Małgorzata Zofia Kowalska &
Björn Kröger

Lake Views – A Conversation about Possibilities on How to do Multidisciplinary Research on Environmental Change

Abstract

European lakes are changing. We, a Polish social anthropologist and a German palaeontologist, have personal histories with lakes – Lake Niedzięgiel in Poland and Lake Stechlin in Germany, respectively – whose character has shifted dramatically in recent years. Since the beginning of 2023, we have been discussing how to relate our scientific perspectives to these lakes and the changes they are undergoing. Here we provide an overview of our conversation, which takes a critical look at dominant practices of knowledge production and considers how we can bring different disciplines into dialogue to make research more responsive to climate change, and therefore more meaningful. We pay particular attention to stonewort: an aquatic macrophyte recognised as an "ecosystem engineer" in the lakes where it forms underwater meadows, but at the same time threatened by pollution and climate change. We conclude that new ways of researching and sharing knowledge are needed if we are to move towards a less destructive and instrumental relationship with lakes and their inhabitants.

© Małgorzata Zofia Kowalska & Björn Kröger
https://orcid.org/0000-0001-7059-5079, https://orcid.org/0000-0002-2427-2364
ETHNOLOGIA FENNICA Vol. 52 (2025, issue 2), 86–104. https://doi.org/10.23991/ef.160938
This work is licensed under Creative Commons CC-BY-NC 4.0 International License.

Introduction[1]

The vast lowlands south of the Baltic Sea have thousands of lakes[2]. They are the heritage of the last Ice Age – they formed when the glaciers retreated, more than 10.000 years ago. Two of them are Lake Stechlin (DE) and Lake Niedzięgiel (PL). Even though they are more than 330 kilometres apart, they share some commonalities; both lakes are not very large, but their shores are rich in bays, their ground is sandy and poor in nutrients and hence their water is clear, allowing extensive meadows of stonewort to grow. Stoneworts (a common name for charophytes) are remarkable aquatic macrophytes known as pioneer species and ecosystem engineers; the lakes in which they grow in large communities are sometimes called "Chara-lakes." Both lakes in recent years underwent dramatic changes, threatening their underwater meadows and rising concerns of what the future holds. The two lakes, each in its own way, are paradigmatic examples of lakes of the Anthropocene. At Stechlin the water gets increasingly turbid, blooms of cyanobacteria cause deep water anoxia and extensive death zones at its bottom (Kröger et al. 2023; Gonsiorczyk et al. 2024; Wollrab et al. 2025). Lake Niedzięgiel is part of the region that is known for a long time for unfavourable hydro-meteorological conditions, but the water regime in the region has been significantly altered by open-cast mining, resulting in the formation of a cone of depression (Kędziora 2008). Together with other anthropogenic pressures (such as tourism and agriculture), this has led to a steady decline in water levels since the 1980s (Nowak and Przybyłek 2020). The shoreline has receded by 20-30 m, and in some parts of the lake by as much as 100 m (Pasztaleniec et al. 2021). The underlying causes of these changes are complex and involve multiple temporal and spatial scales. They point to specific characteristics of the lakes in terms of topography and history, and to similarities such as their Ice Age origin, the industrialisation of both regions, development of tourism and agriculture, and climate change.

Lake Stechlin is a deep lake, reaching 69 metres at is deepest point. It is located in the middle of an extensive nature reserve and under protection since the 1930s. In the 1960s, a nuclear power plant (NPP) was built on its shores. It operated from 1966–1990, using the lake water as cooling medium for its reactor.[3] Lake Niedzięgiel is relatively shallow, with a maximum depth of 21 m, and surrounded by forests and an open agricultural landscape. It has been part

1 This work was supported through the Bioart Society, Finland, by Rewilding Cultures, a Creative Europe program of the European Union, which aims to support European projects in the field of cultural production and innovation.

2 The region is called *Südbaltischer Landrücken* in German and *Pojezierza Południowobałtyckie* in Polish.

3 Interestingly, as the last coal mines in the region are being closed in Poland, a project is being lobbied to replace the mining industry with a nuclear power plant.

of an agricultural region since at least the Middle Ages, but for more than half a century the region has been known mainly to summer visitors for its transparent lakes. Local tourism is an important factor for both lakes; the tourist centre of Skorzęcin on the northern shore of Lake Niedzięgiel is equivalent to the village of Neuglobsow east of Lake Stechlin. Both villages saw their heyday during the socialist era, when they provided thousands of beds for visitors. Both lakes are covered by several conservation programmes, and both are protected as Natura 2000 sites under the European Habitats Directive as "hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp." (European Commission 2013). The Stechlin is known to many Germans through the novel *Der Stechlin*, written by Theodor Fontane in 1899 (Fontane 1899).

Our own histories are interwoven with those of the lakes. Until recently, however, we did not pay much attention to the lake stories. We appreciated their existence, loved the trips to their shores, loved swimming in the clear water and walking in the silence of the surrounding woods. The lakes' presence was something given, unquestioned, timeless. This feeling of security and stability changed in recent years. It motivated us to look closer, and to try to understand what happens with these lakes. The confrontation with unquestioned certainties led, for both of us, to a cascade of events that made us question the relevance of our scientific interests, practices, and methods. We met while expanding the scope of what is germane to our disciplines and engaging in discussions beyond them.

While maintaining a critical stance on the prevailing methods of producing knowledge about environmental changes, this article examines the potential of multidisciplinary research in fostering a more comprehensive understanding of nature conservation and local environments. Kim Fortun's (2012) non-literal understanding of ethnography as an experimental method to "stage encounters" between different perspectives and areas of expertise is helpful in our conversation about how we can learn from each other to approach our respective environmental field sites in less extractive and more caring ways. We believe that conservation and cooperation on issues that matter to the general public, rather than further specialisation, might help us to make our research and our environments more sustain-able, i.e. capable of sustaining life and, to use Tim Ingold's words, enabling us to *carry on* our existence together *with* others (2024, 88).

We decided to discuss the possibilities and potential of such multidisciplinary cooperation in the form of a conversation rather than a typical scientific article. This better reflects the way we worked, walking and talking by "our" lakes. We also hope that, rather than being just an interaction, it will be more of a "correspondence": ongoing, open-ended and dialogical (Ingold 2021, 11) and inviting further exploration.

Disturbances

Kröger: Lake Stechlin has been a place of longing for me since I left it in my early youth. I return to the lake during holidays, weekends, short daytrips, walk along its shores and jump into the water. The lake seemed timeless, a centre of calm in a world spinning faster and faster. For many years, I hardly noticed what was happening in its depths. My relation to the lake came never into question. I was sure the lake belonged to me, and I belonged to the lake. I did identify with its beauty; its fame made me proud. The point in time when I started to question my relationship was amidst the Covid-pandemic. It was during this time that I spent a couple of weeks in a row at the lake for the first time in decades. Extensive daily walks and regular swimming gave me a deeper sense of how much the lake had changed since my childhood. At first, it was a diffuse sense of a change in the colour of the water that I noticed: different light reflections, a different texture of the bottom. It took me some effort to understand its reason, but I instantly felt a kind of guilt for my ignorance. Why hadn't I noticed this before? Why did nobody tell me? This was for me the start of a longer process of inquiry into the question of how the people who live near the lake, who have a close relation to the lake and a specific knowledge, how they relate to that lake and what it makes with them that the lake changed so drastically in recent years. I also began to think how my own scientific research as a paleontologist is related to my own history with the lake. I asked myself: what is the relevance of my studies? Why am I spending my time studying something that happened millions of years ago somewhere in the world, and at the same time being ignorant about the processes that are happening right in front of my door?

Kowalska: I did not know Lake Niedzięgiel very well when I was a child. I visited it a few times with my parents, as it was known in the region for its clear water and as a tourist centre, but there were other lakes closer to where I lived, where I cycled with other kids and where I learnt to swim. But then, in the first decade of this century, I met my future husband, who grew up on Lake Niedzięgiel. That was when I started to get to know the place and it has been important to me ever since. You could say that our "relationship timeline" is closely linked to the lake. And after quite some time in this relationship, both with a man and with the lake, I noticed that Niedzięgiel was changing. It was never really a deep lake, but now sandy islands were appearing in the shallows. People started talking about these changes and how the lake was literally disappearing. At the same time, I didn't know if anyone was looking into it, doing anything about it. I knew that the lake was part of one or two conservation programmes (today I know it is part of three), but I did

not know, and I never really wondered what it actually meant. I think no one really knows what it means unless they start digging for the information, and that is a problem I write about elsewhere (Kowalska 2024).

Anyway, at the time I had just finished my PhD on the politics of megaprojects, I was newly married and expecting a child, and it struck me that the lake was drying up so… quietly. If anything was being done to stop it, it was being done elsewhere, not on the lake. It is not that the changes were unnoticed, but it was as if people did not know how to make sense of them. I needed to look at how and what was being protected on the lake, and how people felt about these conservation projects, their practices and their "objects". I intuitively felt that the conservation experts were operating at a different level, while the local people were left alone with their very limited understanding of the changes. I was curious to understand the reasons and consequences of this separation, this discontinuity between the management of the environment and the local community. So, for me there was a shift in interest from studying urban projects to studying environmental projects. The conservation programme in Niedzięgiel, however, covered the place to which I felt connected and also *solastalgic*[4], so it was both a personal and a scientific interest.

How was this in your case, how did you start your research into the changes that have been taking place in the lake? And did you call it research at all, since it was more of a sideline for you, at least in the beginning?

Kröger: During my stay at Stechlin in 2020 I began reading intensively research articles about the lake's ecology. Lake Stechlin is heavily researched. When the NPP was built in the 1960s, a limnological research station was set up on the lake to document the changes in the lake that were expected as a result of the NPP's operation. The station published its own scientific journal. In the 1980s a comprehensive scientific monograph was published in English language (Casper 1985). So, there is a huge body of literature available. The station exists until today under a different administrative structure and with different research tasks. I realised that there is a continuous monitoring time series of the water quality and the micro-phytoplankton (i.e. the free-swimming microscopic algae) taken at two-to-four weeks intervals that goes back into the early 1990's. At the same time, in 2020, I found very little published information that could explain to me the dramatic changes in the lake that were clearly underway. So, I contacted a senior scientist of the station that I know since childhood. Through this I got contact to Judit Padisák, a leading

4 The term *solastalgia* was introduced by Australian philosopher Glenn Albrecht (2005) to describe the distress and suffering caused by environmental change and the degradation of one's home environment.

expert in lake phytoplankton ecology, living in Hungary. She is involved into the phytoplankton monitoring at Stechlin for decades (see e.g., Padisák et al. 2010). She entrusted me with the raw data; a list of species counts per dates collected from Stechlin beginning in 1992. I was curious to see if the changes in phytoplankton could tell anything about the changes of the character of the lake. As a palaeontologist, I am familiar with computational methods to study temporal change in ecosystems. Using these methods, it makes no difference whether the time periods used for the calculations are measured in days or millions of years. As a palaeontologist, I am interested in the question of how ecological communities change in geological timescales. At Lake Stechlin for the first time now I had the chance to look at first hand data of how ecological communities change within weeks, seasons, and years (Kröger et al. 2023). I even was able to connect the individual collection dates with dates in my own biography. I could see how many species of diatoms thrived in the lake at the date when my younger daughter was born, etc. This was extremely exciting because it was concrete. The volatility of the composition totally surprised me. It was an almost physical experience to see how drastic and chaotic and unpredictable the changes in the lake can be within weeks and at the same time how regular some patterns are at seasonal scale. This gave me deep new insights into how important the question of scale in time and space is, when trying to understand Earths changing biodiversity at global scale. Most importantly these new insights deeply changed my personal relation to the lake and its history. It seemed to me at that moment as if something was coming together; my personal life experience became connected to something larger, like geological time scales and the global change we experience.

Relevance

Kowalska: When a palaeontologist who studies fossils and marine animals gets involved in research outside his field, isn't that seen as a waste of time by fellow palaeontologists, and as a bizarre interest by limnologists? What is the aim of your involvement there as a natural historian?

Kröger: My first impulse was curiosity. Also, in terms of the data. For so many years I analysed occurrence data of fossils, now I had the possibility to study data from a living community. Because the quality of the data was so good I was able to use them for computational methods of causal inference, and more generally to apply methods to measure changes within the ecological communities. I was aware that I am totally naïve, when it comes to an understanding of the dynamics of populations of planktonic algae in a lake,

but I thought that the diagrams resulting from my analysis will probably tell anything. I thought my paleo-perspective could possibly be relevant for the limnologists, too. I was curious to see if I could find some pattern that I am familiar with from the fossil data, such as rapid extinction events. This work was only possible because Judith Padisak was so open and trustful to give me the partly unpublished data and to spend time to co-write a manuscript with me. There were also an openness and interest at my Helsinki Museum, where I am employed as a curator and researcher, when I presented the first results of the analyses in an internal colloquium. But that only relates to the hard science aspect of it, if you like.

My underlying motivation was slightly different: I wanted to improve my relationship with this lake. I wanted to open my senses to the dynamics of its plankton, and I wanted to understand what has happened to this lake in the recent past because I thought something is going terribly wrong there. At the same time, I was afraid that my work would be seen as a hobby or a kind of sentimental act. And I still don't think I'm wrong in these concerns. Using my palaeobiological methodological toolkit, paradoxically, helped me to cross the boundaries of the disciplines.

Kowalska: When you say that you wanted to improve your relationship with the lake, what do you mean by "improving a relationship"; and how do you understand a "relationship with a lake" at all? One might argue that the focus of my discipline, social anthropology, is on relations (Strathern 2020), but why would a naturalist want to explore his own relations with the "object" of his study?

Kröger: I would say that I was not primarily motivated with this research by my role as a scientist but as a person, who feels a deep connection to this lake and its landscape. When I started with this research, my relation was that of a visitor. My point of view was much more superficial, coloured by memories. I wanted to get out of this rather passive position into an active relationship where I could contribute knowledge, something that was directly related to the lake, something that possibly even makes some difference. It was only during this process that I realised that certain questions, questions that I became interested in, have never been asked by the limnologists at Lake Stechlin. At least not in a published form. It was a mystery to me why this analysis, which I did, had never been done before. Why was there no published story about the 20+ years plankton change in the lake? Why was there not much more effort to follow the question of what the current dynamics of free-swimming algae could tell us about the deteriorating state of the lake? Since I was a child, I always believed that the limnologists would somehow mysteriously take care of

the lake. This impression is a result of how the research station presented itself to the public and how it was portrayed by the local press. Now, being part of the academic attention economy, I know better that this is only one aspect of a larger story. The caretaking was never a focus. The lake should serve as a model to understand cooling water reservoirs and lakes in general. The peculiar stories of the organisms inhabiting the lake were not of interest. For me it was more interesting to know, how I can relate these aspects of my personal biography, feeling of belonging, disturbance due to the speed of change to my research. Am I right in thinking that it is easier to bring this personal aspect into anthropological research?

Kowalska: In a way, yes. But it was not so much a question of incorporating my personal biography into the ethnography or anthropological writing. Rather, I engaged in this research because I felt it mattered. I remember how moved I was when I first read Isabelle Stenger's appeal for science to take seriously what she, following Latour, calls "matters of concern" (Stengers 2018; 2023): issues that matter to and worry communities. She argued that scientists are trained to focus on very specific problems in siloed, specialised fields and to ignore anything outside those problems, which is seen as disruptive. But she urges them to admit that their knowledge and interests are situated, and that their facts need to be brought into conversation with perspectives outside their expertise. The value of conversation is not addressed in science. It is missing at "my" lake. There is science and conservation, and fascinating natural histories and ecologies that go with them, and virtually no interaction with the local community.

My reading of Stengers, however, is that the aim of my anthropological involvement should not be simply to criticise this situation. Instead, I agree with Kim Fortun (2012) who argues that research can bring together people with different perspectives who are all concerned about a particular issue and willing to learn about other points of view. The aim of the research is therefore not so much social analysis, but rather a dialogue about what matters. If you think of anthropology in this way, its interdisciplinary potential becomes clear, don't you agree? This approach also resonates with Tim Ingold's call for "correspondence". He writes: "For life on earth to carry on, and to flourish, we need to learn to attend to the world around us, and to respond with sensitivity and judgement. Corresponding with people and things – as we used to do in letter-writing – opens paths for lives to carry on, each in its own way but nevertheless with regard for others." (Ingold 2021, 3)

So there was this rapid change in the lake, taking place in a changing landscape, which seemed to be noticed and which had caused concern among various parties involved – from naturalists and conservationists to local politi-

cians to residents and long-term visitors – and I felt that my role was not only to describe it, but perhaps to start a conversation among various parties involved, or at least to understand why that conversation is not taking place. My research focused on different perceptions of the environment and its conservation, and the relationships people had with that environment and its ecosystems. Funded by the Polish National Science Centre, the project involved a small team and myself conducting engaged fieldwork, primarily based on participant observation and interviews with the local community, as well as natural scientists and conservationists.

Kröger: Were the naturalists and conservationists interested in this conversation?

Kowalska: Many definitely saw the need of it.[5] Essentially, ecological crises and climate change are also social problems. They are not the result of the very fact of human existence. Rather, they are the result of how we live: how we understand the world and our place in it, and how we shape the reality accordingly. In their book *Living with Environmental Change* Kirsten Hastrup and Cecilie Rubow write that as social sciences join the hard sciences in the attempts to understand climate change, some even speak of "the human turn" (Hastrup and Rubow 2014, 7). Climate and environmental change are experienced and understood locally, by people with different interpretations of what is happening and various coping strategies. Engaging in discussions with them is both necessary and inspiring, and some scientists seek it out.

At the same time, naturalists or conservationists I talk to sometimes say that local communities are "unaware", "they do not understand", or even that "people are the problem", because they are not willing to cooperate. They ask what can be done to convince them not to do this or that. But I do not think it is a matter of top-down education – it is not about experts teaching lay people about science and people complying with this "guidance". The ways we relate to local environments is founded on certain assumptions and beliefs about nature and its value, or lack of the value. If we want to change practice, we need to look at the value system that shapes it. Whether and how we protect or care for the environment depends on how we perceive it, so the debate about conservation is ultimately also a debate about cultural values and our understanding of sociality.

5 The growing awareness among scientists of the need to engage with conservationists and the local community is becoming increasingly evident, as demonstrated by a recently published paper by internationally renowned limnologists (Barouillet et al. 2024).

Kröger: Perhaps this reflection requires a certain disturbance, as in our case. In order to build a new relationship, I used the tools available to me through scientific knowledge. I framed a question as a testable hypothesis and tried to find a formula and a model that would support or reject that hypothesis. So, at that point I was already in a certain value system, which put me in a certain position in discussions with other scientists and with people who are not involved in science. In that discussion I use the results of my scientific framing as a starting point to argue what is right and what is wrong. What happened in my case was that the results of my scientific research left me puzzled and I realised how little is known about this lake, even after generations of research. At the same time, the results of my own scientific engagement made me see more clearly how alive this lake is, how unpredictable, chaotic, open and interconnected, and this confronted me with my own delusion that I could find easy answers. It also confronted me with the limits of concepts that I had used confidently in my daily life, and that have been used by ecologists and biologists for decades, including the scientists at Lake Stechlin.

One of these is the concept of the ecosystem. It seems obvious that the lake is an ecosystem. But I found out that, historically speaking, the concept is quite new; it really only came into use after the Second World War (see e.g., Golley 1992). The ecosystem concept was the first to quantify the material and energy flows of certain interacting organisms in time and space. It is historically strongly based on ideas of spatial and temporal confinement, self-preservation and stability. Scientific models play a key role in the study of ecosystems. It is therefore not surprising that ecosystem research has been closely linked to the nuclear industry from the very beginning (see also Kröger 2025). I suspect that at Stechlin the ecosystem perspective strongly promoted research of the open water aspect of the lake with its planktonic organisms, because it promised to gain control over the material and energy flows within the lake. And so, of course, I used the data from that kind of research, the change in phytoplankton composition. But this ecosystem lens, if you like, had some important side effects. One of them is that the individual histories and fates of many individual plankton species, apart from those that were valued as keystone species in the models, were no longer of interest to scientists, they were neglected. A second side effect is that research on organisms living on the bottom of the lake has been neglected, because they have been interpreted as irrelevant to the fluxes of matter and energy in the open water. Conservationists pointed this out early on (see Oldorff and Päzolt 2010), but this dominant view has only recently started to change (see Gonsiorczyk et al. 2024).

Now, as my motivation for doing this research at Lake Stechlin was to find a new way of relating to the lake, at some point I found myself asking: where and when does this ecosystem begin and end; what are its boundaries? I have

also always focused on the open water, on the increasing turbidity of the water. When I looked back nostalgically at the former Stechlin, I only had the crystal-clear water in mind. It was only when we met and talked about our experiences with the lakes that I understood that the different reflections of light, the different textures on the bottom of the lake, were mainly caused by a new type of algae and water plants that are now growing all over the Stechlin but were not there before. One could say that my unconscious ecosystem-lens filtered out the water plants, the vanished stonewort meadows. When I saw the stonewort meadows during our visit in December in Lake Niedzięgiel, I suddenly realised that these evergreens give that bright colour to the lake during the dark season and that this is probably one of the main aspects of what has changed at Stechlin since my childhood.

Kowalska: Stonewort meadows are central to how I think of Niedzięgiel today. I look at them as engineering this place – as making this place, as I wrote elsewhere (Kowalska 2024), making it possible with its clear waters and white bottom. My research at the lake shows that local people and visitors have little or no knowledge of the protected habitats in the area. But that does not mean they do not value or care about the place. They are simply used to seeing conservation as an expert task and responsibility. This, by the way, is a view shared by conservationists and naturalists. The focus of our culture is elsewhere, not on building and caring for relationships with the local environment – quite the opposite. Now, as many of these local ecosystems deteriorate, communities have few tools not only to respond to the changes, but even to understand them. "There is nothing I can do," is a common response from residents and visitors whom we talked to about the lake drying up. They expressed a deep sense of belonging to the place. At the same time, they did not even know what was this conservation body that was supposed to react. Conservationists, with whom I talked, as I already mentioned, point to the unsustainable behaviour of local people as the main problem on the ground. But what I see most of all is the gulf between the lake with all its inhabitants and "its" conservationists on the one hand, and the local community on the other. This dualism between nature and man, as Val Plumwood (1993) describes it, the backgrounding and radical exclusion of the environment from community life, is symptomatic of our social reality. It also divides people, experts on one side and the public on the other. I argue that we need to challenge it if we are to respond to climate change.

I am convinced that drawing attention to the stoneworts, appreciating them, valuing them, could change the way people think about the lake and about themselves in relation to the lake. Their role there, unrecognised by the wider public, visitors and residents, has the potential to challenge the role of

humans as those who control – or "conserve" – the place. You might ask: who really cares for whom here? Who really sustains this place?

Stonewort

Kowalska: Stoneworts are very little-known outside of the expert circles – they are unrecognised by the locals, submerged, unnoticed. Conservationists and biologists value them as pioneer species and ecosystem engineers, and stonewort meadows are important habitats for many species. Also, stoneworts bind excessive nutrients contained in the open water and contribute to maintain clear water conditions, which are a basic requirement for many species in the lake (Pełechaty et al. 2013). They have an evolutionary agency: stoneworts create heritable environments, which we can thus see as reproduced and inherited communities as a heritable change that goes beyond DNA and beyond species level (Laland et al. 1999). But the ecosystems they create are not even close to the popularity of well-known marine ecosystems such as *Posidonia* seagrass meadows or kelp forests.

Kröger: I now remember that the first time I came across them was during my studies of geology at the university. There was this moment when we were going through the group of stoneworts in a seminar about limestone formation. Stoneworts and their close relatives of the charophycean family are a geologically very old group. It is important for geologists and palaeontologists to know them because they produce a lot of lime sediment during growth, and because their calcareous spore capsules, the so called gyrogonites, are often well preserved in sediments. In that seminar I thought wait, I know these. At Stechlin, when I went swimming, I had to step through their wonderful mossy light green underwater meadows. This was in the 1990s. Today I know that their fossils help to reconstruct the evolution of early land ecosystems. In fact, charophyceans gave rise to all land-plants ca. 470 Million years ago (Bowman 2022). Their beautifully ornamented gyrogonites are also fascinating. They can form mass concentrations in the sediments of lakes and ponds, so called "seed banks" from which new individuals can germinate even after hundreds of years (Stobbe, Gregor and Röpke, 2014). So, they are connecting in many ways: in forming extensive underwater meadows, they connect all kinds of organisms in a tangled web of interrelationships; they form a kind of memory of the flora of lake, connecting ecological communities through time; in an evolutionary sense they connect green algae with land plants. In retrospect I must conclude that it was only after their introduction in that university seminar that I became consciously aware of them. It is difficult to name them and to explain them to people who have never heard of them before. They are not

really algae, but neither are they aquatic plants, because they are not plants in the strict sense, but something in between.

Kowalska: Yet, what I think should be emphasised here, is that they could be of interest not only to scientists. I am excited about this possibility of recognising their evolutionary and ecological stories at the community level.

Kröger: In fact, as you mentioned, they should be compared with the sea grass meadows (Rotini et al. 2023). What the sea grass is for the sea is what stonewort is for the lake. I know of several initiatives that have been formed to protect sea grass meadows from all kinds of human made destruction (for instance, Ceccherelli et al. 2024). Maybe charophytes could play a similar role in freshwater ecosystems?

Kowalska: Therefore, I like to use the term "ecosystem engineers" (Jones, Lawton and Shachak 1994) because it draws attention to what stoneworts do. It points out that they create the ecosystem and who is actually central to that system. But I also use the term with the caveat that it implies a somewhat instrumental perspective. People may learn to value stoneworts because they are so important to this ecosystem. What if they weren't? Shouldn't we be emphasising the intrinsic value of life beyond humans? After all, they are not engineering this ecosystem for us; they are simply living – they are "beings-for-themselves" (Mathews 2021). But even their name is virtually unknown to non-specialists. I did not know it until I started researching the conservation of the lake.

Kröger: This reminds me that the German vernacular name for stonewort is *Armleuchteralgen*, meaning candelabra algae, and one meaning of the term *Armleuchter* is pejorative, describing someone who is clumsy and hangs around pointlessly.

And what to do with those water plants which are invasive, which take over when the lakes are polluted? In Lake Stechlin, masses of hornwort (*Ceratophyllum demersum*), a flowering water plant, now grow every summer. At the end of the season, they form large floating masses which eventually die, decompose and cause further accumulation of nutrients in the water. They are also ecosystem engineers, but they engineer a different system – they are toxic to stonewort and its communities. Their "weedy emergence" (Tsing 2017, 3) is transforming the lake.

Kowalska: I do not think we can care about everything. The problem, as I see it, is that we are not noticing these "world-making projects" (Tsing 2022) that we should be recognising and caring about – because they actually sustain

"our" environments in the state that we value on many personal and community levels. And their disappearance affects how the world around us changes. I think we should strive to recognise the enormous role they have played and continue to play in making our lives possible – with the clear blue lakes we cherish and return to so often.

I remember when you showed me the results of playing with the phytoplankton data from Lake Stechlin and comparing it to a community, with some members leaving and new ones arriving, some returning after a long time and then disappearing again. You could extend this comparison beyond the plankton and see the whole lake as a community that is constantly changing. But more interesting to me is whether we can really see ourselves as members of that community. Whether we can admit that we have arrived at one point and may leave at another and, more importantly, that we are not in control of what happens and who is there. Of course, what we do certainly affects the community – naturalists would call it anthropogenic pressure, which has increased so much that we now sometimes call the epoch our community has recently entered the Anthropocene – but there are other subjects who, to use this term again, engineer the place. With all our expertise, also because it is usually not place-based but model-based, we do not have full control over the place. And I think we are struggling with that realisation on a global scale today.

Thus, anthropologist Veronica Strang (2021) urges us to "re-imagine communities", that is, to think beyond the dualism of nature and culture, to think of the community as constituted and possible thanks to human-non-human processes and interconnections, as both ecological and social – or as "more-than-human sociality" (Tsing 2013). It is also what Deborah Bird Rose (2022) argued for, expanding the boundaries of anthropology and writing about the world "shimmering" with life. Thinking of the world as shimmering helps us to challenge our understanding of it in mechanical and therefore instrumental terms. Rather, this perspective suggests that we see ourselves as one of the rhythms of the world, as part of it. I think these ideas are much more than fancy theoretical concepts. They are tools for approaching the world differently, on a practical level – for enabling us to act differently, including the way we do research.

Kröger: Actually, Rose's shimmer reminds me to the concept of the *aura* used by German philosopher Walter Benjamin for a certain type of empathic experience that is open to the ineffable (cf. Hansen 2018). For me, these concepts help us to go beyond the scientific approach, because they remind us that there is necessarily this element of the unknown, unpredictable in the things and processes we try to understand. Still, the question is to what extent these ideas can be reconciled with a scientific practice.

Territorial labs

Kowalska: Well, my intuition is that anthropology is well suited to bringing concepts from different scientific perspectives into conversation. But it requires that the parties involved are interested in this exchange, in learning from each other in order to better understand or address a particular problem. The crucial question behind such an interdisciplinary work is, I think, why do we want to engage in it? We must have similar motivations; we do not cooperate only to use someone's expertise or data. It does not start with a hypothesis and does not aim to verify it. Rather, it begins with the broader questions that arise when people with different perspectives, knowledge and expertise come together to talk about a common (not discipline-specific) problem. Any sort of such a cooperation should be related to specifics, and ideally should be place related, place-based (or topic, question, problem related). One does not embark on truly interdisciplinary project to gather new data.

Kröger: Yes, this is something I learnt in our conversations, this bringing-together as a dimension of research. I consider it a privilege to be able to do this thanks to the arts organisation who funds our visits, and thanks to the relative freedom of research we have in our institutions. But still, it is a kind of an exceptional situation in the context of our everyday business, and in our institutions, which then creates limitations. The topic would need a long-term engagement, a kind of a local structure, which would facilitate and promote transdisciplinarity at the place, or better even a network of such structures in Poland, Germany, Finland, and elsewhere. I have a utopia here which is inspired by the late Bernard Stiegler, a French philosopher, who suggested to establish regional platforms of research that he called "territorial laboratories" (Stiegler 2021). In these territorial labs collectives of researchers and inhabitants of a certain territory would work together, debate, make decisions, and most importantly, would be engaged in a novel way of knowledge production. The territory would be the defining entity; in our case this would be the Lake Stechlin or Lake Niedzięgiel territories.

Kowalska: Or lakes in this part of the world, with very specific histories and ecologies. I like this concept of territorial labs because it helps discussing the need of more place-based knowledge and place-based education. It also resonates with these proposals for "re-imagining community" and bringing people together to stir conversation about the "matters of concern" I mentioned before.

Kröger: Surely our conversation is a kind of novel knowledge production. I wouldn't have learned about the shimmer of stonewort meadows in a winterly lake, if we wouldn't have met.

Kowalska: Certainly, but I dare say that it is not only about producing knowledge. By practically challenging the dualisms of the world – that is, by challenging the category of a radically separate and distinct "nature" that is a distant field of expertise explored by scientists, and by bringing together diverse people who share little more than a concern for a particular place – we open up the possibility of making scientific engagement more meaningful. Especially today, when so much is at stake, we should talk well about scientific facts (Stengers 2023). Territorial laboratories seem to be a perfect way to practice a more grounded science, which also benefits the community by making people feel less alienated from the ever-more-than-human world.

AUTHORS

Małgorzata Zofia Kowalska, PhD, is a social anthropologist based at Adam Mickiewicz University in Poznań. Her recent research into the Natura 2000 Special Area of Conservation was funded by the Polish National Science Centre. She is a co-founder of the interdisciplinary Research Centre for Energy and Environmental Challenges.

Björn Kröger, PhD, is Curator of the Paleontological Collections of Finnish Museum of Natural History, and Associate Professor at University of Helsinki. He is an expert on the evolution of the earliest known cephalopods. His research focuses on ecosystem change across temporal and spatial scales. He also has an active interdisciplinary interest in how our knowledge of the Earth's deep history is acquired, narrated and utilized.

REFERENCES

Albrecht, Glenn. 2005. "Solastalgia. A new concept in health and identity". *Philosophy, Activism, Nature* 3: 44–59. https://doi.org/10.4225/03/584f410704696.

Barouillet, Cécilia, Juan David González-Trujillo, Juergen Geist, Gísli M. Gíslason, Hans-Peter Grossart, Kenneth Irvine, Sonja C. Jähnig, and Philip J. Boon. 2024. "Freshwater Conservation: Lost in Limnology?" *Aquatic Conservation: Marine and Freshwater Ecosystems* 34 (1): e4049. https://doi.org/10.1002/aqc.4049.

Bowman, John L. 2022. "The Origin of a Land Flora." *Nature Plants* 8 (12): 1352–1369. https://doi.org/10.1038/s41477-022-01283-y.

Casper, S. Jost, ed. 1985. *Lake Stechlin: A Temperate Oligotrophic Lake*. Dordrecht: Dr W. Jost Publisher. https://doi.org/10.1007/978-94-009-5506-6.

Ceccherelli, Giulia, Filiberto Chiabrando, Francesca Gallitto, Andrea Lingua, Valeria Longhi, Paolo Maschio, Francescu Matrone, Fabio Menna, EErica Nocerino, Massimiliano Scalici, Silvia Secco, and Beatrice Tanduo. 2024. "Multitemporal Seagrass Mapping and

Monitoring of Posidonia Meadows and Banquettes for Blue Carbon Conservation: The Poseidon Project." *The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences* XLVIII-1-2024: 65–71. https://doi.org/10.5194/isprs-archives-XLVIII-1-2024-65-2024.

European Commission 2013. Interpretation manual of European Union habitats – Version EUR 28. DG Environment - Nature and Biodiversity. Accessed April 12, 2025: https://eunis.eea.europa.eu/habitats/10066.

Fontane, Theodor. 1899. *Der Stechlin*. Berlin: F. Fontane & Co.

Fortun, Kim. 2012. "Ethnography in Late Industrialism". *Cultural Anthropology* 27 (3): 446–464. https://doi.org/10.1111/j.1548-1360.2012.01153.x.

Golley, Frank B. 1991. "The Ecosystem Concept: A Search for Order." *Ecological Research* 6: 129–138. https://doi.org/10.1007/BF02347157.

Gonsiorczyk, Thomas, Michael Hupfer, Sabine Hilt, and Mark O. Gessner. 2024. "Rapid Eutrophication of a Clearwater Lake: Trends and Potential Causes Inferred From Phosphorus Mass Balance Analyses." *Global change biology* 30 (11): e17575. https://doi.org/10.1111/gcb.17575.

Hansen, Miriam Bratu. 2008. "Benjamin's Aura." *Critical inquiry* 34 (2): 336–375. https://doi.org/10.1086/529060.

Hastrup, Kirsten and Cecile Rubow. 2014. *Living with Environmental Change. Waterworlds*. London and New York: Routledge.

Ingold, Tim. 2021. *Correspondences*. Cambridge and Medford: Polity Press.

Ingold, Tim. 2024. *The Rise and Fall of Generation Now*. Cambridge, Hoboken: Polity Press.

Jones, Clive G, John H Lawton, and Moshe Shachak. 1994. "Organisms as Ecosystem Engineers." *Oikos* 69 (3): 373–386. https://doi.org/10.1007/978-1-4612-4018-1_14.

Kędziora, Agnieszka. 2008. "Bilans wodny krajobrazu konińskich kopalni odkrywkowych w zmieniających się warunkach klimatycznych [Water balance of Konin strip mine landscape in changing climate conditions]". *Roczniki Gleboznawcze* Tom LIX, Nr 2: 104–118.

Kowalska, Małgorzata Zofia. 2024. "Making a conservation site: Stonewort meadows as lake engineers". *Environmental Values*, 34(6): 441–456. https://doi.org/10.1177/09632719241308427.

Kröger, Björn. 2025. "Stechlin (Germany) – A Lake Machine." *Politics of the Machines: Lifelikeness & beyond, Aachen 2024*, edited by Ana María Guzmán Olmos, Gabriele Gramelsberger, Laura Beloff, Morten Søndergaard, Hassan Choubassi, and Joe Elias: 292–303. http://dx.doi.org/10.14236/ewic/POM24.39.

Kröger, Björn, Géza B. Selmeczy, Peter Casper, Janne Soininen, and Judit Padisák. 2023. "Long-term phytoplankton community dynamics in Lake Stechlin (North-East Germany) under sudden and heavily accelerating eutrophication." *Freshwater Biology* 68 (5): 737–751. https://doi.org/10.1111/fwb.14060.

Laland, Kevin N, F John Odling-Smee, and Marcus W Feldman. 1999. "Evolutionary Consequences of Niche Construction and Their Implications for Ecology." *Proceedings of the National Academy of Sciences* 96 (18): 10242–10247. https://doi.org/10.1073/pnas.96.18.10242.

Mathews, Freya. 2021 [1991]. *The Ecological Self*. London and New York: Routledge.

Nowak, Bogumił, and Jan Przybyłek. 2020. "Recharge and drainage of lakes in the Powidzki Landscape Park in conditions of increased anthropogenic and environmental pressure (central-western Poland)". *Geological Quarterly* 64 (1): 205–219. http://dx.doi.org/10.7306/gq.1524.

Oldorff, Silke, and Jens Päzolt. 2010. "Nährstoffbelastung des Großen Stechlinsees von 1945 bis 2009 – Historische Daten, Bilanzierung und Neubewertung." In *Aktuelle Probleme Im Wasserhaushalt Von Nordostdeutschland: Trends, Ursachen, Lösungen.*

Scientific Technical Report 10/10, edited by Knud Kaiser, Judy Libra, Bruno Merz, Oliver Bens, and Reinhard F. Hüttl: 173–179.

Padisák, Judit, Éva Hajnal, Lothar Krienitz, József Lakner, and Viktória Üveges. 2010. "Rarity, Ecological Memory, Rate of Floral Change in Phytoplankton—and the Mystery of the Red Cock." *Hydrobiologia* 653 (1): 45–64. https://doi.org/10.1007/s10750-010-0344-2.

Pasztaleniec Agnieszka, Kolada Agnieszka, Kutyła Sebastian, and Aleksandra Bielczyńska. 2021. *Obszary ochronne zbiorników wód śródlądowych – aspekty przyrodnicze i uwarunkowania formalno-prawne. Dokumentacja jezior regionów wodnych Noteci i Wart: Niedziegiel, Chłop i Szarcz* [Freshwater Protection Areas – Natural and Legal Considerations. Documentation of the Lakes of the Noteć and Warta regions: Niedziegiel, Chłop and Szarcz]. Warszawa: Wydawnictwo IOŚ-PIB.

Pełechaty, Mariusz, Andrzej Pukacz, Karina Apolinarska, Aleksandra Pełechata, and Marcin Siepak. 2013. "The Significance of Chara Vegetation in the Precipitation of Lacustrine Calcium Carbonate." *Sedimentology* 60 (4): 1017–1035. https://doi.org/10.1111/sed.12020.

Plumwood, Val. 1993. *Feminism and the Mastery of Culture*. London, New York: Routledge. https://doi.org/10.4324/9780203006757.

Rose, Deborah Bird. 2022. *Shimmer: Flying Fox Exuberance in Worlds of Peril*. Edinburgh University Press. https://doi.org/10.1515/9781474490412.

Rotini, Alice, Chiara Conte, Gidon Winters, Marlen I. Vasquez, and Luciana Migliore. 2023. "Undisturbed Posidonia Oceanica Meadows Maintain the Epiphytic Bacterial Community in Different Environments." *Environmental Science and Pollution Research* 30 (42): 95464–95474. https://doi.org/10.1007/s11356-023-28968-x.

Stengers, Isabelle. 2018. *Another Science is Possible. A Plea for Slow Science*. Cambridge, UK and Medford, USA: Polity Press.

Stengers, Isabelle. 2023. *Making Sense in Common: A Reading of Whitehead in Times of Collapse*. University of Minnesota Press.

Stiegler, Bernard. 2021. *Bifurcate: There is No Alternative*. Open Humanities Press.

Stobbe, Astrid, Thomas Gregor, and Astrid Röpke. 2014. "Long-Lived Banks of Oospores in Lake Sediments from the Trans-Urals (Russia) Indicated by Germination in over 300 Years old Radiocarbon Dated Sediments." *Aquatic Botany* 119: 84–90. https://doi.org/10.1016/j.aquabot.2014.07.004.

Strang, Veronica. 2021. "Envisioning a sustainable future for water". *AQUA – Water Infrastructure, Ecosystems and Society* 70 (4): 404–419. https://doi.org/10.2166/aqua.2020.101.

Strathern, Marilyn. 2020. *Relations. An Anthropological Account*. Duke University Press: Durham and London. https://doi.org/10.1215/9781478009344.

Tsing, Anna Lowenhaupt. 2013. "More-than-human sociality: A call for critical description". In: *Anthropology and Nature*, edited by Kirsten Hastrup. London and New York: Routledge, 27–42. https://doi.org/10.4324/9780203795361-2.

Tsing, Anna. 2017. "The Buck, the Bull, and the Dream of the Stag: Some Unexpected Weeds of the Anthropocene." *Suomen Antropologi: Journal of the Finnish Anthropological Society* 42 (1): 3–21.

Tsing, Anna Lowenhaupt. 2022. "The sociality of birds. Reflections on ontological edge effects." In *Kin. Thinking with Deborah Bird Rose*, edited by Thom van Dooren, and Matthew Chrulew. Durham, London: Durham University Press, 15–31. https://doi.org/10.1215/9781478022664-002.

Wollrab, Sabine, Silke R. Schmidt, Jason Woodhouse, Peter Kasprzak, Stella A. Berger, Ute Beyer, Matthias Bodenlos, Johanna Dalchow, Monika Degebrodt, Lars Ganzert, Thomas Gonsiorczyk, Elfi Huth, Christine Kiel, Lutz Küchler, Lothar Krienitz, Maren

Lentz, Elke Mach, Uta Mallok, Jens C. Nejstgaard, Monika Papke, Armin Penske, Solvig Pinnow, Reingard Roßberg, Diethelm Ronneberger, Michael Sachtleben, Adelheid Scheffler, Hans-Peter Grossart, Peter Casper, Mark O. Gessner, and Rainer Koschel. 2025. "Fifty Years of Limnological Data on Lake Stechlin, a Temperate Clearwater Lake." *Scientific Data* 12 (1): 1028. https://doi.org/10.1038/s41597-025-05319-8.