

Palâstikket imaup Kângani

Plastics in surface water

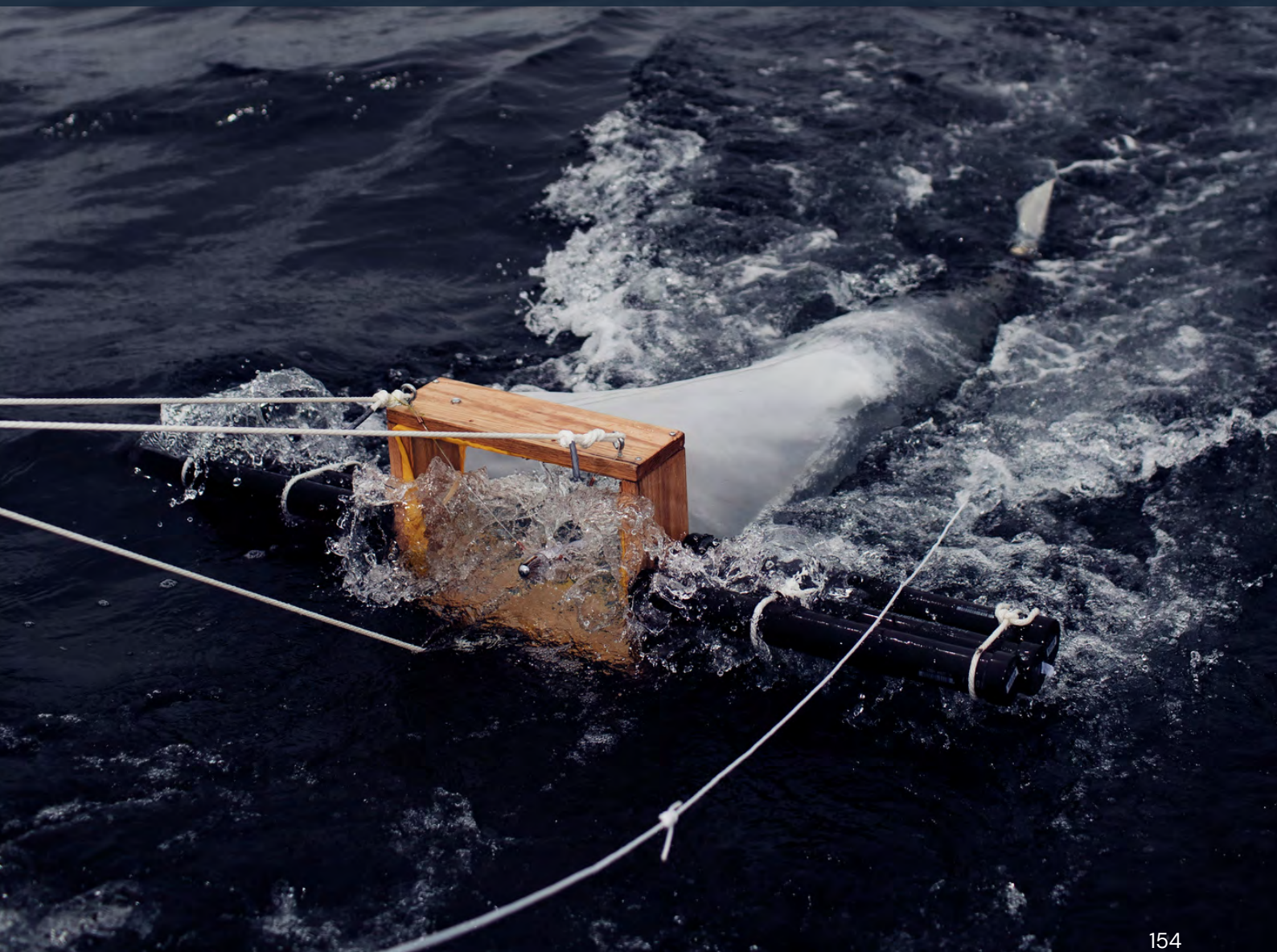
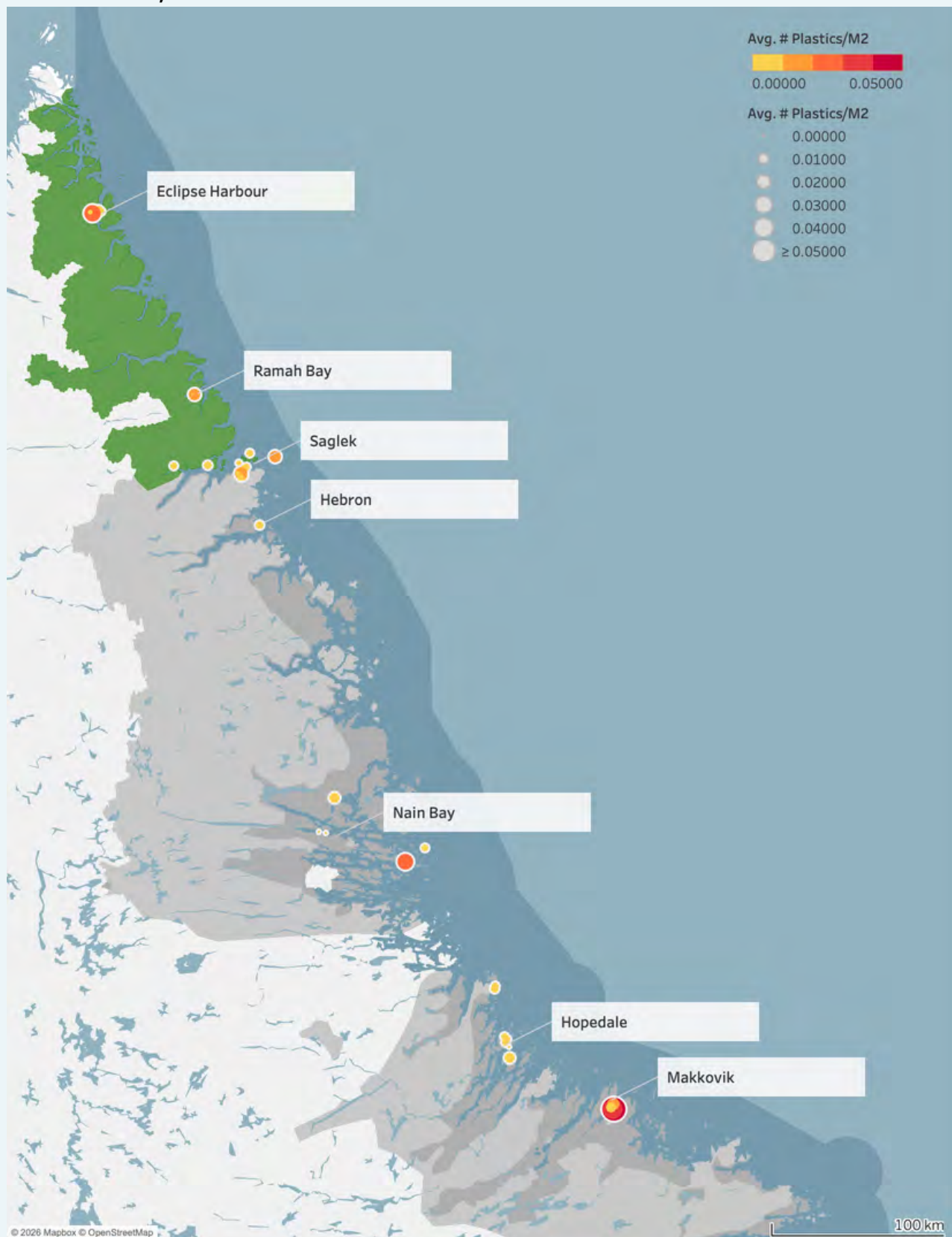


Figure 45: Map of concentrations of plastics in surface water in Nunatsiavut, 2017–2024



The larger and darker the point, the more plastics there are per square meter of water. Places like Makkovik (Maggovik) and Saglek have multiple circles because there are multiple trawls there, showing a diversity of concentrations within a single place. Note, the high concentration in Makkovik is from the wharf, not an indication of a southerly flow of waste. The higher level near Nain is Paul's Island, which is mainly fishing gear.

Land use patterns

The highest concentrations of plastics are around communities

Fragments

More than half of all plastics were fragments from larger items

<5 mm

Most plastics were microplastics under 5mm (smaller than a grain of rice)

Mix of polymers

Polymer types of plastics were extremely variable

One of the environments we study is surface water, the top 40 cm or so of water in the ocean. Roughly half of all plastics sink because they are denser than water, and the other half float for awhile (pretty much everything sinks, eventually), and some are neutrally buoyant, like fishing line, which hang out in the water column. We use a surface trawl with a fine mesh (333um, or a third of a millimeter) to capture anything floating on the surface of the water, including plastics. We have 51 trawls in different parts of Nunatsiavut that are included in the report, nearly all collected by Liz. For some of these trawls, we can't tell the concentration of plastics in the water (the number of plastics per volume of water), because of an issue with equipment. Even though we can't assess these samples for concentration, the plastic found inside the trawl still helps paint a picture of the kinds of plastics in the waters around Nunatsiavut.

Plastics found around the wharf in Maggovik (Makkovik) in 2019. Collected by Max Liboiron and Babylegs, boat driven and sample locations chosen by Hayward Broomfield. Photo: Max Liboiron.

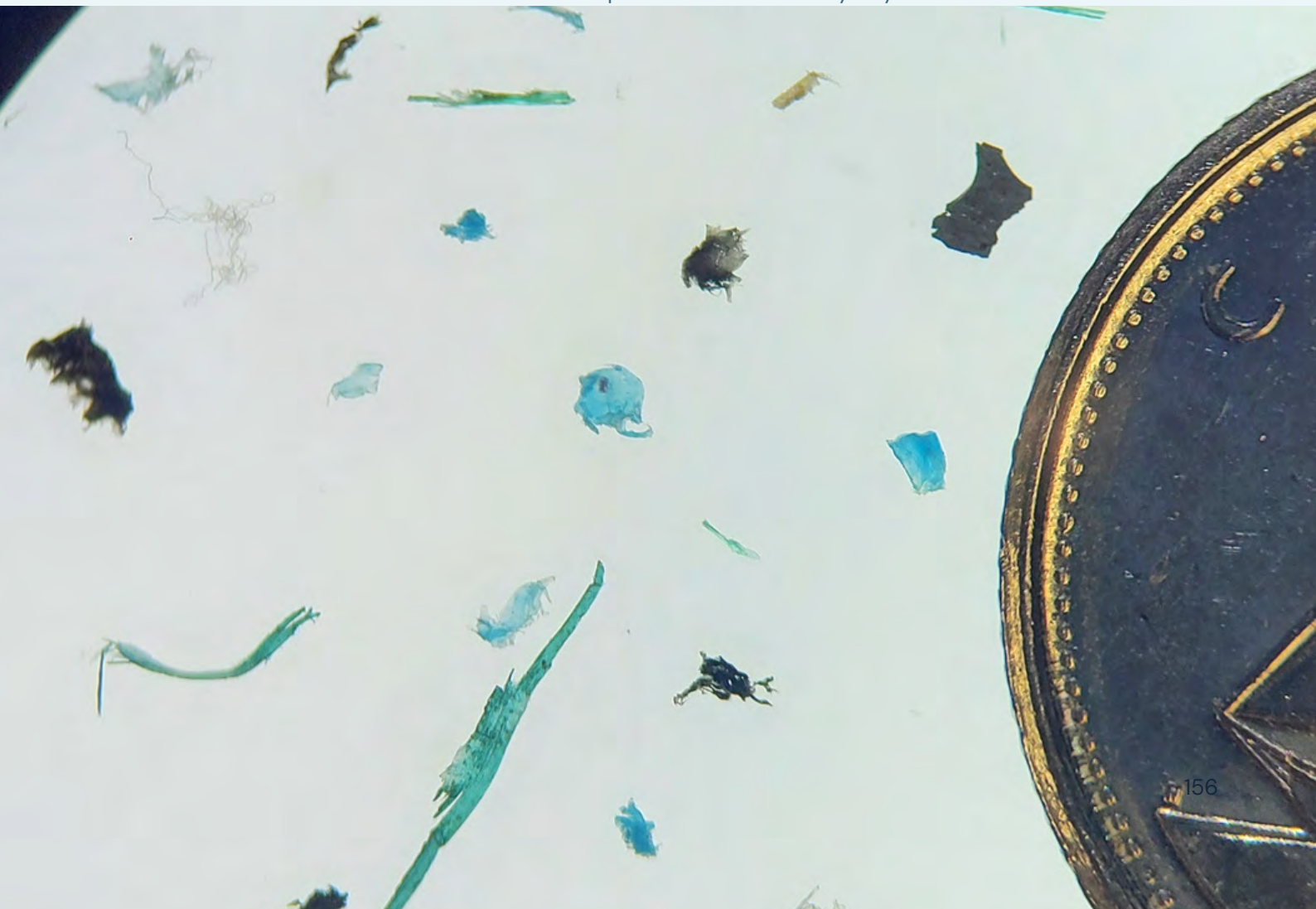


Table 22: Summary of plastics in surface water in Nunatsiavut, 2017–2025

Place	n samples ^a	Samples with no plastic (%)	Mean concentration	Average plastics per NHL hockey rink
Nain (average)	5	3 (60%)	0.0068	11
Nain Bay	2 ^b	2 (100%)	0.0000	0
Webb's Bay	1 ^b	0	0.0083	13
Paul Island	2 ^b	1 (50%)	0.0128	20
Hopedale (average)	12	2 (17%)	0.0029	5
Hopedale	6	0	0.0033	5
Nunaaksaluk	3	0	0.0035	6
Umiattugiak	3	2 (67%)	0.0027	4
Uivak Point	1 ^b	1 (100%)	0.0000	0
Makkovik (average)	7	0	0.0278	44
Makkovik wharf	1 ^b	0	0.0738	117
Makkovik Harbour	4	0	0.0242	19
Outside Makkovik	2 ^b	0	0.0118	38
Torngats (average)	26	11 (42%)	0.0049	8
Eclipse	5	1 (20%)	0.0077	12
Saglek	18	8 (44%)	0.0039	6
Ramah	3	2 (67%)	0.0060	9
Hebron	1 ^b	0	0.0052	8
Total	51	16 (31%)	0.0077	12
Total without wharf^c	44	10 (23%)	0.00326	4

^a We were unable to measure the concentration of plastics in some samples due to technical malfunctions during sampling, meaning this table contains only samples with concentration data.

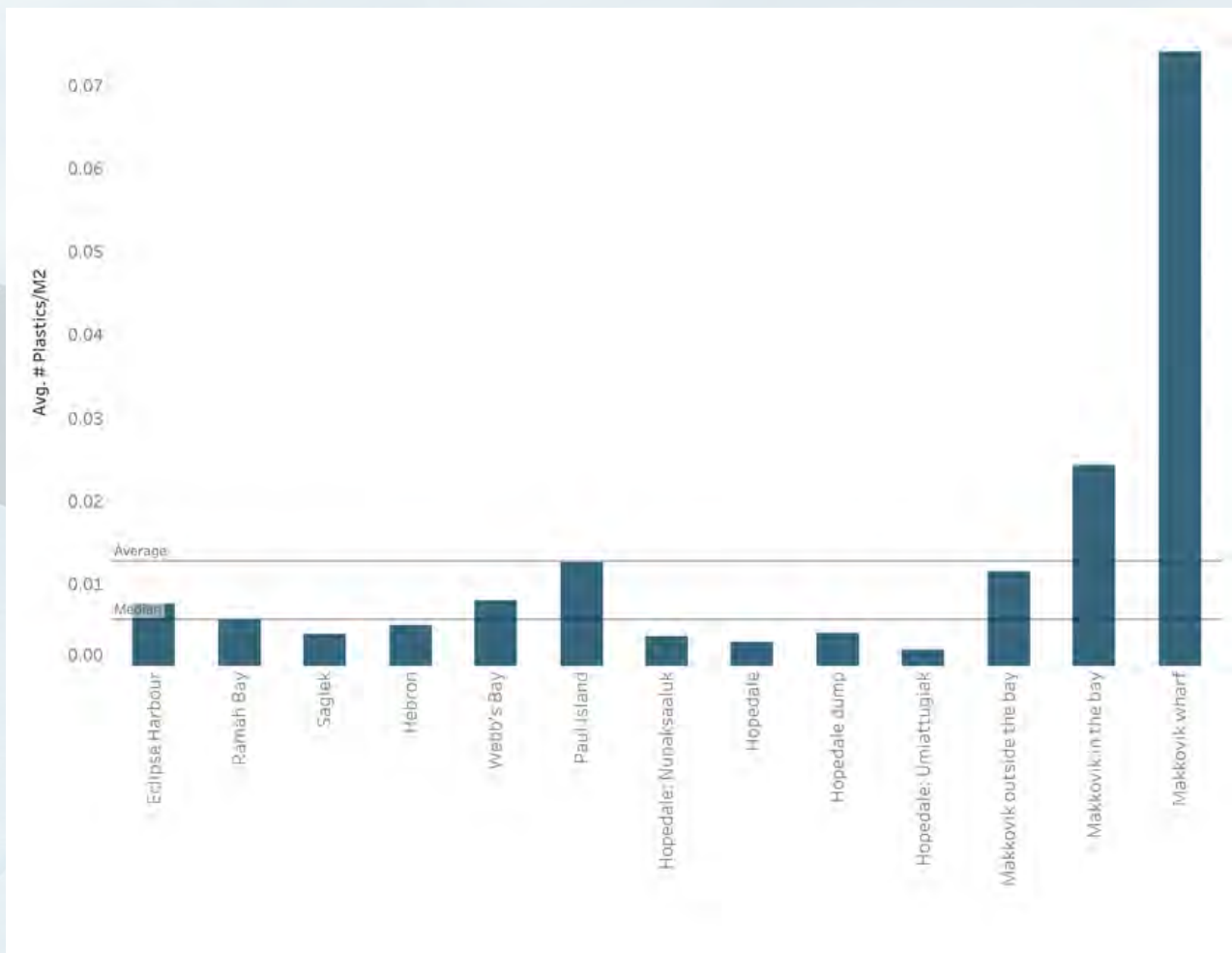
^b We usually only calculate concentrations for areas with three samples collected that accurately measured the volume of water sampled to be sure of our results. Given that this is a community report, we summarize all data here, but generally, 3 or more samples produce more reliable results.

^c Because of the high number of plastics around the wharf in Makkovik skews the average, we recommend using an overall summary average of the total without the wharf data

Katrina Anthony changes the cod end on a trawl sample in Hopedale, 2024. Photo: Max Liboiron.



Figure 46: Average concentration of plastics in surface waters per place, 2018–2024



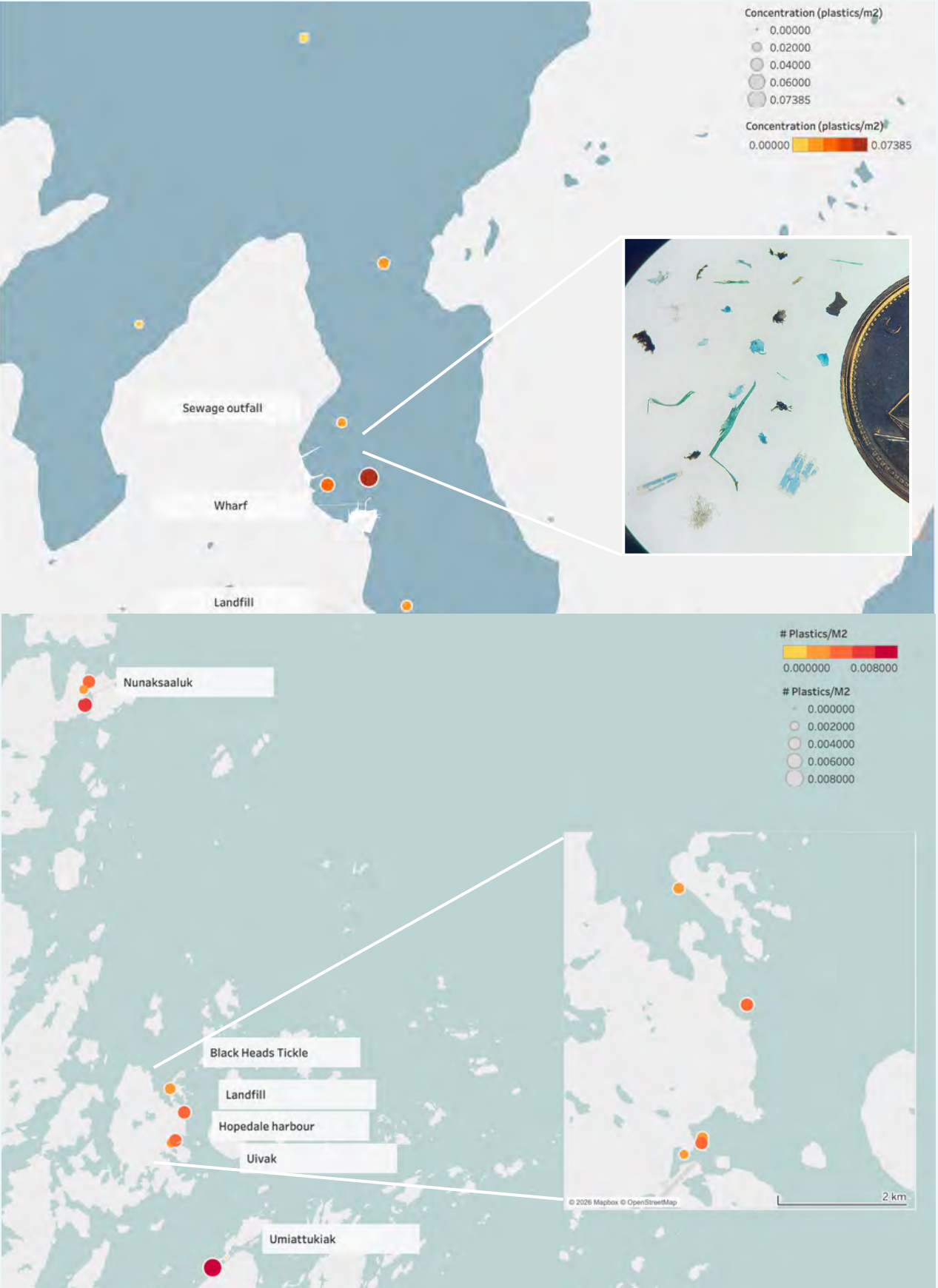
Places in this bar chart are organized from north to south. The variation shows that there isn't an obvious north-south trend, but that areas closer to communities usually have more plastics, with some notable exceptions such as Eclipse Harbour. The very high concentration of plastics near the Makkovik wharf skews the overall average (which is why we have an average for all of Nunatsiavut and one for Nunatsiavut minus the Makkovik wharf in our baselines). The average without Makkovik is very close to the median, which is also shown here. Only places with concentration data are in this plot.

Plastics over time: We have samples from Saglek from 2020–2024 and a statistical test (one-way ANOVA) found that concentration over time in Saglek did not increase enough to make a meaningful difference.

Hot spots: There are a few key areas where plastic concentrations are higher than others. The highest concentration of plastics in surface water in the study are from around the wharf in Makkovik (Maggovik). Any study that includes wharves finds the highest amounts of plastics near them compared to surrounding waters (Liboiron et al. 2020, Morris et al. 2016, Han et al. 2019).

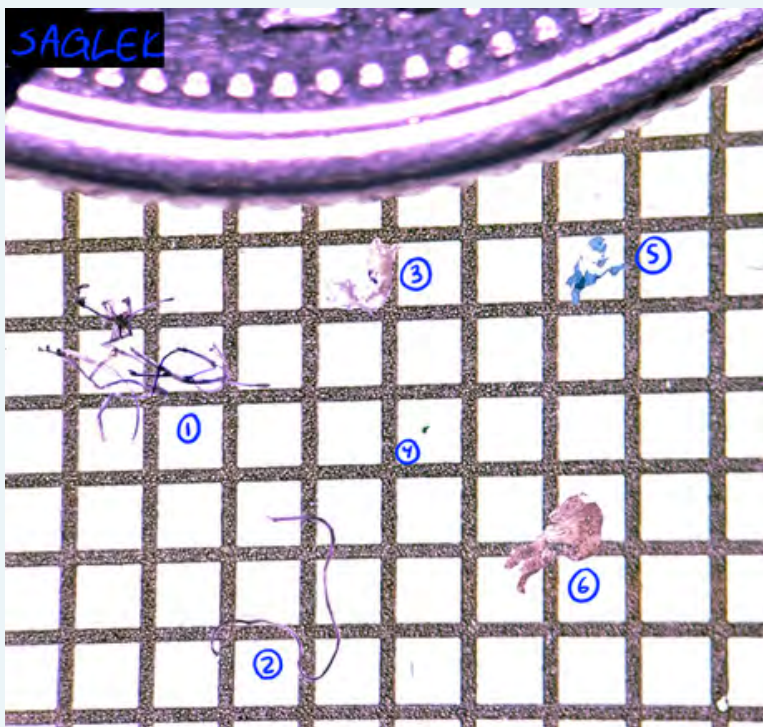
There is no statistically meaningful difference between the concentrations of plastics around basecamp compared to the waters nearby in Saglek (independent samples t-test).

Figure 47: Detailed maps of plastic concentrations found in surface waters in Maggovik (Makkovik) in 2019 (top) and Agvitok (Hopedale) in 2024 (bottom)



These maps show each trawl's concentration of plastics. Larger, darker circles mean more plastics than smaller, lighter circles.

Figure 48: Detailed maps of plastic concentrations found in surface waters around Saglek, 2017–2022



Plastics found at Saglek in September 2022. Photo: Riley Cotter.

Liz captured these six plastics with the LADI trawl at Saglek in September 2022. Each square in the grid is 1mm, and there is a dime at the top of the photo for scale. Some of these plastics may come from the same source, but perhaps not.

There is no statistically meaningful difference between the concentrations of plastics around basecamp compared to the waters nearby in Saglek (independent samples t-test).

Liz captured these six plastics with the LADI trawl at Hebron (Kangitlusuak) in October 2022. Each square in the grid is 1mm, and there is a dime at the top of the photo for scale. As you can see, it looks like some of the plastics might be from the same source because they are the exact same colour of blue.

Thank you to people who have worked to help us identify these plastics: Sophie Keelan, Rutie Dicker, Roxanne Barbour, Nicola Burke, Melvin Gilbert, Mark Saksagiak, Margaret Lidd, Manasse Pijogge, Kayla Wyatt, Joseph Onalik, Joanna Lidd, Jane Angnatok, Debbie Lyall, Kelly McLean, April Andersen, Andrea Angnatok, Tracy Denniston, Regina Saimat, Mary (Binky) Andersen, Dorman Angnatok, Don Dicker Jr., Connie Pijogge, and Alec Dicker.

Image of plastics found in surface waters at Kangitlusuak (Hebron) in October 2022. Photo: Riley Cotter

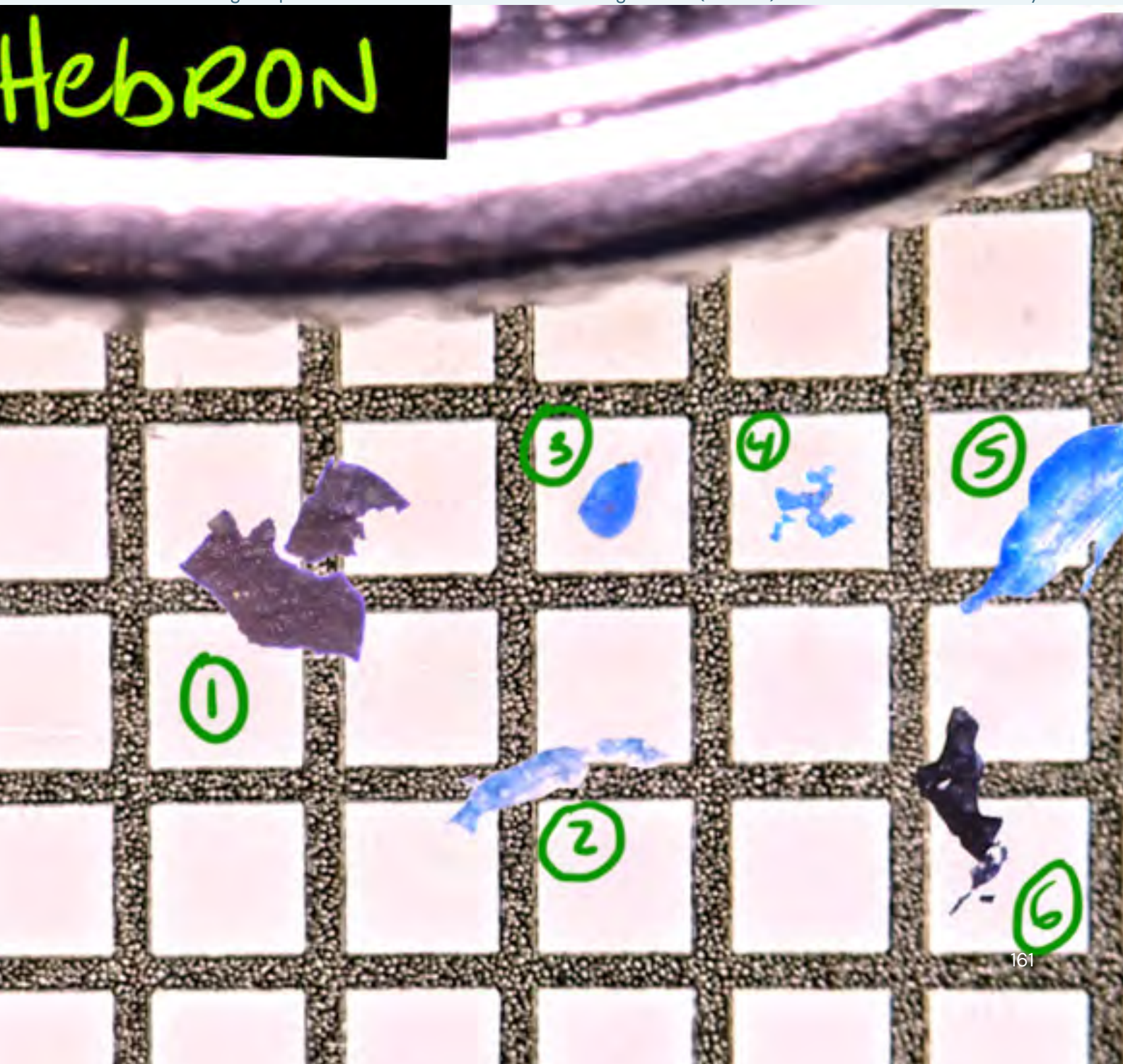


Table 23: Summary of plastic morphologies (shapes) in surface water from Nunatsiavut, 2019–2024

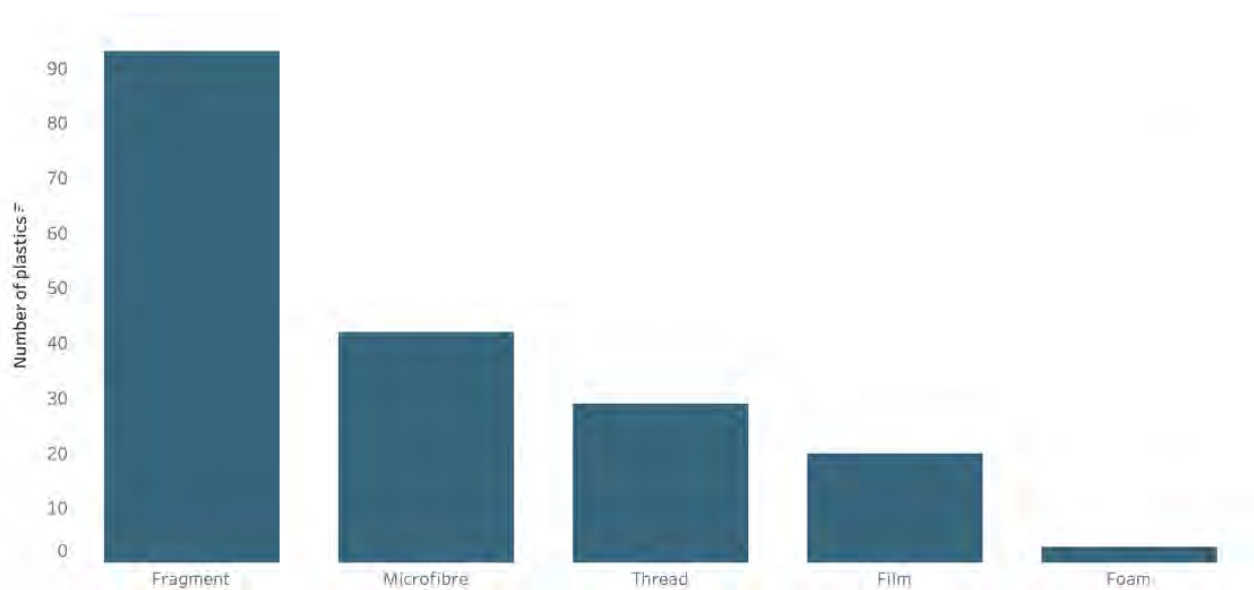
Location	Sample size	Microfibres	Fragments	Thread	Films	Foam	Total plastics
Nain Bay, 2023	3		4 (100%)				4
Webb's Bay, 2023	3		2 (50%)		1 (25%)	1 (25%)	4
Paul Island, 2023	3		3 (21%)	10 (71%)	1 (7%)		14
Hopedale, 2024	12	4 (27%)	6 (40%)	3 (20%)	2 (13%)		15
Makkovik wharf, 2019	1	2 (8%)	19 (79%)	2 (8%)	1 (4%)		24
Makkovik, 2019	4	1	23	6	7	1	38
Eclipse, 2022–2023	5	4 (25%)	9 (56%)	3 (19%)			16
Saglek, 2020–2024	25	17 (37%)	22 (48%)	5 (11%)	2 (4%)		46
Ramah, 2022–2023	6	6 (55%)	4 (36%)		1 (9%)		11
Hebron, 2022–2023	6	8 (53%)	4 (27%)		2 (13%)	1 (7%)	15
Total	70	41 (22%)	92 (49%)	30 (16%)	21 (11%)	4 (2%)	187

1–24%	25–49%	50–74%	75–100%
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Locations are grouped when their results are similar. The Makkovik wharf, for example, is so different from other areas around Makkovik that even though there is only one trawl in that location, it is separated so it does not lead to misleading averages (see the section of the report on place for details, pp 92).

Research sites usually have three trawl samples to deal with variation. For summaries for each set of trawls, see Appendix Table A5.

Figure 49: Morphologies of all plastics in surface water in Nunatsiavut, 2019–2024

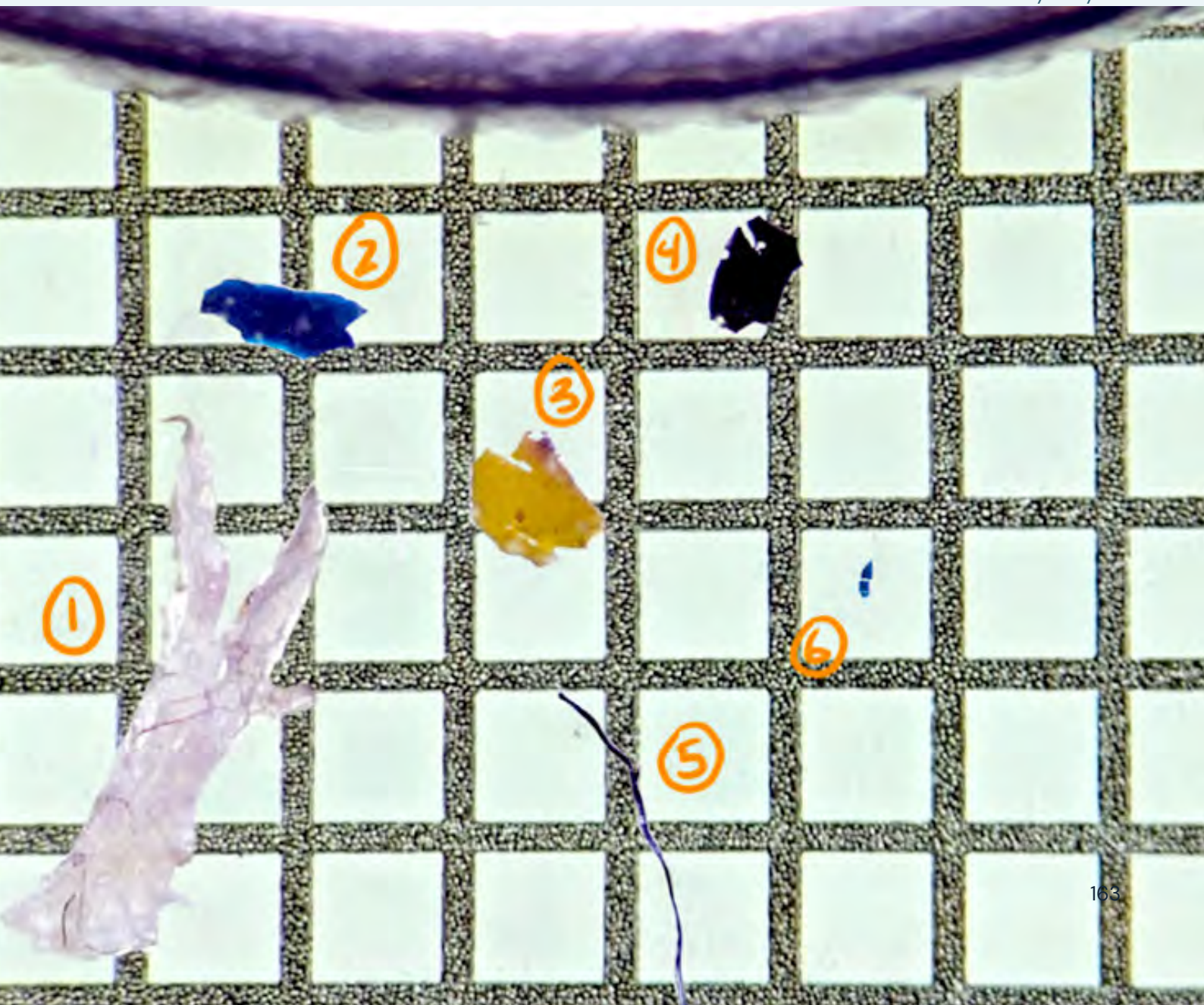


What is surprising is that **one trawl in Eclipse Harbour** (in the Tongait (Torngat) Mountains) **has the highest concentration of plastics outside of a community**. The concentration of plastics in this sample (around 39 plastics per hockey rink) is still lower than the average in Maggovik (Makkovik), but it's still surprising that one sample would have so many plastics so far up in the Tongait (Torngats). Importantly, we can't say that this sample is indicative of the plastics that would be found in Eclipse since we don't have enough data. We are gathering more trawl samples to investigate.

When we look at the plastics in both of these high-concentration trawls in Eclipse Harbour, many of the same type and colour occur. This indicates there is a common source of some of these plastics, which almost always means a local source since plastics spread out in the open ocean very quickly.

The photo below shows the types of microplastics we found in the very high concentration 2022-ECL-NG-TRAWL-01 in Eclipse Harbour, up in the Tongait (Torngats).

Photograph of plastics found at Eclipse. Squares are 1 mm in size, and the coin at the top is a nickle for scale.
Photo by Riley Cotter.





Top: Katrina Anthony changes the cod end of a surface water trawl while sampling plastics in water near Hopedale.

June 30th 2024. Photo: Max Liboiron

Bottom: Detail of LADI's mouth, deployed in the stream by Ranger Bight in Makkovik, 2023. Though we left this trawl in the stream for a full day, there were no plastics. Photo: Max Liboiron

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Types of Plastics in Surface Water

One of our main findings about plastics in Nunatsiavut's surface waters is that the kinds of plastics vary greatly depending on place. It is not meaningful to talk about all these together in averages, so we break them down according to place in most analyses.

The number of individual plastics discussed in this section may seem high or low compared to the concentration for the same area because trawls were longer or shorter and concentration is determined by the number of plastics divided by the amount of water sampled. Short trawls with low numbers of plastics might have a similar concentration to longer trawls with more plastics, for example. Or a location like Maggovik (Makkovik) with more trawls will also have more plastics. The number of polymers recorded will be fewer than the total number of plastics for a location because not all samples go through this process.

Trends across places: Plastics were most often microplastics under 5mm (smaller than a grain of rice). With some variation, fragments and microfibers were the most common morphologies found; the consistently high number of fragments is somewhat unusual compared to other studies in the Arctic that find that microfibers dominate samples (e.g. Mu et al. 2019). Blue and black plastics were consistently well represented in samples, which is similar to global trends in surface water.

Variation: With the exception of size class, there is notable variation in the types of plastics we find in different places. For instance, we found no thread plastic (like fishing line) in Hebron or Ramah, but a quarter of the plastics found in Eclipse Bay were threads. Polymer type (the specific kind of plastic found in the water) was the most variable quality of the plastics we found in these three places. For instance, we can see that Nylon particles were totally absent from samples in Hebron, whereas they comprised over half of the plastics found in Ramah Bay. On the other hand, nearly half of the plastics in Hebron were PET but we found only one PET particle in Ramah. Further, in Eclipse, PET and nylon were both fairly common, and we found them in similar frequencies (see Appendix Table A9).

Tire crumb: Tire crumb refers to the fragments of polymer that fragment from vehicle tires. Both of the crumb tire samples were from Maggovik (Makkovik). These are plastics that fragment off of tires. One crumb was from near the wharf, and one from out to the Labrador sea, which was likely from a local source because crumb rubber is denser than water and is expected to sink (the density of crumb rubber is between 640 and 720 kg/m³ and the density of surface seawater is between 1020–1029 kg/m³).

Table 24: Details on the plastic colours found in surface water by place

Place	Samples (n)	Plastics (n)	Blue	Black	White	Clear	Grey	Green	Brown	Red	Other
Nain area	9	23	2 (9%)	4 (18%)	1 (4%)	10 (45%)	1 (5%)	1 (5%)		1 (5%)	2 (9%)
Nain Bay	3	3		1 (25%)	1 (25%)						2 (50%)
Webb's Bay	3	4	2 (50%)	1 (25%)						1 (25%)	
Paul Island	3	16		2 (14%)		10 (71%)	1 (7%)	1 (7%)			
Hopedale area	12	16	4 (26%)	3 (20%)		3 (20%)		1 (7%)		1 (7%)	3 (20%)
Hopedale	5	9		3 (38%)		2 (25%)		1 (13%)			2 (25%)
Nunaaksaluk	3	6	4 (67%)			1 (17%)					1 (17%)
Umiattugiak	3	1								1 (100%)	
Uivak Point	1	0									
Makkovik area	7	62	20 (33%)	16 (26%)	5 (8%)	12 (19%)	1 (2%)	4 (6%)		2 (3%)	2 (3%)
Makkovik wharf	1	24	9 (38%)	6 (25%)	2 (8%)	2 (8%)		4 (17%)			1 (4%)
Makkovik Harbour	4	30	10 (33%)	8 (27%)	2 (7%)	7 (23%)	1 (3%)			1 (3%)	1 (3%)
Outside Makkovik	2	8	1 (13%)	2 (25%)	1 (13%)	3 (38%)				1 (13%)	
Torngats	36	74	17 (19%)	30 (34%)	2 (2%)	16 (18%)	7 (8%)	2 (2%)	1 (1%)	7 (8%)	7 (8%)
Eclipse	5	16	3 (19%)	6 (38%)	1 (6%)	5 (31%)					1 (6%)
Saglek	25	47	10 (21%)	17 (37%)		8 (18%)	6 (13%)	2 (4%)	1 (2%)	2 (4%)	
Ramah	6	11	1 (9%)	1 (9%)		3 (27%)				4 (36%)	2 (18%)
Hebron	6	14	3 (20%)	6 (40%)	1 (7%)		1 (7%)			1 (7%)	3 (20%)
Total	70	189	43 (23%)	52 (28%)	7 (4%)	41 (22%)	9 (5%)	7 (4%)	2 (1%)	11 (6%)	13 (7%)
1-24%		25-49%		50-74%		75-100%					

Summary tables of plastic characteristics show what kinds of plastics are present and can help identify changes in their composition, even when the overall amount of plastic does not change. They summarize part of the baseline data, but are not themselves a baseline. The baseline provides the reference point against which future observations can be compared, while the summary table highlights particular characteristics within that reference data.

Even though we consider different factors when trying to identify local versus non-local plastics, we can rarely definitively tell if plastics originate locally or non-locally. Based on what we can tell, however, **it seems like most plastics in Nunatsiavut's surface waters originate locally**. In some cases, like Maggovic (Makkovik), this makes sense since there's human activity in the area which could result in plastics in the water. In places like Hebron, where there's less human activity, many of the plastics still seem to be local.

Table 25: Proportion of likely local vs. non-local plastics in Nunatsiavut surface water

Likely origin of plastic	Torngats	Makkovik	Nain area	Hopedale	Total
Likely local	26 (35%)	19 (31%)	23 (62%)	4 (25%)	72 (38%)
Likely non-local	15 (20%)	13 (21%)	5 (14%)	3 (19%)	36 (19%)
Unknown	33 (45%)	30 (48%)	9 (24%)	9 (56%)	81 (43%)

Table 26: Likely sources of plastics in Nunatsiavut surface waters

Likely origin of plastic	Torngats	Makkovik	Nain area	Hopedale	Total
Packaging (e.g., wrappers)	3 (4%)	8 (13%)	4 (17%)	2 (13%)	17 (9%)
Fishing (e.g., fishing line, netting)	9 (12%)	8 (13%)	10 (43%)	3 (19%)	30 (16%)
Paint	19 (26%)		1 (4%)	1 (6%)	21 (11%)
Textiles (i.e., fibres from laundry)	27 (36%)	3 (5%)		4 (25%)	34 (18%)
Tires (crumb rubber)		2 (3%)			2 (1%)
Unknown	26 (35%)	41 (66%)	8 (35%)	6 (38%)	81 (44%)
1-24%	25-49%	50-74%	75-100%		



Below: Boat pulled up on Cross Island, near Rigolet, June 29, 2025. Photo: Alex Bond

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Comparison of plastics in surface water between Nunatsiavut and nearby waters

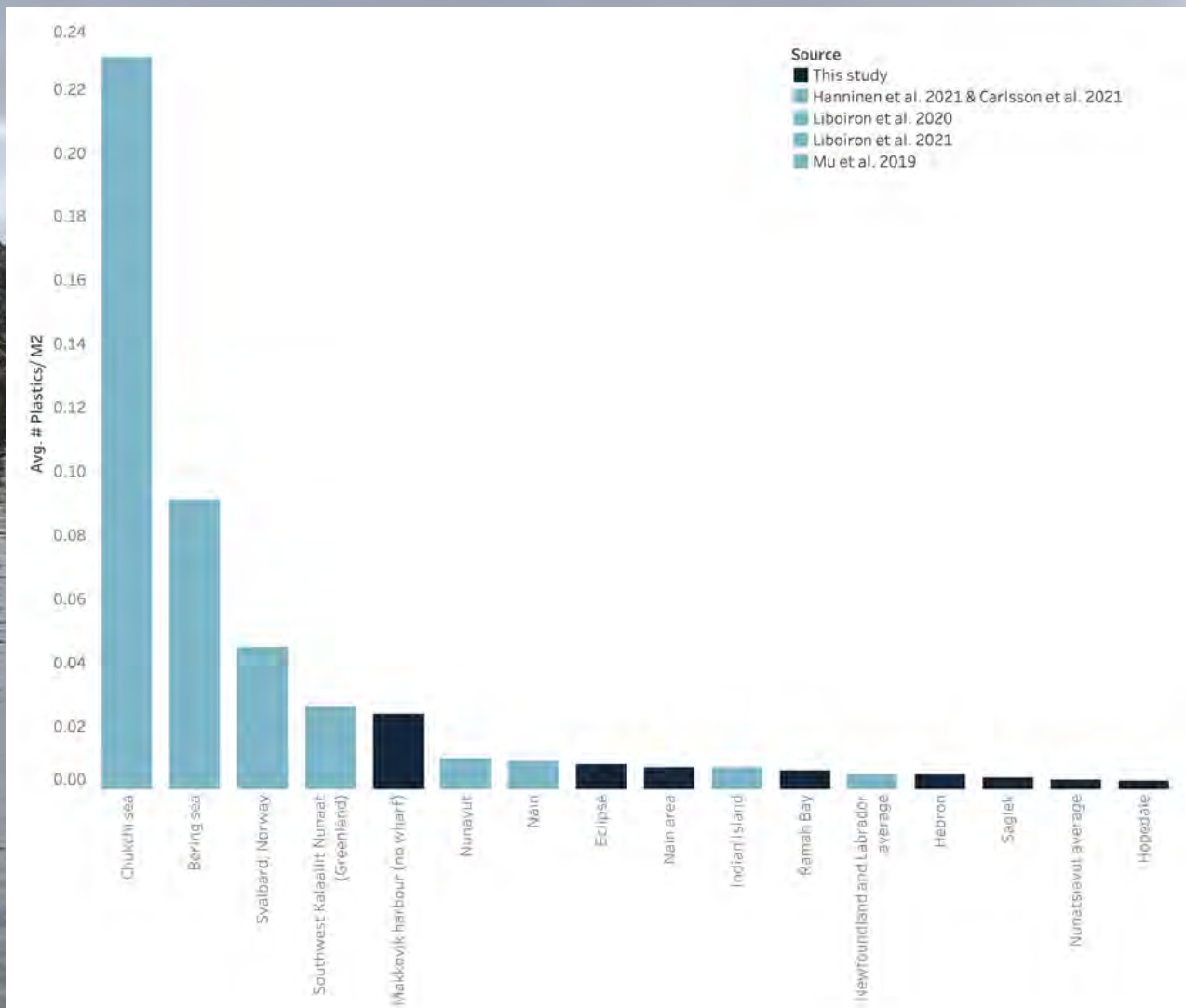
Nunatsiavut has an average concentration of plastics in surface water compared to nearby and comparable regions. The average concentration of plastics in surface water in Nunatsiavut is similar to Nunavut, higher than the island of Newfoundland (mainly the west coast), and lower than Kalaallit Nunaat (Greenland), Norway, the Bering Sea, and the Chukchi Sea. This puts Nunatsiavut somewhere in the middle.

Some scientists hypothesize that plastics in the Northern hemisphere are slowly flowing to and staying in the Arctic Circle as a final resting place (Mishra et al. 2021; Bergmann et al., 2022). This could be happening in the overall figures, since the further north the location compared to Nunatsiavut, the higher the plastics overall. While there are many other studies that look at surface water, their methods are too different for direct comparison.

Katrina Anthony looks for eggs near Hopedale, 2024. Photo: Max Liboiron.



Table 27: Comparison of concentrations of plastics in surface water between Nunatsiavut and other Arctic waters



These figures show the data from Table 28 (page opposite)

Table 28: Comparison of concentrations of plastics in surface water between Nunatsiavut and other Arctic waters

Location	Sample size	# plastics/ m ²	#plastics/ hockey rink ^b	Source
Indian Island	1	0.007	12	Liboiron et al. 2020 ^a
Makkovik harbour (no wharf)	4	0.024	38	This study
Hopedale	12	0.003	5	This study
Nain area	9	0.007	11	This study
Nain	1	0.009	16	Liboiron et al. 2020 ^a
Hebron	6	0.005	8	This study
Saglek	25	0.004	6	This study
Eclipse	5	0.008	12	This study
Ramah Bay	6	0.006	9	This study
Ramah Bay	1	0.00	0	Liboiron et al. 2020 ^a
Nunatsiavut average ^c	44	0.003	4	This study
Newfoundland and Labrador average ^d	18	0.005	9	Liboiron et al. 2020
Nunavut	8	0.01	18	Liboiron et al. 2021
Southwest Kalaallit Nunaat (Greenland)	4	0.026	46	Liboiron et al. 2021
Svalbard, Norway	15	0.045	79	Hanninen et al. 2021 & Carlsson et al. 2021

There are many more studies of plastics in surface water than those referenced here, but to ensure comparability with our study we only included studies that used a similar size range of netting for their study (between 200–425µm). From our own study, we only included places where we were sure an average was a valid metric.

Greyed-out text indicates studies with too few samples to have strong results.

^a These results are likely lower due to the method, since samples were processed outside of a lab and may have missed plastics that would have been found in a laboratory setting.

^b It is difficult, even for scientists, to imagine what 0.007plastics/m² looks like, so we have provided the same measure, but zoomed up to the more understandable size of an NHL regulation-sized hockey rink. It's much easier to understand what 12 plastics in a hockey rink looks like.

^c This average is for all Nunatsiavut trawls in this study except for the wharf in Makkovik, which skews the regional data

^d This figure includes a few samples from Labrador as well as many from around the island of Newfoundland.



Top: The Aventure Canada crew moves into zodiacs for surface water research in Greenland (Kalaallit Nunaat). Photo by Liz Pijogge. Bottom: Ian Winters looks for eggs on Pigeon Island during a research trip near Agvitok (Hopedale). Photo by Max Liboiron