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Using Social Media to Determine the Global Distribution of Plastics in Birds' Nests: The Role of Riverine Habitats

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Abstract: Plastics are widely distributed in all ecosystems with evident impacts on biodiversity. We aimed at examining the topic of plastic occurrence within bird nests. We conducted a systematic search on three social media platforms (Facebook, Instagram, and Twitter) to fill the gap of knowledge on plastic nests worldwide. As a result, we observed nests with plastics mostly belonging to synanthropic species inhabiting riverine habitats, mainly in Europe, North America, and Asia, with an increase in occurrence over the years. Two common and generalist freshwater species (Eurasian Coot *Fulica atra* and Swans *Cygnus* sp.) showed the highest frequency of occurrence of plastic debris. We suggest plastics in bird nests as a proxy for debris occurring in the environment. However, our data may be biased, due to our sample's low representativeness. Therefore, more data are necessary to have more information on plastic distribution. In conclusion, social media might be pivotal in indicating plastic hotspot areas worldwide and being an indicator of plastic pollution within the environment.

Keywords: bird nest; social web platform; international plastic database; citizen science; plastic debris; riverine habitats

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1. Introduction

Plastic pollution has been recognized as an important environmental topic in recent years [1–8]. Although rivers constitute the main vector of plastics to the sea [3,9–14], research has focused more on assessing plastics in marine ecosystems [4,15–22]. However, the number of studies on plastics in terrestrial and freshwater habitats is increasing in the past years [2,3,9,10,13,23–27], with only a few studies emphasising the interactions between freshwater and terrestrial biota (i.e., evidence of negative impacts, such as ingestion, entanglement, and opportunistic use of plastics to build nests [8,28–30]).

Regarding these interactions, little is known about plastic incorporation into bird nests (hereafter, "plastic nests" [29]). This topic has been largely studied in seabird nests [31–36], whilst plastic debris within nests of freshwater and terrestrial birds is a topic still less investigated [3,25,29]. Few studies have reported that plastics can be incorporated into freshwater and terrestrial bird nests, such as plastic films, cables, bottle caps and bag fragments [3,25,28]. Considering the different habitats, plastics can be found in bird nests in several ecosystems, and the incorporation of plastics in nests is highly correlated with the increase in the human influence on the environment [12,35,37–41]. For example, the use of plastics in nests by the house sparrow decreased going from the urban and agricultural areas (i.e., with a more evident source of plastics) to the rural areas (i.e., with fewer plastics [42]). Generally, the type of plastic in nests reflects the litter in the surrounding environment, such as in urban ecosystems with nests containing cigarette butts [39,43].

Among plastics, macroplastics (i.e., >0.5 cm; hereafter MA, *sensu* [12]) are well-detectable and can also be easily recorded by citizens using social media. Specifically, the use of social media as a citizen science tool started with the upload of reports on an online website (i.e., https://www.birdsanddebris.com; accessed 11 January 2023); however, most information concerns marine species [35]. Currently, citizen science provides the opportunity for scientists to investigate the basic and applied ecology of species [44–46]. For example, data obtained by citizen science can be used in studies of ecology, conservation biology and wildlife management [47], being useful in macro-ecology, community ecology, management of threatened and invasive species, and biodiversity and ecosystems' monitoring [43,44,46,48]. Recently, citizen science has been applied to general plastic pollution projects [47,49–53] where, for instance, the public has been involved in plastic collection (see "Plastic Pirates" and schoolchildren collecting plastics and "conservation by children" [51,54–56]. As citizen science is seen as a new approach to advancing ecology, education, and conservation [44], and given that social media are used worldwide [57], then these tools also can be used in providing more indirect information on plastic pollution [29].

Given all these reasons, social media are well-spread and so they can potentially be a useful tool for acquiring information on plastics in terrestrial and freshwater habitats, especially in bird nests. However, data obtained by social media may be affected by bias being focused mainly on Europe and America and, in some cases, we think that a first arrangement may be useful for further in-depth studies.

Plastic interactions with freshwater and terrestrial biota are an understudied threat. In this study we assessed whether social media reporting the occurrence of plastics in non-marine bird nests has increased over the past 10 years. Specifically, we investigated if the number of posts published on social media increased with years. Moreover, we provided an assessment of plastic hotspot areas using data about the main recorded bird species, grouping them in categories (e.g., geographic areas, size and colours of plastic items incorporated, co-occurrence of MA assemblages).

Since rivers are carriers of land-based plastics to the sea [10,11,14], riverine ecosystems are environments with high available plastics [9,12]. Thus, our main hypothesis is that water-related birds could be better represented in our sample. Moreover, since social media posts are biased towards people that live in urbanized highly frequented habitats, we hypothesize that the included information might refer mainly to common, generalist, and largely distributed species, easily detectable and inhabiting anthropized habitats.

2. Materials and Methods

2.1. Sampling Metadata

We searched for "plastic" and "nest" (i.e., #plasticnest, #plasticnests) from 12 December 2012 until 31 December 2021 on Facebook, Instagram, and Twitter, as they were considered the most popular social networks worldwide as of January 2022 [57].

Metadata from each post were collected (hashtags, location, country, species, land use). In detail, some information was provided by each post concerning the publication year, continent, country, city, habitat (see land use), location of the birds' nest, the bird species, plastic coverage, and a first quantification (e.g., estimation of the number of litter items, category of litter, colours). Land use was assessed considering what the photo reported and additionally with the most occurring habitat according to the Corine Land Cover approach (i.e., artificial, natural, agricultural). In addition, the location of bird nest (i.e., city, country) was reported in the posts. To count the number of anthropogenic litter, we estimated (1) the number of items and the (2) coverage of plastic litter on the whole nest. For the (1) number of plastic items, we considered three main classes of item concentration: low (0–100), medium (101–200), high (>200). We considered only photos including anthropogenic litter in nests, with the only exception that when the type of litter was difficult to classify, we did not consider the item. We assessed the plastic coverage in nests by the cover of the plastic on the whole organic part of the nest. For collecting data, we consider both the wall-cup part of the nest as well as the external part. Therefore, to estimate plastics within nests, plastic coverage was divided into 5 classes. We obtained a coarse-grained percentage value of nests having a specific range in plastic coverage (in classes), using a grid system to estimate the percent coverage of plastic in the nest. In detail, the first class ranged from 0 to 20%, the second one from 21 to 40%, the third one from 41 to 60%, the fourth one from

61 to 80%, and the last from 81 to 100%. This value may be biased since birds might not include artificial materials with the same area in all nest walls; therefore, we considered this information preliminary and indicative.

Species were identified if an adult was present in the nest or if a citizen indicated the species name in the post. More specifically, we took information reported in the posts by people and then we filtered it through expert judgment, with specific competence in the field. Expert judgment refers to making a judgment based on skills, expertise, and specialised knowledge of someone in a particular field area (i.e., in this case "experts" are "ornithologists" that classified nests). Particularly, all the nests in the photos were identified with taxonomic diagnosis using guides and handbooks [46]. Posts regarding marine species nests were not considered in our search. We grouped the identified species into three ecological guilds using a habitat-focused approach (i.e., coarse-grained ecological preferences, e.g., forest, water, and synanthropic/urban species [58]). We considered as "forest species" the species inhabiting forest habitats, including generalist and specialised ones (i.e., interior species); as "water-related species", the species inhabiting freshwater ecosystems and immediately surrounding habitats (waders, waterfowls, and rails); as "synanthropic species", the species inhabiting anthropized ecosystems (human-transformed urban and sub-urban habitats with high hemeroby [58,59].

2.2. Statistical Analyses

Data normality was checked with the Shapiro–Wilk test before conducting analyses. When data were not normally distributed, non-parametric tests were used.

To test if water-related birds could be better represented in our sample and to understand if there is a difference between the ecological guilds of birds (e.g., forest, water, and synanthropic/urban species), we performed a χ^2 test. To check the significance of the progressive increase of posts over the years, we carried out a Spearman rank correlation test (r_s) [60].

Plastic litter can be found as a large number of different "species" categories represented by several items ("individuals"). In this regard, all the various categories form the community of plastic litter (i.e., plastic community [61]).

To investigate further if the plastic community (characterized by 16 plastic categories) occurred significantly in each nest, we performed a non-parametric Kruskal–Wallis test (H′) using a 16×50 matrix. To assess if there was a significant difference in plastic contained in nests within different habitat land use, we conducted a Kruskal–Wallis test (H′) on the plastic categories found in the four main habitats. In addition, a Dunn's post hoc test was performed when the Kruskal–Wallis results were significant, to investigate further possible similarities of plastics within nests in different habitats.

We also analyzed the plastic community (i.e., several 16 plastic categories and items) within nests performing a co-occurrence test with Ecosym [62]. In this case, this test checked if two different plastic categories would occur more in the same nest. Thus, to run this test, a C-score and V-ratio indices were performed with 5000 iterations. The first provides information on the randomness of the distribution of two or more species (and plastic categories in this case), while the second one provides a ratio that explains the variance in plastic categories and items among nests considering the sum of the variance of the plastics. While C-score has been performed with fixed-fixed and fixed-equiprobable (ff, fe) iterations [63], V-ratio needs fixed-equiprobable iterations (fe; [64]). When the C-score ratio provides observed results smaller than expected by chance, together with a V-ratio larger than expected by chance, we expect aggregation of taxa (OC < EC; OV > EV). Taxa segregation occurs when you obtain results with a C-score larger and a V-ratio smaller than expected by chance (OC > EC; OV < EV). To check significance of results, we followed the observed and expected values ($P\ O \geq E$ or $P\ O < E \leq 0.05$) as in these studies [62–64]. Additionally, for iterations, we selected the pattern that retains zeros indicating that data were not due to randomness. To evaluate which colours of plastics are the most used by species, we carried out a Wilcoxon signed-rank test (W) [60]. To calculate the coverage of plastic litter on the whole nest, we followed [65].

All statistical analyses were carried out using Past software [66]. Alpha level was set to 0.05.

3. Results

Overall, a total of 195 posts were found. Most of them belonged to Instagram (73.9%, n = 144), followed by Facebook (13.3%, n = 26), and Twitter (12.8%, n = 25). From these 195 posts, a total of 50 posts were selected as they reported data on plastics in bird nests for freshwater and terrestrial species, avoiding the marine ones. In detail, 50 nests from 13 different taxa were found. In 52% (n = 26) of the selected posts, the bird species was reported and identified, while in the other 48% (n = 24) this was not reported. The most commonly reported species were the Eurasian Coot *Fulica atra* (Linneus, 1758) and the Swans *Cygnus* sp., respectively 50% and 7.7% (Figure 1).

Figure 1. Collage of plastic nests by post on Instagram. (**a**) Eurasian Coot *Fulica atra* in Amsterdam canals, and bird nests with chicks (**b**,**c**) in Delft (The Netherlands) and India, (**d**) bird nest on a citric tree in Sicily (Italy). Photocredits (profile name of the person, social media used, link to the picture): (**a**) plasticsoupfoundation, Instagram, https://www.instagram.com/p/BTWmIeMBXH2/, (**b**) fandouille22, Instagram, https://www.instagram.com/p/B05QelolXZZ/, (**c**) anna_pdy, Instagram, https://www.instagram.com/p/Bh-3FhGBbWI/, (**d**) ggiiorgiia, Instagram, https://www.instagram.com/p/B-t8Oc_lWHe/ (all accessed on 26 December 2021).

Among ecological guilds, nests made by water bird species (50%; n = 17 taxa) were the most representative rather than synanthropic and forest species (11.8%; n = 4 and 8.8%, n = 3, respectively) (χ^2 = 19.94; df = 2, p = 0.0001).

We found a significant positive association between the publication year and the number of posts (r_s = 0.83, p = 0.004; Figure 2). In particular, the number of posts increased from 2019 (Figure 2, see Supplementary Materials Table S1).

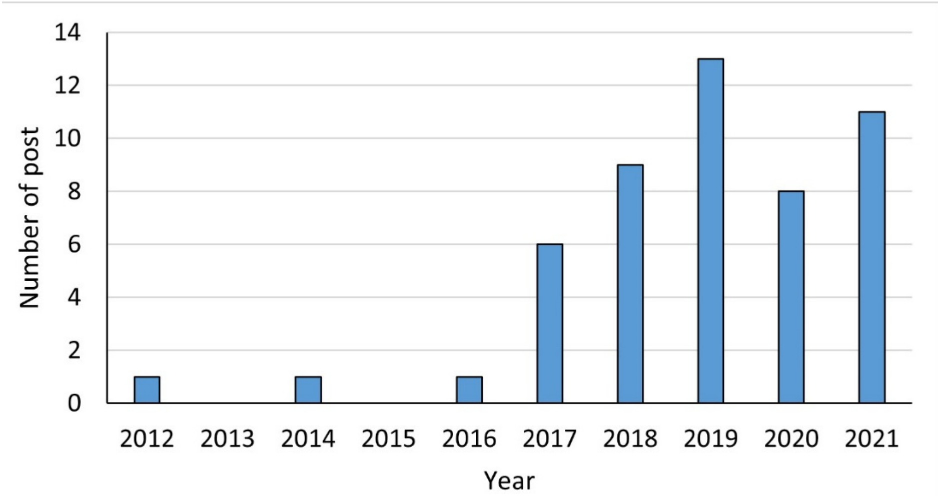

Figure 2. Number of posts increasing during years.

The highest number of posts was found in Europe (56%; Figure 3), with the United Kingdom (24%), the Netherlands (22%), and the United States (14%) as the most represented countries (Figure 4, see Supplementary Materials Tables S2 and S3).

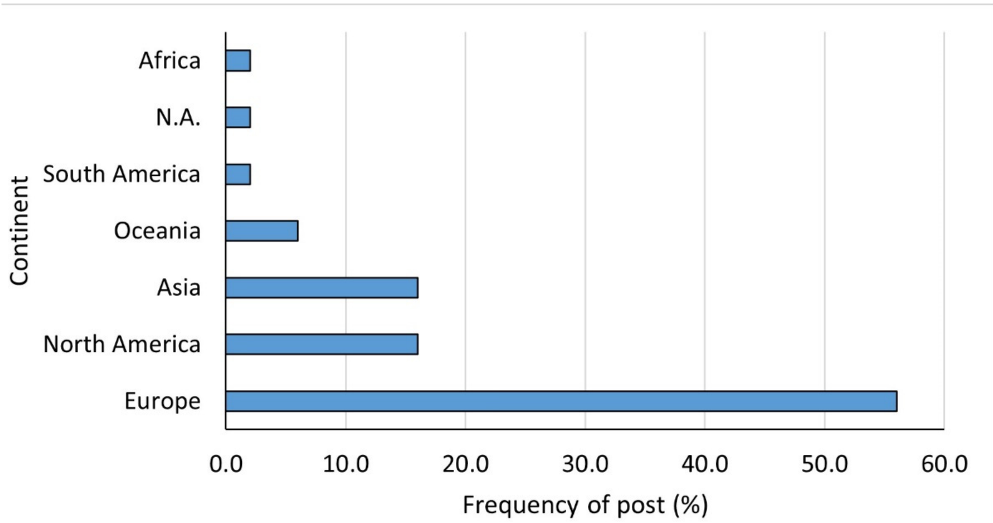

Figure 3. Frequency of post (%) in each continent. N.A. (not assessed) indicates that data were not reported.

Locally, each nest was mainly occurring in rivers (46%), urban parks (20%), and urban areas (18%; Supplementary Materials Tables S4 and S5).

Regarding the plastic coverage within nests, plastic occurred in nests mostly with coverages such as 0–20%, 41–60% and 21–40% (36%, 24%, and 20% respectively), with few ones occurring in 61–80% (8.0%) and in 81–100% (12.0%).

Particularly, we provided an estimate of the number of plastic pieces incorporated into nests. The higher number of nests (98.0%) contained a low concentration of plastics (ranging between 0 and 100 plastic items), followed by the class of >200 items (2%). Overall, considering the mean of total plastic coverage, we estimated that plastic coverage in nests was 39.1% (n = 1273 anthropogenic plastic items).

Figure 4. Global distribution of plastic nests according to social's posts.

The most representative bird species for plastic nests (i.e., the Eurasian Coot and the Swans) showed the highest nest plastic coverage and plastic number items (Eurasian Coot: 30.9% and 27.6%, respectively, while Swans: 5.9% and 3.9%, respectively, see Supplementary Materials Table S6).

Plastic items showed a significant difference in all the nests (H′= 113.3, p = 0.0001). The top-10 category items accounted for 97.3% of the total litter within nests. The most occurring plastic categories were packaging/wrapping items (32.3%, n = 411), plastic bags (22.2%, n = 283), and filaments/fibres (10.5%, n = 134) (Figure 5). Among categories, Eurasian Coot nests contained mainly packaging/plastic wrap (8.3%), plastic bags (5.4%), and net/fishing line (3.8%), while the Swan nests contained mainly plastic pieces (1.6%), horticultural fleece fibres (1.5%), and plastic twine/nylon garden string (1.4%; Figure 5, see Supplementary Materials Table S6). Moreover, COVID-19 products (i.e., face masks and gloves; Figure 6) have been reported to be incorporated into bird nests (Figure 6; Supplementary Materials Table S7). Furthermore, we found a significant difference between plastic category occurrence and habitat land use (H′ = 11.45, p = 0.0095, see Figure 7). Particularly, plastic bags and packaging occurred in all the habitats, while nets, plastic twines, ropes, and plastic pieces occurred more in canals and rivers (see Figure 7 for more details). Among habitats, Dunn's post hoc test revealed that plastics found within nests in farmland were like the ones in rivers (Dunn's post hoc, p = 0.0094), while no significant results were found among urbanised habitats and rivers or farmland (Dunn's post hoc, p = 0.11, p = 0.99, and p = 0.07, respectively).

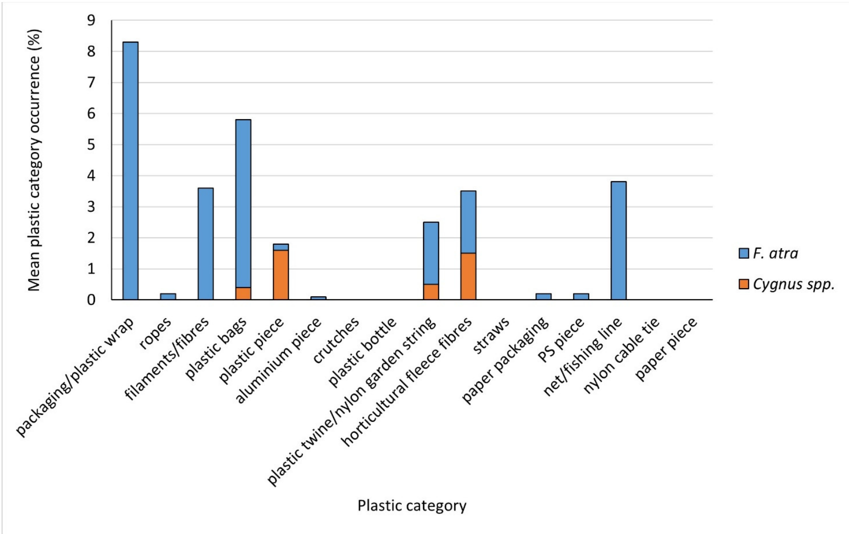

Figure 5. Mean plastic category occurrence (%) in Eurasian Coot *Fulica atra* and Swan *Cygnus* spp. nests.

Figure 6. Face mask within bird nest in Finland reported by Maiju Lehtiniemi on https://www.birdsanddebris.com (accessed on 11 March 2021).

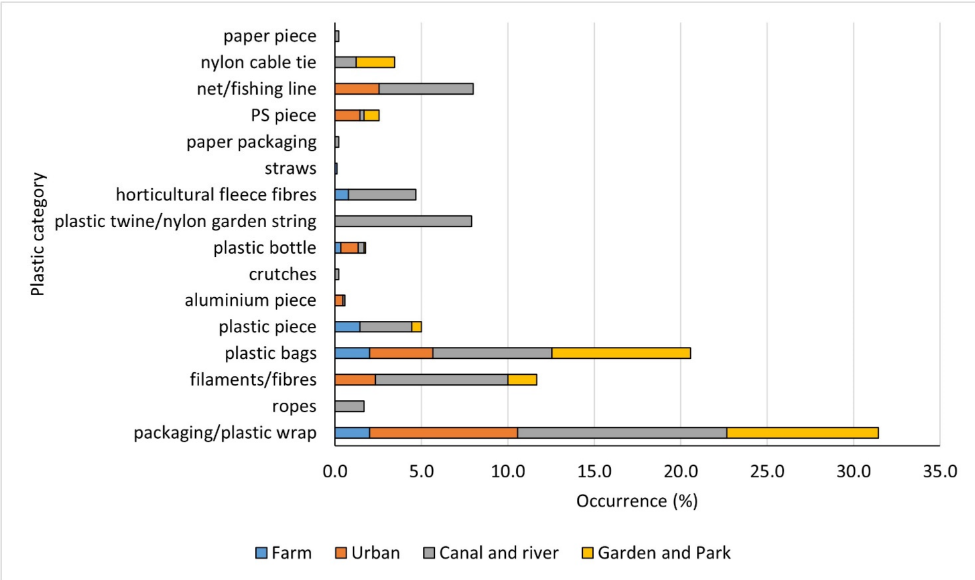

Figure 7. Plastic category occurrence (%) within habitat land use. Note that in the plastic categories there are also not plastic items (i.e., litter items).

Concerning co-occurrence between plastic categories (see Supplementary Materials Table S8), plastic community within nests resulted in a segregated community. Precisely, for the C-score we found that the observed results were higher than the expected (OC > EC), while for the V-ratio the observed results were lower than expected (OV < EV). Then, the fixed-equiprobable (fe) iteration for the C-score provided a significant result, while the fixed-fixed iteration was not significant (fe: $p_{obs} > p_{exp}$, $p = 0.002$; ff: $p_{obs} > p_{exp}$, $p = 0.08$; V-ratio, fe: $p_{obs} < p_{exp}$, $p = 0.04$). More precisely, the number of pairs of checkerboard units among plastic categories is significant ($p_{obs} > p_{exp}$, $p = 0.003$). Most co-occurring plastic items within nests are plastic packaging with plastic twine/nylon string ($n = 155$), filaments ($n = 135$), horticultural fleece fibres ($n = 145$), plastic pieces ($n = 145$), then plastic bags with filaments ($n = 175$), plastic twine ($n = 104$), and net/fishing lines ($n = 100$).

With regard to colours, white (32.3%, $n = 411$), transparent (31.7%, $n = 404$), and blue (13.8%, $n = 176$) represented the most abundant colours (Figure 8).

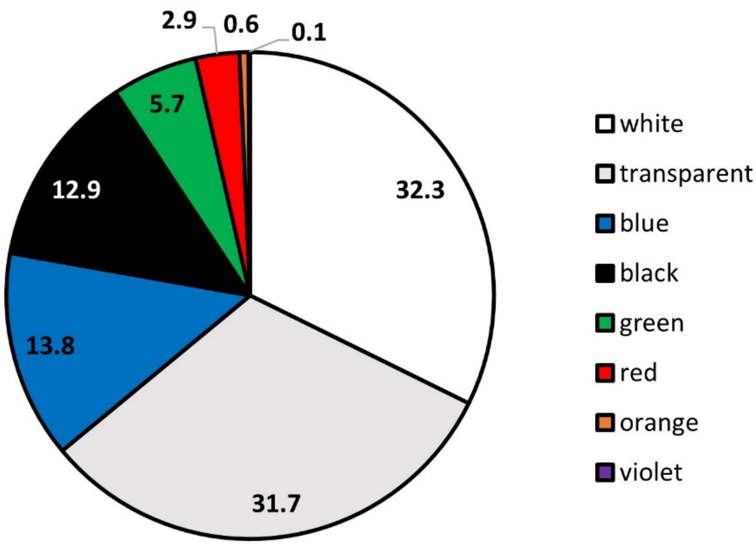

Figure 8. Most occurring colours (%) of plastics within nests.

Concerning colours related to species, the main used colours by species showed a significant difference ($W = -25$, $p = 0.04$). Eurasian Coot and Swans shared transparent and white as the most common colours ($W = -25$, $p = 0.04$). However, while Eurasian Coot also has black items as dominant colours, Swan nests showed more green items.

4. Discussion

For the first time, our data highlight the occurrence of MA in terrestrial and freshwater birds using social media as a tool. In the literature, only a few studies (e.g., [7]) used photographs to provide a coarse estimation of pollution levels, and they are limited to marine environments [31–34], with only a few studies available on the interaction of MA in freshwater and terrestrial biota [25].

The relationship between the number of reports and years suggested an increase in attention to this topic for specific geographic areas. According to our social-based metadata, the number of posts were shown to be correlated significantly with the publication year, with a large increase from 2019. However, fewer posts were published during 2020 and 2021, probably due to the coronavirus pandemic. This result is also in line with [40]: They examined 892 nests held in museum collections between 1823 and 2018 and found that before the 1950s, nests mainly incorporated degradable debris, while afterwards, anthropogenic plastic litter in bird nests increased over time. In the past years, plastic incorporation within nests has particularly increased [40], mainly in urban areas, as well-known sources of plastics [4,10]. Thus, for these reasons, awareness among scientists and citizens increased during the past years with an increased focus on freshwater and terrestrial habitats [28,29]. In these ecosystems, there is evidence that bird nests can incorporate plastics, posing a risk to birds and their offspring to plastic contamination, entanglement, and ingestion [8].

In our study, we also provided an estimation of plastic pieces entrapped within nests corroborating a pattern yet observed. In this regard, Potvin et al. [40] pointed out that 30% of Australian bird nests incorporated plastics. This could be a great concern if we consider the risk of entanglement and ingestion of plastic by birds [8]. Macroplastic litter occurring in nests might interact with birds, causing also sublethal and lethal effects [8,29,67].

Our data highlight that Eurasian Coot and Swans were the most frequent species incorporating MA litter, confirming previous evidence. For example, the Eurasian Coot has been recorded using plastic items for building the nest in Leiden canals [68]. However, although the Eurasian Coot is the most photographed species, we do not know if this is because they more commonly incorporate plastic in their nests or because their nests are highly detectable by citizens, so further research is necessary in this regard. Rails (Rallidae) and ducks (Anatidae) seemed to be more occurring in these ecosystems, and consequently, their nests were more used for detecting plastic pollution. These water-related species could be used as an indicator for plastic pollution in nests, as they: (i) are widespread and common species; (ii) have nests highly detectable from general people; and (iii) inhabit freshwater urban habitats where a large amount of MA occur.

Further studies should also focus on the availability of plastics in the nest surroundings to understand if there are species that select specific characteristics of plastics. Regarding colour, we observed that most of the nests contained plastic with white and transparent colours. For example, Briggs et al. [69] conducted an experiment on pied flycatcher (*Ficedula* sp.) nests by providing them with plastics of different colours and observing an active selection for the colour white. However, the size of our sample was small, and the data need to be investigated on reliable samples.

A large number of records belong to Europe, North America, and Asia, with the United Kingdom, the Netherlands, and the U.S. being the most representative countries [35], while few studies in the literature focused on Australia [40] and South America [70]. No posts on plastic nests were found from Africa and South America. For instance, O'Hanlon et al. [34] pointed out that on 10,274 marine bird nests, there was plastic debris in 12% of nests from across five countries in northwest Europe. This could be explained by (i) the wider use of social media, (ii) the higher awareness of plastic as a problem, and (iii) the higher amount of plastic pollution in these countries [71].

Regarding the terrestrial context, the observed nests were mainly found near canals and rivers, gardens and urban areas, all areas easily accessible and with high human density. Different authors [35,38] highlighted that the incorporation of plastics in nests is highly correlated with the increase in the human density, different from natural areas. Townsend and Barker [36] recorded plastics in nests of the American crow *Corvus brachyrhynchos* in intensively human-modified landscapes (e.g., urban and agricultural areas; see also for White Stork *Ciconia ciconia* [38]). Thus, the use of anthropogenic materials to build a nest is higher nearby urban and agricultural systems rather than in natural ones [41,42,72].

In regard to the plastic categories, we mainly found packaging/wrapping items, plastic bags, and filaments/fibres among the litter. Other studies in literature also found plastic strips, plastic foils, and cigarette butts incorporated into bird nests [73,74]. This could be related to local factors, since many plastic categories are largely used in agricultural activities and others are mainly discharged by urbanised areas and transported by rivers [11,73,74]. It will be easier to find some plastic categories near rivers coming from the surrounding environment (i.e., plastic bags, sanitary towels and others [12]) than in urban areas (i.e., cigarette butts; see [43]). The plastic inside the nests found in agricultural land and rivers was closely related to the categories of litter found in these environments (L. Gallitelli, pers. obs., 2021; see also [12]; Figure 9).

Figure 9. Plastic-incorporated bird nests collected in field along (**a**) Arrone, (**b**) Melladra (near Mignone River), and (**c**,**d**) Aniene rivers. Photocredits: Luca Gallitelli.

The literature has highlighted how people may be utilized to fill research gaps in plastic pollution providing information to decision-makers [50–52]. Citizen science can also increase the awareness of those people, starting citizen management processes (e.g., clean-up activities [12,53]). Citizens may be employed to identify target species and sites of concern, using their reports to improve a "plastic international database". Citizen science has started uploading reports on an online website (i.e., https://www.birdsanddebris.com; accessed on 11 January 2021); however, this has mostly concerned marine species. However, the main problem with social media is the lack of basic information and reliability, so judgement of the experts should be mandatory [25]. Indeed, we should consider that searching on social media using the specific hashtag "#plasticriver" or "#riverplastic" provides thousands of posts (overall, 3022 posts on Instagram). Due to a lack of data in the literature, social media can fill these gaps by providing more results to understand the plastic phenomenon. Although there are many advantages of using social media, some limitations should be considered.

First, to date, the sample size is probably not large enough to provide a reliable dataset explaining a general phenomenon. In this regard, further records belonging to posts from some further countries (e.g., in Asia) should be considered to obtain a bigger dataset. Moreover, the datasets do not come from standardised samples. In addition, the literature (i.e., [25]) found a relatively small dataset on plastic occurrence in terrestrial and freshwater nests (n = 40 plastic nests) in their studies. However, macroplastic used as nesting material was the dominant encounter that they found [25]. To collect more data, awareness among citizens should be increased and standardised protocols launched to understand whether bird nests reflect the actual availability of plastics in the environment.

Second, as rivers are carriers and reservoirs of plastics [9,12], nests found in the aquatic environment should, at least partially, reflect the amount of plastics in watercourses, and nests in agricultural crops should provide information on plastics in the crop fields. However, this is only a hypothesis, and this correlation should be tested.

Third, the number (and percentage cover) of plastic items in the nests can be underestimated and biased using only photos obtained by social media. In this regard, some suggestions to carry out a reliable photo should be made available for citizens. Moreover, some images do not have a good quality or a good focus so it is difficult to identify species or (the concentration of) plastic items; still, the general problem is identified and estimated [56] as well as plastic hotspot areas in nests that might be removed now. Regarding biases, biases in detecting categories and coverage of plastics in the nests belong to different categories: social, context-based, and species-specific (detectability) bias. Indeed, nests posted on social media are generally photographed and posted by citizens living in anthropized contexts. Consequently, only nests easily detectable by citizens and belonging to common and generalist species may be included.

Fourth, the taxonomic diagnosis of the species building the nests could be largely affected by uncertainty, so information provided by citizen scientists needs to be checked by experts.

Further research will be necessary to improve the dataset available to obtain reliable data and allow for building a pattern on a global scale. These data could test hypotheses regarding the distribution of litter in bird nests, the role of some species as indicators of the amount of plastic surrounding the nest, and the possible selection toward category, colour and size carried out by birds on plastic litter.

5. Conclusions

Our study revealed that plastic is highly present in nests, particularly in riverine species. These early data suggest that some common and widespread freshwater species (i.e., Eurasian Coots and Swans) are more represented as birds including plastics in their nests, using social media as a tool. This may be due to the easy detectability of the nests of these species, widely represented also in anthropized water-related environments more frequented by citizens and, probably, showing a high availability of MA. In this regard, more sampling and future studies are necessary to test a possible role of these species (and their plastic nests) as proxy and effective indicators of plastics occurring in the areas surrounding the nests. Moreover, it could be interesting to verify whether, in the process of building the nests, these species select the plastics in relation to the category, size, and colour. In addition, estimating plastic pollution concentration might be pivotal to detect plastic accumulation areas. Although social media provides occasional and weak data, we encourage the launch of a "plastic international database" providing standards to citizens on how to create images and on the information to attach, as yet suggested (birdsanddebris.com). Thus, more future actions may be taken to acquire more data for finding out global plastic hotspot areas and, consequently, tackling the plastic problem. In this regard, social media might support solving the challenges in plastic pollution research.

Supplementary Materials: The following supporting information can be downloaded at: https://www.mdpi.com/article/10.3390/land12030670/s1, Table S1: Number of posts subdivided for year of publication; Table S2: Number of posts subdivided for continent; Table S3: Number of posts subdivided for Countries; Table S4: Number of posts subdivided for land use; Table S5: Plastic categories subdivided for nests located in different habitat land use classes; Table S6: Plastic categories in nest of riverine habitat-related bird species; Table S7: Number of occurrences for plastic categories; Table S8: Co-occurrence of plastic category in nests.

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