Hydrobiologia
https://doi.org/10.1007/s10750-023-05453-7

PRIMARY RESEARCH PAPER

Tracking abandoned, lost or discarded fishing gears of anglers by analyzing magnet fishers' catch

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Received: 31 May 2023 / Revised: 5 December 2023 / Accepted: 11 December 2023

Abstract Abandoned, lost, or discarded fishing gears (ALDFG) are major pollutants in water ecosystems, however, there is a serious lack of estimates on the loss of recreational fishing gears worldwide. To fill this gap, some recreationists like magnet fishers, who use neodymium magnets to retrieve metal items from water, can provide additional information. As they often remove ALDFG, we aimed to carry out the first social media analysis of their online content by searching ALDFG in their posts. During our work, we analyzed Hungarian magnet fishers' posts, covering a total of 6 years from their initial activities on social media. In total, 2,889 posts were scanned of which 1,039 photos and 84 videos were analyzed. Magnet fishers caught 2,018 fishing gears while a total of 31 types of fishing gear were identified. Significant differences were found between flowing ($n = 1{,}959$, mean ± SD = 12.89 ± 16.51) and standing waters ($n = 889$, mean ± SD = 24.69 ± 31.39) in the numbers of fishing gears. Based on the results, we can conclude that ALDFG is a common freshwater pollutant in the country, and social media activities of magnet fishers can be used in detecting freshwater ALDFG containing metal.

Keywords Conservation · Hungary · Recreational fishers · Water pollution

Handling editor: Fernando M. Pelicice

Supplementary Information The online version contains supplementary material available at https://doi.org/10.1007/s10750-023-05453-7.

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Published online: 25 January 2024

Introduction

Abandoned, lost, or discarded fishing gears (hereafter ALDFG), also known as "ghost gear", are major pollutants of marine, coastal and freshwater ecosystems, with extensive social, economic, and environmental impacts. It has become evident that lost fishing gears in marine and coastal ecosystems can contribute to declines in fish stocks (Gilman, 2015), cause losses not only to commercial fish stocks but also to non-target species (Moschino et al., 2019), or facilitate the spread of invasive alien species and harmful algae (Miralles et al., 2018; Gilman et al. 2021). ALDFG are also one of the major components of marine and seafloor litter (Galgani et al. 2022), while they also represent a serious threat to wildlife (Broadhurst et al., 2006; Grade et al., 2019; Berón & Pon, 2021; Martinazzo et al., 2022).

Although we have some well-documented studies in marine and coastal ecosystems on the major issues listed above, it is still challenging to estimate the amount of ALDFG and their real impact on nature, as there are serious research gaps remaining in this topic (Gilman, 2016). In parallel, it seems that estimating the actual amount of lost fishing gears is still very difficult for stakeholders at both local and global scales (Richardson et al., 2021). According to a recent estimation of Richardson et al. (2022), most likely nearly 2% of all fishing gears are lost to the ocean annually, which means that at least tens of thousands of commercial and recreational fishing gears are lost year by year worldwide (Drinkwin, 2022). The situation is further complicated by the fact that most studies of the topic focus on marine or coastal ecosystems, while only a limited number of analyses have an exclusive focus on freshwaters (e.g., Ross-Winslow & Teel, 2011; Spirkovski et al., 2019; Pander et al., 2022; Azevedo-Santos et al., 2021), therefore, our knowledge about the issue in freshwater environments is poor. In addition, much of the researches concentrate on ALDFG of fishermen while ALDFG of recreational anglers have received less attention so far.

Besides the loss of fishing gears caused by unknown, illegal, unreported and unregulated fishing activities, serious knowledge gaps remain around the amounts of fishing gear losses from artisanal and recreational fisheries of both marine and freshwater habitats (Richardson et al., 2022). Despite the contribution of marine recreational fishing to marine litter, in field interviews, anglers still consider the loss of fishing gear as a rare event (Lewin et al., 2020). This has been challenged by recent studies, which discovered thousands of pieces of fishing gear in marine and freshwater environments over a short period of time (Lloret et al., 2014; Pander et al., 2022). The limited reporting of gear loss by recreational fishermen has resulted in a deficient understanding of the potential areas where fishing gear is lost (Pedersen et al., 2021), and caused the omission of the lost fishing gears as environmental pollutant from freshwater management (Pander et al., 2022). While obtaining information in the topic is still challenging, recent papers have shown that social media and video analysis offer an easy and efficient way to collect data on freshwater-related issues involving recreational fishers, proving their usefulness in various studies (Izquierdo-Gómez, 2022; Lennox et al., 2022; Lim & Then, 2022).

Another tool to possibly learn more about lost fishing gears in the field is through magnetic actions, which are widely used worldwide for different purposes. These primarily include cleaning up water bodies by retrieving various items without preliminary destruction (Romanyshyn et al., 2020). In addition, magnet fishing has also become a popular recreational activity, with initial activities driven by the magnet fishers' desire for profit and/or a "treasure hunting" feeling (e.g., Ali, 2009; Gill et al., 2022). Magnet fishers use a strong neodymium magnet, with a pull force of up to 900 kg or even more, attached to the end of a rope to retrieve metal items from bodies of water. They seek for ferromagnetic items available to pull in both coastal and freshwater ecosystems. Recreational magnet fishers often remove polluting metal items from water bodies, including ALDFG. Despite the fact that only those lost fishing gears can be collected by magnet fishers, which can be magnetized, i.e., at least part of it is made of magnetizable metal, their catches sometimes are significant enough to contain large numbers of lost fishing gears. Although many fishing gears do not contain any metal but plastic (Charter & Whitehead, 2022), magnet fishers' contribution to removing ALDFG from angling waters can be still considered significant. Moreover, several magnet fishing groups or profiles have been created on the various social media platforms in the recent years, providing the opportunity to learn more about the composition of their catch by checking their posts. Additionally, since magnet fishers often showcase their prey on social media, it also provides an excellent opportunity to perform a detailed analysis of ALDFG caught by their magnets. Based on user activity, the platforms Facebook, YouTube and Instagram are the most suitable sources to search for magnet fisher groups, since these are the most popular photo and video sharing platforms worldwide.

The aim of the present study was to give an estimate of the amount and type of ALDFG in freshwaters, taking Hungarian freshwaters as a study area, and social media activity of magnet fishers as a data source. Such estimate of ALDFG is challenging with traditional interviews, because anglers usually underestimate their impact or are not interested in the topic, so we had to take a different approach using the social media profiles of Hungarian magnet fishers. Following this line, the main objectives of the present study were to (1) identify the most common types of ALDFG in Hungary, (2) compare the proportion of lost fishing gears in flowing and standing waters, and (3) check the relevance of social media profiles of magnet fishers as a source of information on ALDFG in freshwaters.

Materials and methods

Fishing activities in Hungary

Basically, three types of fisheries can be distinguished in Hungarian freshwater habitats (Specziár & Erős, 2015). Commercial fisheries (large gear fisheries) used to be important until the second half of the twentieth century, until commercial fishing was basically banned in the country in 2016. 'Little gear fisheries' where fishing is performed by lift nets, traps, etc. also have a long tradition in the Carpathian Basin, while by now, these types of fisheries have become insignificant and only a limited number of licenses is allocated annually for specific locations. The popularity of the third fishing activity in the country, recreational angling, has been growing rapidly for years. The number of registered anglers tripled between 2010 and 2023 exceeding 870,000 in January 2023 (Pecaverzum, 2023). Local anglers are allowed to use only rods and line for fishing, but a lift net of maximum 1 × 1 m may also be used for capturing bait fishes. Although there are possibly tens of thousands of suitable fishing spots in the country, currently there is no public information on ALDFG in Hungary.

Besides the professional use of neodymium magnets, magnet fishing was introduced in Hungary around 2016 as a treasure hunting activity following international trends. Since then, the hobby has been promoted by members uploading their catches to the various social media platforms, where the largest group now exceeds 30.000 members in its public social media group (Mágnes Horgászat Official, 2023).

Social media analysis

We carried out a social media analysis on a total of four Hungarian magnet fisher Facebook groups (https://www.facebook.com/), four Instagram accounts (https://www.instagram.com/), and five YouTube channels (https://www.youtube.com/), specifically created to collect and share information and present the catches of magnet fishers. The search engines of the above applications were used to identify the magnet fisher groups by entering the following keywords in Hungarian: 'mágneshorgász' (magnet fisher), 'mágneshorgászat' (magnet fishing), 'mágnes' (magnet). Groups suitable for our analysis were selected by screening the available published content.

Analyzed posts were uploaded between 10 March 2016 and 20 January 2023. A single video on YouTube or a post on Facebook or Instagram (containing one or more photographs, occasionally videos) was considered a post. In case the same image/video was found in different posts, it was excluded from data collection in order to avoid data duplication. During our work, a total of 2,540 Facebook and Instagram posts and 349 YouTube videos were scanned, which represent 2,889 posts altogether (see also Table 1). We included only those posts in the statistical analyses where at least one ALDFG could be identified in the post. In a single image or video, the ALDFG and any other items were counted manually (Fig. 1). All the identified ALDFG were organized, while non-identified items were considered only in the total number of items. We classified ALDFG into six main categories (see also Table 2): basic (e.g., hook, rod, reel), bottom (e.g., groundbait feeder, weight), spinning (e.g., spoon, spinner), net (e.g., keepnet), tools

Table 1 Number (Nr) of items/year in the analyzed posts

Year	2016	2017	2018	2019	2020	2021	2022	2023
Nr of ALDFG	26	30	428	59	293	279	763	140
Nr of posts containing any ALDFG	6	5	34	9	37	70	151	18
Average Nr of ALDFG/post	4.33	6.00	12.58	6.55	7.91	3.98	5.05	7.77

Fig. 1 Examples of the images taken by magnet fishers showing their total catch. **A** Total catch of a magnet fishing event. Arrows indicate the ALDFG sorted out for the social media analyses. **B** Selected catch of a magnet fisher after having the twisters, spinners, spoons, groundbait feeders and weights from multiple catches separated and cleaned. Images taken by Sándor Csekő

(e.g., fishing forceps), other (e.g., bait catapult). We also georeferenced the determinable locations according to the site mentioned by the uploaders of the posts, otherwise the location remained unspecified.

Statistical analysis

First, the different water bodies were grouped into two broad categories separating flowing waters (rivers and channels) and standing waters (lakes, fishing ponds and oxbow lakes). We used Mann–Whitney's test (1947) to compare the number of ALDFG found in the two main water types (flowing vs. standing water) and Kruskal–Wallis's test (1952) to compare subcategories (river, channel, lake, fishing pond, and oxbow lake). Upon a significant result ($\alpha < 0.05$) of Kruskal–Wallis's test, we applied Dunn's post hoc test (1964) to evaluate the differences among multiple groups. We repeated the above steps using data on all the six types of fishing gears.

Furthermore, we performed χ^2 test (Pearson, 1900) on the contingency table of the five water subcategories and the six fishing gear types to find associations between them. Statistical tests were performed in R v4.2.2 (R Core Team, 2022). Visualization was performed in QGIS v3.28.10 (QGIS Development Team, 2020).

Results

Amount and type of ALDFG

After scanning a total of 2,889 posts, the total number of ALDFG found was 2,018, also taking into account the posts of magnet fishing locations that could not be identified geographically. ALDFG was found in 330 (11.4%) posts. On average, 6.1 ALDFG appeared in the posts with at least one fishing gear, while considering all scanned posts, an average of 0.7 fishing gears were identified in a post. Table 1 indicates the numbers of ALDFG and posts of each year. In summary, a total of 31 different types of fishing gear were identified in the posts analyzed (Table 2): for images of the 10 most common type of ALDFG identified, see Online Resource 1. Exact locations were identified in 238 posts (Fig. 2), while the rest of the locations ($n = 92$) remained unspecified. Specified sites with coordinates were located near or within populated areas (Fig. 2).

Table 2 Number (Nr) and main categories of each fishing gear identified in the posts of magnet fishers

		Images		Videos		Total Nr of locations	Total Nr of items
		Nr of locations	Nr of items	Nr of locations	Nr of items		
Basic equipment	Bank stick and Rod pod	65	302	34	93	99	395
	Hook/Jig	64	124	21	41	85	165
	Fishing reel and components	12	16	3	4	15	20
	Fishing rod and components	8	9	4	5	12	14
	Fishing chair	5	9	1	1	6	10
Bottom fishing	Groundbait feeder	84	223	32	70	116	293
	Weight	30	57	10	40	40	97
	Bite indicator/Bite alarm	17	33	6	8	23	41
	Boilie needle/drill	5	7	1	1	6	8
	Bait spike	3	3	0	0	3	3
	Bait mould	1	1	0	0	1	1
Spinning	Twister/Soft plastic shad	77	306	38	196	115	502
	Wobler	39	56	14	17	53	73
	Spoon	36	47	16	18	52	65
	Wire leader	24	37	2	2	26	39
	Spinner	26	31	3	4	29	35
	Treble hook	15	18	1	1	16	19
	Tirol stick sinker	8	8	1	2	9	10
	Fishing stringer	3	3	0	0	3	3
	Pike gag	3	3	0	0	3	3
Net	Landing net/Keepnet/Bait seine	8	11	7	8	15	19
	Steel keepnet	2	2	0	0	2	2
Tools	Fishing knife	35	82	5	7	40	89
	Fishing forceps	9	14	4	8	13	22
	Fishing pliers	4	7	3	3	7	10
	Fishing scissors	7	9	0	0	7	9
	Fishing scale	1	1	0	0	1	1
Other equipment	Swivel	27	56	3	4	30	60
	Float	5	5	2	2	7	7
	Bait catapult	1	1	0	0	1	1
	Fishing winder	1	1	0	0	1	1

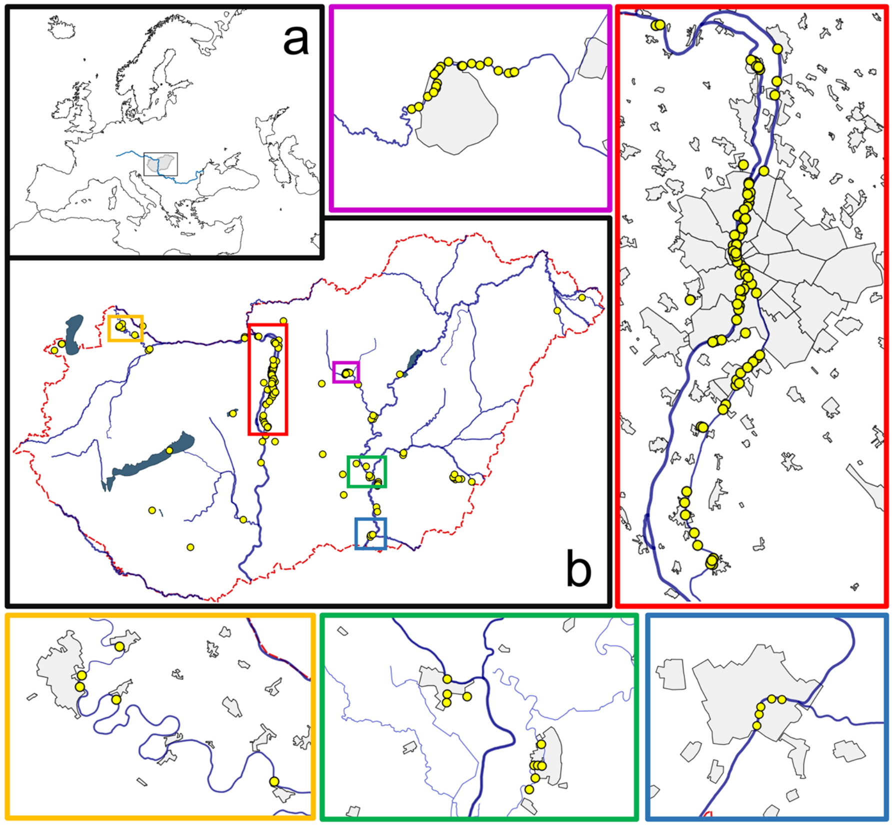
Facebook and Instagram images

In total, 246 of the scanned 2,540 posts contained any fishing gear (9.6%). A total of 4,333 items were found in the posts which included ALDFG, of which, 1,482 were identified as fishing gears. A median of 3 gears per post that contained any fishing gear was observed. A total of 52 posts (20.6%) contained exclusively fishing gears, while at least half of the items found was fishing gear in the case of 134 posts (53.1%). The highest number of fishing gears found in a single post was 61, while 29 posts (11.5%) contained at least 10 fishing gears. The post contained only one fishing gear at 80 times (31.7%, Fig. 3).

YouTube videos

In total, 84 of the 349 scanned videos had any content of fishing gears (25.2%). Magnet fishers of the analyzed videos caught a total of 536 fishing gears, while the total number of all the items retrieved by magnet fishers could be determined in only 17 videos. The highest number of fishing gears found in one

Fig. 2 Locations of catches that contained fishing gears (n = 238). (a) Map of Europe. (b) Map of the study areas in Hungary, Central Europe. Settlements are indicated with grey rectangles in the different colored frames



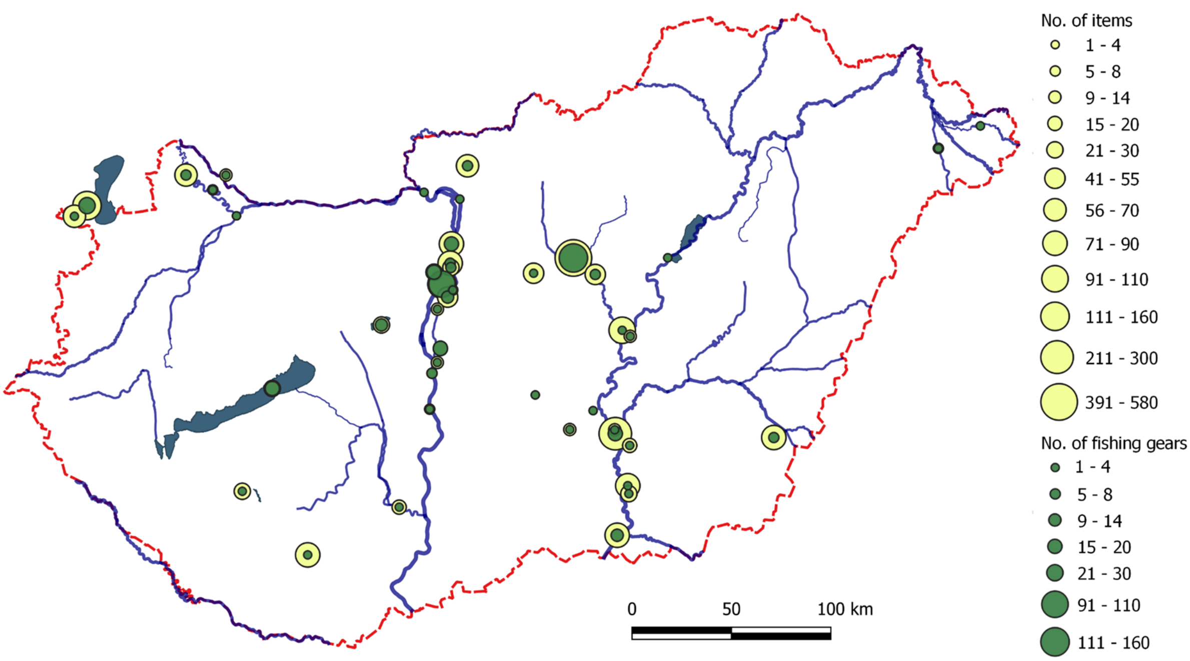


Fig. 3 Number of all items (fishing gears included) and fishing gears found by magnet fishers in Hungary. For clarity, magnet fishing spots close to each other on the same waterbody are grouped together

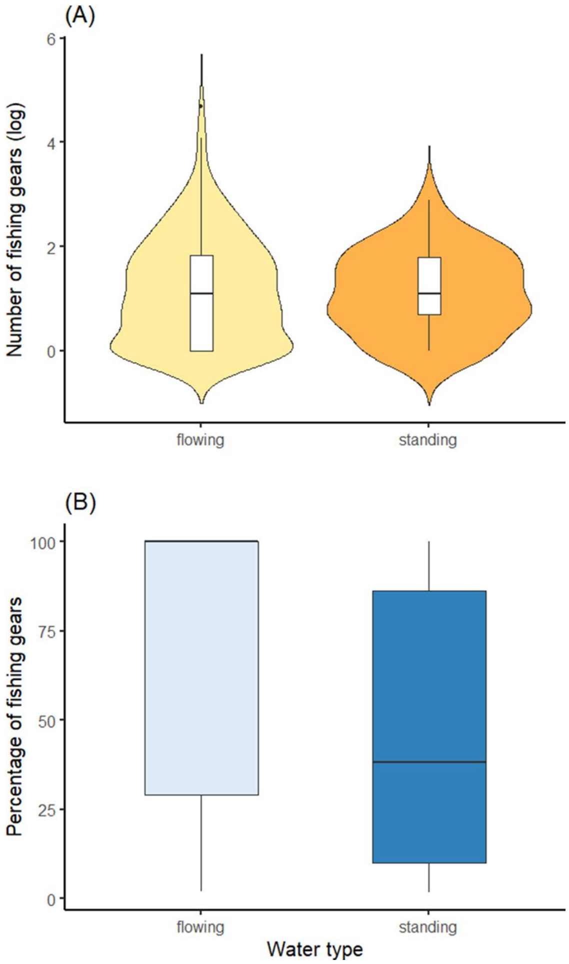


Fig. 4 The number of fishing gears (log-transformed) reported in the relevant social media sources (**A**), and the proportion of ALDFG within the items (**B**) by main water types. The shapes indicate the distribution of the values, the boxes show the minimum, 25th percentile, median, 75th percentile and the maximum of each category

video was 118, while 9 videos contained at least 10 fishing gears. A total of 22 different types of fishing gears were identified in the videos which included any fishing gear.

The effect of the water body type on ALDFG

Since the number of ALDFG identified was statistically similar (Mann–Whitney's test: $U=4{,}060.5$, $P=0.589$) in the two main data sources (image vs. video), we used all the posts (combined) in further analyses. We found significant differences between flowing and standing waters in the number of ALDFG ($U=2{,}027.5$, $P=0.016$, Fig. 4A) but not among the subcategories (Kruskal–Wallis's test: $\chi^2=7.32$, df = 4, $P=0.120$). The proportion of fishing gears differed significantly between the two main water types ($U=3634$, $P=0.001$, Fig. 4B). According to the results of Dunn's test in the six subcategories, we found that rivers had significantly higher proportion of fishing gears than channels (Table 3A) and had remarkably higher than fishing ponds, however, the rest of the comparisons did not show statistically significant differences.

By comparing the number of fishing gears in six different categories, we found statistically similar values, in almost all cases, either between the two main water types or among the subcategories (Table 4). Only the number of spinning gears differed significantly between flowing and standing waters. Although Kruskal–Wallis's test suggested statistically significant differences in the number of spinning gears among subcategories, Dunn's test showed only marginal significance in two of the comparisons (Table 3B).

Table 3 Results of Dunn's test for comparing the proportion of fishing gears (A) and the number of spinning gears (B) between the subcategories of water type

	Oxbow lake	Channel	Fishing pond	Lake	River
(A)					
Oxbow lake	–	0.57 (0.815)	0.77 (0.879)	0.15 (0.882)	−1.63 (0.257)
Channel		–	0.24 (0.899)	−0.47 (0.798)	**−2.66 (0.039)**
Fishing pond			–	−0.70 (0.809)	−2.78 (0.054)
Lake				–	−2.19 (0.096)
(B)					
Oxbow lake	–	−1.53 (0.317)	0.09 (0.925)	−1.08 (0.398)	−2.39 (0.084)
Channel		–	1.67 (0.317)	0.53 (0.747)	−0.48 (0.700)
Fishing pond			–	−1.22 (0.372)	−2.63 (0.086)
Lake				–	−1.25 (0.422)

Statistics are presented as: Z value (P). Significant differences ($P<0.05$) are indicated in bold

Table 4 Summary statistics for the comparisons of the number of fishing gears between water types

Fishing gear	Main water types (Mann–Whitney's test)		Subcategories (Kruskal–Wallis's test)	
	U	*P*	χ^2	*P*
Basic	2,229	0.066	7.62	0.107
Bottom	2,385	0.191	2.77	0.598
Nets	2,649.5	0.471	1.33	0.856
Spinning	**3,647.5**	**0.001**	**12.56**	**0.014**
Tools	2,640	0.489	2.96	0.564
Other	2,696	0.792	0.27	0.992

Significant differences are indicated in bold

However, Pearson's χ^2 test suggested associations between the five subcategories of waters and the six categories of fishing gears ($\chi^2 = 65.44$, df = 20, $P < 0.001$). Higher numbers in basic gears were associated with oxbow lakes and fishing ponds, similarly as bottom gears in lakes, but lower numbers in spinning gears were found in all types of standing waters (Fig. 5).

Discussion

The present study provides the first estimation of the amount and type of abandoned, lost, or discarded fishing gears in Hungarian freshwaters, using social media analysis. Our study demonstrates that the social media activity of recreational magnet fishers can be used as an effective tool for the investigation of ALDFG in freshwaters, while the study also highlights that the proportion of lost fishing gears in flowing and standing waters can be different. As more than 2,000 items of 31 different types of fishing gears were found in only 238 specified and 92 unspecified locations of the country, most likely at least tens of thousands or possibly hundreds of thousands of ALDFG lie at the bottom of Hungarian freshwaters.

Since little information is available on freshwater ALDFG, as anglers in most cases are unwilling to provide information on their lost gears, novel approaches are required to collect data on ALDFG. Stakeholders other than recreational anglers may be involved in future studies and solutions: the issue, however, goes beyond those, as Weißbach et al. (2022) suggested that heavy metal contamination by ALDFG must be limited or stopped. Such solutions might include the engagement of stakeholders in awareness raising activities (Hardesty et al., 2021),

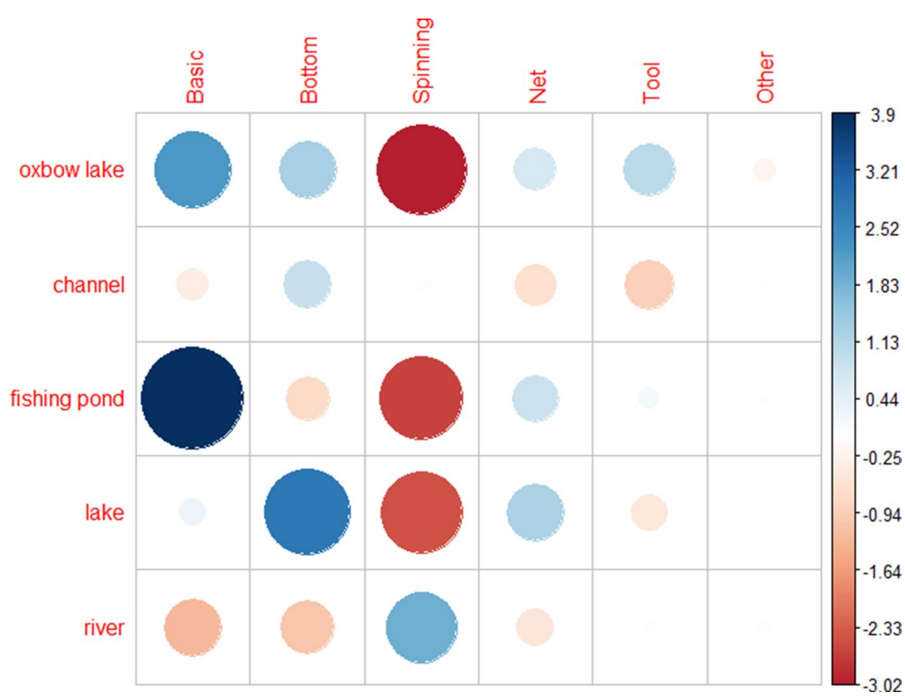


Fig. 5 Contingency table showing the association between water subcategories and fishing gear types. The size of the circles is proportional of the cell contribution: e.g., basic fishing gear is strongly positively associated to fishing pond, whilst weakly negatively to channel

marking fishing gears (He & Suuronen, 2018), performing ALDFG retrieval trips (Goodman et al., 2021), and in the long term, developing better product design solutions (Petetta et al., 2021). According to recent studies, the harm caused by ALDFG varies mostly by the type of the fishing gear, its time spent in the water, the water condition, the fishery and the habitat (Drinkwin, 2022; Pander et al., 2022). Better product design must be also a goal to prevent plastic pollution and establish a functioning circular economy. In addition, as some part of the solution for this issue is definitely preventative, Gilman (2016) also suggests that, as conventional fishing gears can take decades to degrade, producing biodegradable fishing gear could at least partially prevent ALDFG of the future from burdening the environment.

Here, we demonstrated that only a few hundred fishing locations of the country contain more than a total of 2,000 ALDFG. Similarly to the findings of Pander et al. (2022) in Lake Eixendorf the largest proportion of the 2,018 items found was attributed to twisters and soft plastic shads. Given the fact that in the year 2023 more than 870,000 registered anglers fish in Hungarian freshwaters, and the number of fishing sites probably exceeds thousands of suitable places, most likely at least tens of thousands or even hundreds of thousands of ALDFG lie all across the country's waters. In any case the rapidly growing number of recreational fishers suggests a similar trend in the numbers of lost ALDFG, which poses an increasing threat to wildlife and the environment.

Digital fisheries data in the age of internet are emerging tools for both research and monitoring in recreational fisheries (Lennox et al., 2022), and Instagram users also influence nature conservation (Šmelhausová et al., 2022). While data mining on YouTube may be useful in providing auxiliary data (e.g. Sbragaglia et al., 2020, 2021), we have found that analyzing magnet fishers' posts on social media is not less effective when it comes to collecting data on freshwater ALDFG. During the first retrieval campaign focusing exclusively on recreational ALDFG by Lloret et al. (2014) in the coastal waters of Northeast Spain, the total catch weighted 109.7 kg, while during a three years campaign, their effort involved 80, 100 and 8 divers, respectively. Their huge effort showed that a single fishing location could hide more than a hundred kilograms of ALDFG, and according to the present study, social media analysis of the posts of magnet fishers may represent a cost-effective alternative way of gaining supplementary information on lost fishing gears worldwide, while thematic magnet fishing campaigns might contribute to the cleaning of marine and freshwater habitats. We also believe that, as their recreational activities connect them to coastal and freshwaters, magnet fishers can also be considered as stakeholders of water habitats worldwide, and besides learning from them about the tracked ALDFG, they should also be involved in the responsible collection and neutralization of ALDFG in both freshwaters and coastal habitats.

There is one main drawback of the magnet fishing method which is only ferromagnetic items can be retrieved in most of the cases. Yet, it is worth mentioning that in most cases the fishing gear consists of several components, e.g., steel, lead and plastic. Fishing lines, including various elements of gears tied to the line, can be also retrieved if they are attached to ferromagnetic items. Another restraint of magnet fishing is that the hobby is focused on coastal and freshwater rather than marine environments: this is probably in connection with the (1) limited length of the rope, since the magnet fishing equipment is usually carried on foot along the beaches, and with the fact that (2) the magnet can easily get stuck to the metal hull of the boat/ship, oil rigs, or other heavy metallic trash at ocean dumping sites, so performing such activities in marine environments risks losing the magnet.

A difference has been found in the attitudes of magnet fishers taking images and videos of their activities: while the full catch is observable in most of the images taken by magnet fishers, YouTubers rather focus on showing the activity, and the full catch retrieved during magnet fishing was only observable at 17 times (11.4%) in their videos. It also needs to be mentioned that based on our results, magnet fishers' activity is not geographically representative, as their activities are mainly focused on waters around settlements with larger populations, especially the capital of Hungary (Fig. 2). After analyzing the hotspots of magnet fishers' activities (Fig. 3), we suggest that future studies should not exclusively focus on densely populated areas in Hungary, but also elsewhere. Based on the results shown, local magnet fishing groups may be also reached out for interviews on the topic, while they may also cooperate in organizing retrieval campaigns of ALDFG as stakeholders. Despite the dataset is geographically limited to Hungary, and thus, it can be used only as a complementary source of data, we still believe that this method represents a pioneer approach to quantify freshwater ALDFG. As most studies about ALDFG focus on coastal ecosystems, our research may contribute to the better understanding of the ALDFG issue in freshwater ecosystems where research is limited. Following this line, thematic efforts by a strong magnet focusing on ALDFG could make significant contributions to the topic, not just in Hungary, but also worldwide.

It is also yet to be addressed to which extent magnet fishers share their catches on social media. In the case of recreational fishers, a recent online survey and an online questionnaire by Vitale et al. (2021) pointed out that a proportion of 12% and 21% of the fishers shared their catches on public or semi-public social media, respectively. It is yet to be determined if the same applies to magnet fishers. Another difference found was the number of spinning gears in flowing and standing waters which may stem from environmental factors. Since spinning is an active angling method, the number of casts is significantly higher than in the case of passive methods which results in higher chances of finding any obstacle, e.g. rocks, branches or roots. Fishing ponds are usually cleared of such obstacles which means that rivers contain more of them resulting in more spinning gears lost.

Since currently neither the total amount of lost ALDFG nor the typical events leading to the loss are clear, besides the basic inventory of lost fishing gears, better understanding of the perceptions and behavior of anglers responsible for lost fishing gears may also be crucial in the future (Barbosa-Filho et al., 2020). We suggest social media analyses of magnet fishers' posts, and using magnets on field to investigate the topic should consider these viewpoints in future studies. Such studies might include the further analysis of the catches of magnet fishers in the social media and on the field, while interviews with anglers regarding the estimation and perceptions of their abandoned gears could also provide key information in the topic. As mentioned earlier magnet fishers may be also interviewed to get a better view on to what extent they post their catch on social media and also on their observations on ALDFG. Since social media is available worldwide, such approach may be applied to magnet fishers of any coastal or freshwater ecosystems, provided they are willing to post their catches or ready to give an interview.

Conclusion

The present study represents the first research on the amount and type of abandoned, lost, or discarded fishing gears in Hungarian freshwaters, by conducting a social media analysis. During our work, more than 2,000 items of 31 different types of fishing gears were found in only 238 specified and 92 unspecified locations of the country: according to this, most likely at least tens of thousands or possibly hundreds of thousands of ALDFG lie at the bottom of Hungarian freshwaters. Our study clearly demonstrates that the social media of recreational magnet fishers can be used as an effective tool for the investigation of ALDFG in freshwaters, while the study also highlights that the proportion of lost fishing gears in flowing and standing waters may be different. Based on these results, we concluded that social media analysis of the posts of magnet fishers may represent a cost-effective alternative way of obtaining supplementary information on ALDFG worldwide, while investigating the activities of coastal magnet fishers in the topic would also offer a presumable success. Future studies should not exclude the further analysis of the catches of magnet fishers in the social media and on the field, while interviews involving both anglers and magnet fishers in the topic seems essential in moving further and gaining valuable insights in the topic.

Acknowledgements The authors are grateful to Titanilla Posgay for the initial concept of the present study, and to Sándor Csekő who contributed to publish his images of magnet fishing in the paper.

Author contributions ZN: Investigation, Visualization, Writing—Review and Editing. AN: Investigation, Visualization. AH: Writing—Review & Editing. JN: Statistical Analyses, Visualization, Writing—Review and Editing. ZV: Visualization, Writing—Review and Editing. BAL: Writing—Review and Editing, Funding Acquisition. VL: Conceptualization, Methodology, Writing—Original Draft, Writing—Review and Editing, Funding Acquisition.

Funding Open access funding provided by HUN-REN Centre for Ecological Research. This research was funded by

National Research, Development and Innovation Office—NKFIH, OTKA under the Grant PD 138715. BAL was supported by János Bolyai Research Scholarship of the Hungarian Academy of Sciences and New National Excellence Programme of the Hungarian Ministry of Innovation and Technology. The research presented in the article was carried out with the support of the RRF 2.3.1.-21-2022-00014 National Multidisciplinary Laboratory for Climate Change Project.

Data availability Data will be made available on request.

Declarations

Conflict of interest The authors declare no conflict of interest.

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