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ESTABLISHING A STANDARD-BASIS FOR THE CHARACTERIZATION OF MARINE MICROPLASTIC-PELLETS

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ABSTRACT: Plastic pellets are small granulated microplastics (diameter ranging from 1-5 mm), which are considered as emerging pollutant in aquatic environment. Currently, the literature provides a poor database for classification and standardization of plastic pellets, impairing the comparison of environmental impacts assessed by several studies. Thus, in this work, a classification related to pellet characteristics was proposed in order to establish a standard of identification. Four sampling surveys were carried out in the Pecém-CE port area in the year of 2017 (northeastern coast of Brazil). The pellets were characterized according to its size, shape, transparency, and color. From the characterization of the 1,411 pellets collected, granules with different morphologies were observed. Most classes of pellets had light colors (white 37%, yellow 22% and amber 12%). The classification of the granules resulted in a catalog with 155 classes, divided into four blocks. The standardization of the characteristics of the pellets in classes, provided a documentation of the types of granules produced and found near the port area, making it possible to quantify and characterize the granules manually and with the naked eye. This type of classification can be used anywhere in the world as a tool to assist research on the presence of pellets in the marine environment and the impacts caused by them.

Keywords: beach survey, environmental pollution, plastic pellets, standardized characterization.

RESUMO: *Pellets de plástico são pequenos microplásticos granulados (diâmetro variando de 1-5 mm), que são considerados como poluentes emergentes no ambiente aquático. No entanto, a literatura fornece um banco de dados insuficiente para classificação e padronização de pellets plásticos, dificultando a comparação dos impactos ambientais avaliados por diversos estudos. Assim, neste trabalho, foi proposta uma classificação relacionada às características do pellet a fim de estabelecer um padrão de identificação. Quatro coletas foram realizadas na área do porto de Pecém-CE (litoral nordeste do Brasil) em 2017. Os pellets foram caracterizados quanto ao tamanho, forma, transparência e cor. A partir da caracterização dos 1.411 pellets coletados, foram observados grânulos com diferentes morfologias. A maioria das classes de pellets apresentou cores claras (branco 37%, amarelo 22% e âmbar 12%). A classificação dos grânulos resultou em um catálogo com 155 classes, divididas em quatro blocos. A padronização das características dos pellets em classes, permitiu a documentação dos tipos de grânulos produzidos e encontrados junto à zona do porto, permitindo quantificar e caracterizar os grânulos manualmente e à olho nu. Este tipo de classificação pode ser utilizado em qualquer parte do mundo como ferramenta para auxiliar nas pesquisas sobre a presença de pellets no meio marinho e os impactos causados por eles.*

Palavras-chave: *Pellets plásticos, pesquisa de praia, caracterização padronizada.*

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1. INTRODUCTION

Plastics are synthetic organic polymers (Barnes *et al*., 2009; Worm *et al*., 2017), whose world production between the years of 1950 and 2019 increased from one and a half million ton to three hundred and sixty-eight million tons (PlasticsEurope, 2010; 2020). According to their size, plastics are classified into megaplastics, macroplastics, mesoplastics, microplastics and, nanoplastics (Barnes *et al*., 2009; Dris *et al*., 2015; Bhuyan *et al* 2021; Kershaw and Rochman, 2016). In particular, microplastics with diameters between 1 and 5 mm are most preferred for marketing and transportation (Fred-Ahmadu *et al*., 2020; Cai *et al*., 2018; Galloway *et al*., 2017; Wessel *et al*., 2016).

The microplastics can originate from primary sources such as pellets (raw material to produce plastic goods) (Andrady, 2011; Cai *et al*., 2018; Underwood *et al*., 2017; Wagner *et al*., 2014; Worm *et al*., 2017) or secondary ones, resulting from the fragmentation and degradation by photo-oxidation or physical abrasion of larger plastics (Avio *et al*., 2017; Veerasingam *et al*., 2016; Wagner *et al*., 2014). In turn, plastic pellets, also referred as granules or thermoplastic resins (Epa, 1992; Takada, 2006; Wilcox *et al*., 2015; Worm *et al*., 2017) are generally cylindrical or spherical granules with a diameter normally between 2 and 5 mm (Costa *et al*., 2010; Epa, 1992). The most produced resins are those composed of polyethylene (PE), polypropylene (PP), polystyrenes (PS), polyvinyl chloride (PVC) and polyethylene terephthalate (PET) (Ivar Do Sul and Costa, 2014; Lebreton *et al*., 2017; Wright *et al*., 2013).

These plastic pellets can enter the aquatic environment through different pathways (Dris *et al*., 2015). For example, dispersion from the mainland to the marine environment can occur through stormwater runoff, discharges from sewage treatment plants, wind, river runoff, and accidental spills (Dris *et al*., 2015; Underwood *et al*., 2017). In addition to natural toxic substances added to the pellets, other chemical compounds present in the aquatic environment can be adsorbed/adhered, such as: persistent organic pollutants (POPs), aromatic hydrocarbons (PAHs) and polychlorinated biphenyls (PCBs) (Endo *et al*., 2005; Mato *et al*., 2001; Ogata *et al*., 2009; Rios *et al*., 2007; Takada, 2006). Unfortunately, due to the small size, density and color, pellets can be ingested by aquatic animals (Acampora *et al*., 2017; Cole *et al*., 2013; Lusher *et al*., 2013; Miranda and de Carvalho-Souza, 2016), causing serious toxicity effects due to the bioaccumulation/biomagnification at various food chain levels (Costa *et al*., 2019; Le *et al*., 2016; Worm *et al*., 2017). Interestingly, some studies showed how the growth of biofilm adhered to microplastics increase the incorporation of pollutant metals (Richard *et al*., 2019). However, the wide variety of pellet contents found in the environment makes it difficult to standardize scientific studies regarding the real effects of these materials directed to the type of material.

Until the beginning of 21st century, research on pellets focused on quantifying and qualifying the sampled material (Fernandino *et al*., 2015). At the beginning of this century, studies began on the quantification of POPs in pellets (Mato *et al*., 2001) which gained relevance with the implementation of the International Pellet Watch (IPW) global monitoring program in 2001 (Takada, 2006). In addition, many studies have been carried out to identify pellet intake by marine animals (Acampora *et al*., 2017, Bellas *et al*., 2016, Choy and Drazen, 2013, Cole *et al*. al., 2015). However, according to Fernandino *et al*. (2015), there is no standard to classify these resins and this impairs the standardization of information provided by several studies characterizing this material for the scientific community. Therefore, the objective of this work is to establish a standard classification related to the pellet characteristics visible to the naked eye for future scientific works.

2. MATERIAL AND METHODS

2.1. Sampling area and pellets sampling

For this work, the study area comprised beach strips near the port of Pecém (offshore, built in an industrial-port complex), located on the west coast of Ceará, in São Gonçalo do Amarante city, Brazil.

Four monthly samples were carried out near to the port of Pecém (Table 1), in portions of the previous sand strip (PA), east of the port with initial latitude 3°33'23.14'' S initial length 38°48 '8.05 " W and final latitude 3° 33'27.56" S and final longitude 38°48'5.46 " W, based on the influence of ocean current. It was also sampled in the posterior sand strip portion (PP), west to the port, initial latitude 3°32'42.13' 'S initial longitude 38°49'2.6'' O, final latitude 3°32'43.87" S and final longitude 38°49'7.09'' O, having as reference the geographic north (Figure 1).

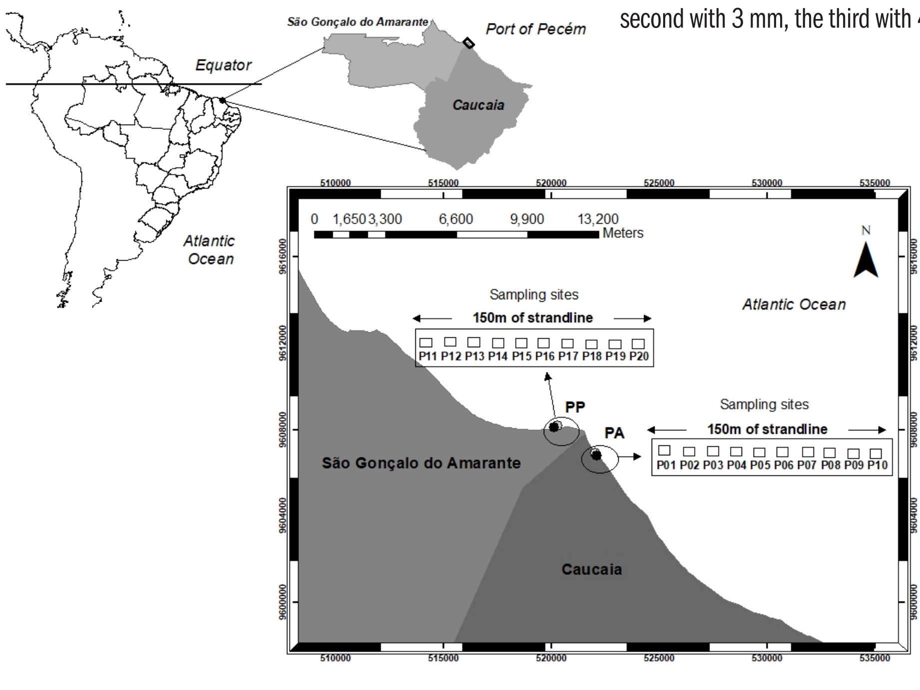
For sediment sampling, it was used the methods with adaptations (Lippiat *et al*., 2013; Sivadas *et al*., 2022). The adaptations consisted in determining a sample area of 150 m (the initial points being 0 m and final 150 m) parallel to the coastline and dividing it by 10 equidistant sections of 15 m in length.

In the present study, it was possible to determine sampling pellets at the post-beach (Fernandino *et al*., 2015) in 10 quadrats in each sampling area (Figure 1), using a square transect (1 m²). Pellets visible by the naked eye were manually removed from the surface layer of the sediment. Then, a sediment layer was collected from the entire transect area from one to three centimeters deep. The sediment was immersed several times in 10 L-buckets, until all sediment was immersed, with approximately 8 L of sea water and the floating pellets were separated from the plastic fragments and removed one by one manually.

Table 1. Date and tidal regime of sediment sampling in PA e PP in the adjacencies of port of Pecém.

Date (2017)	Time (h:min) (Start - end)	Tide Regime	Tidal range (m)
May 7-8th	9:00 - 11:30	Spring tide	2.5 – 0.5
June 4th	8:00 - 10:30	Spring tide	2.2 – 0.7
July 7th	9:00 - 12:30	Spring tide	2.4 – 0.6
August 20th	09:00 - 12:00	Spring tide	2.8 – 0.0

Source: Directorate of Hydrography and Navigation (DHN) (2017).



Note: PA: Previous sand strip (E); PP: Posterior Sand strip. WGS 1984 coordinate system UTM zone 24 S. Projection Transverse mercator.

Figure 1. Area and sampling site on the beach strip adjacent to the port of Pecém, Ceará, Brazil.

2.2. Pellets characterization

The granules were stored in plastic containers and transported to the Effluent and Water Quality Laboratory (EQUAL) of the Federal University of Ceará, (UFC) city of Fortaleza, Brazil, where they were duly quantified and later characterized by the naked eye according to size, shape, transparency and color. The pellet size was measured with pachymeter with an accuracy of 0.05 mm. In relation to the shape, the pellets were divided in spherical, flat, cylindrical, cylindrical flat, rectangular, cubic, and irregular (those that did not present any of the previous forms). The color characterization was performed from the RGB universal color table (R-red, G-green and B-blue), one of the most widely used color standards for image data processing and storage (Vezhnevets *et al*., 2003).

The color was determined by a single researcher so that there was no distortion in the results and the pellets was divided into: white, yellow, amber, red, turquoise, blue, light blue, lime green, yellowish green, gray, black, brown, brown yellows and violets. The transparency degree was divided into three categories: opaque, translucent, and transparent.

After the characterization, the pellets were separated and organized in blocks according to the diameter of the granules, also considering the other characteristics (color, shape and transparency). The first block was pellets with diameter 2 mm, the second with 3 mm, the third with 4 mm and the fourth with 5 mm.

3. RESULTS

Pellets characterization

From the characterization of the 1,411 pellets collected, granules with different morphologies were observed (Supporting material). It was also observed that in most samples, most of the pellets had light colors, but also dark colored resins were found. The classification of the granules resulted in a catalog with 155 classes, divided into four distinct blocks, considering four factors: size, shape, color, and transparency. Figure 2 show the cluster pellets by size (2, 3, 4 and 5 mm) for the 155 classes group found. The Classification and characteristics of pellets by size are separately discriminated in Supplementary materials (Table 2 to Table 5).

When the different classes and blocks were analyzed, granules with diameters of 6 and 8 mm were found with characteristics that classify them as thermoplastic resins. However, these granules are not considered microplastics standards, due to their size (> 5 mm) (Costa *et al*., 2010; Dris *et al*., 2015; Fernandino *et al*., 2015; Mato *et al*., 2001; Underwood *et al*., 2017). The percentage to general characteristics of the pellets found are shown in Figure 3.

4. DISCUSSION

4.1. Intrinsic aspects of color

Not surprisingly, most of pellets classes found (37%) were white followed by yellow pellets, as being an issue resulting from the industry's tendency to produce white pellets (Figure 2). Since it is known that industries produce more light-colored pellets (Epa, 1992), because thus, chemical additives and plasticizers can be added when manufacturing the final product from the resins, modifying the initial coloration (Andrady and Neal, 2009).

The additives optimize the performance and give other properties to the resins (*e.g.*, change the original density of the granules) (Bellas *et al*., 2016; Talsness *et al*., 2009), which can increase resistance to heat, oxidative damage, and microbial

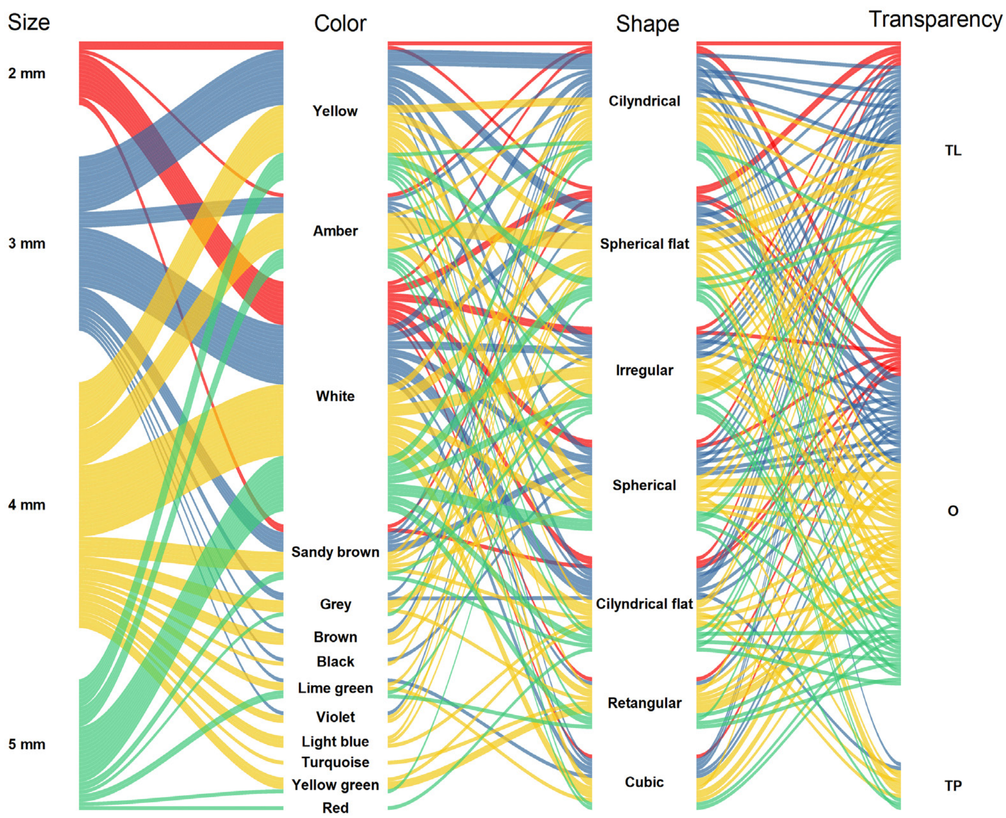


Figure 2. Cluster of characterization and classification for all 1,411 pallets by size, color shape and transparency. The 155 classes are shown in supplementary material.

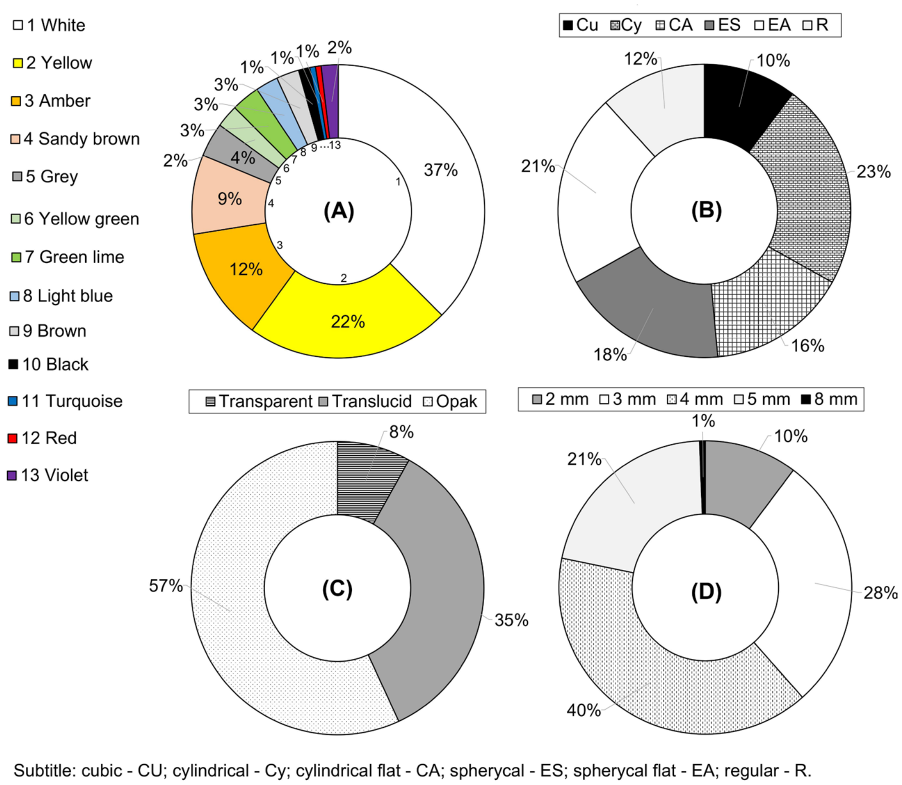


Figure 3. Percentage of the 155 classes by color (A), shape (B), transparency (C) and size (D).

degradation, making them stay longer in the environment (Browne *et al*., 2007; Lithner *et al*., 2011; Thompson *et al*., 2009).

On the other hand, yellow and brown, in their different shades may have originated from the photo-oxidation process by ultraviolet radiation (UV) or by physical weathering (Ismail, 2009; Karapanagioti and Klontza, 2007; Turner and Holmes, 2011). The degradation of pellets exposed to UV rays can vary according to environmental conditions. Therefore, it is fundamental knowing the process of photo-oxidation in different environments to calculate the dwell time and degradation, as well as to provide a basis for assessing the situation of plastic pollution in the environments (Cai *et al*., 2018). For instance, Cai *et al*. (2018) carried out a laboratory experiment in which they used three types of plastic resins (PP, PE and PS). The samples were placed on glass plates and submerged in pure water and simulated sea water and subjected to a UV light bulb (UVA340).

According to Cai *et al*. (2018), the degradation of all analyzed plastic resins was significantly higher in air-exposed condition than in aqueous solution environments (*e.g.*, sea water and ultrapure water). This may be related to the higher oxygen content in the air, as well as to the higher rate of UV radiation incident on the pellets. Therefore, knowing the origin of the pellets in relation to the collection site (whether water or soil) is important, as there may be places where there is a higher incidence of UV radiation, as well as contact with sea water or air, changing the rate their degradation. Thus, polymer discoloration can be caused by several factors (Endo *et al*., 2005), such as type and concentration of additives, environmental condition, and elapsed time after polymer production. In addition, the different colors or shades of yellow and brown suggest that the pellets underwent different degrees of weathering (Turner and Holmes, 2011).

Many studies classify the pellets by color, shape, size (Corcoran *et al*., 2020; Li *et al*., 2020; Wessel *et al*., 2016), but there is no standardization as proposed here. According to Corcoran *et al*. (2020), identifying these characteristics can be useful for pellet manufacturers and processors who want to determine whether their products are contributing to pellet pollution in different beach places. Thus, when organizing by numeric classes, it would not be necessary to place all the characteristics of the pellets, just the number being sufficient.

4.2. Marine microbiota and the presence of microplastics

Some studies suggest that the color of the resins may influence their ingestion by the aquatic animals because, together with the small size, they resemble the prey (Choy and Drazen, 2013; Hidalgo-Ruz *et al*., 2021; Wright *et al*., 2013). According to Fotopoulou and Karapanagioti (2012), there is evidence that seabirds select specific plastic shapes and colors and are generally white or yellow in color; behavior also common among other animals, such as fish and turtles.

As a result of the selective ingestion of food, by color, by some organisms, the characterization and separation of granules in color may be ecotoxicologically important (Bellas *et al*., 2016; Endo *et al*., 2005; Neves *et al*., 2015). Depending on the color of the pellet ingested by the animal, it would be possible to assume the presence or not of organic pollutants *e.g.*, yellow pellets. However, as light colors (white, yellow, amber) are the most observed in the stomachs of animals, the prevalence of these resins may reflect the pellets availability of these colors in the environment, rather than a selectivity colors (Lusher, 2015) as described by Wright *et al*. (2013) and Fotopoulou and Karapanagioti (2012). With the classification detailed here, it would facilitate the organization of pellets that are found in animals, allowing a standardization in future results.

4.3. Size and morphology shape

The size of pellets is another important factor, because of their small size, they are more readily available to organisms throughout the food chain. Size allows pellets to be ingested by a wide range of marine animals, both in benthic and pelagic ecosystems (Lusher, 2015). Wright *et al*. (2013) stated that resins with diameters <0.5 mm are ingested 37 times more than the larger ones. The ingestion of pellets causes negative effects on animals, from physical intestinal blockage to organ damage caused by the release of toxins (Wilcox *et al*., 2015).

Most of the classes found were 4 mm in size, followed by the 3 mm size. The size of the pellet directly impacts availability for the animal, because the smaller, the more easily ingested, whether by larger or smaller beings. Conversely, few papers morphologically describe the pellets addition, the behavior and fate of microparticles of different types and forms of polymers also need to be established. Additionally, the description and inclusion of the morphology for the characterization of the pellets complements the other data (color, shape, size, and transparency). The division and characterization of the classes of this work provide data on various types of resins produced by the industry, since, although many researches make identifications about the occurrence (Corcoran *et al*., 2020; Fotopoulou and Karapanagioti, 2012; Holmes *et al*., 2012; Lozoya *et al*., 2016; Miranda and de Carvalho-Souza, 2016; Moreira *et al*., 2016; Choong *et al*., 2021; Tavares *et al*., 2016; Turner and Holmes, 2011; Turra *et al*., 2014; Wright *et al*., 2013), colors, shapes and sizes, in the literature raised for this work, no classification of this type was found. Therefore, monitoring programs in the study region are needed to assess the temporal trends of pellet accumulation on sandy beaches and are decisive for evaluating possible strategies to reduce their entry into the oceans.

In addition, other physical factors must be considered because they change the distribution of pellets such as waves, tides, speed and direction of the winds (Izar *et al*., 2019). The assessment of the physical and biological processes that influence the accumulation of pellets, especially on land and in depth, would help in the interpretation of data and the understanding of the establishment of zones of accumulation.

5. CONCLUSIONS

The standardization of the characteristics of the pellets in classes, provided a documentation of the types of granules produced and found near the port of Pecém, Ceará, Brazil, making it possible to quantify and characterize the granules manually and with the naked eye, with a classification in four blocks and 155 different classes of pellets. Yellow, amber, and brown (yellowish brown and light brown) pellets are the most frequent.

Since these colors are produced by photo-oxidation they indicate a longer travel time and presence of the respective pellets in the environment. Thus, a ratio of fresh-colored pellets divided by the number of bleached pellets can be used as an indicator for the proximity of the beach to the sources of the emitted pellets and can easily aid in estimating the time spent in the environment, either at sea or in sediment.

This type of classification can be used anywhere in the world as a tool to assist research on the presence of pellets in the marine environment and the impacts caused by them, since one of the biggest problems in the scientific community today is that there is no standardization in relation to the characteristics of resins, thus hindering in-depth studies on the subject.

In addition, more research is recommended to evaluate patterns of pellet accumulation in the Brazilian coast, which lacks data. The classification made in this work may help in future studies, in relation to the characteristics of the pellets and a possible standardization of the resins in other works.

AUTHORSHIP CONTRIBUTION STATEMENT

Clara Cabral Almeida Conceptualization, methodology validation, field sampling, laboratory analysis, manuscript writing; **Willame Araújo Cavalcante**, manuscript writing, data interpretation, validation; **Camila Dourado Alves Brito**. Field Sampling and investigation; **Lucas Nogueira Guerra** investigation; **Mathias Bochow** resources, manuscript writing and review; **Sandra Tédde Santaella** resources, manuscript writing and review, supervision.

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SUPPORTING MATERIAL

ESTABLISHING A STANDARD-BASIS FOR THE CHARACTERIZATION OF MARINE MICROPLASTIC-PELLETS

Pellets characterization

From the characterization of the 1,411 pellets collected, granules with different morphologies were observed. It was also observed that in most samples, most of the pellets had light colors, but also dark colored resins were found. The classification of the granules resulted in a catalog with 155 classes, divided into six distinct blocks, considering four factors: size, shape, color, and transparency. Tables 2 to 5 show the classes of pellets by size (2, 3, 4 and 5), respectively.

Table 2. Classification and characteristics of pellets with 2 mm.

Class	Color	Shape	Transparency
1	Yellow	Cilyndrical	TL
2	Yellow	Spherical flat	TL
3	Amber	Cilyndrical	0
4	White	Irregular	TL
5	White	Cilyndrical	0
6	White	Spherical flat	TL
7	White	Spherical	TL
8	White	Cilyndrical flat	0
9	White	Irregular	0
10	White	Retangular	0
11	White	Cilyndrical flat	TL
12	White	Spherical flat	0
13	White	Cubic	0
14	White	Spherical	0
15	Sandy brown	Cilyndrical flat	0
16	Sandy brown	Spherical flat	0

Transparency: 0 = opak, TL = translucent.

Table 3. Classification and characteristics of pellets with 3 mm.

Class	Color	Shape	Transparency	Class	Color	Shape	Transparency
17	Yellow	Spherical flat	0	39	White	Cilyndrical flat	TL
18	Yellow	Cubic	TL	40	White	Cilyndrical flat	TL
19	Yellow	Cilyndrical	0	41	White	Cilyndrical flat	0
20	Yellow	Cilyndrical	TL	42	White	Cubic	0
21	Yellow	Spherical flat	TL	43	White	Spherical	0
22	Yellow	Spherical	0	44	White	Cilyndrical	0
23	Yellow	Cilyndrical	0	45	White	Irregular	0
24	Yellow	Irregular	TL	46	White	Retangular	0
25	Yellow	Spherical flat	0	47	White	Spherical	TL
26	Yellow	Spherical	TL	48	White	Spherical flat	0
27	Yellow	Cilyndrical	TP	49	White	Cilyndrical flat	TP
28	Yellow	Cilyndrical flat	TL	50	Grey	Cilyndrical flat	0
29	Yellow	Irregular	0	51	Grey	Cilyndrical	0
30	Yellow	Cilyndrical flat	0	52	Sandy brown	Spherical	TL
31	Amber	Cilyndrical flat	TL	53	Sandy brown	Irregular	TL
32	Amber	Cubic	TL	54	Sandy brown	Cilyndrical	0
33	Amber	Cilyndrical	TL	55	Sandy brown	Spherical	0
34	Amber	Irregular	TL	56	Sandy brown	Spherical flat	0
35	White	Spherical flat	TL	57	Brown	Cilyndrical	TL
36	White	Cilyndrical	TL	58	Black	Spherical	0
37	White	Irregular	TL	59	Lime green	Cubic	0
38	White	Cubic	TL	60	Violet	Cilyndrical	0

Transparency: 0 = opak, TL = translucent, TP= transparent.

Table 4. Classification and characteristics of pellets with 4 mm.

Class	Color	Shape	Transparency	Class	Color	Shape	Transparency
61	Lime green	Cubic	O	92	White	Cilyndrical flat	TP
62	Yellow	Spherical	TL	93	White	Cilyndrical flat	O
63	Yellow	Spherical flat	TL	94	White	Irregular	O
64	Yellow	Cilyndrical flat	TL	95	White	Spherical	O
65	Yellow	Cilyndrical	O	96	White	Retangular	O
66	Yellow	Cilyndrical	TL	97	White	Spherical flat	O
67	Yellow	Retangular	O	98	White	Irregular	TL
68	Yellow	Spherical	O	99	White	Cubic	O
69	Yellow	Spherical flat	O	100	White	Cubic	TL
70	Yellow	Irregular	TL	101	White	Retangular	TL
71	Yellow	Cubic	O	102	White	Irregular	O
72	Yellow	Cubic	O	103	White	Cubic	O
73	Yellow	Spherical	O	104	Grey	Retangular	O
74	Amber	Spherical	TL	105	Grey	Irregular	TL
75	Amber	Cilyndrical	O	106	Grey	Irregular	TL
76	Amber	Spherical flat	O	107	Brown	Cilyndrical	O
77	Amber	Spherical	O	108	Brown	Cilyndrical	TL
78	Amber	Spherical flat	TL	109	Brown	Irregular	TL
79	Amber	Spherical	TP	110	Sandy brown	Spherical	O
80	Amber	Irregular	O	111	Sandy brown	Cilyndrical	O
81	Amber	Spherical flat	O	112	Sandy brown	Spherical flat	O
82	Amber	Spherical flat	TL	113	Sandy brown	Irregular	O
83	Light blue	Cilyndrical	O	114	Sandy brown	Cilyndrical flat	O
84	Light blue	Cilyndrical flat	TP	115	Black	Cilyndrical	O
85	Light blue	Spherical flat	TP	116	Turquoise	Retangular	O
86	White	Cilyndrical flat	TL	117	Yellow green	Retangular	O
87	White	Cilyndrical	TL	118	Yellow green	Retangular	O
88	White	Spherical	TL	119	Yellow green	Cilyndrical flat	O
89	White	Spherical flat	TL	120	Lime green	Spherical flat	TP
90	White	Spherical flat	TP	121	Violet	Cilyndrical	O
91	White	Cilyndrical	O	122	Violet	Spherical flat	TP

Transparency: O = opak, TL = translucent, TP= transparent.

Table 5. Classification and characteristics of pellets with 5 mm.

Class	Color	Shape	Transparency	Class	Color	Shape	Transparency
123	Yellow	Spherical	0	140	White	Irregular	0
124	Yellow	Cilyndrical flat	TL	141	White	Spherical flat	TL
125	Yellow	Spherical flat	TL	142	White	Retangular	TL
126	Yellow	Cilyndrical	0	143	White	Cilyndrical	TL
127	Yellow	Irregular	0	144	White	Spherical	TP
128	Yellow	Spherical flat	0	145	White	Spherical flat	TP
129	Yellow	Cubic	0	146	White	Cilyndrical flat	0
130	Amber	Spherical	TL	147	White	Spherical	TL
131	Amber	Cubic	0	148	White	Cilyndrical	0
132	Amber	Cilyndrical	0	149	Grey	Cilyndrical	0
133	Amber	Retangular	0	150	Sandy brown	Irregular	0
134	Amber	Cilyndrical flat	0	151	Sandy brown	Cilyndrical flat	TL
135	White	Irregular	TL	152	Yellow green	Spherical flat	TP
136	White	Spherical	0	153	Lime green	Irregular	0
137	White	Retangular	0	154	Lime green	Retangular	0
138	White	Spherical flat	0	155	Red	Cilyndrical flat	0
139	White	Cilyndrical flat	TL				

Transparency: O = opak, TL = translucent, TP= transparent.