Supplementary Material

Public awareness and perceptions of ocean plastic pollution and support for solutions in the United States

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# Supplementary Data

## Supplementary Figures

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**Appendix 1.** Survey instrument entered into Qualtrics survey platform for U.S. adults and Ocean Conservancy (OC)-connected individuals, including programming language.

**US Awareness, Exposure and Attitudes Toward Ocean Plastic and Microplastics Survey: 2021**

**SECTION A>OCEAN CONSERVANCY LIST SCREENING**

OC\_1. How would you describe your relationship to Ocean Conservancy? Select all that apply

1. I am a donor
2. Made a one-time contribution
3. I am a subscriber
4. I am a supporter
5. I follow them on social media
6. Other [DESCRIBE: ]

**SECTION ONE> SAMPLE SCREENING FOR REPRESENTATIVE DISTRIBUTION FOR PANEL.**

**OC CONTACT LIST WILL SKIP Q1 THRU Q12. OC LIST WILL SEE Q1-Q5 AFTER Q26 AND BEFORE Q27**

1. In which state do you live? [SET REGIONAL QUOTAS FOR PROSPECT/PANEL SAMPLING UNIVERSE]

PULL DOWN.

1. Which category includes your age? [SET AGE QUOTAS FOR PANEL FOR INCOMING SAMPLE]
2. Under 18 TERMINATE
3. 18-21
4. 22-24
5. 25-29
6. 30-34
7. 35-39
8. 40-44
9. 45-49
10. 50-54
11. 55-59
12. 60-64
13. 65-74
14. 75 or older

1. Do you describe yourself as a man, a woman, or in some other way? [SET GENDER QUOTAS FOR PROSPECT PANEL FOR INCOMING SAMPLE]
   1. Man
   2. Woman
   3. Some other way: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**[PUT RACE (Q04) AND ETHNICITY (Q05) ON SAME PAGE**

1. Do you consider yourself Hispanic, Latino/Latina or of Spanish descent? [SET ETHNIC/RACE QUOTAS FOR PROSPECT/PANEL ON INCOMING SAMPLE]
   1. Yes
   2. No
   3. Prefer not to answer
2. How do you identify? Select all that apply. [SET RACE QUOTAS FOR PROSPECT/PANEL ON INCOMING SAMPLE]
3. White
4. Black or African American
5. American Indian or Alaska Native
6. Asian
7. Native Hawaiian or Other Pacific Islander
8. Other (please specify\_\_\_\_\_\_\_\_\_\_\_\_\_)
9. Prefer not to say [EXCLUSIVE]

**SECTION TWO> GENERAL CONSUMER EXPOSURE TO MPs & NPs**

**NOTE: OC CONTACTS SKIP Q6-8B IN THIS SECTION**

**Some questions about your food preferences and habits.**

1. About how often would you say you eat fish or other seafood?

1 Never **TERMINATE AFTER BASE SAMPLE CLOSES**

2 Once or twice a year **TERMINATE AFTER BASE SAMPLE CLOSES**

3 A few times a year **TERMINATE AFTER BASE SAMPLE CLOSES**

4 Once a month

5 Once every couple of weeks (2-3 times a month)

6 Once a week (about 4 times a month)

7 More than once a week (5+ times a month)

8 [VOL] Don’t know/not sure **TERMINATE AFTER BASE SAMPLE CLOSES**

1. In the last 30 days, have you eaten **any type** of fish or seafood while out at a restaurant or purchased any type of seafood for home consumption? This can include any type of fish or shellfish.

1 Yes

2 No TERMINATE AFTER BASE SAMPLE CLOSES  
3 Not sure TERMINATE AFTER BASE SAMPLE CLOSES

1. In the past 30 days, how many times have you eaten each of the following? Your best estimate is fine. [Enter a number. Programming note: Range is 0-30, Total for all cannot exceed XX.]

RANDOMIZE

1. Salmon ENTER # \_\_\_\_\_\_
2. Tuna (fresh or canned) ENTER # \_\_\_\_\_\_
3. Shrimp (fresh or frozen) ENTER # \_\_\_\_\_\_
4. Pollock (fresh or frozen fillet) ENTER # \_\_\_\_\_\_
5. Beef (fresh or frozen steak) ENTER # \_\_\_\_\_\_
6. Chicken (fresh or frozen breast, thigh, leg) ENTER # \_\_\_\_\_\_
7. Pork (fresh or frozen cut) ENTER # \_\_\_\_\_\_
8. Fish sticks ENTER # \_\_\_\_\_\_
9. Chicken nuggets ENTER # \_\_\_\_\_\_
10. Battered shrimp ENTER # \_\_\_\_\_\_
11. Plant protein “chicken” nuggets ENTER # \_\_\_\_\_\_
12. Plant protein “fish” sticks ENTER # \_\_\_\_\_\_
13. Plant protein ground “burger” alternative ENTER # \_\_\_\_\_\_
14. Tofu (pressed block) ENTER # \_\_\_\_\_\_

8B. ASK FOR EACH ITEM WITH VALUE >0 IN Q8

Using the image below as a guide, what would you estimate is a typical serving size for you when ate each of the following foods in the last month? Bear in mind, many times restaurant portions are larger than 6 ounces.

SHOW IMAGE:

Images for servings of chicken, pork, beef, fish

A phone next to a row of chicken breasts

Description automatically generated

Images: Chicken Nuggets, Fish Sticks or Battered Shrimp=4oz

Chicken nuggets on a white background

Description automatically generated

Image for Tofu block

A close-up of a block

Description automatically generated

Image for fresh shrimp: 8-10 mediums shrimp in 4 oz

A pile of shrimp on a white background

Description automatically generated

1. Salmon (fresh, frozen or canned) ENTER TYPICAL SINGLE SERVING SIZE \_\_\_\_\_\_OZ
2. Tuna (fresh, frozen or canned; 1 can=5 oz) ENTER TYPICAL SINGLE SERVING SIZE \_\_\_\_\_\_OZ
3. Shrimp (fresh or frozen)

10-12 medium=4 oz; 6-7 jumbo=4oz)) ENTER TYPICAL SINGLE SERVING SIZE \_\_\_\_\_\_OZ

1. Pollock (fresh or frozen fillet) ENTER TYPICAL SINGLE SERVING SIZE \_\_\_\_\_\_OZ
2. Beef (fresh or frozen cut) ENTER TYPICAL SINGLE SERVING SIZE \_\_\_\_\_\_OZ
3. Chicken (fresh or frozen cut) ENTER TYPICAL SINGLE SERVING SIZE \_\_\_\_\_\_OZ
4. Pork (fresh or frozen cut) ENTER TYPICAL SINGLE SERVING SIZE \_\_\_\_\_\_OZ
5. Fish sticks ENTER TYPICAL SINGLE SERVING SIZE \_\_\_\_\_\_OZ
6. Chicken nuggets ENTER TYPICAL SINGLE SERVING SIZE \_\_\_\_\_\_OZ
7. Battered shrimp ENTER TYPICAL SINGLE SERVING SIZE \_\_\_\_\_\_OZ
8. Plant protein “chicken” nuggets ENTER TYPICAL SINGLE SERVING SIZE \_\_\_\_\_\_OZ
9. Plant protein “fish” sticks ENTER TYPICAL SINGLE SERVING SIZE \_\_\_\_\_\_OZ
10. Plant protein ground “burger” alternative

(typical burger patty is 4oz.) ENTER TYPICAL SINGLE SERVING SIZE \_\_\_\_\_\_OZ

1. Tofu (pressed block, ¼ block is 4oz.) ENTER TYPICAL SINGLE SERVING SIZE \_\_\_\_\_\_OZ

**SECTION THREE> OCEAN CONNECTION AND CONCERNS**

**NOTE: OC CONTACTS SKIP Q9-12 IN THIS SECTION AND GO TO SECTION FOUR, Q13**

**Now for some questions on a different topic.**

1. Thinking about the overall health of the world’s oceans, taking into account water quality, health and abundance of marine life and habitats, how would you rate the health of the world’s oceans today?
2. Very Good health
3. Somewhat Good health
4. Only Fair health
5. Somewhat Poor health
6. Very poor health
7. Not sure about this
8. Compared to other issues you care about, where does concern about the ocean fit?
   1. The most important
   2. Important, but not the most
   3. Somewhat important
   4. Not important to me at this time
9. Below is a list of problems that could impact the ocean or how people interact with the ocean. For each, please tell us if you think it is:

1 A pressing problem of today

2 A problem for the future

3 Not too much of a problem

4 Not sure/Never heard about this

**RANDOMIZE**

1. Climate change impacts such as sea level rise, warming water and changes to ocean chemistry
2. Decline of sea life populations
3. Pollution from nutrients (agricultural waste run-off from the land, sewage, others)
4. Pollution from chemicals (flame retardants, heavy metals, PFAS, others)
5. Plastic pollution (bottles, bags, packaging and other trash) entering the ocean
6. Impacts to the ocean from coastal development and increasing coastal populations
7. Too few protected areas to allow ocean species and habitat space to recover and replenish
8. Inadequate investment in science to understand the ocean and human impacts
9. Oil spills

IF SELECTED F ABOVE AS PROBLEM TODAY (QXXF=1)

1. You indicated that plastic trash entering the ocean is one of the pressing problems facing the ocean today or will be in the future. What concerns you most about plastic pollution in the ocean? Second most?

1 Most concerning to me

2 2nd most concerning to me

**RANDOMIZE**

1. Marine animals getting tangled up and injured by plastic garbage
2. Marine animals eating plastic/mistaking it for food
3. Plastic breaking down into smaller pieces but never disappearing
4. Accumulation of massive amounts of plastic in the ocean
5. Plastic trash ruins beautiful places and how we enjoy them
6. Plastic contains toxic chemicals which can leach into the environment or into organisms
7. It is disrespectful and no way to treat nature in the long run
8. Human health impacts from consuming microplastics when eating seafood
9. Health/sanitation issues involved with human encounters with ocean plastics
10. Economic impacts of plastic trash in the ocean
11. Coastal communities being disproportionately impacted by ocean plastic pollution
12. Something else [PLEASE EXPLAIN: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_]

**SECTION FOUR> MICROPLASTIC AWARENESS**

**OC CONTACTS RESUME THE SURVEY**

1. Have you ever heard of MICROPLASTICS?
2. Yes
3. No

IF YES, HEARD OF, Q13=1:

1. How familiar are you with MICROPLASTICS?
2. Very familiar – know a lot
3. Somewhat familiar – know a little
4. Not too familiar – only heard the term

ROTATE NEXT 2 QUESTIONS

IF YES, HEARD OF, Q13=1:

1. How concerned if at all, are you about microplastics in the environment?
2. Very concerned
3. Somewhat concerned
4. Neutral/not sure
5. Not too concerned
6. Not concerned at all

IF YES, HEARD OF, Q13=1:

1. How concerned if at all, are you about microplastics that humans are exposed to in day-to-day life?
2. Very concerned
3. Somewhat concerned
4. Neutral/not sure
5. Not too concerned
6. Not concerned at all

**RESUME ASKING ALL**

1. Microplastics are plastic pieces that are less than five millimeters in length (or about the size of a sesame seed). These tiny plastics with different sizes, shapes, colors and formulations enter the environment where they break up into smaller and smaller pieces, persisting from decades to thousands of years. Microplastics come from a variety of sources, including from larger plastic debris, tires wearing down during use, and clothing and textiles made from synthetic materials. Intentionally manufactured microplastics may be added to cleaning products, coatings, or cosmetics, and are so small, they become airborne and also easily pass-through water filtration systems, winding up in soils, lakes, rivers, and the ocean.
2. Having read this definition, what if any questions or concerns do you have about microplastics? [OPEN-END, NOT REQUIRED]

IF NOT AWARE OF MP BEFORE, HEARD OF, QXX=2:

1. Reading this, how concerned if at all, are you about microplastics?
2. Very concerned
3. Somewhat concerned
4. Neutral/not sure
5. Not too concerned
6. Not concerned at all
7. How significant a threat do you think microplastics are to:
8. Very significant threat
9. Somewhat significant
10. Neutral/not sure
11. Not too significant
12. Not significant at all

RANDOMIZE

1. The health of the ocean
2. The health of ocean animals
3. The health of freshwater (river, lake, stream) ecosystems
4. The health of freshwater (river, lake, stream) animals
5. The health of terrestrial (land) ecosystems
6. The health of terrestrial (land) animals
7. Human health
8. Below are some concerns that have been raised about plastics and microplastics. For each one, how much does it concern you?
9. Very concerning
10. Somewhat concerning
11. Not too concerning
12. Not at all concerned
13. Not really sure how you feel

RANDOMIZE

1. Microplastics contain chemical additives and attract other pollutants in the environment, and are often eaten by wildlife.
2. Scientists have found microplastics in 1,288 ocean species and at least 277 land-dwelling and freshwater species. Around the worldat least 1,565 species have been found to have plastic in their bodies.
3. Microplastics have become incorporated into food chains in ecosystems around the world.
4. Microplastics are found not only in animals, but have also been found in plants.
5. Humans get microplastics in their bodies by breathing in airborne particles and eating them when their food picks up particles from surfaces of plastic food containers.
6. The raw materials for most plastics are created from fossil fuels including oil and natural gas in a process that releases large amounts of chemical pollution into the air.
7. Plastic packaging such as styrofoam trays, plastic bags and plastic bottles can release microplastics into food and drinks.
8. Microplastics are nearly impossible to effectively clean up once they have been released into the environment.
9. Communities around the world, especially poorer island countries that depend on wild seafood for their diet, face greater risks to their health and livelihoods from microplastics, which are highly concentrated with chemicals
10. Reading this, how concerned if at all, are you about microplastics?
11. Very concerned
12. Somewhat concerned
13. Neutral/not sure
14. Not too concerned
15. Not concerned at all
16. How significant a threat do you think microplastics are to:
17. Very significant threat
18. Somewhat significant
19. Neutral/not sure
20. Not too significant
21. Not significant at all

RANDOMIZE

1. The health of the ocean
2. The health of ocean animals
3. The health of freshwater (river, lake, stream) ecosystems
4. The health of freshwater (river, lake, stream) animals
5. The health of terrestrial (land) ecosystems
6. The health of terrestrial (land) animals
7. Human health

**SECTION FIVE> SOLUTIONS/CALLS TO ACTION**

**INSERT Q1-Q5 FOR OC CONTACT LIST**

1. Below are some actions that could be taken to stop the amount of microplastics entering the environment, water supply and ocean. For each, do you…?
2. Strongly support
3. Somewhat support
4. Undecided
5. Somewhat oppose
6. Strongly oppose

RANDOMIZE

1. Mandating that microplastic-catching filters be installed in all new washing machines manufactured in the U.S.
2. Requiring the U.S. Environmental Protection Agency to regulate the discharge of plastic pre-production pellets and other pre-production plastic into waterways from facilities and sources that make, use, package, or transport pellets.
3. Passing the Break Free From Plastic Pollution Act, which would phase out many single-use plastics, pause new plastic production, and require sellers of plastics to cover the cost of collection and recycling.
4. Passage of plastic reduction measures in your city or town including plastic bag bans and requirements for paper-based carryout/delivery containers.
5. Contributing time or money to campaigns to limit or ban single-use plastics (like straws and plastic utensils) [in your local area or state].
6. Demand that the government fund a comprehensive assessment of the risks to human health from microplastic exposure.
7. Below are some actions you can take personally to reduce your everyday plastic footprint and reduce the likelihood of plastics leaking into the environment. For each, would you…?
8. Definitely do
9. Probably do
10. Might or might not
11. Probably not
12. Definitely not
13. I already do this frequently (all or most opportunities)
14. I already do this occasionally (some opportunities)

RANDOMIZE

1. Carry a reusable water bottle
2. Bring your own beverage container to be filled at a coffee shop or other establishment
3. Bring your own food container to a restaurant for food/beverage takeout or leftovers
4. Bring your own shopping bag to a store or market
5. Do not use the plastic produce bags generally available in grocery stores
6. Specifically choose items at a store, market or vendor not packaged in plastic
7. Specifically choose items at a store, market or vendor that can be recycled
8. Specifically request no straw at restaurants or with food/beverage takeout
9. Carry and use a reusable straw
10. Carry and use your own utensils instead of disposable items provided with food/beverage takeout
11. Support initiatives to create reusable takeout packaging for restaurants in your area. These are programs that allow people to drop off food containers at pick up points where they are sterilized and delivered back to restaurants.
12. Participate in cleanups to remove trash from the environment
13. Ensure recyclable plastics go in the recycling bin
14. Contact specific companies/brands and ask them to reduce plastics in their products or packaging
15. Contact your political representatives and ask them to support measures that would reduce plastic pollution
16. Who do you think has the **most** responsibility to reduce the use of plastics and prevent microplastic pollution from increasing?

Please click or tap on the most responsible entity first, and the second most responsible entity second. **[Please click or tap from 1-2. Programming note: Randomize A-G, keeping E-G together in a block. Randomize within block. Range is 1-2. Each number can only be used once. Include exclusive options for ‘I do not think anyone should be responsible for this/don’t think it is a problem’ and ‘Not sure’]**

1. Plastic industry (raw plastic material producers)
2. Plastic product manufacturers (those who convert plastic resin into products)
3. Plastic product purchasers/consumers
4. Local/municipal governments
5. State government
6. Federal government
7. I do not think anyone should be responsible for this/don’t think it is a problem **[EXCLUSIVE]**
8. Not sure **[EXCLUSIVE]**

**SECTION SIX> OTHER DEMOGRAPHICS**

1. What is the highest level of education you have had the opportunity to complete?

1 Grade school

2 Some high school

3 High school graduate

4 Some college, no degree

5 Vocational training/2-year college

6 4-year college/bachelor's degree

7 Some postgraduate work, no degree

8 2 or 3 years' postgraduate work/master's degree

9 Doctoral/law degree

10 Prefer not to say

1. Are there any children under age 18 currently living in your household?

1 Yes, kids under 18 in household

2 No, no kids under 18 in household

3 Prefer not to say

1. When thinking about social issues, do you consider yourself to be…?
2. Very conservative
3. Somewhat conservative
4. Moderate
5. Somewhat liberal
6. Very liberal
7. Other/My views cannot be expressed in this way
8. Prefer not to say
9. Generally speaking, do you think of yourself as a Democrat, a Republican, an independent, or something else?
10. Strong Democrat
11. Not very strong Democrat
12. Independent
13. Strong Republican
14. Not very strong Republican
15. Other
16. Not sure/prefer not to say
17. For statistical purposes only, please indicate which of the following categories best represented your total household income in 2020:

1 Less than $25,000

2 $25,000 but less than $50,000

3 $50,000 but less than $75,000

4 $75,000 but less than $100,000

5 $100,000 but less than $150,000

6 $150,000 but less than $200,000

7 $200,000 or more

8 Prefer not to say

1. What is your current employment status?
2. Employed full-time
3. Employed part-time
4. Full-time homemaker
5. Full-time student
6. Retired
7. Unemployed
8. Other
9. Not sure/Rather not say
10. How would you describe the area in which you live?

1 City of more than 500,000

2 Small City or suburb of less than 500,000

3 Town

4 Rural

5 Other [SPECIFY]

6 Not sure

1. How far from the ocean or coast do you live?

1 Within 5 miles

2 5 to 10 miles

3 11 to 20 miles

4 20-50 miles

5 50+ miles

9 Not sure

1. And how frequently do you visit the ocean or coastal areas?

1 More than once a month

2 About once a month

3 A few times a year

4 About once a year

5 Less than once a year

6 Never

1. Do you consider yourself a member of or have you made a contribution to any environmental or conservation organizations in the past 12 months?

1 Yes

2 No

3 Not sure

4 Decline to answer

1. In the past 12 months have you contacted an elected representative about an issue of concern to you?

1 Yes

2 No

3 Can’t remember

4 Decline to answer

1. What is your zip code [ENTER 5 DIGITS]

**Appendix 2.** Email sent to Ocean Conservancy (OC)-connected individuals as a method to recruit them to the survey.

A close-up of a letter

Description automatically generated

**Appendix 3.** Demographic information for 1,960 U.S. adult and 882 Ocean Conservancy (OC)-connected survey respondents. Significant differences between each study group are indicated with blue triangles.

A screenshot of a computer screen

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