

# Towards a holistic understanding of the microplastic menace - the NOAA NCEI Global Marine Microplastic Database Initiative

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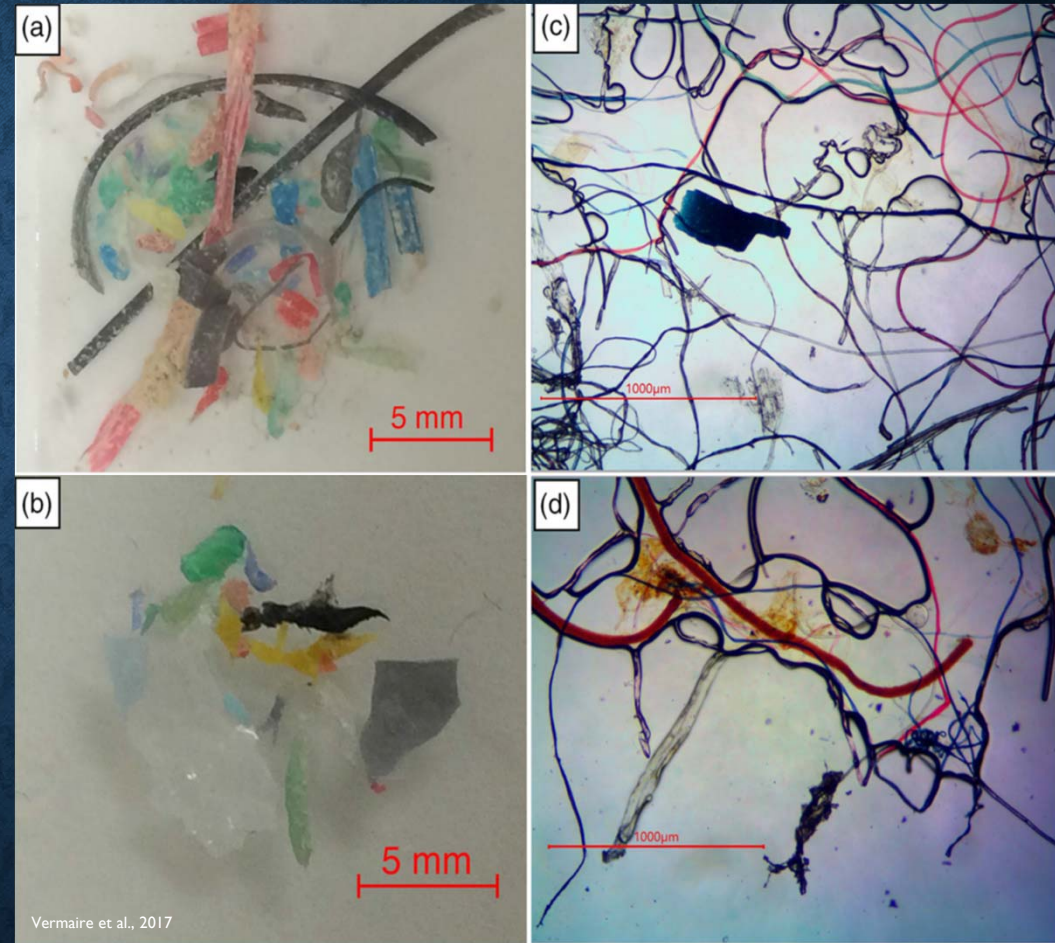
1. Northern Gulf Institute, Mississippi State University, Stennis Space Center, MS
2. NOAA/ National Centers for Environmental Information, Stennis Space Center, MS
3. NOAA/ National Centers for Environmental Information, Silver Spring, NC
4. NOAA/ National Centers for Environmental Information, Charleston, SC

National Environmental Monitoring Conference 2021,  
2-5 August 2021  
Bellevue, Washington, USA



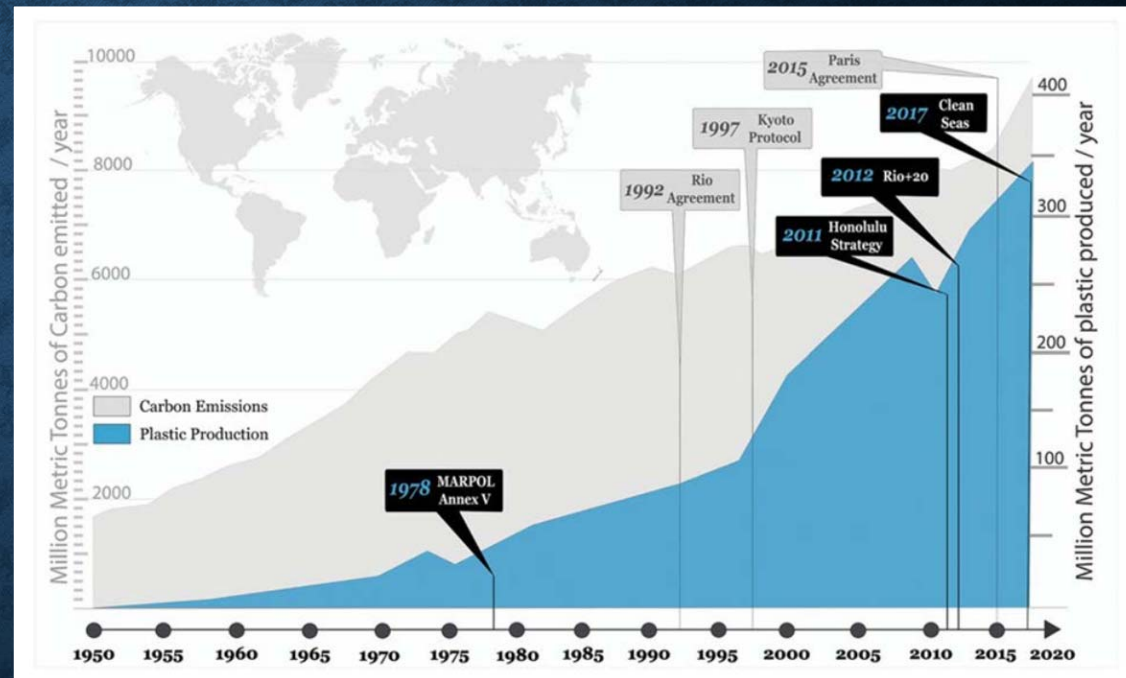
# Microplastics

- 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



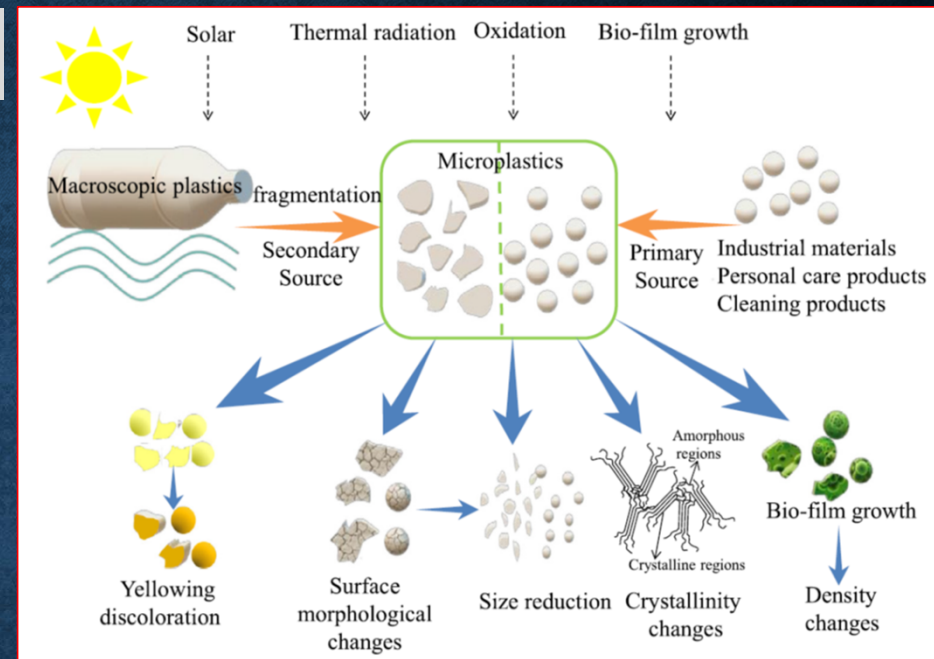
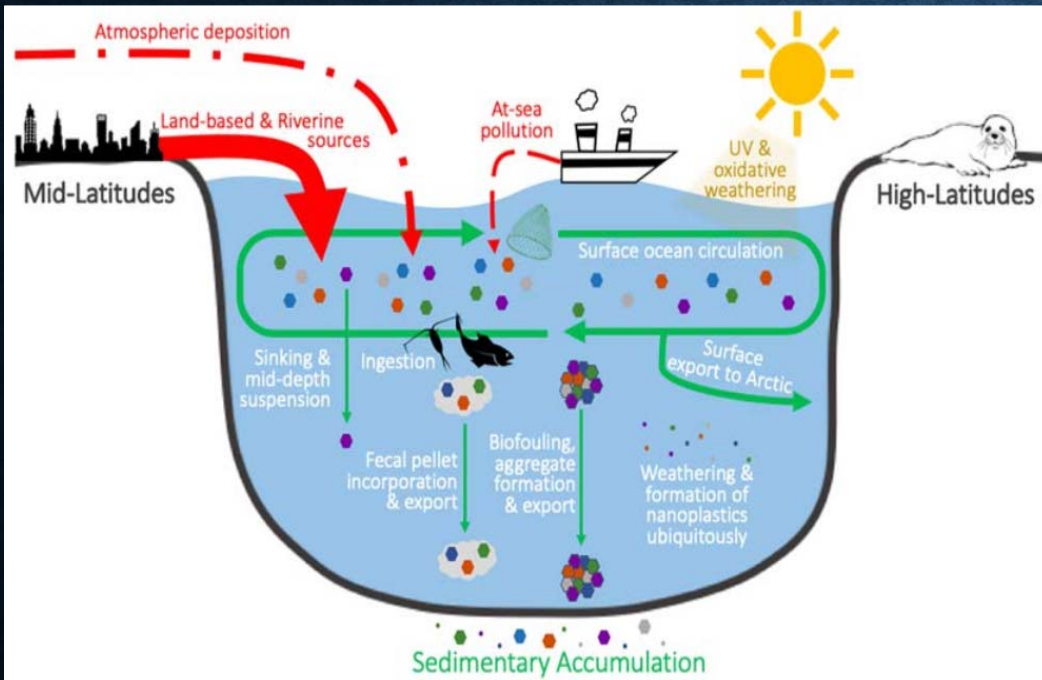
# Microplastics

- 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. 2017)

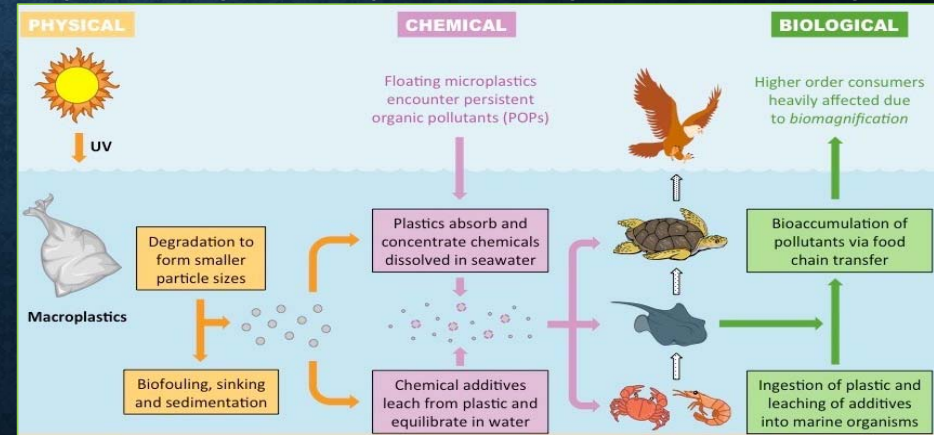




# Microplastics – sources, sinks & fate

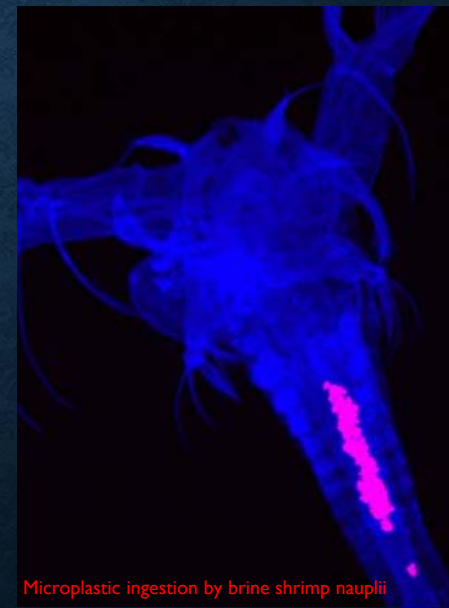


Properties changes of microplastics after degradation- Guo & Wang, 2019



## Microplastics – sources, sinks & fate

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

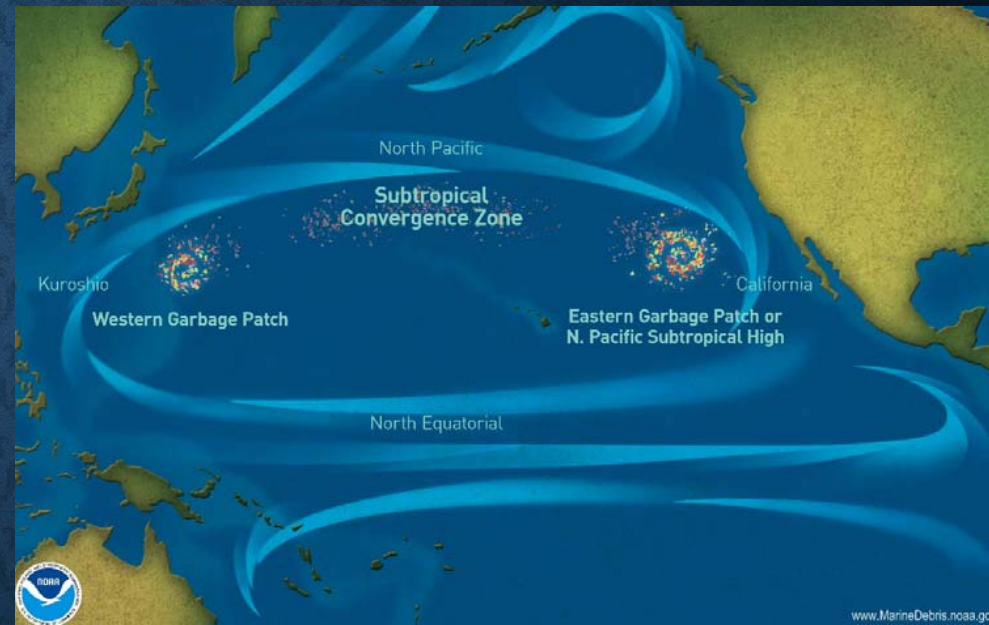


Microplastic ingestion by brine shrimp nauplii



## Microplastics studies – The Challenges

- understand global microplastic occurrence, distribution, transports & fate
- numerical modelling & predictions
- lack of large-scale, long-term, comprehensive data on microplastic
- lack of one stop repository of microplastic & allied data



## Target Audience & Need for product

- Scientists, environmentalists, policy makers, students, fisheries, tourism, media, general public
- assess and quantify the impact on the blue economy
  - marine ecosystem loss (in relation to marine natural capital) between \$3,300-\$33,000 per annum for each ton of plastic into the ocean (Beaumont et al. 2019)
- collate, archive and provide a **one stop repository** of microplastic & allied data



## Target Audience & Need for product

- establish NCEI as the primary location for holistic microplastic data management
- complimentary data: Global Ocean Current Database, World Ocean Database, and Surface Underway Marine Database
- standardization of units, quality of measurements, applications of data



# NOAA - NCEI

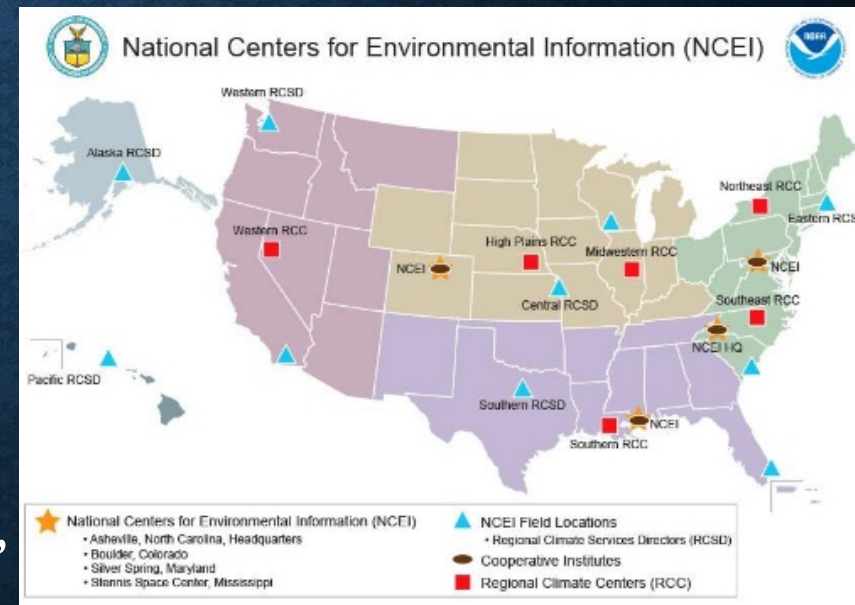
- **Mission statement**

- 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
  - data discovery and access – advanced search and visualization tools to optimize data query
- Expertise
  - environmental data collection
  - database development
  - archiving
  - transformative technologies (e.g. cloud computing, AI)



## 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

## Tour of Database:

<https://www.ncei.noaa.gov/products/microplastics>

The screenshot shows a web browser displaying the NOAA National Centers for Environmental Information website. The URL in the address bar is <https://www.ncei.noaa.gov/products/microplastics>. The NOAA logo is visible in the top left corner, and the text "National Centers for Environmental Information" and "NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION" is displayed below it. A green banner with red text reads "launched July 2021". A search bar with the placeholder text "Search NCEI" is located in the top right. The main navigation menu includes "Home", "Products", "Services", "Resources", "News", "About", and "Contact". The breadcrumb trail shows "Home / Products / Marine Microplastics". The main heading is "Marine Microplastics". The introductory text states: "The NCEI Marine Microplastics product provides access to aggregated global data on microplastics in marine settings. Additionally, the product gives researchers and others access to information on ocean currents to enable a unified understanding of the global microplastic problem. The information is used to improve water quality and protect the ecosystem, especially coastal ecological habitats such as salt marshes and mangrove forests that help recycle nutrients, serve as breeding grounds for fingerlings, and permanent homes for oysters and other coastal marine wildlife. This product can also be used to validate remote sensing technologies that identify and characterize microplastics from space." The footer contains three links: "Data Access", "About", and "Submit Data".

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 National Centers for Environmental Information  
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# Marine Microplastics

The NCEI Marine Microplastics product provides access to aggregated global data on microplastics in marine settings. Additionally, the product gives researchers and others access to information on ocean currents to enable a unified understanding of the global microplastic problem. The information is used to improve water quality and protect the ecosystem, especially coastal ecological habitats such as salt marshes and mangrove forests that help recycle nutrients, serve as breeding grounds for fingerlings, and permanent homes for oysters and other coastal marine wildlife. This product can also be used to validate remote sensing technologies that identify and characterize microplastics from space.

[Data Access](#) [About](#) [Submit Data](#)



# Tour of Database:

## <https://www.ncei.noaa.gov/products/microplastics>

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### Datasets

This product is a publicly available collection of marine microplastics data from around the world. The database is a repository for multiple datasets of marine microplastics. The data are aggregated, archived, and accessible to users in a consistent and reliable manner. Contributors from various research cruises and field work provide the data. This is a growing database and data collectors are encouraged to [submit findings to NCEI](#) for inclusion in the Marine Microplastics application.

#### Adventure Scientists

Data collected from Adventure Scientists Microplastics initiative surveys of microplastics pollution in aquatic ecosystems from 2013-2017.

- [Details/Metadata](#)
- [REST Services](#)<sup>cf</sup>
- [Partner Information](#)<sup>cf</sup>

#### SEA

Data acquired from the Sea Education Association (SEA) Plastics Project 2010 Expedition, and SEA Plastics Project.

- [SEA \(1\) Details/Metadata](#)
- [SEA \(2\) Details/Metadata](#)
- [REST Services](#)<sup>cf</sup>
- [Partner Information](#)<sup>cf</sup>

#### GEOMAR

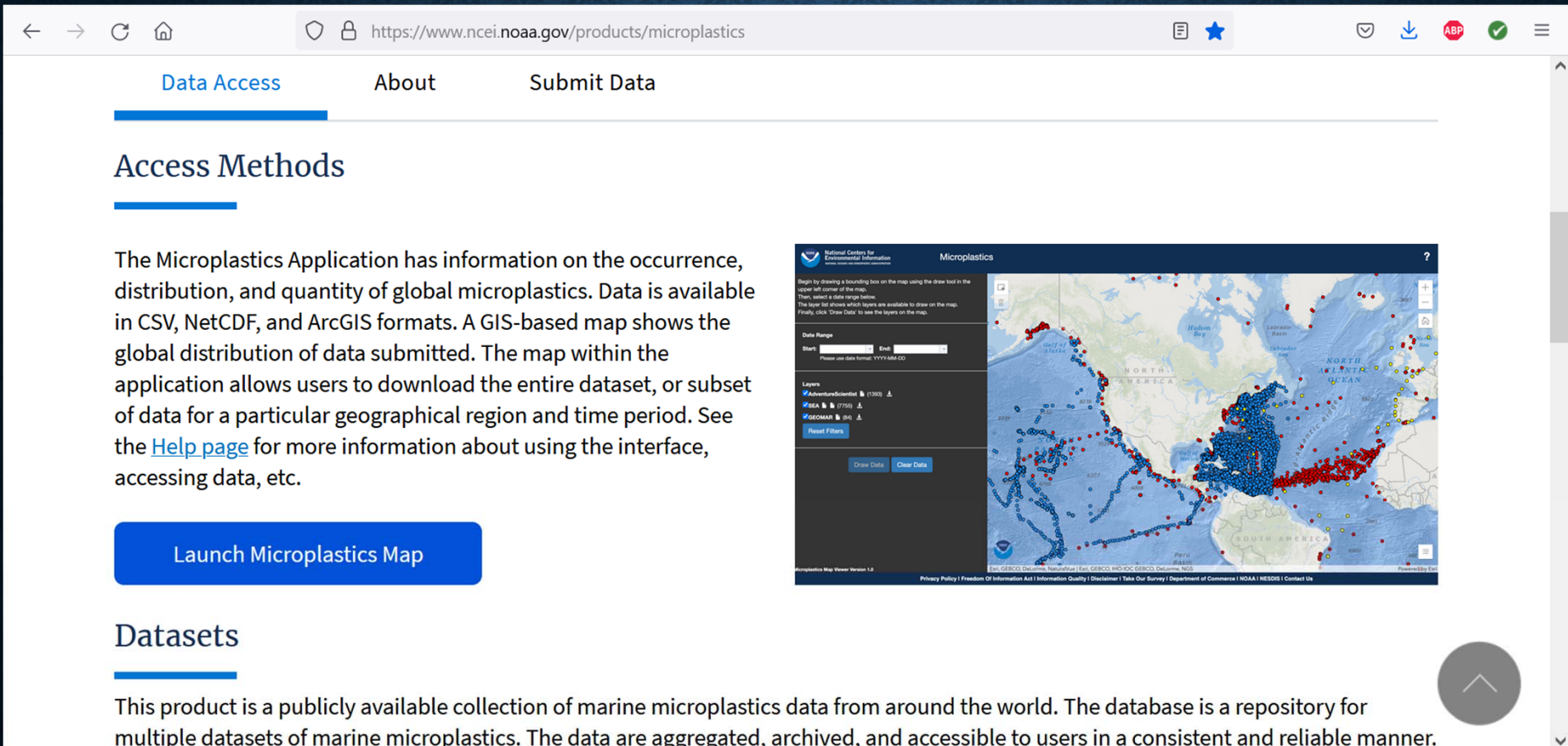
Data from the Volvo Ocean Race 2017/2018 Turn the Tide on Plastic and AkzoNobel by GEOMAR Kiel microplastics project.

- [Details/Metadata](#)
- [REST Services](#)<sup>cf</sup>
- [Partner Information](#)<sup>cf</sup>

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# Tour of Database:

## <https://www.ncei.noaa.gov/products/microplastics>



[Data Access](#)   [About](#)   [Submit Data](#)

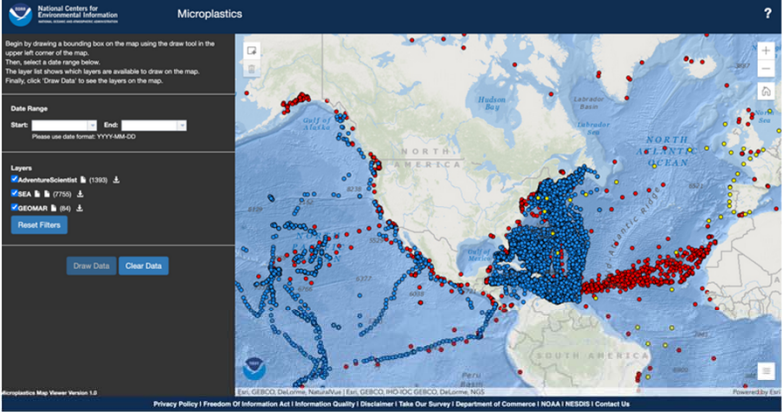
### Access Methods

The Microplastics Application has information on the occurrence, distribution, and quantity of global microplastics. Data is available in CSV, NetCDF, and ArcGIS formats. A GIS-based map shows the global distribution of data submitted. The map within the application allows users to download the entire dataset, or subset of data for a particular geographical region and time period. See the [Help page](#) for more information about using the interface, accessing data, etc.

[Launch Microplastics Map](#)

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**National Centers for Environmental Information**  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

### Microplastics

Begin by drawing a bounding box on the map using the draw tool in the upper left corner of the map. Then, select a date range below. The layer list shows which layers are available to draw on the map. Finally, click 'Draw Data' to see the layers on the map.

**Date Range**  
Start:  End:   
Please use date format: YYYY-MM-DD

**Layers**  
 AdventureScientist (1393)   
 SEA (7755)   
 GEOMAR (84)   
[Reset Filters](#)

[Draw Data](#) [Clear Data](#)

Microplastics Map Viewer Version 1.0  
Esri, GEBCO, DeLorme | Esri, GEBCO, IHO-IOC GEBCO, NGS  
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## Moving forward

- **obtain additional data**
- standardize protocols, standardize units; develop products
- collaborate with technology developers (e.g. remote sensing)

Data Access

About

Submit Data

### Data Submission Process

The microplastics database would not exist without the help of data contributors. This is a new, evolving project that needs community support to grow. Submitting your microplastic data to NCEI will make your research more visible and accessible, and help quantify and stop the global spread of plastic particles.

We recommend using ASCII character encoding (e.g., comma-separated values (CSV) or NetCDF, but no specific format is required.

To submit your microplastic data to the archive, please contact NCEI at [ncei.info@noaa.gov](mailto:ncei.info@noaa.gov).

[NCEI Data Submission Guidelines](#)



**THANK YOU**