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MEDIA FRAMING OF THE BIODIVERSITY CRISIS: A STUDY OF A CROATIAN DAILY NEWSPAPER

ABSTRACT

The paper analyses media coverage in the period 1959–2022 of the biodiversity crisis in Večernji list, the longest-running daily newspaper in Croatia. A sample of 367 articles in both printed and online editions of the newspaper was constructed via a multiple keywords search. Quantitative content analysis was carried out to determine the interest in biodiversity loss issues over time, and the framing of the biodiversity issue.

The results show that, although overall interest in biodiversity loss is inconsistent, there is a quantitative rise in news about biodiversity over time. The prevailing thematic focus is endangered or extinct species and endangered ecosystems. Most of the articles frame biodiversity as a local issue, as a science-related issue, while many link the biodiversity crisis to climate change. Using inductive coding, specific frames related to biodiversity were developed that could be used to advance this or future research.

KEY WORDS: biodiversity crisis, biodiversity loss, climate change, media coverage, framing, Croatia

Medijsko okvirjanje krize biotske raznovrstnosti: študija hrvaškega dnevnega časopisa

IZVLEČEK

Članek analizira medijsko poročanje o krizi biotske raznovrstnosti v Večernjem listu, najdlje izhajajočem dnevnem časopisu na Hrvaškem, v obdobju 1959–2022. Na podlagi iskanja po več ključnih besedah je bil sestavljen vzorec 367 člankov iz tiskane in spletne izdaje časopisa. Izvedena je bila kvantitativna

analiza vsebine z namenom ugotavljanja stopnje zanimanja za vprašanja izgube biotske raznovrstnosti skozi čas in načinov okvirjanja te tematike.

Rezultati kažejo, da je splošno zanimanje za izgubo biotske raznovrstnosti sicer nestanovitno, vendar je skozi čas zaznati postopno povečanje števila objav na to temo. Najpogosteje so v ospredju teme o ogroženih ali izumrlih vrstah in ogroženih ekosistemih. Večina člankov krizo biotske raznovrstnosti predstavlja kot lokalno in znanstveno vprašanje, številni pa jo povezujejo tudi s podnebnimi spremembami. Z induktivnim kodiranjem so bili razviti specifični okviri, povezani z biotsko raznovrstnostjo, ki bi se lahko uporabili za nadgradnjo te ali prihodnjih raziskav.

KLJUČNE BESEDE: kriza biotske raznovrstnosti, izguba biotske raznovrstnosti, podnebne spremembe, medijsko poročanje, okvirjanje, Hrvaška

1 Introduction

There are many different reasons for the current biodiversity crisis. Throughout human existence we, as a species, have "manipulated and transformed land and its natural resources" (Popp 2022). In that sense, humans have significantly altered the Earth by cutting down forests and building cities, diverting rivers and creating artificial landscapes, and "harvesting so much of the ecosystem's biomass leaves little behind to support complex food webs" (De Palma and Purvis 2022: 108). Species are also under threat due to human use of sea, climate change, pollution, and invasive species (Hald-Mortensen 2023)[1]. But biodiversity or the "variety of life on Earth" is "essential for our survival" (De Palma and Purvis 2022: 106). We cannot extract ourselves from the environment we live in, as we need its air and water as well as the soil and the food it provides us with. Humans share this planet with "approximately 9 million types of plants, animals, protists and fungi" (Cardinale et al. 2012: 59) and many of those species are in decline. Many too are facing extinction, and the rates of extinction are around 1000 times higher than the background rate of extinction[2] (Ceballos et al. 2010; Pimm et al. 2014; Wilson 2016). Whereas at ordinary times one wouldn't expect to see a species

1. Still, the main driver of biodiversity loss is human use of land, mainly "deforestation for agriculture" that "is responsible for putting 85% of species at risk" (Hald-Mortensen 2023: 1).
2. That is the rate "that varies from one group of organisms to another" and "is expressed in terms of extinctions per million species-years" (Kolbert 2014: 15). For instance, for amphibians, "the most endangered class of animals" this rate "could be as much as forty-five thousand times higher than the background rate" (Kolbert 2014: 17).

go extinct in what amounts to a human lifetime (such a geologically insignificantly small amount of time), people living today are witnessing the beginning of a mass extinction[3] (see Cowie et al. 2022), an event that has only happened five times in the history of our planet.[4] According to the International Union for Conservation of Nature's (IUCN) Red List of Threatened Species[5], the "most comprehensive information source on the global extinction risk status of animal, fungus and plant species", there are currently more than 45.300 species threatened with extinction (IUCN 2024).

But biodiversity is a complex concept that is frequently misunderstood (Shanahan 2008). It does not only mean "the variability among living organisms from all sources", i.e. "terrestrial, marine and other aquatic ecosystems"; it also includes "diversity within species, between species and of ecosystems" (Convention on Biological Diversity 2011: 4). Partly because of its complexness, but also because it had been developed still quite recently[6], the concept is often not fully appreciated or understood by the media or public in general (Shanahan 2008). This is supported by Eurobarometer research on public opinion, conducted both on EU level as well as in Croatia that has revealed that there are still a lot of citizens unfamiliar with the term biodiversity – as high as 29% in EU and 17% in Croatia, while another 30% (27% in Croatia) have heard of it, but don't know what it means (Attitudes of Europeans towards Biodiversity 2019). In 2022 research, part of the national campaign "Listen to the voice of nature, protect Croatia's

3. Jablonski (1986) defines mass extinctions "as substantial biodiversity losses that are global in extent, taxonomically broad, and rapid relative to the average duration of the taxa involved" (as cited in Jablonski 1994: 11)
4. These extinctions are often being referred to as "the big five" and include: End-Ordovician, Late Devonian, End-Permian, Late Triassic, and End-Cretaceous extinctions (Kolbert 2014).
5. Apart from the IUCN, there are many open access databases and information systems containing biodiversity data. The Global Biodiversity Information Facility (GBIF) is "an international network and data infrastructure" that provides "open access to data about all types of life on Earth" (GBIF 2025). European Nature Information System (EUNIS) collects data from multiple sources to offer datasets that consist "of information on species, habitat types and sites" (EUNIS 2025). Biodiversity information system for Europe (BISE) offers "data collected through key nature-related policy instruments" (BISE 2025). There is also The Encyclopedia of Life (EOL), "an international effort, led by the Smithsonian Institution's National Museum of Natural History" that stores information "on nearly 2 million species" (Smithsonian 2025).
6. The concept was developed in the 1980s when scientists had increasingly become aware of the many "negative trends in abundance and distribution" as well as risk of extinction of numerous species (Turnhout and Purvis 2020: 672).

biodiversity" by the Ministry of Economy and Sustainable Development, similar results were found, although the number of those completely unfamiliar with the term in Croatia has fallen to 12.8% (Research on citizens' attitudes about nature protection 2022).[7]

Despite this lack of understanding, biodiversity crisis is an important subject of the present day, one that is now inextricably connected to climate change[8] and a potential source of doomist thinking and anxiety – whether it is written about in the context of wildlife habitat loss, invasive species introduction or in the context of the mass extinction of the species taking place today. Since "the media play a central role in shaping awareness and discussion of biodiversity issues" (Painter 2021: 185), it is ever more important to analyse just how they portray the existing crisis. Therefore, the aim of this research is to assess the overall interest and framing of the topics regarding biodiversity crisis in the media over time. This will be done by focusing on one media outlet in Croatia – *Večernji list* in a longitudinal frame. The study aims to answer the following research questions:

- RQ1: In what way did the interest for the topic of biodiversity crisis change over time (in terms of quantity of news)?
- RQ2: What are the most prevalent thematic frames covered within the biodiversity crisis?
- RQ3: What other framing mechanisms are used in representation of biodiversity crisis (e.g. is biodiversity crisis presented in the context of climate change, is it framed as a scientific issue, a local or a global issue)?

2 Media interest in biodiversity

As explained by Chevallier et al. (2019) very few studies have analysed media interest in biodiversity issues or the role of the media in shaping "public perception of biodiversity in a context of urgent need for conservation" even though this role "may be critical" (ibid.: 107). Their research, conducted on the media outlets in eight countries, has found contrasting trends as in some analysed countries (Brazil, Columbia, France and Spain) there is a "growing coverage of

7. Such data can be worrisome from the successful data collection point of view as well. Citizens' knowledge on biodiversity is important because their effort in monitoring and collection data from the environment can be crucial for science. As explained by Groom et al. "citizen scientists generate the vast majority of terrestrial biodiversity observations" (2016: 612).
8. De Palma and Purvis (2022) recognize climate change as the newest threat to biodiversity loss which may form "a vicious cycle with climate change" as "ecosystems that have lost biodiversity store less carbon and are less able to cope with extreme weather events and other climate change" (De Palma and Purvis 2022: 109).

biodiversity topics" while in others (Australia, Chile, Costa Rica and South Africa) "a constant or decreasing interest" (ibid.: 114).

Several studies have analysed media representation of both biodiversity crisis and climate change and have found a clear disparity between the media interest in these two issues (e.g., Legagneux et al. 2018; Veríssimo et al. 2014). For instance, Veríssimo et al. (2014) have argued how "climate change has become more mainstream issue than biodiversity" and, similarly Legagneux et al. (2018) have found that changes in biodiversity were covered up to eight times less by the media compared to climate change. Some specific research regarding biodiversity loss – such as "media coverage of pollinator decline" (Althaus et al. 2021) have too shown this disparity. Apart from the mere quantity of reporting, there seem to be differences in the way the two subjects are portrayed. Again, Legagneux et al. (2018) have detected how "climate change coverage was often related to specific events" while this sort of connection wasn't found "in case of biodiversity" (ibid.: 1). Such results have led the authors to propose different strategies for more (media) engagement in biodiversity topics. Legagneux et al. (2018) have proposed considering "emotional component and self-engagement of the public" as communication strategies for biodiversity issues (ibid.: 5). Novacek (2008) too has proposed several strategies, starting with building "a clear and compelling message about the importance of biodiversity and what we risk in depleting it" (ibid.: 11571). Because there has been a shift in public attitudes regarding climate change, now recognized as a serious environmental problem, biodiversity should be related to other environmental issues and the explanation of its importance "should also be contextual" (ibid.: 11575).

Some research points out that journalists do not use the term biodiversity easily, and some authors like Shanahan (2008) even proposed the avoidance of the term "biodiversity" in the media because it is both "poorly understood and not easy to describe". Painter (2021), who has interviewed a "selection of UK-based journalists regularly covering environmental issues", unravelled their opinion of biodiversity being a "difficult term" that their audiences rarely understand (ibid.: 177). He too discovered that it "often masks a series of issues such as species loss or extinction, conservation, ecosystem services, or threats to tropical forests and coral reefs", so some journalists use alternative words like "nature" (ibid.: 178). A similar conclusion was reached by Brunet et al. (2020) who have found that the term "biodiversity was not explicitly defined in the media" but was rather "used as a catch-all argument frequently supporting proponent and opponent views regarding an issue or project." (ibid.: 1655).

Considerable amount of research on biodiversity in the media has focused on the portrayal of "charismatic life-size mammals" like tiger, black bear, and

leopard (Painter 2021). For instance, Sadath et al. (2013) had used a specific topic of "human-tiger interaction" to show how national Bangladeshi newspaper (*The Daily Ittefaq)* and international media (*The Guardian*) differed in their framing of this particular problem (ibid.: 37). Still, one of the most studied emblematic mammals are the polar bears (e.g., Archibald 2015; Born 2019; O'Neill 2022), often seen as "icons of climate change" (Born 2019). By conducting a longitudinal analysis "of visual evidence arising from political, social, scientific, and cultural domains" O'Neill (2022) has identified the change in the visual representation of polar bear to political bear, and finally to climate bear. Born (2019) has studied the representation of polar bears (in *National Geographic*) and identified three stages in the process of bears' "iconization".

Research on the visual representation of biodiversity loss has shown the importance of photographs in constructing "the meaning of stories on biodiversity" (Seppänen and Väliverronen 2003). In their analysis of *The Times* articles and accompanying photographs on biodiversity, Seppänen and Väliverronen have found "that most pictures represent animal species" as their extinction poses "a very real and significant related threat" but also that none of the pictures were of destroyed nature (ibid.: 67).

The existing research on the climate change coverage in Croatian media is scarce (apart from the two notable exceptions – Bašić et al. 2020 and Kalajžić et al. 2022) while the research on coverage of the biodiversity crisis is practically non-existent. By assessing the overall interest and coverage of the biodiversity crisis in news media in a longitudinal time frame, our aim is thus to fill in the literature gap and broaden this issue in the international context.

3 Media framing

For many, the media are the primary source of information and meaning on different issues related to society, environment or other fields. Therefore, the ways in which these issues, including biodiversity, are represented in the media could have significant effects on how people understand and form opinions on them. One of the most widely used theoretical approach in communication research to understand these processes is framing (Guenther et al. 2024), defined as a mechanism by which some aspects of the perceived reality are selected and made more "salient in communicating text" (Entman 1993: 52).

Researchers broadly differentiate between two main types of media frames. Generic frames are those that can be recognized in news stories regardless of the issue of the story, or in other words, that cut through different issues. Examples of generic frames are conflict frames, human interest or economic consequences

(Guenther et al. 2024). In contrast, thematic frames are issue specific and refer to the thematic focus of the news article. In that sense, thematic frames are only applicable to a specific topic such as, for instance climate change, and they cannot be applicable to other issues (Guenther et al. 2024).

There has been an increasing application of framing theory to research of the representation of climate change in the media (Guenther et al. 2024) and this research most often focuses on media content and thematic frames, discussing measuring frames of, for example, climate action, climate policy or climate justice (Guenther et al. 2024). Other commonly used framing mechanisms for studying climate change include: the extent to which it is framed as an issue of scientific uncertainty or consensus, or local or global issue, or the issue of local or global responsibility (Stoddart et al. 2016).

When it comes to biodiversity, there is no evidence of such wide applications of framing theory. There are, though, examples of studies analysing framing used by different communicators in science and policy discourse about biodiversity (e.g., Elliott 2020; Uggla 2018) or using generic frames to explain the media representation of certain species (Sadath et al. 2013). One study focused on valence, demonstrating that biodiversity is presented in a positive valence, and more often as having intrinsic, rather than utilitarian value (Brunet et al. 2020).

In the analysis of the representation of climate change in the media, researchers have often employed four frames identified by Entman (1993: 52): defining problems (determining "what a causal agent is doing with what costs and benefits"), diagnosing causes (what is creating the problem), making moral judgements (evaluating causal agents as well as their effects), and suggesting solutions (remedies for the problems and predicting the effects). These frames have been tested and used by for instance, Wessler et al. (2016) and Lück et al. (2016), both for framing Conference of the Parties (COPs). It has been used by Lopera and Moreno (2014) in media coverage of climate science in Spanish newspapers to develop the following frames: causes, consequences, solutions and responsibility. In this study, we are drawing on Entman's (1993) and Lopera and Moreno (2014) conceptualizations of media frames and are applying them to the biodiversity issue. Since the moral judgement frame has been shown to be problematic in the analysis as it overlaps with the diagnosing causes frame (Wessler et al. 2016), in this analysis we redefined the frame as the responsibility frame. Here, the responsibility frame does not refer to the moral evaluation of causal agents, but to addressing responsibility of actors for the solution of the problem. Besides generic frames, in this study we will be also analysing thematic frames specific for the biodiversity issue, and applying frames commonly used in analysing climate change to biodiversity (e.g. science frame, global or local issue frame).

4 Data and method

The media representation of the biodiversity crisis in Croatia was studied by using content analysis of newspaper articles published in one media outlet – the influential daily newspaper *Večernji list* for the period 1959 – 2022. *Večernji list* changed ownership and political leaning in this long time period. During the socialist Yugoslavia, the newspaper was published by the publishing house Vjesnik. It was the company's most successful daily newspaper with the highest circulation of 370 thousand copies recorded in 1986 (Novak 2005). After the dissolution of Yugoslavia, the newspaper went through the privatization process and ownership changed for many media outlets, but *Večernji list* continued to exert influence over its readership. Up until the emergence of *Jutarnji list* in 1998, *Večernji list* had no real competition on the newspaper market. Since 2000, *Večernji list* has been published by the Austrian media company Styria Media Group. It is considered to be a conservative leaning media outlet. According to Digital News Report 2024 for Croatia, the digital edition of *Večernji list* is on the sixth place (weekly reach for online media outlets) with a 26% audience reach (Peruško, 2024). Despite the higher reaches for other media outlets, *Večernji list* still retains readership for its printed edition (15% reach; Reuters Digital News Report 2024) and therefore has both historic and contemporary significance.

The units of analysis – news articles published in *Večernji list* – were acquired using their archive of the printed editions[9] (for the available period 1959–2010)[10] and their digital edition Vecernji.hr (for the remaining period 2011–2022).[11]

We selected articles for the analysis by searching via keywords related to biodiversity. Due to the complexity of the term biodiversity and the fact that it has only been introduced in the scientific community in the 1980s (see Shanahan 2008; Turnhout and Purvis 2020), apart from the keyword "biodiversity", we used

9. The archive consists of digitized editions of printed newspapers published from 1959 (first edition of *Večernji list*) till 2010 and is available on site: https://arhiva.vecernji.hr/ that offers search via keywords or by date, while for Vecernji.hr we used a search engine available on the site.
10. This was the only available print media outlet for a longitudinal study. Apart from *Večernji list*, there are only two newspapers that have a longer publication history – *Novi list* (published from 1900) and *Slobodna Dalmacija* (published from 1943). Both newspapers were excluded from the study due to them being regional newspapers. The only other newspaper with a longer history, *Vjesnik* (published from 1941) ceased publication in 2012.
11. The reason for analysing digital editions from 2011 onwards was that the access to the archive for the printed editions was limited to 2010. This is a limitation of the study which will be discussed in the conclusion.

additional keywords: "ecosystem", "species extinction", "endangered species", "invasive species" and "habitat loss".[12] The search via keywords in both the archive of printed editions as well as the digital edition of *Večernji list* yielded results not connected or only remotely connected to biodiversity loss so each article had to be checked. Only articles that dealt with the topic in its main part or in entirety were selected for the analysis. The final sample consisted of 367 news articles.

The coding scheme was developed based on literature review and inductive reading of articles by the authors of the study. The articles were analysed for the following categories: date of the publication; (newspaper) section; visual equipment (presence of photos and illustration and what they portray); thematic frames; does the article mention plants, animals, both or none; if animal is mentioned, what class it belongs to; dominant frame and subcategories; is the article prompted by an occasion (e.g., Earth Day, appeal or movement for protection; opening of an environmental protection centre; protests); is the issue of biodiversity presented in the context of climate change; does the article mention scientists, experts, scientific data; valence of the story; geographic range of biodiversity crisis.

Framing of biodiversity was informed by framing categories by Entman (1993) and Lopera and Moreno (2014), and issue specific thematic frames. We used Entman's (1993) generic frames and Lopera and Moreno's (2014) application of these frames on climate change (framing causes, consequences, solutions and responsibility). However, we also tried to expand the generic frames by applying them more specifically to the biodiversity issue (e.g. defining specific causes or solutions). The categories referring to generic framing of biodiversity were therefore developed by inductive coding through initial reading of news articles. However, as the intercoder reliability results for generic frames were not high enough for presenting the quantitative results, in the results section we will only describe the way they were developed inductively. Thematic frames refer to the dominant theme addressed by the news article. We could not find specific thematic frames applied to biodiversity in the literature review, so we developed new codes by inductive reading of news articles in the sample.

Authors of the paper were coding the sample of 367 news articles. Intercoder reliability was calculated on the random subsample of 37 articles, which is approximately 10% of the total sample. In the results section the variables with at least 0.7 percent agreement will be presented.[13]

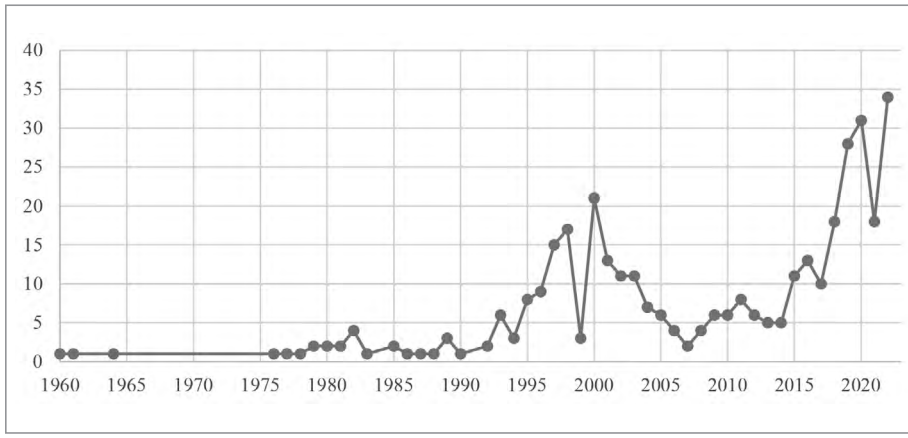
12. Words "environment" and "nature" were not used because, as explained by Legagneux et al. (2018), are not specific enough to the biodiversity crisis.
13. The percent agreement for the variable measuring thematic frames is 0.73, for framing biodiversity through science 0.84, for framing biodiversity in the context of climate

5 Results and discussion

5.1 General characteristics of articles on biodiversity crisis

Of in total 367 articles analysed, 180 were published in the printed editions (from 1960 till 2010) and 187 in online editions (from 2011 till 2022). The highest number of articles was published in 2022 (34) and 2020 (31) but the overall trend is an uneven distribution of articles over the years with a rise in the number of articles and then a steep decline (years 1999 and 2021). According to Seppänen and Väliverronen (2003), it was in the 1990s that "biodiversity loss became one of the 'big' environmental issues" globally (p. 64–65). This is only in part visible in our sample through the rise in articles on biodiversity from 1995 to 1998. Even though, due to the different nature of print and online editions, it is hard to make direct comparisons, the fact that more than half of the analysed articles were published in the last 11 years speaks in favour of the topic being recognized as more important with time.

Figure 1: Number of articles per years.



There are several very important years for the biodiversity: first, in 1992, at the Earth Summit in Rio de Janeiro, The Convention on Biological Diversity was adopted by "the vast majority of the world's governments" (Convention on Biological Diversity 2022); 2010 was designated as the International year of Biodiversity by the UN (UNESCO 2010); and in 2012 resolution on

change 0.97, and for the story valence 0.73. Cohen's kappa for thematic frames is 0.6, for framing biodiversity through science 0.63, for framing biodiversity in the context of climate change 0.89, and for the story valence 0.48. Story valence was also not presented in the results section because of the low value of Cohen's kappa coefficient.

the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services was adopted (IPBES 2012).

Given these important years, we examined the data to see whether it is possible to detect the rise in interest in biodiversity in *Večernji list* – through the rise in number of articles but also through examining the exact topics written about in the recognized important years. No rise in the number of articles was detected for 1992, 2010 or 2012, but the International year of Biodiversity was the expressed reason for publication of three (out of six) articles in 2010.[14] A small increase in use of the term biodiversity in news media was noted by Brunet et al. (2020) "during the 2010 International Year of Biodiversity compared to the average" in their analysis of "major newspapers in the province of Québec, Canada" (ibid.: 1655).

Painter (2021) too has pointed out the importance of 2019 that yielded "the most comprehensive report" published by IPBES that "mapped the rapid decline in recent years in nature's resources" and was given an "unusual salience" by many media outlets that focused on "around one million animal and plant species" that were "now threatened with extinction" (p. 173). This report too was picked up by *Večernji list* that informed on it in two articles: "We are responsible for the extinction of a million species on which we ourselves depend"[15], and "New UN report: One million species are facing extinction because of humans".[16]

There were no specific sections in either newspaper or online edition on nature, environment and/or animals. Most of the analysed articles in both printed and online editions were published under the section "News" – in total 173 articles (47.1%), and in online editions frequently under subsections "Science and Tech" (43) or "World" (37). In printed editions many were published under the section "Garden" (21) and under the section that had the translations of selected articles from domestic or foreign press (25).

In total 295 articles were accompanied by one or more photographs (80.4% of the total number), 22 had an illustration or a graph (5.9%) and only 4 (1%) featured a video. There were 51 articles (13.9%) without photographs, illustrations or videos, mostly in printed editions.

14. "Tajanstvena riba krških rijeka", *Večernji list*, 7 March 2010; "Ljubavno kreketanje sve je tiše", *Večernji list*, 6 June 2010; "Dugokrili noćni lovac", *Večernji list*, 12 September 2010.
15. "Odgovorni smo za nestanak milijun vrsta o kojima i sami ovisimo", vecernji.hr, 24 April 2019.
16. "Novi UN-ov izvještaj: Milijun vrsta pred izumiranjem je zbog ljudi", vecernji.hr, 6 May 2019.

We used an open-ended question for the description of subjects in main or cover[17] photographs and illustrations and those were later grouped under 19 categories (Table 1).

Table 1: Categories for the subjects of photographs and illustrations (main/cover photo).

Subjects of main/cover photographs/illustrations	Number of photographs/ illustrations	%
Animals	143	45.1
Fires, floods, cut down trees, polluted environment, dead animals	20	6.3
Scientists, experts, people who take care of the animals, people who help animals	20	6.3
Plants, fungi, and algae	15	4.7
Other	14	4.4
Urban environments	13	4.1
Activists, protesters, activities of cleaning and helping the environment, calls for action	12	3.8
Humans in nature, humans with animals	12	3.8
People	11	3.5
Nature without human presence	9	2.8
Politicians	8	2.5
Celebrities and opinion leaders	8	2.5
Fisherman and boats	8	2.5
Earth and ecosystem	6	1.9
Botanical gardens and museums	4	1.3
Oil and gas platforms and powerplants	4	1.3
Markets with animals and plants	4	1.3
Future environment	3	0.9
Post stamps with endangered species	3	0.9

Most of the photographs portrayed animals (143) which is consistent with the Seppänen and Väliverronen's (2003) analysis who have found that most pictures represented animal species. While they found a complete absence of pictures of destroyed nature, in our sample those photographs were present. Photographs of

17. For printed editions, in cases where more photographs were present in the article, we analysed the biggest or the most prominent photograph. In the articles of online editions, we analysed the cover photo of the article.

dead animals, cut down trees and polluted or devastated environment were grouped with photographs of fires and floods and we found in total 20 such photographs. Plants (individual trees, flowers...) were subjects of only 13 main photographs/ illustrations, while as little as two photographs were of fungi and algae.

Photographs showing people were grouped under several categories: scientists, experts and people who help animals or take care of the animals (20 photographs), humans in nature/humans with animals (12 photographs), celebrities (8 photographs), politicians (8 photographs) and fishermen (8 photographs). In cases in which it was unclear who the portrayed people were, they were labelled under the category people (11 photographs). The category of protest and activism (12 photographs) was a broader category that not only included people but also posters and calls for action as well as environmental cleanup campaigns.

Only 9 photographs showed nature without human presence, while 13 photographs showed urban environments – cities, and urbanized environments such as coasts and beaches with housing. There was also a category for the portrayal of what could be the environment of the future (soil affected by drought and deserts) (3 photographs).

5.2 Characteristics of the mentioned species

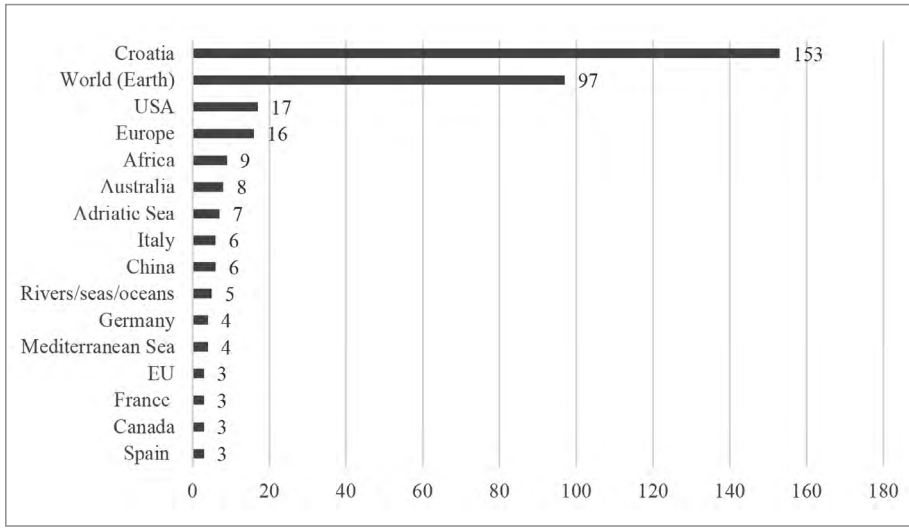
The majority of the articles put focus on animals (243 or 66.2%), rather than on plants (30 or 8.2%), and in 37 articles (10.1%) both animals and plants were mentioned. A total of 57 articles (15.5%) had no mention of animals or plants.

Many articles mentioned more than one class of animals. In 138 articles there was mention of mammals, in 68 of birds, in 57 of fish, in 42 of reptiles, in 31 of amphibians, and in 38 of invertebrates. In 29 articles it was not clear which class of animal the text referred to. We compared the obtained results with the data provided by the IUCN Red List of Threatened Species. According to the list, the most endangered species are reef building corals – 44% are threatened with extinction, followed by "41% of amphibians, 38% of trees, 37% of sharks and rays, 34% of conifers, 26% of mammals, 26% of freshwater fishes and 12% of birds" (IUCN, 2024). This shows that the media interest in a certain class of animal is not entirely consistent with the data on the number of species in those classes that are threatened with extinction. A similar conclusion was reached by dos Santos Morini et al. (2023) who compared "the frequency of threats to deer species in media reports with the threats' relevance indicated by experts in the IUCN assessments". The authors found that although "the main threats described at IUCN assessments coincide" with media reports, some of the threats were underreported (dos Santos Morini et al. 2023).

5.3 Presentation of biodiversity crisis

Focus on the biodiversity crisis seems to be mainly directed at local, i.e. biodiversity issues in Croatia (153 articles or 41.7%), followed by the presentation of the issue as global phenomena (97 articles or 26.4%). In total 7 articles had in focus biodiversity crisis in the Adriatic Sea, which again can be connected to Croatia, and additional four had in focus the Mediterranean Sea. This would mean that the biodiversity issue is mostly framed as a local issue, which might have a specific effect on audiences perceiving biodiversity as something that has direct connection to their immediate environment. As research shows, the Mediterranean coast is especially vulnerable to climate change (Lincke et al. 2020), and this, due to its vicinity to Croatia, is obviously perceived as important.

Figure 2: Geographical range of biodiversity crisis (mentioned more than three times).



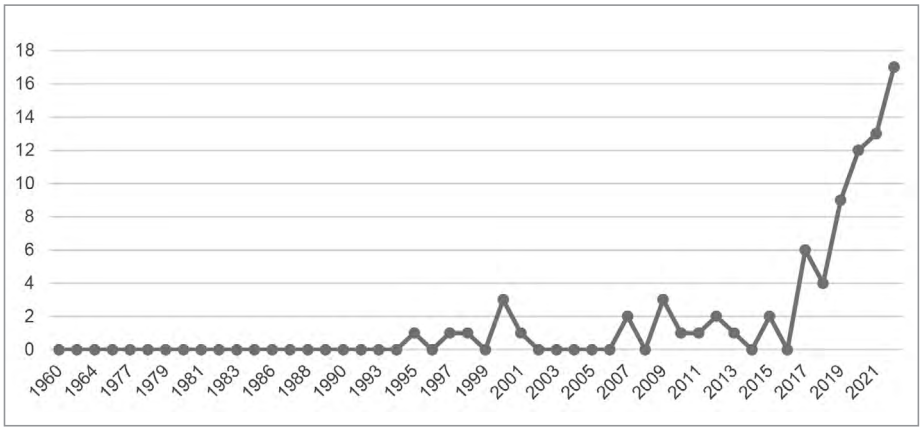
We were also interested if biodiversity was framed as a science-related issue, which is a frame important for climate change reporting (e.g. the question if climate change is a matter of scientific consensus). In that sense we analysed whether there was a mention of scientists, experts and/or scientific data (including international organizations such as UN, FAO) in the articles on biodiversity crisis. In total 253 articles (68.9%) had such mention or data, and 114 articles (31.1%) did not, which would point to the conclusion that biodiversity is in large part framed as a science-related issue.

Another examined characteristic was if the article had an occasion, i.e. if it was motivated by celebration (e.g. Earth Day, World Biodiversity Day...) or protest.

The results have shown that 288 or 78.5% of the articles were not prompted by any such occasion, while 79 articles or 21.5% were.

We also examined if the biodiversity issues were presented in the context of climate change and discovered that 287 or 78.2% were not, and 80 articles or 21.8% were presented in that context. The number or articles on biodiversity crisis framed in the context of climate change has risen dramatically in the last few years (since 2018) (Figure 3).

Figure 3: Biodiversity crisis in the context of climate change (N).



Although climate change is still not the main driver of biodiversity loss, the two may form "a vicious cycle", one in which the loss of biodiversity that would otherwise slow climate change (by taking CO2 out of the atmosphere) and make "warming easier to bear" (given that trees in the cities help lower temperatures) could now exacerbate the conditions (De Palma and Purvis, 2022: 109). Our results, indicating the rise of the writing on biodiversity loss in the context of climate change from 2018 onwards certainly point in the direction that this connection has been acknowledged by the journalists in their texts.

5.4 Themes and frames

As outlined earlier in the text, this analysis draws on the thematic frames specific to the biodiversity issue, and generic frames (based on Entman's 1993 and Lopero and Moreno 2014 conceptualizations). As there was no overview of the thematic frames specific for biodiversity in the literature, we developed the themes inductively by initial reading of texts. The explanation of the developed thematic frames is presented in Table 2. Generic frames were developed in more detail in order to be applied to the biodiversity issue. The development of subcategories of generic frames referring to biodiversity are presented in Table 4.

Table 2: Description of thematic frames related to the biodiversity issue.

Thematic frames	Explanation
Endangered or extinct species	Endangered or extinct animals or plants, including the victims of the "big five" extinctions and the current "sixth extinction"
Endangered ecosystem	Consequences of human action (including tourism), fires, floods and invasive species
Education campaigns and activities	Educational campaigns on biodiversity and environment of both governmental organizations and NGOs; activities of environmental organizations and movements; campaigns for the ban on hunting
Restoring species back in the environment	Attempts of restoring species back in their native environments, including capture breeding programs and success stories
People who study and look after animals/plants/ environment	Scientists (and their research and conferences) and experts on different species; people who take care of animals (e.g. in zoos, nature parks...)
Legislation	Legislation in terms of protection of species and environment
Wildlife trafficking	"Illegal trade, smuggling, poaching, capture, or collection of endangered species" and "protected wildlife" (UNODC, 2019); illegal forest logging
Hunting and fishing	Overhunting and overfishing as a threat to land and marine species
Discovery of a new species	Could also include a rediscovery of a species previously thought to be extinct18
Biodiversity	Biodiversity as a concept

The largest share of news stories about the diversity focuses on endangered or extinct species (31.6%) and endangered ecosystems (23.2%). This finding suggests that media representation of biodiversity tends to focus on species loss rather than on the causes for those losses. Larger proportion of news also focuses on education campaigns and activities of environmental organizations (15%). Biodiversity as a concept is the focus in only three articles of the sample, which goes in line with the argument about the difficulty of integrating this concept in journalistic discourse (see Painter, 2021).

18. Although no such example was found in the analysed articles, Zablocki et al. (2016) have analysed media coverage of species rediscoveries along with the factors that influence this coverage so it is reasonable to assume that this topic could appear in future media content analysis.

Table 3: Frequencies and percentages of thematic frames in the sample.

Thematic frames	N	%
Endangered or extinct species	116	31.6
Endangered ecosystem	85	23.2
Education campaigns and activities of environmental organizations	55	15.0
Restoring species back in the environment	24	6.5
People who study and look after animals/plants/environment	23	6.3
Legislation (protection of species and the environment)	19	5.2
Wildlife trafficking (illegal trade, smuggling, poaching) and forest logging	16	4.4
Hunting and fishing	10	2.7
Discovery of a new species	5	1.4
Biodiversity as a concept	3	0.8
Other	11	3.0

We found frames related to causes, consequences, solutions and responsibility for biodiversity in news articles in the sample: all the frames with their subcategories are named in Table 3. When discussing causes, news articles would emphasize human or natural impact on biodiversity, or both at the same time. For example, when discussing human impact, news articles would discuss human activity such as hunting (including poaching) and agriculture development or the role of industry in polluting the environment (among other activities). When discussing natural impact on biodiversity, news articles would discuss changes in natural environments.

In terms of consequences, the loss of biodiversity would be framed as a loss for a diverse ecosystem, in which diversity is presented as a value by itself. Besides this kind of framing, more anthropocentric frames were also present. For example, biodiversity loss would be framed in a utilitarian way as a threat for the survival of human species or economic threat (e.g. for sustainable agriculture).

News articles were also framed in terms of solutions for the biodiversity loss – they would discuss either legal issues or regulation (including restrictions, sanctions, increasing protected areas), education and raising awareness or direct human intervention in fighting biodiversity loss through expert and scientific activities.

Finally, in this paper responsibility was defined as framing certain actors to be responsible for solving the issue of biodiversity loss. We were not interested in framing responsibility for causing the problem, as this would overlap with the definition of causes. In the analysis, we found that news articles would assign responsibility for solving the biodiversity loss to states, industry, politicians,

scientists or experts or international organizations. A part of the news articles would be ambiguous, and assigned responsibility to "humans", acknowledging in this way the anthropogenic role in biodiversity loss, but failing to assign concrete responsibility.

Table 4: Description of generic frames applied to biodiversity issue.

Frames	Subcategories
Causes	Natural impact on biodiversity
	Human impact on biodiversity
	Mixed impact (both human and natural)
Consequences	Loss for the ecosystem (biodiversity as a value)
	A threat to the survival of human species
	Economic (on agriculture, fishing...)
Solutions	Increase of the protected areas
	Restriction or prohibition of hunting or fishing
	Sanctioning of poaching and endangering endangered species; illegal logging
	Better legal protection
	Education and raising awareness of biodiversity importance
	Direct human intervention (e.g. capture breeding program, invasive species removal; new scientific advances in terms of intervention)
	Industry adjustment (e.g. sustainable tourism)
Responsibility	Humans (human race)
	Certain state/states (including EU)
	Industry
	Politicians
	International organizations (e.g. UN)
	Scientists and experts

6 Conclusion

Biodiversity loss is one of the most important topics of our day, and scientists and experts have long warned of the potentially disastrous effects of the ongoing mass extinction of species. Edward O. Wilson (2016) has called the current extinction a "global endgame" that will be fatal for many species while Elizabeth Kolbert (2014), in her influential book of the same name, wrote of the sixth extinction as humans "most enduring legacy" that "will continue to determine the course of life long after everything people have written and painted and built

has been ground into dust" (ibid.: 269). Still, regardless of these warnings, media interest does not seem to be consistent with the magnitude of the problem (see Shanahan 2008) and research has consistently shown the differences in media interest for biodiversity loss as opposed to climate change issues that seem to be much more on the media agenda (e.g., Legagneux et al. 2018; Veríssimo et al. 2014). But the scientific research on media representation of biodiversity loss is also scarce (compared to research on the media representation of climate change) and is generally focused on the representation of certain species, mostly large and charismatic mammals as identified by Painter (2021).

The goal of this research has therefore been to assess the overall interest and coverage of the biodiversity crisis in *Večernji list*, the longest running daily newspaper in Croatia, and thus to fill in the literature gap and broaden the issue in the international context. Since the research in general did not provide a comprehensive overview of the framing of biodiversity loss in the media, quantitative content analysis was carried out to determine the framing of the issue.

The obtained results show the prevailing thematic focus to be endangered or extinct species, followed by endangered ecosystems. The longitudinal analysis carried out for the period 1959–2022 allowed us to determine that the overall interest for biodiversity loss is inconsistent. Still, the highest number of articles was published in the most recent years – in 2022 and 2020 so the rise of interest in the topic is detected. The analysis could not establish a link between important years for biodiversity (adoption of The Convention on Biological Diversity in 1992, designation of 2010 as the International year of Biodiversity by the UN and the adoption of IPBES in 2012) and the rise in the number of published articles. Still, the rise in the number of articles in 2020 could perhaps be explained as the aftereffect of the most comprehensive report published by IPBES in 2019 since the research has shown it had generated substantial media coverage worldwide (see Painter 2021).

The majority of the articles put focus on animals (rather than plants) and the focus is, in majority of articles, on mammals, followed by birds, fish, reptiles and amphibians in fifth place. Putting focus on species humans most easily identify themselves with was expected but is nonetheless inconsistent with the data from IUCN Red list that puts amphibians highest in terms of risk of extinction.

Regarding the media framing of the biodiversity loss, we have found that the focus seems to be mainly directed at local or covering the issue in the Croatian context which was present in more than 40% of the articles. While biodiversity is a global issue and should be reported as such, emphasizing locally endangered species and ecosystems may enhance public awareness and foster engagement in conservation efforts.

This study shows that biodiversity loss in Croatia is predominantly portrayed as a scientific issue (69% of the articles), with a gradual shift toward linking it to climate change (22% of articles in overall sample, but 43% in the last five years). Media coverage remains largely centred on species loss – particularly endangered species and ecosystems – while devoting far less attention to the causes of biodiversity decline. Although frames addressing causes, consequences, solutions, and responsibility do appear, our inductively developed subcategories demonstrate how these could be applied more systematically and explicitly to biodiversity reporting.

However, the study has limitations we would like to address. One of the limitations of the study is the sample. As was discussed, the sample includes articles from printed editions (until 2010) and digital editions of *Večernji list* (from 2011 onwards). As Lechpammer (2024) has shown, digital news tends to be different than those in the print media, in terms of authorship, visual equipment and issues being covered. However, the sample also reflects the agenda setting power of print and digital news media. Because printed editions in Croatia have experienced sharp decline in number of copies sold in years from 2008 onwards (Vozab 2014) and since according to Reuters Digital News Report for Croatia in 2024, digital media are the most dominant source of news (80%) while print media are the most dominant source for only 20% (it was 43% in 2017) (Peruško 2024), digital media content could be more suitable for the analysis of the recent period due to more readers and influence of digital news.

Statistics for several variables were not presented in the results section because of low intercoder reliability. Future studies could use this study as a starting point to create more reliable measures for the analysis of media representation of biodiversity. Future research should also put more focus on digital news outlets (including born digital media outlets) to ensure that the sample includes those media outlets with the highest audience reach. This research could also benefit from a broader sample of media outlets that would include both regional and local media since, as shown, the biodiversity crisis is mainly directed at the issue in the Croatian context. A broader methodological approach which would include other methods – such as interviews with journalists and editors could provide insight into the news selection mechanism. Putting more focus on qualitative analysis such as discourse analysis might add to nuanced analysis of language used in representing biodiversity.

Despite the limitations, findings of this research can serve as a starting point for media researchers, media practitioners, policy makers as well as biologists and conservationists. For journalists it can be a starting point in learning how to place greater emphasis on causal chains and climate-related links. By putting focus on

less "charismatic", but equally endangered species, the media could contribute to a more balanced public discourse. For policymakers and experts, the results can offer insight into media reporting and framing which can be important in discovering how the topic of biodiversity can be communicated more effectively.

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