., Zhu L., Pei X., Wang X., Gao L., Li D., 2019. Analysis of suspended microplastics in the Changjiang Estuary: implications for riverine plastic load to the ocean. *Water Research* 161, 560-569.
14. **Zhao S.**, Ward J. E., Danley M., Mincer T. J., 2018. Field-based evidence for microplastic in marine aggregates and mussels: implications for trophic transfer. *Environmental Science & Technology* 52, 11038-11048.
13. Jiang P., **Zhao S.** (*Co-first author and Corresponding author*), Zhu L., Li D., 2018. Microplastic-associated bacterial assemblages in the intertidal zone. *Science of the Total Environment* 624, 48-54.
12. **Zhao S.**, Danley M., Ward J. E., Li D., Mincer T. J., 2017. An approach for extraction, characterization and quantitation of microplastic in natural marine snow using Raman microscopy. *Analytical Method* 9, 1470-1478.

11. **Zhao S.**, Zhu L., Li D., 2016. Microscopic anthropogenic litter in terrestrial birds from Shanghai, China: not only plastics but also natural fibers. *Science of the Total Environment* 550:1110–1115.
10. **Zhao S.** (*Corresponding author*), Zhu L., Li D., 2015. Microplastic in three urban estuaries, China. *Environmental Pollution* 206: 597-604.
9. **Zhao S.**, Zhu L., Li D., 2015. Characterization of small plastic debris on tourism beaches around the South China Sea. *Regional Studies in Marine Science* 1: 55-62.
8. **Zhao S.**, Zhu L., Wang T., Li D., 2014. Suspended microplastics in the surface water of the Yangtze Estuary system, China: first observations on occurrence, distribution. *Marine Pollution Bulletin* 86: 562-568.
7. **Zhao S.**, Wang Y., Li D., 2014. Effects of known and unknown toxins produced by *Microcystis aeruginosa* on the growth of *Brachionus calyciflorus*. *Journal of Freshwater Ecology* 29: 377-386.
6. Jiang, X., Li Q., **Zhao S.**, Zhang L., Zhao Y., Chen L., Yang W., and Liang H., 2014. Temperature reaction norms of *Daphnia carinata* fitness: the effects of food concentration, population density, and photoperiod. *Journal of Freshwater Ecology* 29: 1-11.
5. Jiang, X., Yang W., **Zhao S.**, Liang H., Zhao Y., Chen L., and Li R., 2013. Maternal effects of inducible tolerance against the toxic cyanobacterium *Microcystis aeruginosa* in the grazer *Daphnia carinata*. *Environmental Pollution* 178:142-146.
4. Jiang, X., Li Q., Liang H., **Zhao S.**, Zhang L., Zhao Y., Chen L., Yang W. and Xiang X., 2013. Clonal variation in growth plasticity within a *Bosmina longirostris* population: the potential for resistance to toxic cyanobacteria. *Plos One* 9, e73540.
3. Jiang, X., Zhang L., Liang H., Li Q., Zhao Y., Chen L., Yang W. and **Zhao S.**, 2013. Resistance variation within a *Daphnia pulex* population against toxic cyanobacteria. *Journal of Plankton Research* 35, 1177-1181.
2. Jiang, X., Liang H., Yang W., Zhang J., Zhao Y., Chen L., **Zhao S.** and Jing X., 2013. Fitness benefits and costs of induced defenses in *Daphnia carinata* (Cladocera: Daphnidae) exposed to cyanobacteria. *Hydrobiologia* 702, 105-113.
1. Jiang, X., **Zhao S.**, Xu Z., Wang G., He J., and Cai M., 2012. Abundance and age of viable resting eggs of the calanoid copepod *Boeckella poppei* Mrázek in sediments: evidence of egg banks in two Antarctic maritime lakes. *Polar Biology* 35:1525-1531.

BOOK CHAPTERS

2. **Zhao S.**, Mincer T. J., Ecological Roles of the Plastisphere in Marine Environments. A chapter in the book of *Microplastics in the Sea: Occurrence and Impacts* edited by Shumway S.E. & Ward J.E. (Academic Press).

1. **Zhao S.**, Zhu L., Gao L., Li D., 2018. Limitations for microplastic quantification in the ocean and recommendations for improvement and standardization. A chapter in the book of Microplastic Contamination in Aquatic Environments edited by Zeng E., 27-49 (*Elsevier*).

TALKS AND POSTERS

- **Zhao S.** et al., (2025), Microplastics beneath the North Pacific Subtropical Gyre. **Marine Plastic Workshop at Canada Embassy to Japan, Feb. 20th, Tokyo**
- **Zhao S.**, Mincer T. J., Lebreton L. and Egger M., (2024), Microplastics in the deep ocean. Webinar | **Joint Exploration of the Twilight Zone Ocean Network**
- Toxics Webinar | Frontiers of research on Micro- and Nano-plastic pollution, **Invited panelist**, May 20th, 2023 [<https://mdpi.cn/announcements/899>].
- **Zhao S.**, Ward J. E., Mincer T. J. (2022), The role of bivalves in monitoring the marine Microplastics. **Invited speaker**, 2022 International Conference on international Cooperation and Integration of Industry, Education, Research and Application for Future Ocean (Online conference, Ocean University of China)
- **Zhao S.**, (2022) Plastic marine debris interaction with natural progress. **Oral presentation**, The event of Barbados young leaders' visit at JAMSTEC.
- **Zhao S.**, (2022) Microplastics in the blue water. **Invited speaker**, on-board *Statsraad Lehmkuhl* on *The One Ocean Expedition* from Yokohama to Naha.
- **Zhao S.**, Zettler E. R., Bos R., Lin P., Amaral-Zettler L. A., Mincer T. J. (2022) Microplastic in the Ocean's Interior. **Invited speaker**, 1st Ocean Pollution and Ecotoxicology Symposium (OPECS 2022), Universiti Malaysia Terengganu, Malaysia.
- **Zhao S.**, Zhu L., Stubbins A., Mincer T. J. (2021) Microplastic at Sea – A Carbon Perspective. **Oral**, Ocean Plastic Webinar (<https://www.youtube.com/watch?v=zMOIw4sEpp0&t=17>).
- **Zhao S.**, Ward J. E., Mincer T. J. (2020), The Fate of Microplastic in the Ocean: The Role of Biological Interactions. **Oral**, Nanqiang forum, Xiamen University (Online conference)
- **Zhao S.**, Ward J. E., Mincer T. J. (2019), Can marine bivalves be the robust bioindicators of microplastic pollution? **Oral**, Sun Yat-sen University, China.
- **Zhao S.**, Zhu L., Gao L. (2019), Methodological limitations for microplastic quantification in the ocean. **Poster**, ALSO-Aquatic Science Meeting, San Juan, Puerto Rico.
- **Zhao S.**, Mincer T. J. (2018), The Potential Interactions of Natural Processes in the Fate of Plastic Marine Debris. **Oral**, HBOI Science Seminar, Fort Pierce, USA

- **Zhao S.**, Mincer T. J., Li D. (2017), The role of marine aggregates in transferring microplastic out of the surface layer. **Oral**, International Forum for Young Scholars in Marine Science, Shanghai, China.
- **Zhao S.**, Zhu L., Li D. (2016). Microscopic anthropogenic litter in terrestrial birds. **Poster**, 7th SETAC World Congress, Orlando, USA

SCIENTIFIC SERVICES

- **Guest Editor of *Frontiers in Marine Science***, 2023. “Physical Processes in the Arctic Ocean and their Effects on Climate and Marine Ecosystem” (<https://www.frontiersin.org/research-topics/55182/physical-processes-in-the-arctic-ocean-and-their-effects-on-climate-and-marine-ecosystem>)
- **Guest Editor of *Oceanography* Supplement 2022** • *Frontiers in Ocean Observing: Emerging Technologies for Understanding and Managing a Changing Ocean; Ocean Pollutants. Theme: Assessing the Damage Caused by Marine Plastic Pollution.* (<https://tos.org/oceanography/issue/volume-36-supplement-1>)
- **A Member of Editorial Advisory Committee of APN Science Bulletin** (<https://www.apn-gcr.org/bulletin/wp-content/uploads/2023/01/APN-Science-Bulletin-2022-compressed.pdf>)
- **Peer reviewers for grants:** MIT Sea Grant, Maryland Sea Grant, Fondecyt National Projects Competition 2021-Chile, National Science Foundation-China, Asia-Pacific Network of Global Change Research program
- **Peer reviewers for Journals:** *Nature*, *Nature Communications*, *Communications Earth and Environment*, *Environmental Science: Nano*, *Environmental Science & Technology*, *Environmental Science & Technology Letter*, *Environmental Microbiology*, *Environmental Pollution*, *Science of the Total Environment*, *Marine Pollution Bulletin*, *Journal of Phycology*, *Journal of Freshwater Ecology*, *Anthropocene Coasts*
- Consultant (one time) for National Geographic

RESEARCH CRUISES

September /2024, 20 days duration

- Scientist on *M/V Le Commandant Charcot* in the TranArctic Ocean cruise (CC060924): Study how microbial communities responding to plastic pollution along a Trans-Arctic transect passing through the North Pole Ocean in the views of both Molecular Ecology and Marine Chemistry.

June/2024—July/2024, 2 weeks duration

Updated March, 2025

- Scientist on *R/V Yokosuka* in the North Atlantic Ocean (YK24-11): Dive in the submersible *Shinkai6500* (Japan Trench, a Depth of 6426 m) to study how plastic debris at the seafloor to select microorganisms from surroundings by collecting eDNA from water, sediment, plastic and other debris samples.

November/2023—December/2023, 5 weeks duration

- Scientist on *R/V Pelagia* in the North Atlantic Ocean (PE527): Collect water-column particles with *in-situ* pumps from the surface to deep waters during a Trans-Atlantic cruise.

August/2023—October/2023, 6 weeks duration

- Scientist on *R/V Mirai* in the Arctic Ocean (MR23-06C): Collect water-column particles with *in-situ* pumps from the surface to deep waters, and conduct incubation experiments of microbes colonizing particles.

December/2022—January/2023, 2 weeks duration

- Scientist on *R/V Kaimei* off Shikoku area in the North Pacific Ocean (KM22-15, Leg.2): Collect water-column particles with *in-situ* pumps and samples of microbes attached to plastic particles with the Neuston Net.

September 2022, 2 weeks duration

- Local Scientist on *The One Ocean Expedition* in Japan waters (Yokohama→Naha→Ishigaki): Collect sea-surface particles with the Neuston Net for microbiome research and quantifying the Microplastics pollution level. [Media: <https://oneoceanexpedition.com/life-on-board/a-poisonous-delicacy>].

January 2018, 4 weeks duration

- Assistant Scientist on *R/V Pelagia* (PE448) during the South Atlantic cruise: Be responsible for collecting large-volume water samples with *in-situ* pumps and sample process; Assisted in deploying *in* Manta Trawl net and *in situ* quantifications of microplastics collected.

August 2017, 10 days duration

- Investigating floating microplastics dynamics with tidal cycles within the inner Yangtze Estuary and testing the Laser Optical Plankton Counter on the Fishing boat.

July 2013, 16 days duration

- Collecting microplastic samples from the Yangtze Estuary to the East China with the Manta Trawl net on the Fishing boat.

REFERENCES

- Dr. Tracy J. Mincer (PhD advisor), Associate Professor, Florida Atlantic University, tmincer@fau.edu
- Dr. J. Evan Ward, Professor, University of Connecticut, evan.ward@uconn.edu
- Dr. Linda A. Amaral-Zettler, Professor, Royal Netherlands Institute for Sea Research, linda.amaral-zettler@nioz.nl
- Dr. Aron Stubbins, Professor, Northeastern University, a.stubbins@northeastern.edu