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Microplastics in sediments of the waters near the Akademik Vernadsky station

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Abstract. Despite Antarctica's remoteness from powerful sources of anthropogenic impact, its natural environment undergoes changes due to the activities of scientific stations, tourism, transport communications, and the extraction of bioresources. The study presents the distribution of artificial polymer particles (microplastics) in the upper layer of the bottom sediments in the waters near the Akademik Vernadsky station. It aims to identify the microplastics in the geological components and to adapt the laboratory cycle of sample processing and particle identification. The samples were collected in 2022 during seasonal fieldwork at 4 to 60 m. In particular, sediment samples from sea straits at different distances from the Antarctic station were subject to testing. Most of the samples included microplastics; they were quantified and classified by morphology. The putative microplastics were tested by Raman spectroscopy (diffraction monochromator MDR-23); the test found such polymers as polypropylene, polyethylene, and polyethylene terephthalate. Some particles (mostly fibers) that morphologically could not be studied by spectrometry were identified as artificial polymers by thermal techniques without chemical analysis. The sediments' material and granulometric parameters were determined to understand the possible link of the microplastics in the upper sedimental layer with the natural and anthropogenic factors. The results were compared to similar studies at other polar stations on the Antarctic Peninsula. The small number of samples did not allow us to establish a qualitative relation between the depth distribution, sediments' granulometry, and the total amounts of the confirmed microplastic fragments. Thus, the publication should be considered a preliminary review and a methodologically indicative study on the identification of microplastic particles in the bottom sediments of the water area adjacent to the Ukrainian Antarctic Station.

Keywords: Antarctic Peninsula, artificial polymers, microscopic studies, pollution, Raman spectroscopy, surface layer of bottom sediments

1 Introduction

Antarctica's remoteness from the industrial centers and powerful sources of anthropogenic influence make it a clean slate for studying unadulterated natural processes and objects. The Antarctic Treaty (https://documents.ats.aq/ats/treaty_original.pdf) makes it one of the largest protected regions on Earth. Meanwhile, the recent decades of human activity at the shoreline have brought about increasing emissions of anthropogenic materials and substances into the waters. Research bases' activity, tourism development, active transport use, bioprospecting, and communication with some other regions of the World Ocean impact the environment, slowly polluting it (Deprez et al., 1999; Balks

et al., 2002; Usenko et al., 2007; Barnes et al., 2010; Klein et al., 2012; Nasiedkin et al., 2022; Antacli et al., 2024). A particularly well-known example is the food chains emitting dangerous stable organic substances, causing the organochlorine pesticides to be identified in the muscle and fat tissues of Antarctic penguins and sea mammals (Usenko et al., 2007).

A particularly pressing issue that has recently begun to be properly addressed is microplastics (MP) – solid particles of synthetic polymers less than 5 mm in size. In the sea, they are usually represented by granules, fragments, or fibers of various polymers roughly the density of seawater. Nowadays, studying MP distribution in the biological, hydrological, and geological components of marine ecosystems (for example, evaluating the scope of the pollution and the type, origin, and transport of its components) is a major scientific field worldwide (GESAMP, 2019). This is also true for the Antarctic waters in which these pollutants in non-trace quantities are a novel phenomenon that can provide valuable information on their sources and ways of transport (Tin et al., 2009; Barnes et al., 2010; De Witte et al., 2014; Obbard et al., 2014; Thompson, 2015; Waller et al., 2017).

About 80% of plastics in the ocean come from the land and are brought in by rivers. Meanwhile, active Antarctic stations commonly pollute the environment via wastewater disposal, unforeseen events, or accidents; this holds for trash, mostly remnants of plastic objects and packaging (Jambeck et al., 2015).

The current activity of 60 stations and bases translates into up to four thousand people present in Antarctica, depending on the season (Klein et al., 2012). The stations' density is highest at the Antarctic Peninsula, similarly to the quantitative parameters of the tourist visits (Yevchun et al., 2021). The local marine environment is thus the most vulnerable. It is necessary to study its components' ecology (Isobe et al., 2017; Cincinelli et al., 2021).

The artificial polymers in the sediments near the Ukrainian Antarctic Akademik Vernadsky station are of interest not just because the station lies at the intersections of sea routes (and human activities). The waters around the station are shallow. It has experienced increasing human presence since 1934–1937 when the British sent an expedition to Graham Land. In 1947, a research base was erected at the site (the Faraday Base); in 1954–1980, most of the buildings were constructed; in 1996, the station was transferred to Ukraine. The over-90-year history of anthropogenic impact must have affected the emissions and the further re-distribution of artificial substances in the local bottom sediments (http://uac.gov.ua/vernadsky-station/station-history).

Therefore, field and laboratory work to establish the MP content in the sediments near the station would add to the whole picture of human impact's scope and propagation in Antarctica.

Identifying the sources of MP introduction (taking into account their size and morphological features) is an interesting possibility. Microplastics have similar dispersion behaviour to low-density sediments (accumulation of microplastic fragments significantly correlates with the percentage of silt in cores) (Cunningham et al., 2020).

Small microplastic fragments are also more often affected by advection and, in general, circulation at all depths of the ocean than larger ones, the main factors in the distribution of which are winds and currents (Woodall et al., 2014). Consequently, the transport and accumulation of the smallest plastic in regions of the World Ocean remote from civilization is determined by meteorological conditions and ocean dynamics, and the functioning coastal Antarctic stations are sources of larger-sized MPs.

2 Materials and methods

2.1 Study area

The study was preliminary; it aimed to identify the presence of artificial polymers in the geologic component of the ocean near the Akademik Vernadsky station. The materials were collected by the 27th Ukrainian Antarctic Expedition of 2022 in selected channels of the Argentine Islands. The depths (Fig. 1) ranged from 4 m (Site 1) to 55 m (Site 4). The sampling was done from a Zodiac

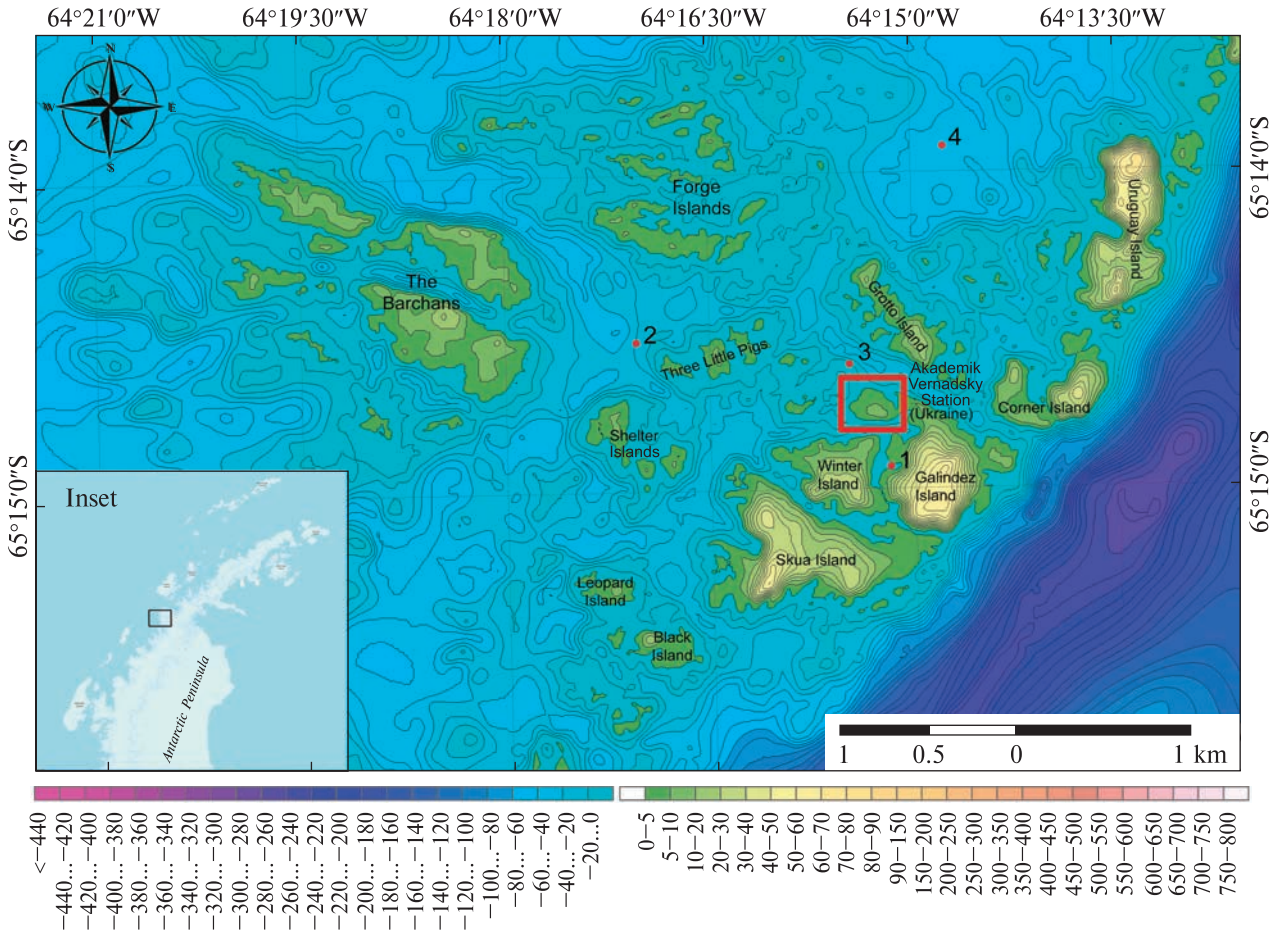

Figure 1. Sampling sites (1–4); red rectangle – location of the Akademik Vernadsky station. The map background for the Inset uses geographical datasetes from the Open Street Maps (https://openstreetmap.org.ua/)

boat using a hand winch and a Van-Veen grab (bottom coverage of 0.1 m^2, sediment layer of the upper 5 cm). The material was a malleable substance composed of aleurite silts with sand.

Site 1 (depth 6 m) is in a small bay between Galindez and Winter Islands. The bay is almost wholly surrounded by land, making it a recommended (and the most frequent) mooring site.

Site 2 (depth 42 m) is at a distance from the station. The British bathymetric map *BA 3575* (*1 : 15000*) offers an anchorage here.

Site 3 (depth 31 m) is relatively close to the station at the mouth of the Meek Channel. The area is crossed by the highest number of small boats as they go north via the Meek Channel, Penola Strait, and French Passage.

Site 4 (depth 52 m) is the farthest away from the station, in a depression separated by Grotto and Forge Islands.

As the samples' weights varied a lot depending on the water content, the results were recalculated to the dry sediments. The analytical methods followed the literature as closely as possible (MSFD..., 2013; Masura et al., 2015; GESAMP, 2019; MSFD..., 2023; Markley et al., 2024).

2.2 Sample processing

Sample preparation (Liebezeit & Dubaish, 2012; Imhof et al., 2012; Nuelle et al., 2014; MSFD..., 2023) included the following steps (Fig. 2):

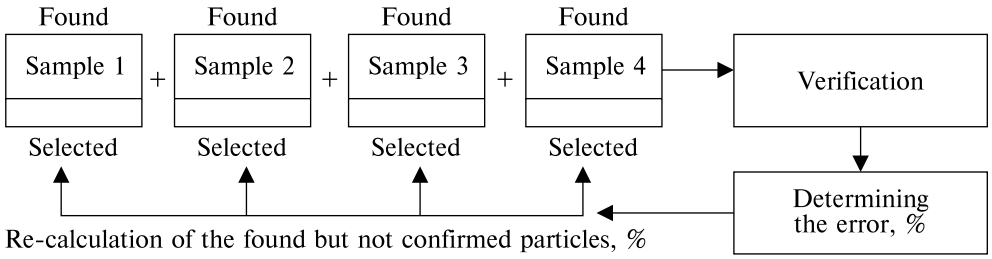

Figure 2. The algorithm of finding the putative MP particles by microscopy, verification by Raman spectroscopy, and re-calculation of the true amount

1. Desiccation at 60 °C without pre-sieving.

Due to the sensitivity of MP to temperature increase and fragility, the minimum temperature regime was selected from the existing methods, which corresponded to (MSFD..., 2023). Subsequent calculations of the number of particles were carried out on the dry mass of the involved bottom sediment samples.

2. Flotation in a $ZnCl_2$ solution to separate the mineral component and decantation of the microplastics. As the particles' density is usually up to 1.4 $g \cdot cm^{-3}$, the $ZnCl_2$ solution's density was 1.8 $g \cdot cm^{-3}$. The reagent was pre-filtered before use, and due to the size of the filter mesh for MP, a polyamide filter with a 26 μm cell was used.

3. Treatment with 35% H_2O_2 to remove the suspended organic substances.

4. Treatment with alcohol to prepare the particles for Raman spectroscopy.

After each stage, the samples were washed in distilled water. Filtering was done through a 36-μm polyamide membrane (the same was used as the reference grid for microscopy, Fig. 3). (Thus, transparent linear objects of approximately the size of the filter's fibers were excluded from the MP counts).

It should be noted that there were some deliberate deviations from the sequences recommended by the methods. Due to the small sample weights, preliminary dry sieving was not used. For homogeneous conditions during sampling, 10% of field blank samples relative to the total number of samples for MP studies are recommended (MSFD..., 2023). However, due to the specifics of the study area and limited possibilities for collecting and transporting samples, it was also necessary to abandon this point of the recommendations. Also, due to the insignificant content of organic and organogenic components of bottom sediments, there was no need to use acidic and alkaline reagents (formic acid, potassium hydroxide, etc.) suggested by methodological guidelines. The laboratory conditions, taking into account the work with small particles, provided a laminar airflow during their visual identification and extraction.

2.3 Pollutant quantification

The pollutants were counted as follows:

• observation at 40×—800× magnification using a BIOLAR microscope for transmitted-light or mixed-light work. The particles identified as potential MP fragments were counted, and the most representative ones were collected by needle for further analysis.

Physical preparation of the particles via one of the two methods:

• confirmation of the putative MPs by Raman spectroscopy using the MDR-23 diffraction monochromator (fitted with a cooled CCD detector (Andor iDus 420, Great Britain)) and a Micromed microscope. The Raman spectra were excited by solid-state lasers at 457, 532, 671, and 785 nm. To prevent thermally induced modification, power density was less than 10^3 $W \cdot cm^{-2}$;

• thermal identification (the hot needle test) (MSFD..., 2013; De Witte et al., 2014; Vermeiren et al., 2020; Mariano et al., 2021). It was usually applied to coloured elongated particles (mostly fibers) less than 10—20 μm wide, for which laser verification is complicated.

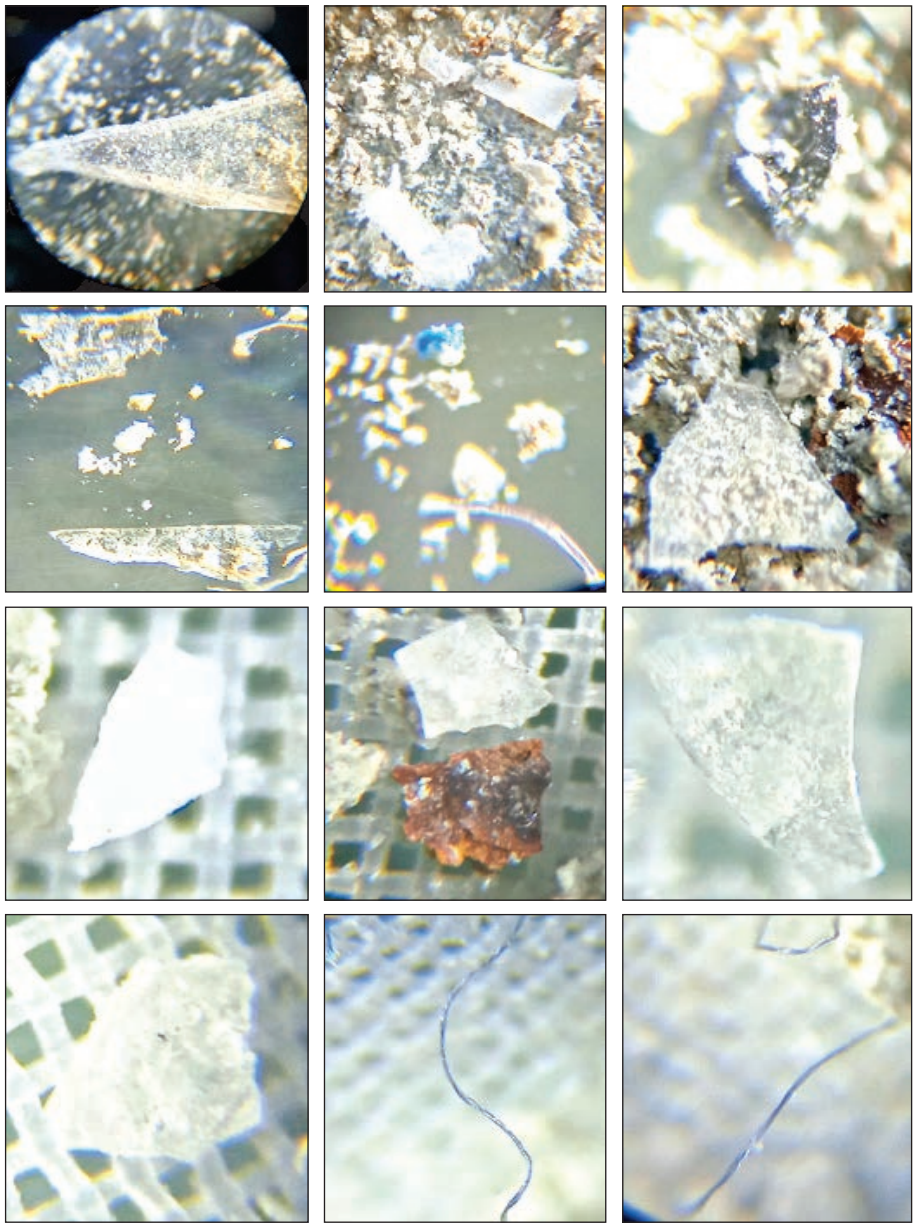

Figure 3. Variously shaped objects from Sample 1, which could be artificial polymers, most of them flat and translucent pieces or matte-coloured fibers (the inner side of the filter cell is 36 μm)

The main parameters were the particle's colour, length-to-width ratio, and morphology. (Colour was also one of the main parameters for visual identification).

On average, the array of the isolated solid fragments of mineral, organic, and anthropogenic origins did not exceed 50–100 per 200 g of dry matter. Selecting potential MP smaller than 200 μm was complicated by the floating polymers being accompanied by plant and animal remains, organic and mineral aggregates, and probably organogenic carbonate buildups at the flotation solution concentration of 1.8 g · cm^{-3}.

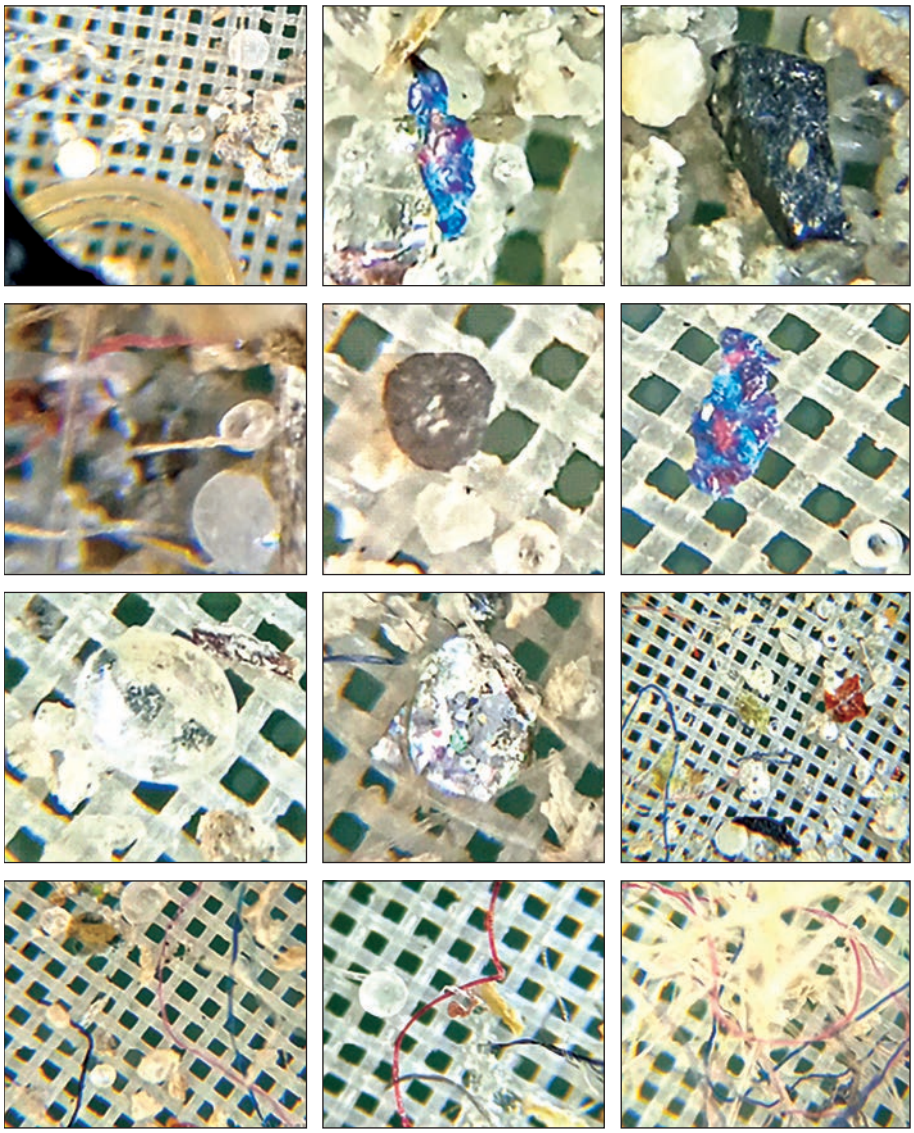

Figure 4. Variously shaped objects from Sample 2, which could be artificial polymers, mostly coloured and bulgy; there are a lot of coloured fibers (the inner side of the filter cell is 36 μm)

The procedure was based on several guidelines, the most recent being Guidance on Monitoring of Marine Litter in European Seas (MSFD..., 2023). The control groups were pooled from different samples to obtain the recommended 20 specimens (particles) or 10% of the overall number. There were two groups of morphologically different specimens, one to be verified by Raman spectroscopy and the other by the hot needle test. This allowed us to statistically process the data and find the identification error for every morphological type; if some components were not confirmed as polymers, their fraction in the control group was taken as the error coefficient to recalculate the amount in the sample (Fig. 2).

3 Results and discussion

The mineral matrix of the sampled sediments was silty aleurite with various amounts of dense, non-

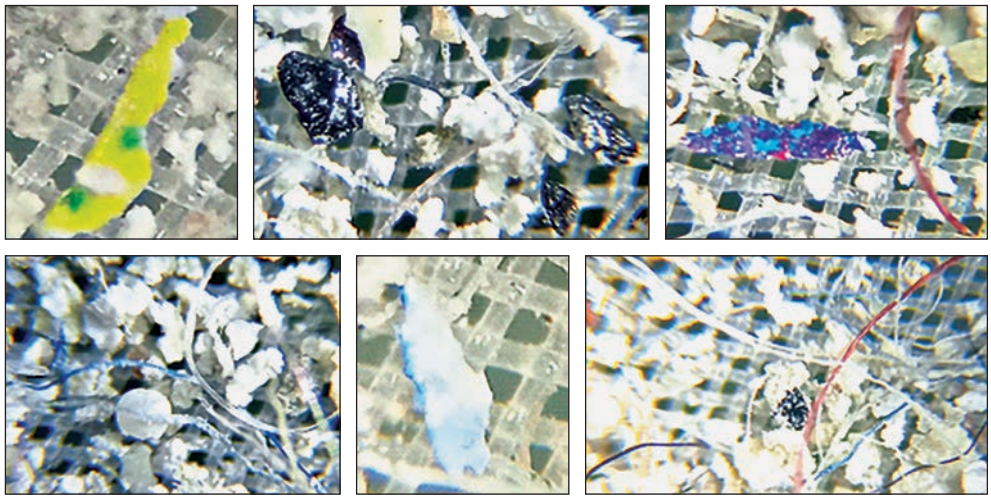

Figure 5. Variously shaped objects in Sample 3, which could be artificial polymers (mostly coloured fibers) (the inner side of the filter cell is 36 μm)

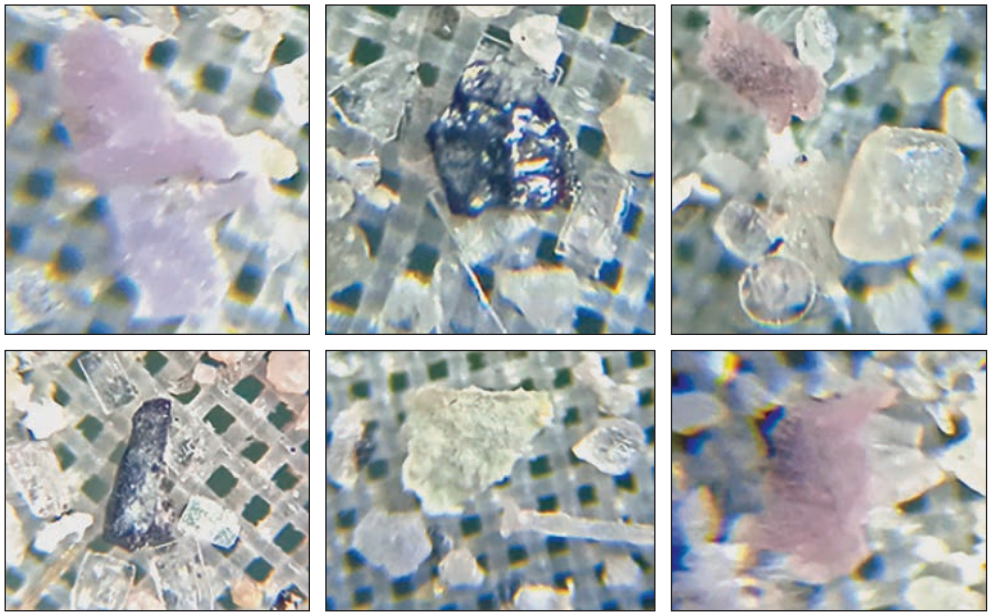

Figure 6. Variously shaped objects from Sample 4, which could be artificial polymers (mostly bulgy coloured and flat transparent pieces) (the inner side of the filter cell is 36 μm)

layered, pale gray sand. The wet-to-dry ratio ranged from 1.2 (Site 1) to 1.6 (Site 3), with the comparison unit being 50 grams of dry residue.

Microscopy showed that a particle visually identified as plastic belonged to one of two morphological groups; particles were then evaluated further (Masura et al., 2015; Markley et al., 2024). The main identifying parameters were the colour, the length-to-width ratio, and morphology. The study employed the recommended templates for the main morphologic classes of particles (MSFD..., 2023) adjusted to the specifics of the sampling area and the particles' types and characteristics. For example, the polymer variety was divided into two groups by visible features.

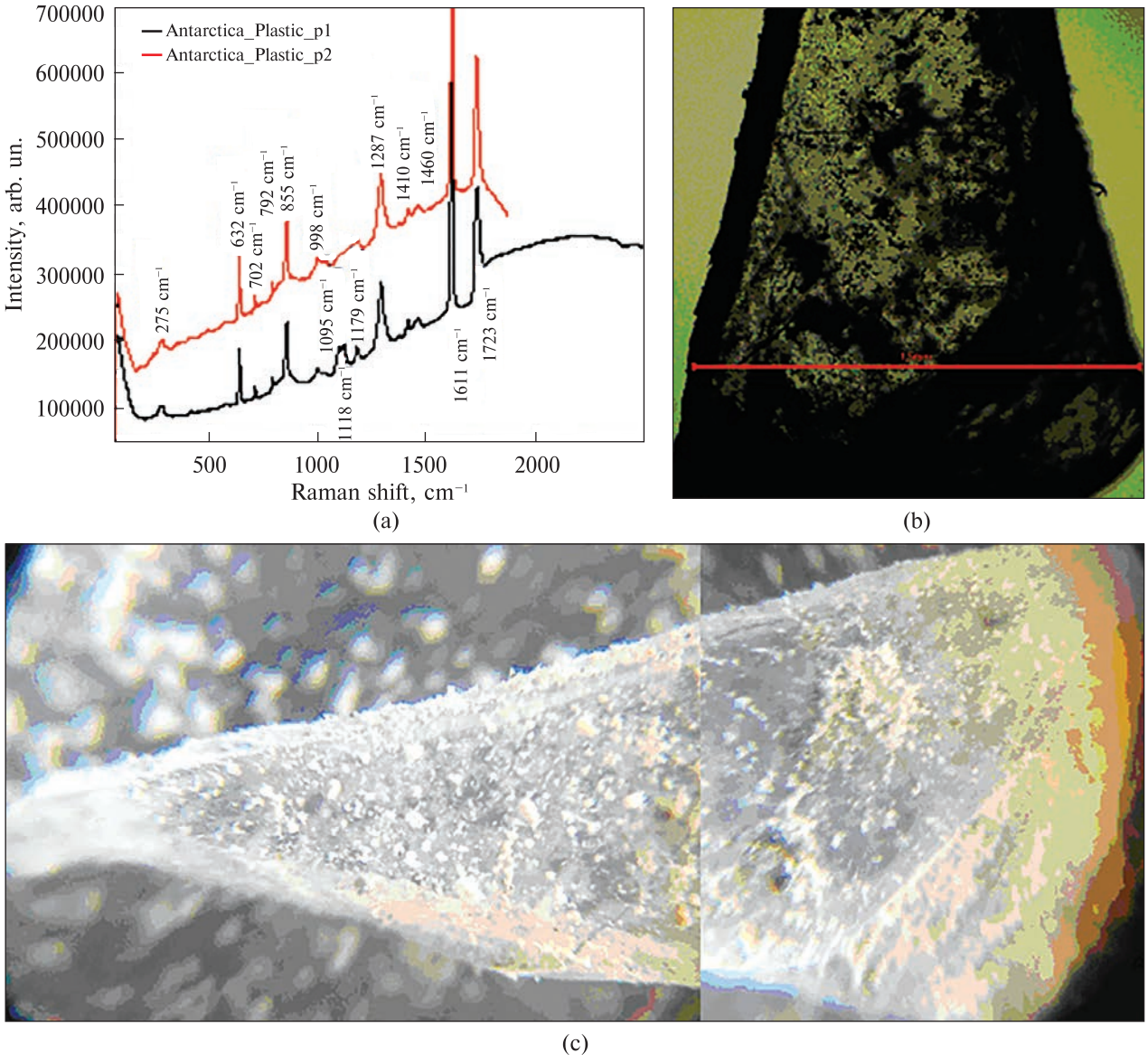

Figure 7. (a) – the Raman spectrum of a polyethylene terephthalate (PET) fragment from Sample 1 in the 200 to 1800 cm^{-1} range (using an MDR-23 diffraction monochromator); (b) – the fragment as seen under the Micromed; (c) – the same fragment seen under the BIOLAR microscope. As its size was 3.5 × 1.5 mm, the last picture is compiled from two fields of view

Linear coloured objects. Length significantly larger than diameter (fibers). As a rule, the criteria for the elongated MP particles were represented in all reference materials: lack of cell or organic structures, uniform thickness, lack of tapering towards the end, and a three-dimensional curvature. To confirm, the hot needle method was used (De Witte et al., 2014) as the spectroscopy was substantially complicated since the fibers' thickness did not exceed 10–20 μm. Meanwhile, the objects' length allowed us to test them thermally by a fairly robust technique for synthetic polymer counts. However, it does not permit confirming the chemical composition and classifying the objects more pre-

cisely. The colourless (transparent, white, or matte) fragments were not viewed as potential MP particles, as previous research confirmed only 20% of them as polymers (Iemelianov et al., 2024). Some non-identified particles were too small for the analysis, and the real amount of MP in the samples was probably larger.

Flat or bulgy objects of different colours and shapes – a collection of objects which morphologically (according to their shape, luster, crack pattern, and so on) could belong to artificial polymers. They were counted, and some were subjected to Raman spectroscopy. By the microscopical evaluation results, a number of 40–5000 μm particles were tentatively identified as MP. The majority of such particles were represented in Samples 1 and 2. Figures 3–6 show the most representative fragments included in the overall count of potentially possible MP particles. The control group was then pooled from all samples, and the final calculation included the fraction of confirmed polymers.

Observations showed that most putative MP particles were isolated from Samples 1 and 3. For the representative specimens selected to test the flat or bulgy objects of different colours and shapes, the error comprised almost 85%, i.e., only one specimen in six was confirmed as an artificial polymer. Two specimens from Sample 1 that were sufficiently large to be "individually" verified were studied separately. Spectrometry confirmed their manmade nature as one turned out to be a fragment of polyethylene terephthalate (PET) with a partially corroded surface (Fig. 7) and the other polypropylene (PP).

To verify particles on the Raman spectrometer, representative fragments were selected: 8 particles from Sample 1, 7 from Sample 2, 5 from Sample 3, and 6 from Sample 4.

The highest confirmation coefficient (25%) was in Sample 1, where two fragments of artificial polymers (polypropylene and polyethylene terephthalate) were verified. Confirmation coefficients of Sample 2 and Sample 3 were approximately the same (15 %); one particle in each sample was confirmed. In Sample 4, not a single particle was

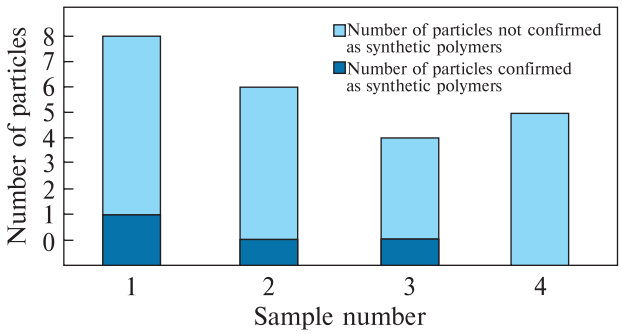

Figure 8. The ratio of the number of measurements on the Raman spectrometer to the number of confirmed polymer particles

confirmed by Raman spectroscopy. 26 measurements confirmed only 4 MP particles, that is, the confirmation coefficient for all samples was 15%, as indicated above (Fig. 8).

This was unexpected for particles from Sample 2, where a significant number of coloured particles allowed us to predict a significantly higher percentage of instrumental confirmation. This influenced the decision not to recalculate the results for coloured objects found in samples but not selected for testing on the Raman spectrometer.

Raman spectrometry also did not confirm the artificial nature of some coloured objects of this group that had been microscopically identified as MPs. In particular, the specimens below strongly scattered the exciting laser beam and intense photoluminescence, so the Raman spectra could not be obtained (Fig. 9).

The largest bulgy black particles were also tested. At 532 nm, they also had intense photoluminescence, which exceeded the Raman scattering by several orders. The materials could not be identified. Meanwhile, at 457 nm, some spectra could be registered despite the strong scattering, and the D and G bands were obtained, which most probably indicate carbon presence in the material (probably coal) (Fig. 10).

The second test (the hot needle test after De Witte et al., 2014) also showed positive results for a set of coloured fibers pooled from the samples. It is used when a particle cannot be classified as either microplastics or organic matter by spectrometry.

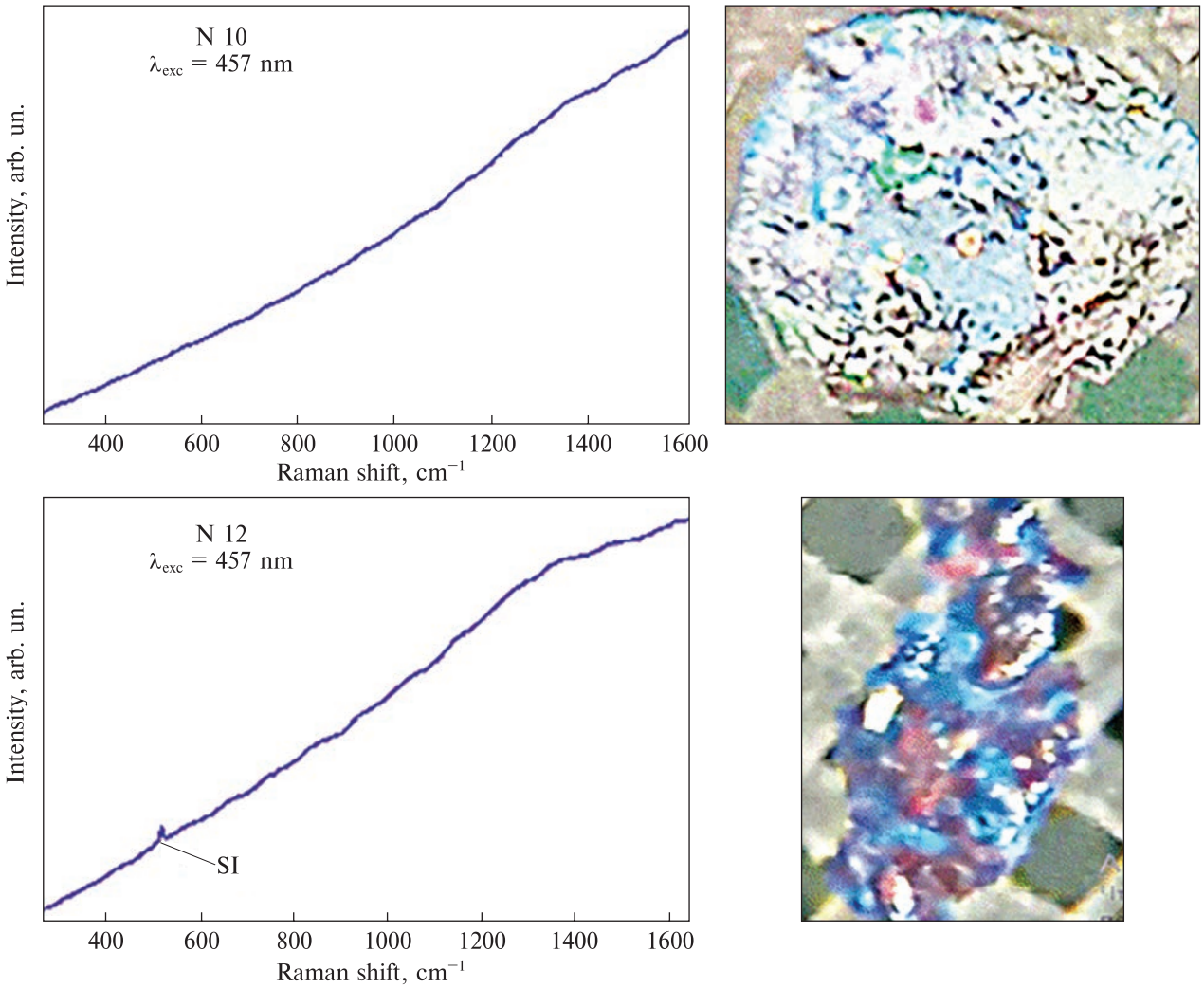

Figure 9. Raman spectrometry results for two coloured objects from the verification set. The illustrated specimens strongly scattered the exciting laser beam and had intense photoluminescence, which precluded obtaining Raman spectra

In our study, most fibers were too thin to focus the laser beam on them (Fig. 11). When touched with a very hot needle, pieces of plastics either melt or curl, while other materials behave differently. The needle must be kept very hot and brought as close as possible to the studied particle. The test is used for fragments with other properties of artificial polymers (such as colour).

The error determined by the hot needle test was calculated similarly to the Raman spectroscopy verification technique; the fraction of coloured fragments was calculated for each sample, the most representative ones were pooled and tested, the set's error was determined, and the findings for individual samples were adjusted accordingly. The individual samples' errors were up to 60%, quite comparable with the findings for the Romanian shelf (Iemelianov et al., 2024).

Due to the significant number of fibers in the samples and, at the same time, their small size, the selection was not complete. It amounted to an average of up to two-thirds of the detected potential MP particles (a particularly large number of fibers was observed in Samples 2 and 3). There-

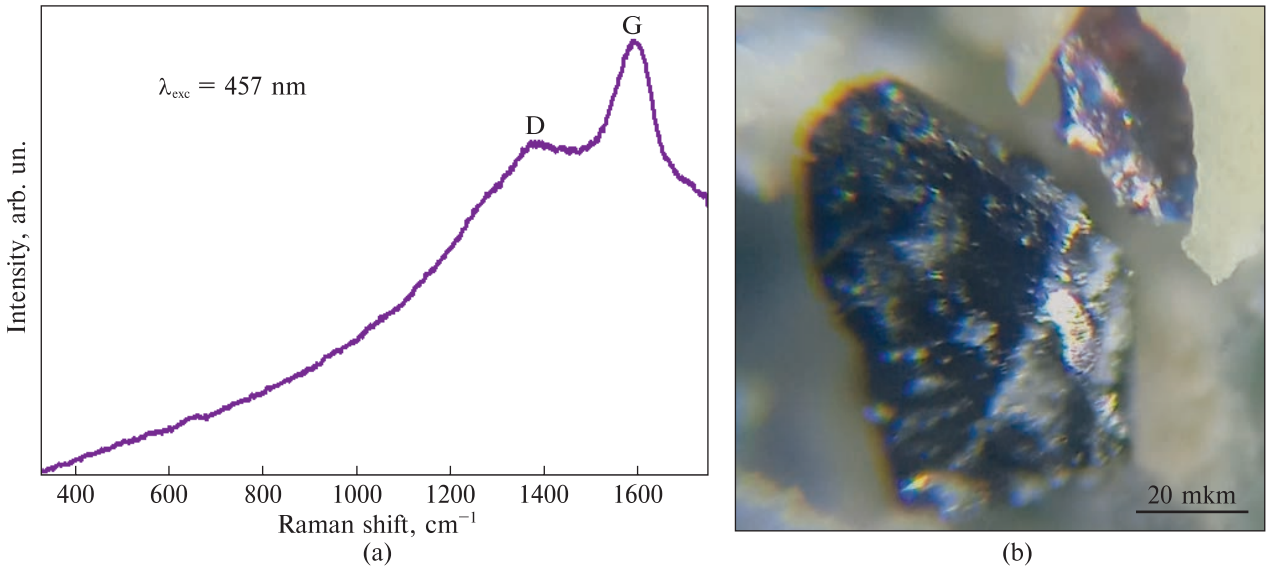

Figure 10. (a) – the Raman spectrogram of a carbon-containing substance from Sample 3 taken at 457 nm; (b) – the studied particle

fore, in this case, the recalculation had its own specifics: the percentage of confirmed polymers increased proportionally in accordance with the total number of particles recorded under a microscope rather than selected for confirmation (Table).

The findings are summarized as diagrams (Fig. 12) of the MP distribution in samples from different sites and the general distribution of the spectroscopically identified artificial polymer types.

When the thermal test results are included, Samples 2 and 3 have most of the coloured fibers. Overall, the number of polymers grows in the following order: Sample 2 > S 3 > S 1 > S 4.

The relative closeness to the station makes it a human-activity hub. An interesting study was done near Adelaide Island (Reed et al., 2018). The area is also adjacent to the British Rothera Station. The authors analyzed the remnants of synthetic polymers in the upper layer of the sediments in 20 sites within 7 km of the station and studied their possible ways of introduction.

Reed et al. (2018) found the highest particle concentration close to the sewage outfall. The MP content 1.6 km from the station did not exceed the method's detection limit. All particles except one were fibers with lengths up to 2–5 mm and diameters up to 0.1 mm; 42% of all studied objects were viscose.

In general, there is not much freely available information on the study of MPs in the bottom sediments of the Southern Ocean. Similar studies (Cunningham et al., 2020) have been conducted for deep-sea sediments in the Antarctic Peninsula, the South Sandwich Islands, and South Georgia. Studies have found quite high concentrations of MP in sediments; microplastic pollution was found in 93% of the sediment cores (28/30). The mean (±SE) microplastics per gram of sediment was 1.30 ± 0.51, 1.09 ± 0.22, and 1.04 ± 0.39 MP · g^{-1} for the specified regions, respectively. Interestingly, the accumulation of microplastic fragments was significantly correlated with the percentage of clay in the sediments.

Other sources (De-la-Torre et al., 2024) indicate that in Bransfield Channel sediment samples, MP particles were detected in 54.5% of sediment samples, with a mean value of 0.09 MP · g^{-1} (ranging from 0 to 0.2 MP · g^{-1}). All suspected MPs were blue fibers (70.7%), cellulose (73.3%), polyethylene terephthalate (PET; 13.3%), or polyacrylonitrile (PAN; 13.3%), making the results similar to (Reed et al., 2018).

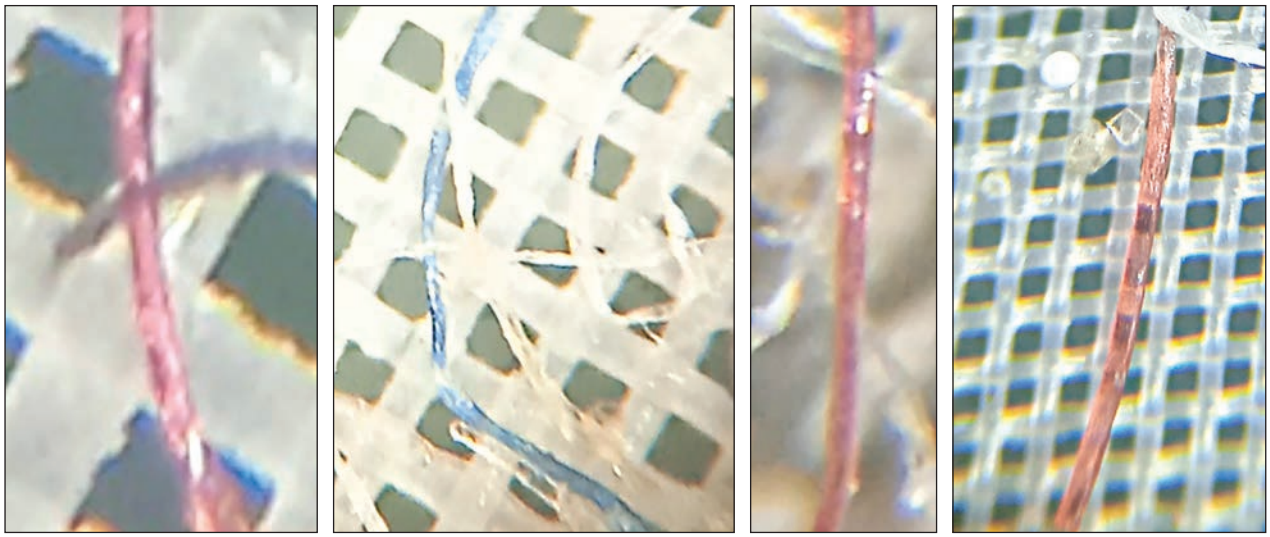

Figure 11. Fiber fragments of Samples 2 and 3 of varying colouration intensity (blue and red were the most common), 20–500 μm long, 15–20 μm wide. (The filter tissue cell's inner side is 36 μm)

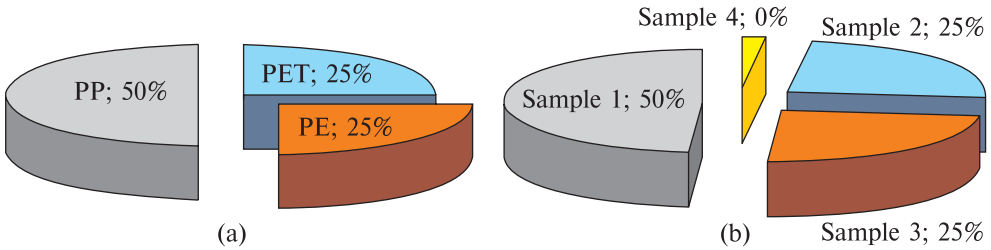

Figure 12. Diagrams: (a) – the distribution of the polymer types confirmed by Raman spectroscopy (polypropylene PP, polyethylene PE, polyethylene terephthalate PET) in all samples; (b) – the distribution of polymers confirmed by Raman spectroscopy in separate samples

In our study, MP concentrations were much lower per unit of volume; the lowest number of polymeric fragments was likewise seen at Site 4 which was farthest away from the potential source of anthropogenic substances (the Ukrainian station).

Our earlier research (Iemelianov et al., 2024) of the Black Sea sediments confirmed microfiber

Table. Generalized results of detection and identification of fibers by the thermal test

Sample number	Particles recorded under a microscope	Particles selected for analysis	Confirmed MP particles	Recalculated to total quantity	Percentage of confirmed from selected
1	6	5	3	3	60 %
2	15	11	5	7	45 %
3	14	10	4	6	40 %
4	5	5	3	3	60 %

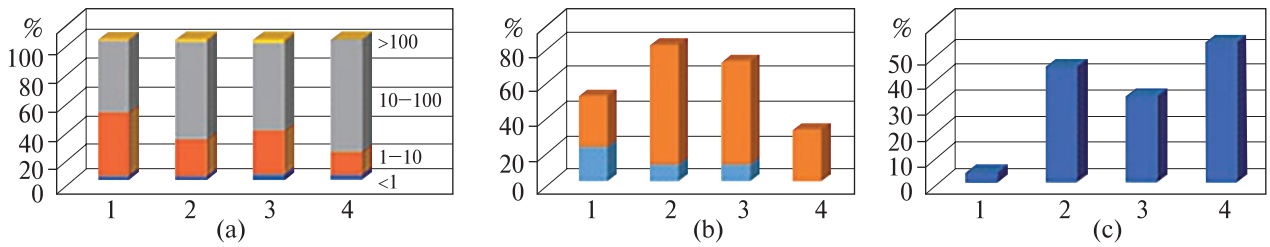

Figure 13. Diagrams: (a) – the distribution of the samples' granulometric components (μm), %; (b) – the total number of MP particles (blue color – confirmed by Roman spectrometry, orange – by hot needle test); (c) – depth at the sampling sites, m

particles: fragments of a fabric made of polyester, polyamide, and other polymers. It is used to make cleaning supplies, dishwasher cloths and other swipes, mats, socks, and so on. Microfiber production can blend polyamide and polyesters as the fiber is extruded as a double thread, with polyester covering a polyamide "star" inside. The composition can be the reason why the type of a polymer cannot be determined with precision.

Our previous experience in the Black Sea showed that sediment type plays a significant role in the distribution of MP concentrations. As a rule, the component with the highest degree of dispersion contains the most polymer particles. A probable reason is the sedimentation conditions in different bottom areas, as the density of the most common MP particles is comparable to that of water (0.9–1.2 $g \cdot cm^{-3}$), so their sinking occurs preferentially in the lowest-hydrodynamic-influence setting.

Our results did not show a positive connection between the depth distribution, granulometric content, and the amount of confirmed MP fragments. Such studies would benefit from a far higher, statistically meaningful number and volume of samples (Fig. 13).

It should be noted that for statistical processing the minimum number of samples in the data set should be 5 units. Therefore, the correlation analysis based on the Microsoft Excel program had a cognitive generalized format. We studied the relationships between such factors: 1) the granulometric composition of samples; 2) the depth of the water area at sampling points; 3) their distance from the Antarctic station; 4) the distribution of plastic fragments (confirmed by Raman spectrometry, confirmed by a thermal test, and their total number). As expected, the most significant correlation was between the water area's depth and the content of the pelitic component (0.97). The relationship between the quantitative distributions of confirmed polymer particles determined by different methods had the lowest correlation degree (zero). The correlation links between the distance of sampling points from the station and the content of the pelitic component with the distribution of detected MPs showed insignificant negative coefficients.

4 Conclusions

The number of samples collected to search for MP in the sediments is too small to draw any conclusions about the sources of contamination and its distribution pathways. The study only outlines some trends in MP distribution in the sediments near the Akademik Vernadsky station. The high-precision methods, such as Raman spectroscopy, confirmed MP presence in the samples. The link between the artificial polymers' amount and variety and the environmental factors was viewed according to a number of parameters, including the following.

We found and estimated the number of artificial polymer fragments in the upper sediment layer in the waters close to the Ukrainian Antarctic Station and determined their type. In the future, comprehensive research based on the current work can allow to identify a number of patterns in the artificial polymers' distribution in the demersal and

bottom ecosystems and delineate conceptual approaches to minimize the pollution.

Author contributions. Conceptualizing: Y. N. & O. O.; methods: Y. N. & S. K.; data collection: Y. N., S. K., & G. I.; investigation and interpretation: Y. N., S. K., & O. O.; drafting: Y. N., S. K., & G. I.; manuscript processing: Y. N., S. K., & G. I. Every author participated in the interpretation and discussion of the results and edition of the manuscript. All authors have read and agreed to the published version of the manuscript.

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Дослідження мікропластику в донних відкладах акваторії антарктичної станції «Академік Вернадський»

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Реферат. Незважаючи на віддаленість Антарктиди від потужних джерел антропогенного впливу, її природне середовище зазнає змін через діяльність наукових станцій, туризму, транспортних комунікацій та видобутку біоресурсів. У роботі представлено розподіл штучних полімерних частинок (мікропластику) у верхньому шарі донних відкладів в акваторії поблизу станції «Академік Вернадський». Метою дослідження є виявлення мікропластика в геологічних компонентах і адаптація лабораторного циклу обробки проб та ідентифікації частинок. Зразки були відібрані в 2022 році в ході сезонних польових робіт на глибині від 4 до 60 м. Зокрема, дослідження охопило проби донних відкладів з морських проток на різній відстані від антарктичної станції. У більшості зразків був присутній мікропластик, який був кількісно визначений та класифікований за морфологією. Передбачуваний мікропластик був досліджений методом раманівської спектроскопії (дифракційний монохроматор МДР-23), в результаті дослідження були виявлені такі полімери, як поліпропілен, поліетилен і поліетилентерефталат. Деякі частинки (в основному волокна), що морфологічно не піддаються спектрометричному дослідженню, були ідентифіковані як штучні полімери термічними методами без хімічного аналізу. Для розуміння можливого зв'язку вмісту мікропластиків в поверхневих донних відкладах з природними та антропогенними факторами було досліджено речовинний та гранулометричний склад осадів, проаналізовано результати аналогічних досліджень, що проводились на інших полярних станціях в межах Антарктичного півострова. Мала кількість проб донних відкладів, задіяних в дослідженнях, не дозволила встановити якісний зв'язок між факторами розподілу глибин, гранулометричним складом проб донних відкладів та загальною кількістю підтверджених фрагментів МП. Таким чином, публікацію слід вважати попереднім, оглядовим та методично показовим дослідженням щодо ідентифікації частинок мікропластику у донних відкладах акваторії, що прилягає до Української антарктичної станції.

Ключові слова: Антарктичний півострів, забруднення, мікроскопічні дослідження, поверхневий шар донних відкладів, Раманівська спектроскопія, штучні полімери