Responses to reviewer's comments

Thank you for reading our work and appreciating its value. Thank you for the valuable tips and comments. Below we have included the answers and explanations for the given problems.

Abstract

L. 29-33. Before starting the hypotheses, it would be good to give a brief overview of what the study is about
Re: We believe that the indicated sentence contains optimal (as for the needs of the abstract) information about what the research is about.

L. 38. please state what a decrease in the values of centrality attributes indicates as the reader might not be familiar with the network analysis method
Re: "…a decrease in the values of centrality attributes in the MW and WW…" changed to "…a decrease of centralization in the MW and WW…"

• *abstract and conclusion contain very similar information and are to a large extent redundant –the results summary in the conclusions section is in my opinion clearer and more confined to the most relevant findings without going into too much detail; I recommend moving parts of the conclusions to the abstract and tighten it, while the conclusions section should take a step forward and set the relevance of the current study into a broader scientific context (e.g. regarding climate change, further steps to do etc.)*

Re: Suggested changes will be taken into account

Introduction

L.65-72 – Changed in:
"The fluctuations and/or permanent changes in the thermal profile of surface waters have been largely associated with the discharge of industrial cooling water, eg. coastal seawater (Capuzzo, 1980), lakes and artificial reservoirs (Ejsmont-Karabin and Wągleńska, 1988, Zargar and Ghosh, 2006; Vandysh, 2009; Ejsmont-Karabin, 2011). There is a general scarcity of research on the hydrobiological impact of geothermal water that reaches water bodies, such as fish culture tanks (Sellami et al., 2009), artificial bathing tanks (Dash et al. 2012), and geothermal water areas (Baksir et al. 2022), and the few available studies have focused mostly on the tropical regions. "

L.73-74 – changed in: „climatic changes"
"In recent decades, climatic changes associated with a rise in global temperature, in particular in northern latitudes, have been recognized as an additional driver of changes in the thermal profile of surface water bodies"

L. 97 – 104 – changed in:
"Previous research has demonstrated that an increase in mean seasonal/annual water temperature induces responses in freshwater zooplankton similar to responses to accelerated eutrophication. The reactions observed were: an increase in total zooplankton density and biomass, changes in species composition (Williamson et al., 2002; Visconti, 2008; Vandysh, 2009; Arlic et al., 2013), elimination of seasonal

succession, including a decrease in the proportion of cold-water species in spring rotifer communities (Ejsmont- Karabin et al., 2020), degrease in size of copepods, and accelerated growth of cladocerans characterized by small body size/low biomass (Daufresne et al., 2009; Gutierrez, 2016; Evans et al., 2020; Zhou, 2020)".

107 – 110: in this context, the authors should refer to the potential mismatch of phyto- and zooplankton succession that has been observed under warming scenarios, e.g. earlier hatching of copepod nauplii, while phytoplankton spring bloom starts later (differential impact of warming on phototrophs and heterotrophs)

We agree with the highlighted phenomena and dependencies. Here we briefly present the effects of the biological effect of increased water temperature on zooplankton, confirmed by previous research. However, we do not intend to develop the problem of seasonal changes, because it is not the focus of this paper.

L. 136-138: Please specify these potential mutualistic interactions???

We assumed that positive interactions between two taxa are correlated with an increase in their biomass as the effect of consumer guilds, where independent species share resources. It refers to the mutualistic interactions in the broader, ecosystemic and evolutionary sense (Krebs, 2009).

L. 139: corrected - **"indicative of indirect negative effects by competing for a common food source**" instead of **"indicative of grazing on phytoplankton"**

L.140. please specify by what mechanism.

"**The temperature gradient differentiates the rate of circulation of organic matter and mineral elements released during decomposition processes. Thus, it affects their availability for the development of primary producers, indirectly determining the resources and type of food for zooplankton**"

L. 148-149: why do the authors expect a weakened role of crustaceans under warming? Before they state that warming increases the proportion of copepod larvae and crustacean growth? **- corrected, clarified (according l 97-104)**

L. 150-151: It would be useful to state the temperature range already in the introduction and set these into the context of predictions on global warming

We do not compare the range and level of temperature, especially in winter, in the studied reservoirs with global warming forecasts. However, we propose to use the obtained results for a broad interpretation of the influence of the thermal factor on the network of interactions between species of zooplankton.

L. 154: please add "seasonal" to the water temperature gradient

We analyze the water temperature gradient between the reservoirs, which, as mentioned above, also applies to differences in the average annual temperature. It is therefore not a seasonal gradient. Of course, the thermal classes of the compared reservoirs were determined on the basis of the temperature gradient in winter, but the consequences of the influence/differences in the zooplankton network are assessed on the basis of a database of year-round results. Hence, we believe that it is not necessary to specify the "seasonal gradient"

L. 157 – 160: Why is this relevant in the context of the current study which investigates

stable conditions that cannot be compared to a temporal disturbance as the authors stated above?
The term "stable conditions" means their repeatability for many years of reservoir using. Thus, from the perspective of the heated reservoir, "warm winters" affected the ecosystem for long time and the changes found in it are not "an accident" of one disturbance. Since thermal changes on the globe occur slowly, gradually, but over the long term, our results can be helpful in interpreting global changes.

Methods

L. 172-173: Only temperature? What about inorganic nutrients and other abiotic parameters?
The description concerns the temperature as a variable which is the main problem of the analysis, differentiating the compared reservoirs. Other abiotic factors are given in Table 1 and commented on in the Results section.

L. 182-185: this is a huge temperature difference – how can that be related to projected climate change scenarios? The authors really need to set their study and the respective temperature regimes into perspective.
Please see response for comments L. 150-151

L. 196: coastal zones usually refer to marine systems (rather littoral zone?); please specify the "vicinity of the filter zone"
Changed to „litoral zone" and added reference explaining „filter zone" (Goździejewska et al. 2018). For better explanation, what the filter zone is, please see the description in doi.org/10.1051/kmae/2018020

L. 197: "Patalas trap" – please specify or provide a reference
Changed to 5-litre sampler

L. 198-199: this is a field study, not an experiment
Changed to "field study"

L. 199: how do 3 samples à 5L add up to 20L? Apparently, the 3 different samples were pooled?
A separate sample of 20 liters was collected at each site. Samples were not combined. Each sample was analyzed separately.

L. 209-217: a lot of parameters were determined in the reservoir itself (that are not described in the Results section, see below); were these parameters also determined in the geothermal water sources? That would have been great in order to estimate the amount of nutrient input fueling phytoplankton production.
The chemical parameters of geothermal waters have not been tested for the purposes of this study. Due to their social (angling) and natural role, the owner of the area (Bełchatów Mine) controls the quality and sanitary condition of the waters supplying tested reservoirs. Here we focus on the thermal factor.

L. 220 – 224: please specify your statistical analyses – what were the response variables tested, especially regarding zooplankton (abundances, biomass, diversity?), were these tests repeated for each sampling event, were data pooled across all time points, or was

time included as a factor in the analysis? This does not become clear at all. Furthermore, it would be useful to include additional analyses (see above). So far, the authors relate their results exclusively to temperature, while it is well known that other abiotic factors and of course food supply may have equal and also interactive effects on zooplankton communities.
Statistical tests were performed on a set of "raw" data, i.e. the results from each separately analyzed sample. The variability of abundance and biomass, variability of zooplankton taxonomic diversity indices, and variability of water physical and chemical parameters were tested, and the differences between thermal classes are shown in Table 1.
L. 225: Please specify what parameters you refer you - zooplankton ID based abundances? sizes? functional groups?
The biomass values of each of the analyzed zooplankton taxa were compared between thermal classes (Tab. S1).

L. 233: please specify "the parameters of the entire network"
Attributes of the entire network refers to its tendency to clustering, centralization, density, heterogeneity and paths lengths.

<u>Results</u>
• 1st paragraph: does mean annual temp. and mean winter temp. refer to the pooled data across all time points? Which time points were part of the "winter" samples? The authors state that "significant variations were also observed in DO, chlorophyll a, TOC, TN, and the parameters describing suspended solids (turbidity, color, SDT, Tot susp) (Table 1)." HOW did the reservoirs differ?? The authors should describe these differences and relate them to their zooplankton data, as phyto- and zooplankton is strongly influenced by a range of different abiotic parameters and not only by temperature (see also general comments).
Winter samples were for months of December–February.
The results of the physical and chemical parameters of water were elaborated in detail and presented in Table 1. Differences in average values were statistically compared. The authors repeatedly relate zooplankton data and the structure of zooplankton networks to abiotic conditions.

L. 269-274: Correlations have not been mentioned in the methods section – the authors should describe all of the analyses conducted. How was the effect of temperature on zooplankton species richness tested? This is also not specified.
Added: Spearman's rank correlation analysis ($p < 0.05$) was used to test for correlations between temperature and zooplankton species richness, and between temperature and the others physical and chemical variables of water.

L. 282 – 284: Were these analyses conducted across all seasons with all sampling time points pooled? In general, pooling all data over time might level out important seasonal dynamics, which are of utmost importance if the aim is to compare the food web dynamics in reservoirs differing in temporal (seasonal) thermal gradients (see above)
We understand that seasonal dynamics periodically change the structure of the food web. However, our goal was not to compare temporal variability across seasons. This concerns a different research topic. The data entered into the model concerned the entire analyzed season, which is consistent with the purpose and methodology of the study. Such an approach synthesizing intra-seasonal variability is needed to answer the question posed in the introduction, which concerned the comparison of entire seasons,

not the dynamics within them. This is the approach found in the literature (Kruk et al., 2020, 2021; Goździejewska and Kruk 2022).

L. 285 – 287: How was this tested? As the effect of temperature on single taxa? Or were the actual temperature differences calculated between different seasons?
The biomass of each taxon identified in each thermal class was calculated. The K-W test determined the significance of differences in the mean biomass of taxa between thermal classes.

L. 326-327: again, the authors relate all differences solely to temperature without taking the other factors into account
Three interspecies zooplankton networks were built based on the main differentiating indicator, i.e. water temperature. On this basis, three thermal classes were determined. Hence, the differences in network attributes were related to thermal conditions. The influence and connection with other abiotic parameters is repeatedly emphasized in the Discussion section.

<u>Discussion</u>

L. 363: what do the authors mean with the term "energy of water"? does the thermal gradient refer to the temporal/seasonal gradient?
"Temperature is a physical factor that modifies flow and transformations of the biologically accumulated energy in the water…" This applies to every aspect of time, but here we compare the differentiated water thermals in the tested reservoirs.

L. 364: which processes? Please specify
The processes described above in L140.

l. 370: how do the authors come to that conclusion? Did they measure organic matter recycling? I don't really get the argumentation here – in the warmer reservoirs organic matter cycling was already higher in winter due to the warm water inflow and did not increase as much in spring as in the CW?
The rate of circulation of matter has not been studied. The researched reservoirs are shallow, polymictic. Therefore, there is homothermy in the reservoirs and equalization of oxygen concentration from the surface to the bottom. Due to the higher water temperature, mineralization of organic matter and its circulation in the winter period is faster in warmer reservoirs than in cold ones. The intensive mineralization of organic matter in WW is indicated by a significantly lower concentration of dissolved oxygen in water compared to CW and MW (Table 1). At the same time, nutrients available in water are used by macrophytes, which deposit them in their tissues. Thus, the increase in water temperature in spring has a much clearer effect on the activation of the above processes of circulation of elements in cooler reservoirs than in warmer reservoirs, where their resources are smaller.

L. 373 – 376: Was that observed in the study in terms of lower Chl. a, or is this an assumption? Wouldn't you assume that phytoplankton production increases more rapidly in spring, when the water is already warmer? How were the reservoirs stratified – was that somehow determined?

An increase in the concentration of chlorophyll a was observed along with the heating of water in the CW class. However, the chl a values did not change in the WW class. The reservoirs are shallow, and thermal and chemical stratification was not observed (methodology).

L. 376-380: I don't get this point - why would heating lead to less rapid cycling? I can only imagine that under continuous recycling induced by warmer temperature, not as much organic matter accumulates rapidly, leading to clearer water and thus more macrophytes can establish?
Winter warming does not mean an increase in the circulation of matter within the plankton. On the other hand, it may contribute to its capture by macrophytes that find thermal conditions for development (Kruk et al. 2022). In addition, the observations are supported by studies by Wollrab et al. (2021).

L. 380 – 382: Why? Because the delta of environmental change (temperature) is higher? Please explain, this is hard to understand.
The mechanism of the influence of temperature on the feeding conditions of zooplankton in the studied reservoirs was explained above.

L. 394: eutrophic conditions do not necessarily relate to good food conditions, as the food quality is usually constrained under eutrophic conditions. The authors refer to the nutrient concentrations measured in the reservoirs in the next sentence for the first time – these patterns need to be described in the Results section
We conclude about good nutritional conditions of CW based on the response of specific species (indicators of increased trophy). In the Results section, it was stated that the differences in "trophic" parameters were significant between the thermal classes and referred to Table 1

L. 397 – 401: These results differ, but also the conditions investigated in the present study are completely different than climate change scenarios (see above) – so please specify the predictions you're referring to.
According to the answer L 150-151, we do not compare, but only propose to use in predicting global changes and their effects.

L. 402-403: please explain, why would an increase in trophy levels (was that observed?) contribute to a higher content of mineral suspensions?
These observations have been confirmed by many previous studies, also in the same reservoirs (please see references).

L. 451-452: does this statement refer to the aforementioned study, or to the current study?
To the current but also earlier by Goździejewska et al. 2018.

L. 466-467: Why? Functionally diverse communities do not necessarily mean dynamic zooplankton communities (dynamic over time?)
In this term, Dynamics means the dynamics (number and strength) of interspecies relationships mentioned above

L. 474: what does immobilization refer to?
Immobilization of nutrients/organic matter in macrophyte tissues

L. 487-489: This could also be an indication for an indirect effect of better water quality characterized by less eutrophic conditions and fewer blooms of potentially inedible phytoplankton.

Of course, such conditions prevailed there, as the results show (Tab.1)