

# NOAA NCEI Global Marine Microplastics Database Initiative

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## Abstract

Marine microplastics (< 5 mm) pollution is a growing problem affecting coastal communities, marine ecosystems, marine life and human health. Microplastics have been detected throughout the entire global ocean, and it is hard to escape news of microplastics debris in our oceans. Despite the growing awareness, the management of marine microplastics data, from large-scale surveys along the coast and open ocean, to effects of microplastics on planktonic communities, lags far behind the needs of the scientific, education, and decision maker communities. The lack of large-scale, long-term comprehensive data on microplastics makes it difficult to completely understand the sources, distribution and impacts of microplastics, as well as forecasting their trajectory and aggregation under current and future climates. The National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information (NCEI), which is regarded as the nation's environmental data steward, is spearheading efforts to create a global database on microplastics. As a first step, we are currently collating microplastics data from across the world into a primary marine debris data warehouse. The ultimate goal is to develop a one-stop repository where data on all types of microplastics are aggregated, archived, and served to the community in a consistent and reliable manner. Together with other NCEI databases, such as the Global Ocean Current Database, World Ocean Database, and the Surface Underway Marine Database, stakeholders will be able to access and assess data for their needs, thereby enhancing our capacity to understand and manage the problem of microplastics pollution. The microplastics database will be freely accessible and maintained with newly received data from global stakeholders.

# NOAA - NCEI Global Marine Microplastics Database Initiative

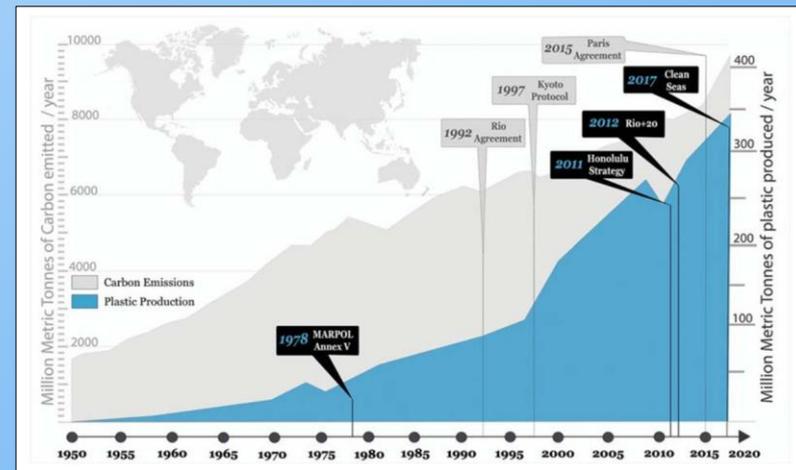
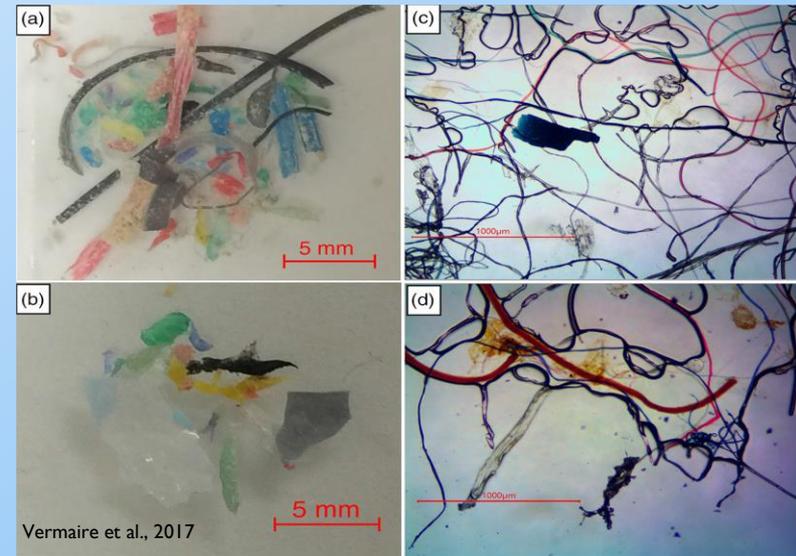
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# Microplastics

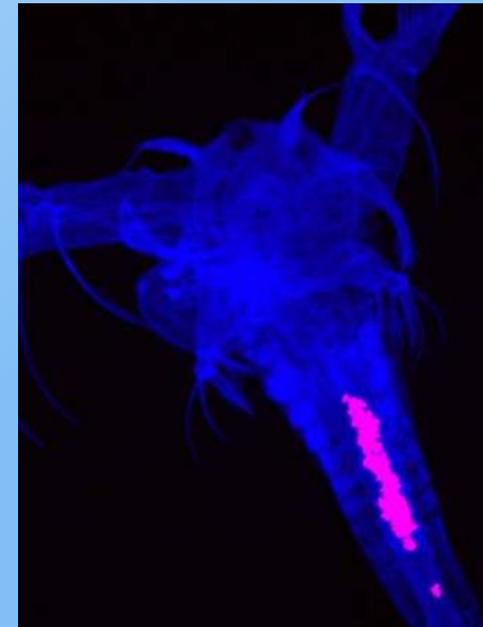
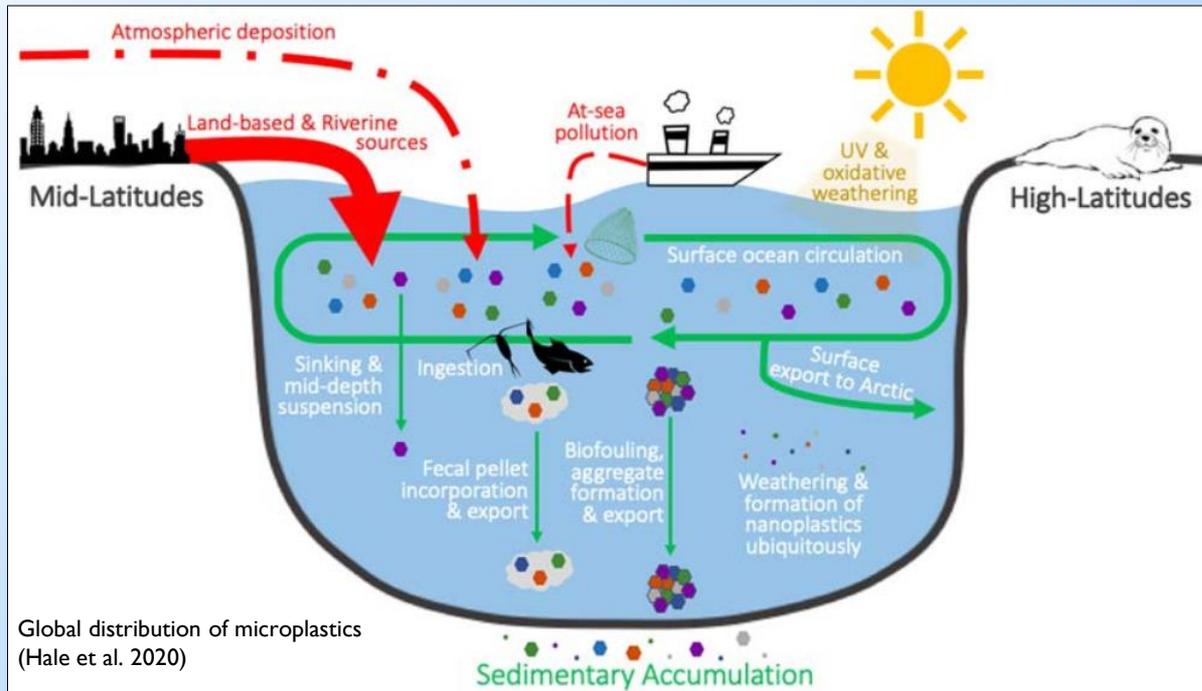
- plastics less than 5 mm
- microplastic pollution is ubiquitous, irreversible & disrupts the ecological system
- come from macroplastics and break down into nanoplastics ( $< 1 \mu\text{m}$ )
- most plastic fragmentation occurs on land: ambient temperatures, frictional forces & UV exposure
- about 4.8 to 12.7 million tons of plastic debris per year enter the ocean (Jambeck et al., 2015)



Rate of plastic production recently exceeded that of carbon emission (Borrelle et al. 20



# Microplastics – sources, sinks & fate



Microplastic ingestion by brine shrimp nauplii

- **ingestion:** by marine organisms; bioaccumulate to humans
- **interaction:** biofouling: pH, invasive species, chemical pollution, vessel navigation hazard
- **entanglement:** encircling, entrapment, constricting

# Microplastics – The Challenges

- understand global microplastic occurrence, distribution, transports & fate
- numerical modelling & predictions
- lack of extensive database on microplastic
- lack of one stop repository of microplastic & allied data



# NOAA - NCEI

- **Mission statement**

- responsible for preserving, monitoring, assessing, and providing public access to the Nation's treasure of geophysical data and information

- NCEI is the Nation's leading authority for environmental info
- NCEI has experience in providing quality environmental data
- Over 25 petabytes of comprehensive atmospheric, coastal, oceanic, and geophysical data



# Resources/Expertise available at NOAA - NCEI

- Resources:
  - database tools
  - geo- database (ArcGIS)
  - IT Infrastructure: large servers and storage
- Expertise
  - environmental data collection
  - database development
  - archiving
  - transformative technologies (e.g. cloud computing, AI)

# NCEI Archive Services

- supports different data types
- data discovery and access – advanced search and visualization tools to optimize data query
- data identification and attribution – e.g. Digital Object Identifiers (DOIs)
- data preservation

# NCEI Innovate - microplastics database initiative

- Marine Debris Program and NCEI: Marine Debris Clearing house
- collate, archive and provide a **one-stop repository** for info needed for marine debris study
- concentrate on one specific type of marine debris - microplastics in order to establish NCEI as the primary location for data management
- complimentary data: Global Ocean Current Database, World Ocean Database, and Surface Underway Marine Database
- holistic environmental information leadership



# NCEI Innovate – Database development

- do literature search; contact research groups, PIs & authors
- acquire, process, QA & QC
- collate, submit, & archive (metadata, standardized data, & GIS)
- Geo- database - provide ArcGIS visualization to facilitate data retrieval of underway microplastics sensor data
- develop user engagement and information services



# NCEI Innovate – Database development

- Work done so far – **website demonstration**
  - Volvo around the world race data collection
  - Adventure Scientists
  - SEA data





# Marine Microplastic Database



**Marine Microplastic Database**

This Marine Microplastic Database is a publicly available collection of microplastic data around the world. Microplastics have been found throughout the entire global ocean. Despite the growing awareness, there is a lack of large-scale, long-term, comprehensive data to enable the complete understanding of the sources, distribution and impacts of microplastics. This database is creating a one stop repository where data on all types of marine microplastics are aggregated, archived, and served in a consistent and reliable manner. These data have been provided by contributors from various research cruises and field work. This is a growing database and data collectors are strongly encouraged to send us their data. Please see [contact](#) section for contact information.





### Introduction

Microplastics, plastics smaller than 5 mm, are found extensively in the world ocean. Marine microplastics pollution is a growing problem affecting coastal communities, marine ecosystems, marine life, and human health. Microplastics are small fragments that come from plastic materials such as bottles, and bags. They mostly occur on land and are carried by rivers and wind to the ocean, from where they get caught in the global ocean circulation system. Once in the ocean, fishes and other marine organisms ingest microplastics which kills them or get accumulated along the feeding chain.

One of the key challenges to effectively understanding the microplastic menace is access to extensive data. This database is currently lacking, making it difficult to effectively study, understand and monitor marine microplastics. The National Oceanic and Atmospheric Administration (NOAA) National Centers for Environmental Information (NCEI), the nation's environmental data steward, is spearheading efforts to make available global data on microplastics. This database is collating microplastic data from across the world and inputting this into a database.





**Dataset Archive**

- [Adventure Scientists](#)

These data are provided by the kind courtesy of Adventure Scientists, a 501(c)3 nonprofit organization that equips partners with data collected from the outdoors that are crucial to addressing environmental and human health challenges. The Microplastics Initiatives of Adventure Scientists conducted surveys of microplastics pollution in aquatic ecosystems from 2013-2017.

- [GEOMAR](#)

This is data from the Volvo Ocean Race 2017/2018 Turn the Tide on Plastic and AkzoNobel by GEOMAR Kiel microplastics project.

- [Sea Education Association \(SEA\)](#)

These data are provided by the kind courtesy of Dr. Kara Lavender Law, Sea Education Association, Woods Hole, MA. The data are derived from hand specimens gathered as part of the 1986 NorthAtlantic\_Law data compilation (Chief Scientist: Dr. Kara Lavender Law; Investigator(s): Dr. Kara Lavender Law and Dr. Giora Proskurowski). Data were acquired as part of the SEA Plastics Project 2010 Expedition, and SEA Plastics Project.

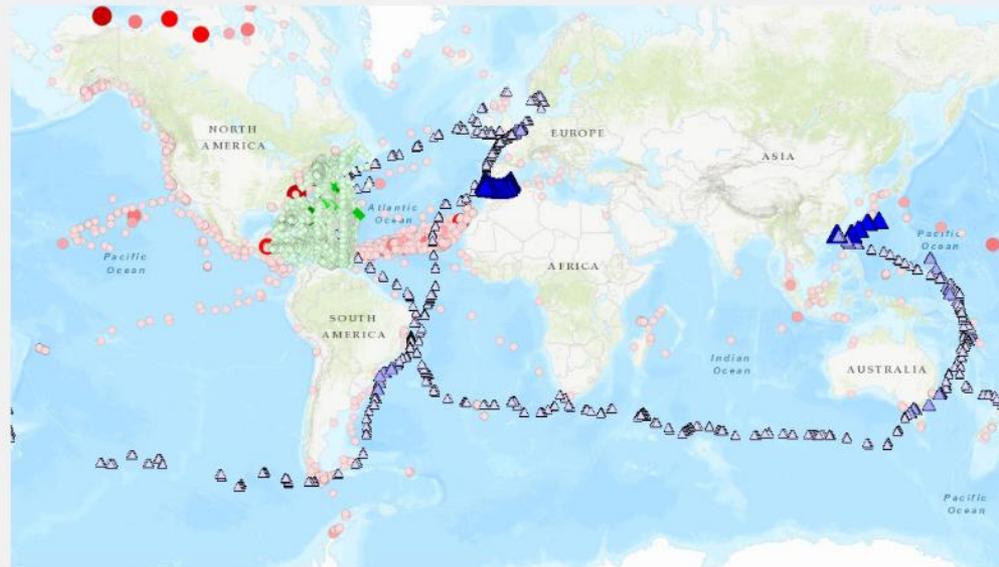




### Subset Data Categories

Geographic Coordinates	+
Observation Dates	+
Data Types	+

Draw Data Clear Data



- SEA
- GEOMAR
- AdventureScientists

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### Subset Data Categories

- Geographic Coordinates +
- Observation Dates +
- Data Types +

Draw Data Clear Data



SEA

GEOMAR

AdventureScientists

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# Moving forward

- obtain **additional funding**
- obtain additional data
- NOAA Office of Exploration & Research (OER) proposal to collect microplastic data
- standardize protocols, standardize units; develop products
- transformative technologies (e.g. cloud computing, AI)
- research papers, collaborate with technology developers (e.g. remote sensing)



**Thank You**

