PICES-2026 Annual Meeting

OCCURRENCE AND CHARACTERISTICS OF MICROPLASTICS IN JELLYFISH ACROSS CHINA SEAS

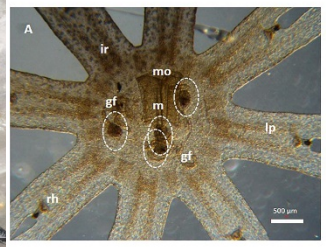
Shan Zheng, Xiaoxia Sun, Yaqi Wang

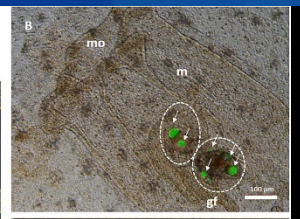
Institute of Oceanology，Chinese Academy of Sciences

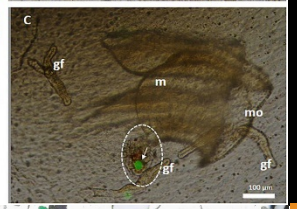
2026.10.25 Nanaimo, Canada

Microplastics Pollution: A Pervasive global ecological issue



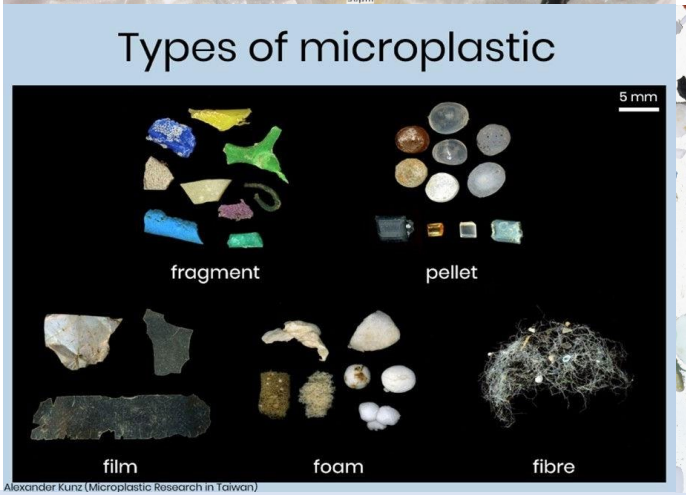




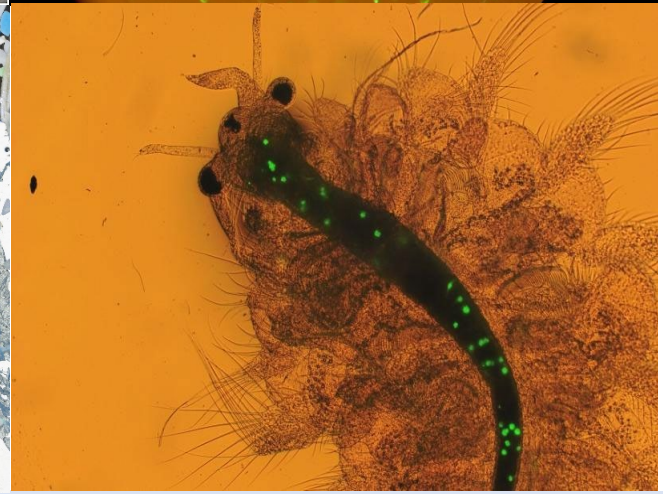


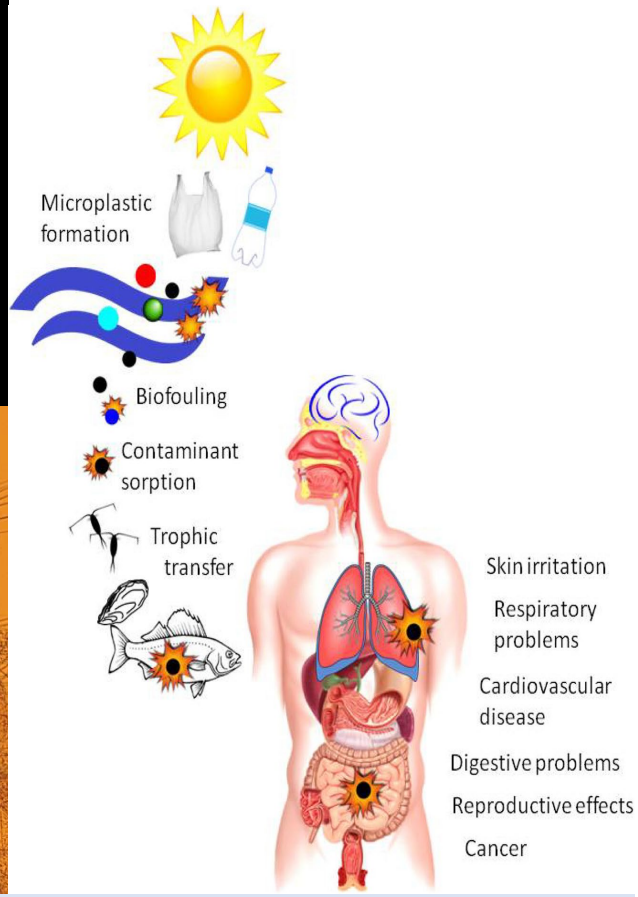
Costa et al., 2020











- **Microplastics are widely present in the marine environment and have been detected in various marine organisms.**
- **Microplastics can enter the human body directly or through the food chain, posing health threats such as toxic effects, inflammation, and physiological damage.**
- **Microplastic pollution is not an isolated environmental issue, but an ecological issue that spans seawater, biological ingestion, and the marine food web.**

Driven by Global Change: Gelatinization with Jellyfish Bloom







- **Jellyfish blooms** and shifts in gelatinous zooplankton communities have been reported in various marine regions
- Changes in gelatinous zooplankton may alter predator–prey relationships, energy transfer, and the fate of organic matter.
- **Jellyfish profoundly influence energy flow within marine food webs.**

What Happens When Microplastics Meet Jellyfish?

Environmental microplastics

↓

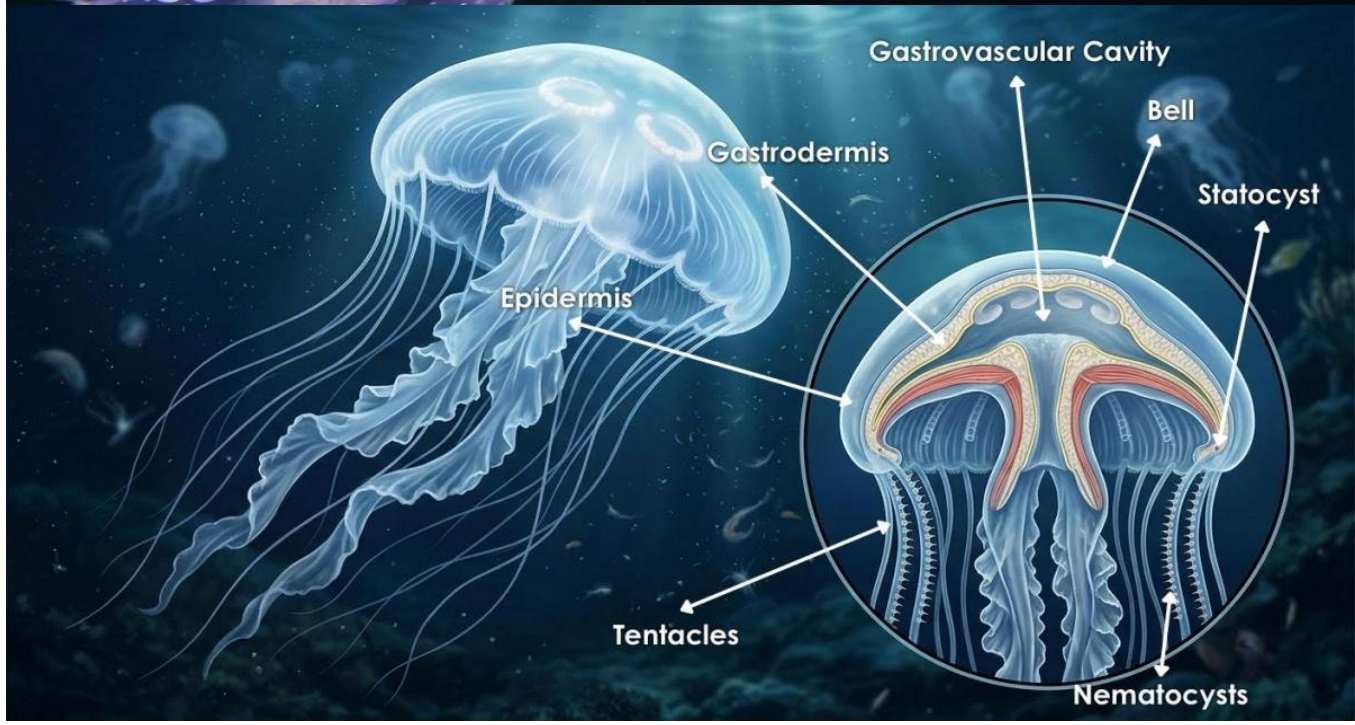
Direct ingestion and Prey-mediated ingestion

↓

Temporary retention/ Egestion

- Tentaclular prey capture
- Oral-arm-mediated feeding
- Gastrovascular processing



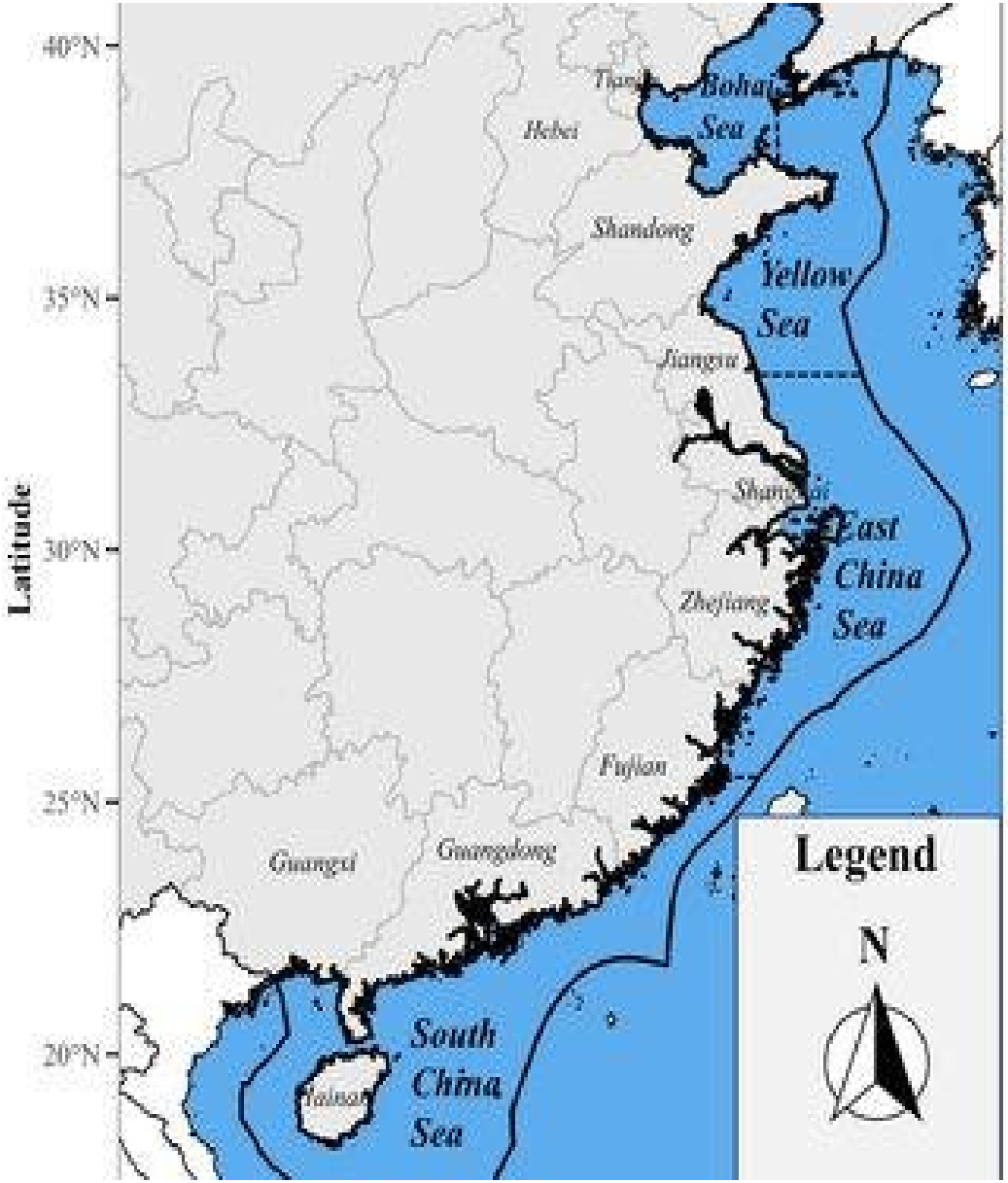


An important Component of Marine Microplastic Research

- Compared with fish and shellfish, research on microplastics in jellyfish remains relatively **limited.**
- Jellyfish possess **unique feeding mechanisms** and **body structures** and may exhibit microplastic **ingestion and retention characteristics** distinct from other zooplankton.

We still lack a systematic understanding of the occurrence, spatial distribution, and driving factors of microplastics in jellyfish under a unified framework

Surveys of Microplastics in Jellyfish across China Seas

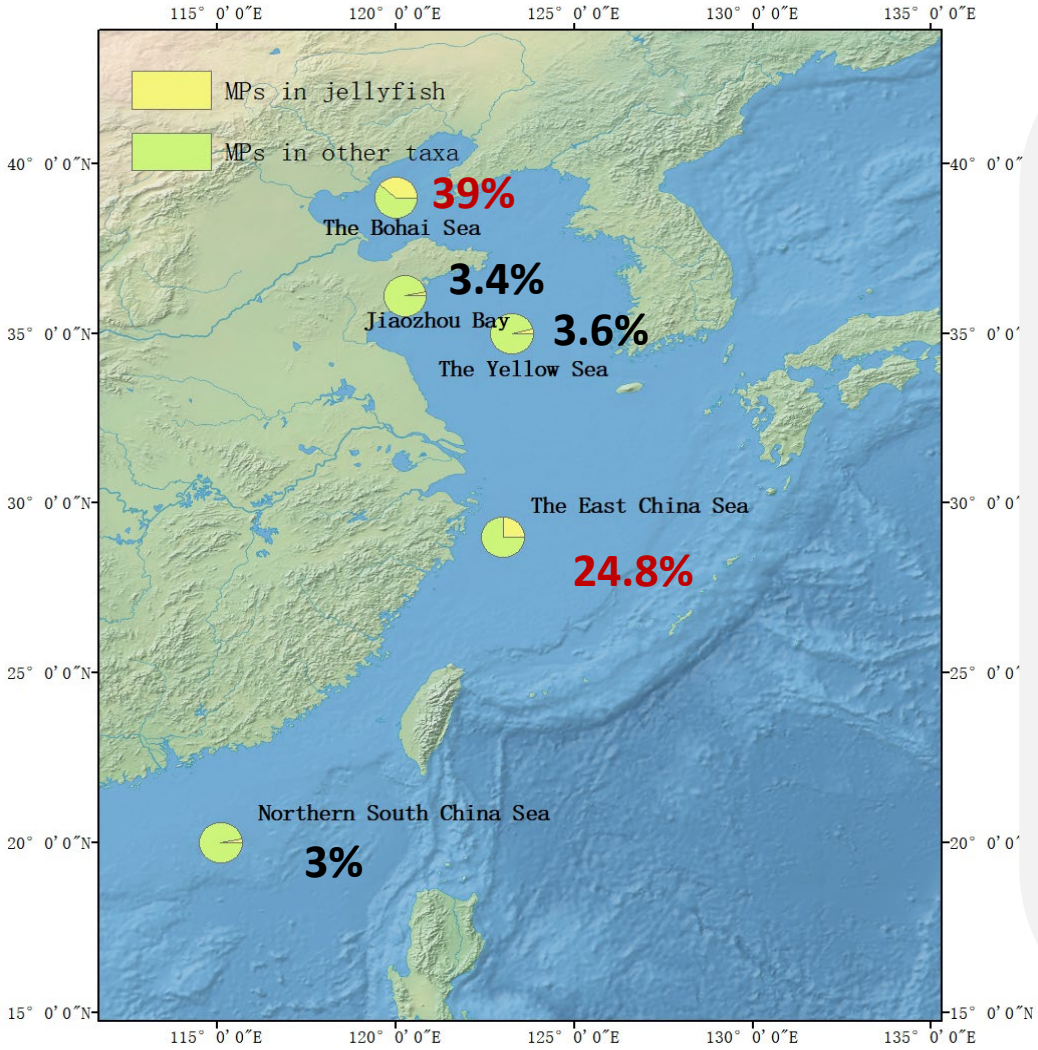


- The Bohai Sea
- The Yellow Sea
- The East China Sea
- Northern South China Sea
- Representative bay in the Yellow Sea (Jiaozhou Bay)

➢ **Widespread occurrence of microplastics in jellyfish across the investigated regions of China's coastal seas**

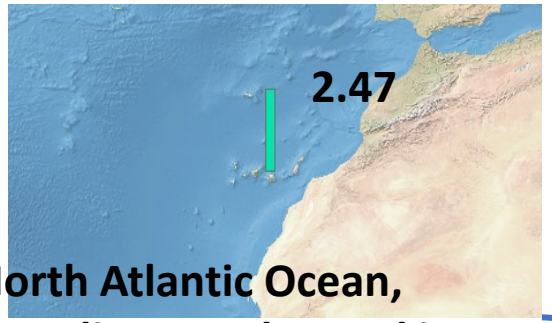
Significant Spatial Heterogeneity ,“Individual” to “Community”

The contribution of jellyfish to the zooplankton microplastic pool shows regional differences

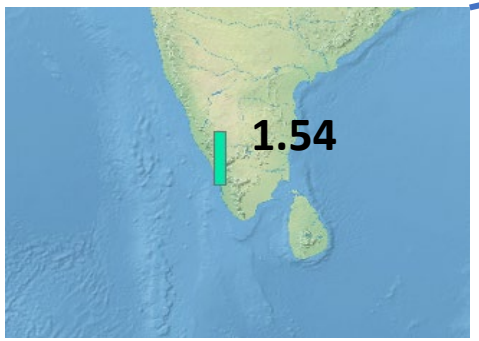


- 0.056-0.117 **items/individual,** 0.12-0.97 **items/m³**
- A single jellyfish does not carry many microplastics, so are jellyfish important in the overall zooplankton microplastic pool? This leads to **community-scale analysis**.
- Individual burden≠Community level contribution
- Due to their extremely high population abundance in specific seasons, they become an important "reservoir" at the community level.

A Global Perspective on Microplastics in Jellyfish



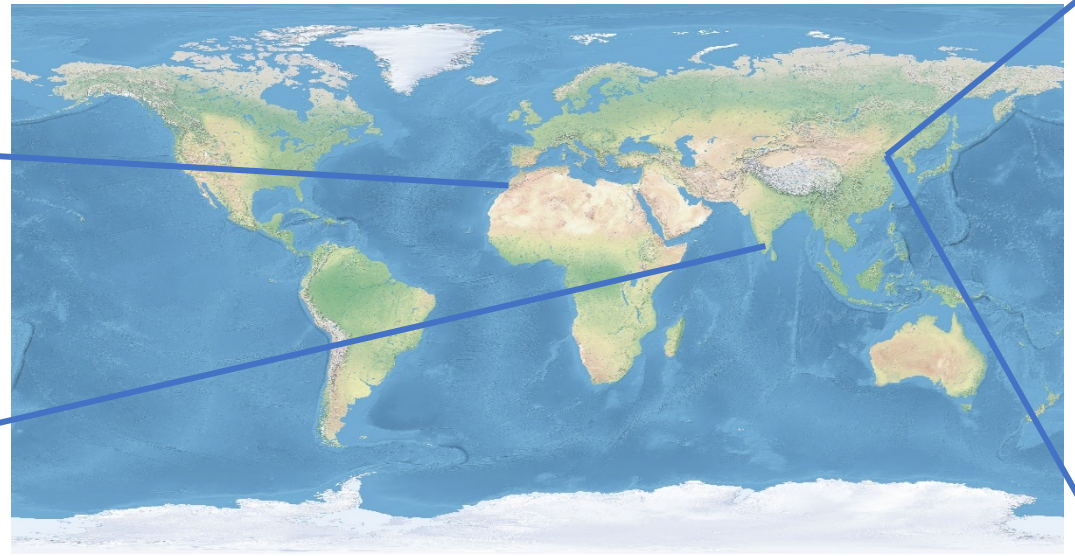
North Atlantic Ocean, sampling area located in the northeast of Gran Canaria Island, in Canary Islands



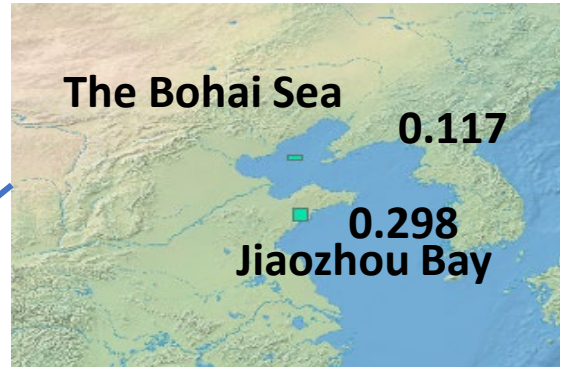
The southwestern coast of India

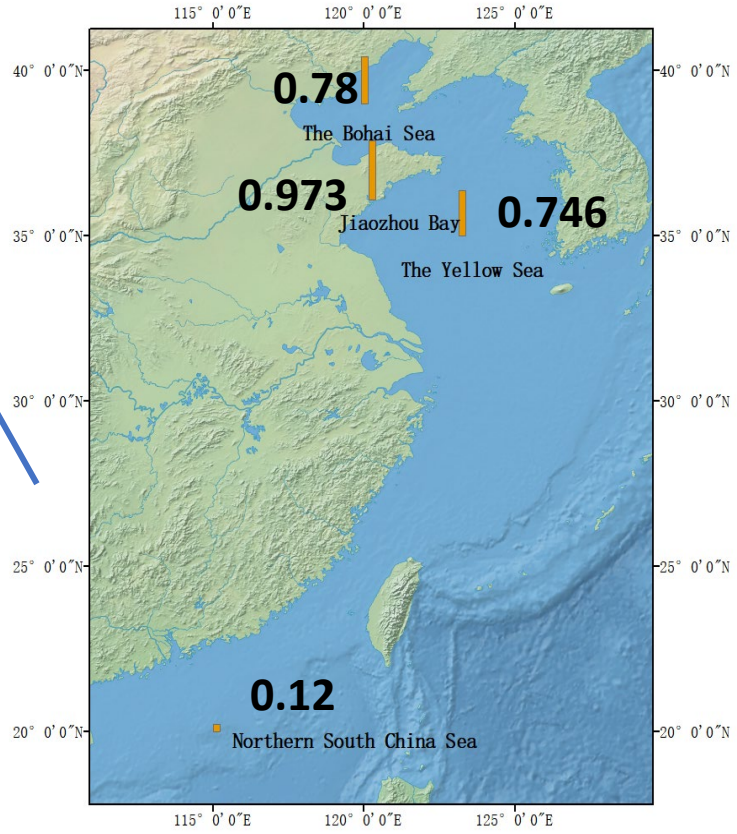
MP/individual

MPs/m^3



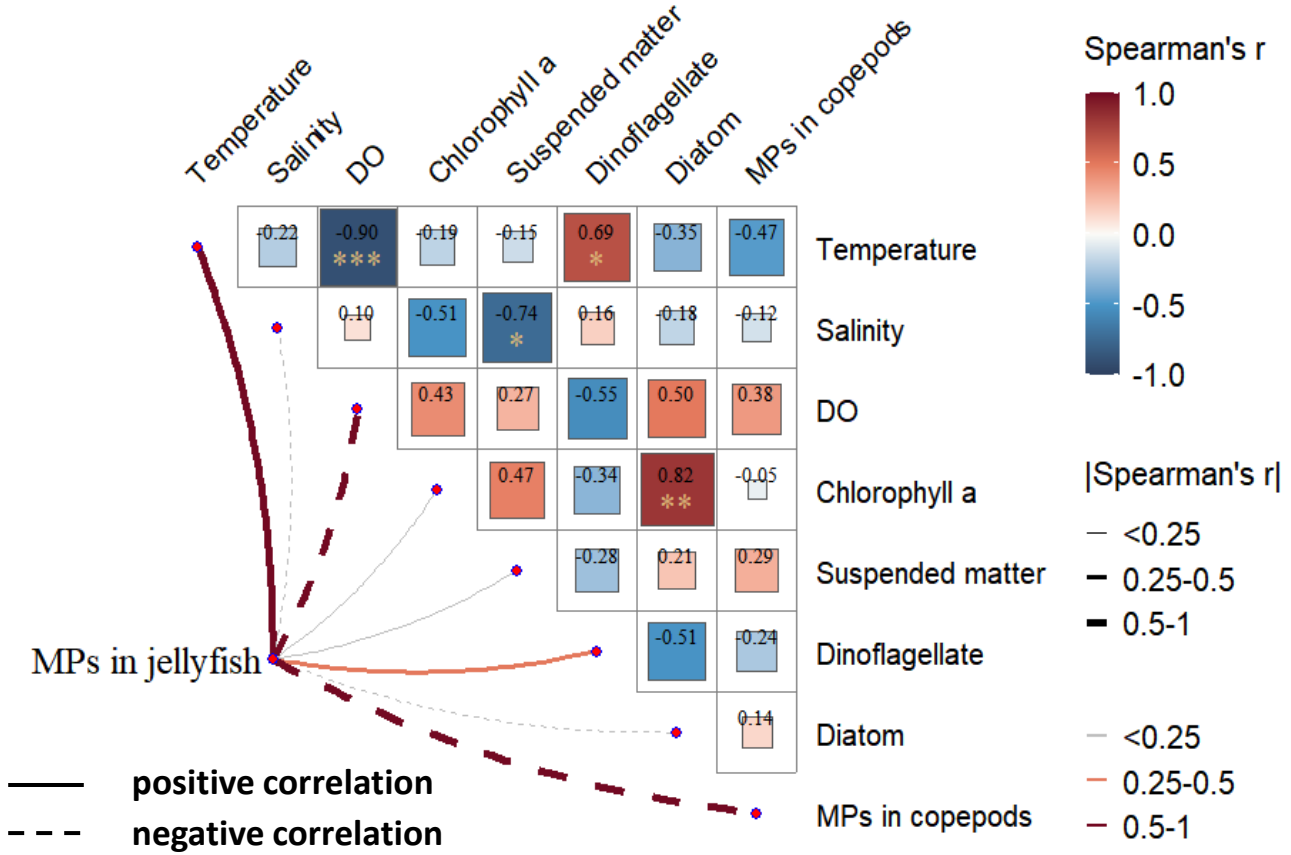
China's coastal jellyfish have a relatively low individual burden (0.1–0.2 items/ind., ~1/10 of the Mediterranean or coast of India.





Key Driving Factors of Microplastics Burden in Jellyfish

Environmental and biological factors



Microplastic loads in jellyfish are jointly driven by interactions between environmental and biological factors

Temperature +

warming accelerates metabolic and feeding rates, increasing the chance of encountering and ingestion of microplastics.

O_2 Dissolved oxygen -

- Hypoxia suppresses feeding and survival in copepods, fish, and other taxa, whereas jellyfish have low metabolic rates and far greater hypoxia tolerance.
- Eutrophication → hypoxia → gelatinization is a typical pathway of jellyfish blooms in coastal seas.

Copepod abundance -

- Community restructuring shifts the microplastic carrier
- Once jellyfish dominate, they suppress copepods through predation and competition, altering the microplastic carrier in the food web.

Take-Home Summaries

- **The "Paradox" of Individual vs. Community Scale**
- A single jellyfish may not carry many microplastics, but because of their massive population blooms, they act as a crucial "reservoir" for microplastics at the community level (e.g., up to 39% in the Bohai Sea). We must look beyond the individual to understand ecological impacts.
- **Extreme Regional Heterogeneity**
- Jellyfish microplastic pollution is not uniform. The high contribution in the Bohai and East China Seas vs. the low contribution in the Yellow and South China Seas proves that it is a complex result of local jellyfish abundance, background pollution levels, and community structure.
- **The "Gelatinization" Coupling Effect**
- Microplastic loads in jellyfish are driven by the synergy of Temperature (accelerating metabolism), Dissolved Oxygen (hypoxia tolerance giving them a competitive advantage), and Copepods (predation altering the food web carrier). Climate change will likely amplify this effect.
- **A "Low-Exposure Baseline" with High Predictive Value**
- China's coastal jellyfish have a relatively low individual burden (0.1–0.2 items/ind., ~1/10 of the Mediterranean). This provides an ideal baseline to track the non-linear acceleration of microplastic accumulation in jellyfish as ocean warming and gelatinization continue.

Thanks !



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