Sand-writings of Woodiana Mussels
Report for the Therolinguistics Association

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Before we begin our paper, we are going to take you through a walking exercise. Please take a pen and draw a line illustrating how you feel today. It can be of any shape and length.

Mussels also leave lines when moving along the riverbed. They move by inserting their foot into the sand or gravel, pulling themselves forward, inching their way along the bottom. So let us try and walk the line you draw as a mussel! Sit down on the ground, with one foot upfront, hands behind back, and start inching your way into the shape of your drawing.

Did you finish the line? Now stay on the ground without moving.

Mussels also rest sometimes, they burrow down deeply into the sediment to avoid being washed out during floods, stay warmer in winter, escape predators and, most importantly, avoid the contamination of the water. As you continue to read these pages, you will understand that learning to walk like a mussel can be a fundamental asset in our uncertain futures.

Yet, please be informed that the present contribution does not seek the rigour of science, but the lyrical essence of an artistic research paper. The roles played by the mussel visitors[1] and *woodiana* within these pages are entirely fictional and the report presented has no factual basis. This is an artistic endeavour, informed by the

1 We adopt the concept of "visitors" as articulated by Donna Haraway, who, traces this concept from Hannah Arendt's method of thinking "with an enlarged mentality" (Arendt 1982: 43, cited in Haraway 2015: 5) in order to describe the practice of Vinciane Despret and encourage others to "go visiting" (Haraway 2015: 5). Visiting is a "Curious practice" (ibid.). It cultivates enthusiasm and the ability to find everything interesting, in order "to retune one's ability to sense and respond" (ibid.). Therefore, it is of utmost importance to train our body, "mind and imagination to go visiting, to venture off the beaten path to meet unexpected, non-natal kin, and to strike up conversations, to pose and respond to interesting questions, to propose together something unanticipated […]" (ibid.: 8).

art project *woodiana.today*, an experimental forecast service developed to save the Danube's future through speculative fabulation.

Esteemed President and Members of the *Therolinguistics Association*![2]

We feel deeply honoured to share our discoveries with the *Therolinguistics Association*, a community of scholars and explorers who have devoted their lives to the meticulous examination of non-human forms of languages. Encouraged by the report of G. D'Axbay and T. R. Bardol on the writings of the decapitated ant worker, and D. Petri's sea-writings of penguins (Le Guin 1988),[3] we aspire in our findings to make a meaningful contribution to the advancement of therolinguistic research. We also understand that the art and science of therolinguistics is still incomplete and that our notion concerning animal language is dependent on our human interpretation. As the President of the *Therolinguistics Association* has already stated, no matter how fragmentary our knowledge is today, it is of utmost importance to engage therolinguistic acts in order to understand and respect each other tomorrow (ibid.).

Drawing upon insights from prior scholars, it is evident that every animal writes. These writings, or languages, encompass diverse forms, many of which human senses are still incapable of comprehending. They write to communicate with each other, and to us. Some dolphins, for example, toss and turn, fall loudly, but always rise. These "*tūpoupou*"[4] can be noisy, making the "ocean […] a drum" (Gumbs 2020: 15), as this climate makes them glum. Māori meteorologists have observed them for centuries, seeking guidance on the weather that has yet to come. This is where our trans-species communion could start: tuning into different shapes by observing silently their "urgent instruction" (ibid.). As the weather is changing, so are we.

Therefore, translating these languages is our urgency! But in order to read them, different kinds of rules than those from human sciences have to be applied. Rules that are not fixed but in constant flux. Rules that ask us humans to constantly reinvent different modes of attention: to be tossed and turned. Even play by the rules that are not set by humans only. The ethical obligation of the therolinguists is, thus, to think beyond the "authority of science" (Despret 2004: 84), to cultivate "a virtue of politeness"[5] (ibid. 2005: 360)

2 The *Therolinguistics Association* is a fictional discipline invented by Ursula Le Guin in 1974 in her short story "'The Author of the Acacia Seeds' and Other Extracts from the *Journal of the Association of Therolinguistics*" (1988).

3 In her short article entitled *Ms. Found in an Ant Hill*, Le Guin guides us through a report made by G. D'Axbay and T. R. Bardol, a pair of literary scholars, who undertook a close reading and interpretation of a found text "written in touch-gland exudation on degerminated acacia seeds" by an ant worker (1988: 167).

4 Gumbs writes in her book entitled *Undrowned* about dolphins found only on the shores of Aotearoa, which Māori meteorologists call *tūpoupou* (2020).

5 Vinciane Despret is committed to a particular epistemological position which she calls "the virtue of politeness" (2005: 360). Donna Haraway offers a useful explanation on how Despret cultivates it: "Despret's sort of politeness does the energetic work of holding open the possibility that surprises are in store, that something interesting is about to happen, but only if one cultivates the virtue

and to practise relatedness that comes with leaning on our intuition and imagination. Because it is only through magic, art and poetry that we can truly talk about therolinguistics.

Supported by all the wonderful colleagues from the *Association*, we are prepared to contribute additional details to the exploration of animal writings.

So Let Us Speak (about) *Mussels*!

The writer Sylvia Plath speaks *mussels*.[6] However, she is not the only one who thought they knew *mussels*. Since ancient times, there have been poets trying to read mussels afoot. Although there is no written evidence, due to the unlikely event of the burning of books in 213 BCE, there was an ancient Chinese fable known as *The Weeping of Mussels (Chinese:* pinyin: *Yíbèi de kūqì*).[7] The only remaining fragment, the prologue, which is still orally passed on through generations in the Water Town of *Longjin Brook* (龙进溪) in Yichang Sanxia, is preserved in the memory of a local Tujia fisherman.[8] Our mussel visitor, S. Angyal[9] had the honour of documenting it for the first time:

> When spit catches onto someone's face, it becomes redundant. Depending on the closeness and the type, it sometimes latches on. There are not many attempts made for this to work. With the right type and proximity, the spit that latches on distributes a great number of descendants, microscopic in size.
> They live on its face, unknowingly. As it swims, they grow. When do they separate – it is up to them. The fish have borne the burden of conception and become unwilling accomplices. With those spit-like residues, they turn into shapes. Shapes that show up, in another place, far, far away. Displaced.
> Once they become independent, they shoot out a leg. There is no longer any need for the fish anymore. They become their legs – a muscular organ, pink and frail. Ready to sense.
> Humans call them mussels.

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of letting those one visits intra-actively shape what occurs. They are not who/what we expected to visit, and we are not who/what were anticipated either. […] With good questions, even or especially mistakes and misunderstandings can become interesting. This is not so much a question of manners but of epistemology and ontology, and of method alert to off-the beaten-path practices." (2015: 6)

6 Sylvia Plath explores nature and our relationship with it in her poem *Mussel Hunter at Rock Harbor* by delving into the world of the mussels and crabs that inhabit the Massachusetts seashore (1958: 22).

7 This fable is entirely fabricated but draws its inspiration from the lamentations found in Chinese *Marriage Crying Songs* (哭嫁歌 *Kū jià gē*). In the culture of the Tujia ethnic minority, the *Marriage Crying Songs* can be sung by the bride to express her sorrow for her destiny, the profound love for her family and the challenges of the feudalistic marriage customs she endures. When two girls sing together, it is referred to as "sister crying". The bride initiates the crying and singing, with the other girl joining in to provide comfort (Qian An 2022).

8 The setting is based on a real place.

9 S. Angyal (Eng. Angel) is a pseudonym for the co-author of this paper, Sanja Anđelković.

Mussels come to life in the most intriguing way. But, despite their form, purpose and function existing well beyond our comprehension, there is something of kin in our utterly contrasting shapes. When they grow up, mussels breathe water that we let go. Of course, "we are all bodies of water" (Neimanis 2012: 85), and are connected to and flowing into each other's body. Taking into account Charles Darwin's "pleasant genealogy" (1860) that our ancestor was "an animal which breathed water" (ibid.),[10] makes this correspondence with the body of mussels even more pleasurable. Water, thus, becomes the medium of our correspondence on the border of natureculture: we drink, digest, excrete; they pump, filter, expel, then we drink it again. Could this be a form of symbiogenesis, becoming by living together (Margulis 2010)? Indeed, water repeats its presence, but these flows not only transit across our bodies in space but also across different times:

> Water not only flows between, and connects bodies; it also facilitates new kinds of bodies. And in this engendering of new watery bodies, water becomes the difference. In other words, instead of simply 'flowing', water suggests a more complex logic of interpermeation, gestationality, and differentiation. (Neimanis 2017: 95)

This complex relationship of water, humans and mussels is cleverly applied in water treatment plants across Europe where mussels control our drinking water by the usage of the biological early warning systems (BEWS) (Bae and Park 2014).[11] In addition to the traditional chemical and physical methods, the BEWS are real-time surveillance systems of drinking water that uses the body of mussels, specifically, the behaviour of their valve gaping, to inform tap water quality. Valve gaping is a natural response in mussels; when they detect a foreign substance, they may close the valves to reduce exposure. In the water treatment plants, these supersensitive mussels are attached to a high frequency non-invasive valvometer which monitors their shell movements in response to toxicants in the water. Consequently, when the mussels detect contamination in the city's water supply, they close up, effectively shutting off the water supply for the entire city (Ferreira-Rodríguez et al. 2023). This mussel-powered system, which protects public health, perfectly demonstrates "how humans create problems for the world and then use living organisms to protect themselves [...] from themselves"[12] (Pełka 2019).

Humans and mussels truly share a way of being together. They influence each other in a most latent way,[13] creating a sort of water-communality or, more precisely, "embod-

10 Charles Darwin wrote a letter to Charles Lyell on 10 January 1860, in which he expressed: "Our ancestor was an animal which breathed water, had a swim bladder, a great swimming tail, an imperfect skull, and undoubtedly was a hermaphrodite! Here is a pleasant genealogy for mankind" (Darwin 1860).

11 Valve gaping behaviour is monitored in over 50 drinking water treatment plants across Poland, including the Dębiec Water Treatment Plant in Poznan (Warta River) and Gruba Kaśka in Warsaw (Vistula River). Germany employs the Dreissena-Monitor at water control stations along the Rhine, Elbe, Danube and various tributaries (Borcherding 2006; Scott 2022).

12 Julia Pełka, a film director, tells the story of the Gruba Kaśka (Eng. Fat Kathy), a clam-based water monitoring system in Warsaw, in a documentary titled *Fat Kathy*, first screened in 2019.

13 Neimanis (2017: 95–97) outlines three aspects of watery embodiment: (i) water as a facilitating and gestational force; (ii) water as a means of differentiation and the actualization of diversity; and (iii) water as simultaneously interconnecting and interpermeating. This "aqueous logic", encom-

ied hydrocommons" (Neimanis 2017: 95). Mussels breathe us, but we breathe them too. And as the water loops around through our bodies, we digest other bodies too, forming "sympoietic arrangements" (Haraway 2016: 58).

> Sympoiesis is a simple word; it means 'making-with.' Nothing makes itself; nothing is really autopoietic or self-organizing. […] Sympoiesis is a word proper to complex, dynamic, responsive, situated, historical systems. It is a word for worlding-with, in company. Sympoiesis enfolds autopoiesis and generatively unfurls and extends it. (ibid.)

It is this very operation and sympoiesis that encouraged us to engage in lyrical research, and inspired us to make suggestions on the linguistics of mussels and their possible meanings.

The Chinese *Swan Mussel*

Our paper centres on swan mussels, belonging to the species *Sinanodonta woodiana*, initially described by Isaac Lea in 1834. They first arrived in Philadelphia around 1829, in a box sent as a gift to Lea from William Wightman Wood, from Canton (now Guangzhou), China.[14] They arrived in Europe more than 130 years later, but this time alive and on a fish.

Sinanodonta woodiana travelled from the Yangtze River as Glochidia on Asian silver carp (*Hypophthalmichthys molitrix*), which humans transported to the Danube river and its tributaries in 1963, with the aim of fighting the effects of eutrophication (Paunović et al. 2006). They were microscopic parasitic larvae, deck passengers clinging with their hooks to the gills of the host fish. After feeding off the body mucus of the host fish, they dropped off within a few weeks and went on to develop into adult mussels on the bottom of the Danube. In this paper, the abbreviated nomenclature *woodiana* will be employed as a concise reference to the species.

As a mussel, *woodiana* are filter feeders. They clean the Danube by reducing algae, particles and toxic materials from the river just by the way they eat their food. They are able to strain the tiny food particles from the Danube with the cilia in their gills, move them down to their mouth where they eat, and eventually digest them. The clean water is then pushed out through the excurrent syphon. However, unlike other Danubian mussels (e.g. *Unio pictorum*, *Unio tumidus*), which are rather sensitive to toxic materials with often fatal consequences, *woodiana* are resilient to a wide range of environmental conditions (Kolarević et al. 2015). They have the capacity to digest hazardous substances without trouble and recover from these encounters rather quickly with their great adaptability to

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passing, within and between, suggests Neimanis, is a dynamic force of becoming. The assertion is that water, as an interconnecting force, provides insights into a broader ontological understanding. Water, driven by its inherent tendency to repeat, primarily serves as a facilitator and gestator, continually giving rise to diverse manifestations and new knowledge.

14 Lea initially described the taxon as *Symphynota woodiana* in an article presented before the American Philosophical Society. However, the name was revised to the now accepted *Sinanodonta woodiana* (Lea 1834: 42–43).

man-made environments. Due to this resilience, *woodiana* are not suitable for BEWS and the real-time analysis of drinking water, as it showed almost complete absence of alarm responses in testing (Giari et al. 2017). However, the toxic materials persisting in their feet serve as crucial indicators in laboratory analyses aimed at detecting hazardous substances, such as dioxins and heavy metals, including phosphates, zinc, copper or nickel, in the Danube. Additionally, their significance extends to the examination of microplastics (Paunović et al. 2006). But when they die in the Danube, the large and long-term persistence of their empty shell can be particularly important as a habitat-modifying effect, attracting a diverse macroinvertebrate community, such as amphipods, caddis larvae, isopods and gastropods (Bódis et al. 2014).

Woodiana demonstrate a notable expertise in us humans and other critters. *Woodiana*, for example, from early on, were surveying humanity's impact on the Danube and its mussel community, which were significantly disappearing even before they were introduced to the new environment. The Danubian mussels were losing their populations because of pollution from agriculture, habitat loss due to hydropower plants, water abstraction, and overfishing for the production of mother-of-pearl buttons.

But despite all of these extraordinary features of *woodiana*, their most important peculiarity is their act of sensing the future by leaving some dazzling temporal movement patterns in the river bed. With a distinct sense for the slightest changes in the Danubian ecosystems, they move slowly through the shallow waters, leaving traces in the sand looking like secret symbols. They change across space and time, revealing often ambiguous glimpses of the Danube's future. To the best of our knowledge, until now, no study has examined the horizontal and vertical movements of *woodiana* in the Danube River. Thanks to our scholars and therolinguists – our mussel visitors who interpret their language with precision and translate it into text – we can now understand mussels.

The Practice of Reading Mussels

The purpose of our study was to engage in research on the language of mussels and the possibility of thinking with them. It can be seen as a scientific and artistic inquiry into how we could classify the traces/lines left by their movement as stories of our peculiar relationship.

It has been already proven that unionid mussels move depending on environmental factors, such as the temperature, length of a day, rising water, reproductive period, flow and food conditions in rivers. The movement behaviour can also help them escape predators and contaminations of the water. In addition, they burrow as a form of protection from predators or toxic water (Amyot and Downing 1997; Schwalb and Pusch 2007). Mussels do a specialized stepping pattern, called Weierstrassian Lévy walks, in order to move (Reynolds 2014). This Lévy-like walk[15] is a "byproduct of crawling" (ibid. 2021) in which they alternate small steps with large leaps that they make randomly and in almost every

15 Research on Lévy walk can be consulted at Reynolds 2018.

direction.[16] When they are not moving and remain at a maximum open position for an extended time, it usually indicates the death of the mussel (Giari et al. 2017). Therefore, understanding how mussels move and behave across space and time can be a fundamental question in the study of the Danube's ecology.

But *woodiana* move differently! *Woodiana* are messengers between worlds and times. They are not moving just for themselves but to inscribe and warn us of what lies ahead. This phenomenon was first brought to our attention by D'Pop,[17] a long-time mussel visitor from Sremski Karlovci. D'Pop studied the movement patterns of *woodiana* to predict the weather to protect his vineyard. He believed that these patterns could forecast not only earlier frosts, severe ongoing droughts or rainy springs, which cause mildew and floods, but also more extreme events, such as supercells, powerful earthquakes or even futile military endeavours. Although his interpretations were supported by natural consequences, the mussel readings echoed the methods of plastromancy[18] and the *ŋgam dù* spider divination.[19] However, unlike the fortune-telling methods of seeking guidance for individual decision-making, *woodiana* are thought to be writing for our collective, human and other-than-human sympoetic futures.

Every organism responds to other living and non-living beings through emotions, sensory perceptions and lines of movement (Ingold 2022: 6), thus, mussels and humans also engage in an ongoing interplay, responding to each-other's *lines* (lives!).[20] So, to understand the lines of the mussels, we do not need to possess the skills of an oracle or a scientist, but of an *imaginista*!

While imagining, we see, sense, think and "*correspond*" (ibid.: 8) with our world.[21] It is a form of sense-making that goes beyond mere observation and classification. Imagina-

16 Assisted by scientific consultation and review by Dr. Maja Raković and Dr. Stoimir Kolarević, IBISS, University of Belgrade, we recorded the movement of *Sinanodonta woodiana* in an improvised laboratory setting (Center for the Promotion of Science Belgrade and woodiana.today 2021). For other Lévy-like walk documentation, see van den Berg et al. 2011.

17 D'Pop (Eng. Priest) is a pseudonym for Daniel Popovic, who first proposed to us the concept of examining the shapes and lines mussels leave by moving in the sand and speculate about their possible meanings.

18 Plastromancy, also known as the turtle-shell oracle, is probably the earliest documented method of fortune-telling. In this practice, the diviner would subject a portion of a turtle shell to heat (sometimes using a hot poker) and interpret the patterns of cracks that formed. These cracks were occasionally annotated with inscriptions, representing some of the oldest Chinese writings that have been unearthed (Keightley 1985).

19 Artist Tomas Saraceno collaborates with spiders through arachnomancy readings. The public is encouraged to develop new skills of observation through the Arachnomancy App and receive their own spider/web oracle reading (Saraceno 2023a). Furthermore, the public can consult the spider and spider diviners of Somié, Cameroon, through the web portal Nggamdu.org (ibid. 2021). Saraceno also published a book of proverbs and exercise in collective memory encouraging some to look into spiders in order to predict the weather. The book titled *Spiders in Motion, Rainy Commotion* is an invitation not to change the climate per se, but rather to change our habits (ibid. 2023b).

20 Tim Ingold describes life as "lived along lines and that as they go along together these lines – rather like melodies in musical counterpoint – continually differentiate themselves from within the texture of their polyphony" (2022: 6).

21 We understand imagination as corresponding with the real, described by Tim Ingold in his *Imagining for Real: Essays on Creation, Attention and Correspondence* (2022; 6, 66–80, 127).

tion enabled us to empathize and adopt a way of engaging with *woodiana* that is more open-ended, deeply perceptive and sustainable than that which sciences and modern technology alone can offer. We slowed down and made time to practise horizontality, time to attune our eyes to the murky Danube and breathe beneath the water. And we learned to read again. This practice then created a condition in which we were able to experiment "in contact with the real"[22] (Deleuze and Guattari 2004: 13, as cited in Ingold 2022: 8). Because, to be sensitive to the lines we wish to read, beside imagination and time, we also need to intervene in the real.

We imagined in contact with the past (history) and with the sciences (biology). We interpreted the lines informed by anthropogenic activities by mirroring past events, for example, wars, industrial accidents or environmental degradation caused by river engineering. We also considered the physico-chemical and biological parameters of the surface water sourced from the TransNational Monitoring Network (TNMN).[23] We made provisional predictions of future concentrations of surface water pollutants using the ARIMA model forecasting algorithm and data from the TNMN archive (covering the monitoring period between 2001 and 2018).[24] These tentative forecasts were then combined with our knowledge of past events, which helped us to correspond to the movement behaviour of *woodiana*. However, in contrast to exact science and contemporary principles of forecasts, we did not aim for clear and precise predictions but rather to inspire us to imagine how other ways of knowing are possible, and what multiple futures could look like. Hopefully, it is this model of connecting the nonverbal knowledge of *woodiana* with human experiences that could help us to create a more liveable future and teach us how to cohabit more responsibly with each other.

In order to pursue this matter, open-air visiting spots were set up along the Serbian section of the Danube: river km 1433 – 1075. The visiting of the mussels was continuously conducted and documented from 15 March 2021 to 15 March 2023. The survey was carried out by free-floating tracking and with an underwater mussel viewer. From the statistical side, the average rate of daily horizontal movement was 0.8 cm, which means 5.6 cm/wk and 173.6 cm/month. When burrowed, the mussels were sometimes found by 'racooning', a tactile searching technique, others were already tagged by a transponder or a fly-fishing line attached to their shells – a technique which helped us to measure the depth of their eventual burrowing. These procedures did not harm the mussels and were conducted with utmost care to ensure their well-being.

They were more often moving towards the shore than away from it, probably influenced by rising water levels, as man-made global warming causes heavier rains and frequent floods. *Woodiana*, for example, during May 2021, were moving onshore, interrupt-

22 For practical ways of imagining for real, Ingold draws on the ideas of Deleuze and Guattari, explaining that "[…] imagination that does not oppose but reaches into, and joins with, the real. This joining is what I mean by correspondence" (Ingold 2022: 6).

23 The TNMN is an important tool under the Danube River Protection Convention. It was formally launched by the International Commission for the Protection of the Danube River in 1996 to observe and analyse the water quality and pollution levels in the major rivers of the Danube River Basin. The findings can be accessed at the Danube River Basin Water Quality Database on the website: <https://wq-db.icpdr.org/> [Accessed 1 July 2024].

24 For the TNMN Yearbooks, see TNMN 2001–2018.

ing their path by burrowing and emerging again. But it is not only *woodiana* that were dislodged in the river. Unexploded landmines left from the Yugoslav wars also started emerging downstream, as a result of flood disasters.[25] In October 2021, a path with three curls was discovered, an activity within *woodiana* that reveals high energy levels – but not of the mussels. They sensed future hydrological alterations, suggesting altered water flow, possibly due to the increased water usage for cooling the new data centre facilities along the Danube.[26] During February 2022, the direction of *woodiana* was frequently doubling back and creating spastic lines in the riverbed. This behaviour coincided with the emission of sonar pulses by Russian military vessels in the Black Sea, which later led to the deaths of numerous harbour porpoises.[27] In April 2022, they were motionless and burrowed in the sediment to depths as much as 20 cm almost entirely for the whole month, when surprisingly, for the last few days they made the longest distance in our study, a total of 3.6 km in three days. The forecasted water quality data for the next month showed the presence of notable quantities of mercury and dioxins. Our mussel visitors interpreted this as a *progenitorial trauma response* of the devastation caused by NATO bombing at the petrochemical plant and oil refinery which took place in April 1999 in Pančevo.[28] In June 2022, the concentration of wastewater discharge in the river spiked dramatically.[29] It also restricted our visit. During this period, *woodiana* was spiralling erratically, creating twisted lines in the riverbed.

These examples are just a few of the ways we have been thinking with *woodiana*, exploring our attempts to translate *mussels* into text. Based on our two-year mussel visit, our team proposed a provisional manual of their patterns. However, this manual does not describe the internal state of *woodiana* but rather its environment, similar to how we might interpret a *river's gesture* to understand its motion and events.

Horizontal movement:
Straight line: stability or stagnation, lack of change, a false sense of security
Curved line: emotionality or unpredictable conditions; the journey ahead may be treacherous

25 For the geologically-driven migration of explosive remnants of Yugoslav wars, see Baselt et al. 2023.

26 Google is opening a new data centre location in Kronstorf, Austria, on the river Enns – a tributary of the Danube – making it an optimal location for water utilization and hydroelectric power generation (Google Cloud 2022). But the significant water consumption of data centres raises concerns about the sustainability and resource depletion in an increasingly water-scarce world (Sattiraju 2020).

27 *Woodiana* in the Danube can sense disturbances from afar, such as underwater explosions and powerful sonar used in the Black Sea. Santora writes about the environmental catastrophe that the war caused for marine wildlife in an article in *The New York Times* (2023).

28 NATO's bombing of Serbia led to significant environmental concerns, including the potential contamination of the Danube River with toxic chemicals from oil refineries and petrochemical plants in Pančevo and Novi Sad (Hedges 1999).

29 Andreas Fath swam through ten countries as part of the Clean Danube project, to raise the awareness of pollution in the Danube River, but refused to swim the 15 km stretch of water through Belgrade (Fath 2022; N1 Belgrade 2022).

1 curl: large and sudden changes, transformation or transition
2 curls: disturbances or conflicts, scandal with another critter, interrupted path
3 and more curls: high energy level, emergency, fire
Bouncy and scalloped line: instability, whirlpool, or turbulence, trouble from strangers
Circle: beginning or ending cycles, phases, entangled in the consequences of one's actions
Spiral: murkiness, poisoning and other unlucky events

Motionless: parched, death, secrets may come to haunt us

Vertical movement:
Buried in the sand up to 10 cm: undertow, obscured depths
Buried in the sand 11 cm and more: darkened waters, or hard freeze

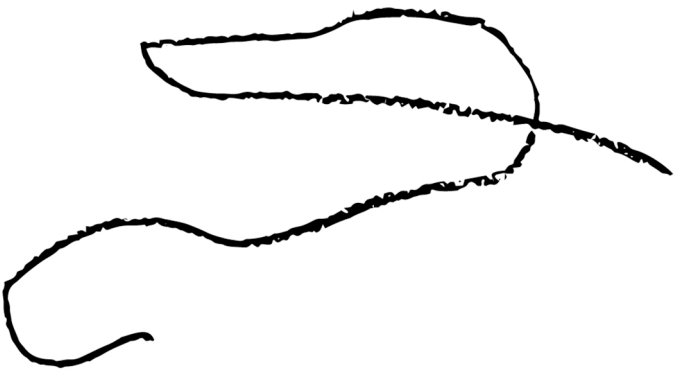
In our study of the movements, daily patterns were traced with the help of a planning frame and an underwater drawing slate.[30] These daily drawings were later synthesized into a monthly diagram. We focused specifically on the mussels' monthly movement patterns, resulting in a new narrative unfolding each month throughout the course of the visit. Today, 24 simultaneous futures emerge in our readings – a series of lyrical narratives known as *forewarning cards*. The translation of these messages are ambiguous, cryptic and incomplete, and are only here as an instrument of reflection, a speculation between indefinite possibilities of meanings. They are influenced and shaped by the knowledge and experiences of the therolinguists regarding their own fears, struggles or confidence. But they unveil the intricacies of extraction, extinction, overconsumption, pollution and wars in their meaning – all interconnected challenges impacting our shared existence. In this paper, we feature 12 such futures unfolding across 12 timespans. When they will occur is unknown to us. Perhaps they already have.

30 To explore the equipment needed for an underwater visit, connect with 3H Consulting at: <https://www.3hconsulting.com/techniques/TechEquipment.html#DrawingSlate> [Accessed 1 July 2024].

Sand-writings and Other Weeping Notes[31]

As they hold their breath, something loud brings them death. Unable to hear what is near, they swim dazed, as others they stay unfazed. Click, click, click, they try to establish a connection quick. No one can hear them flick, as it all happens in a blitz. These foreign objects have to change their matter to be able to hear better. Boom, boom, boom, stop the action soon!

Note: A spastic line brings together actions that are non-viable in their nature. Dolphins "click" as they hear our bombshell is near. It echoes within their shell as well.



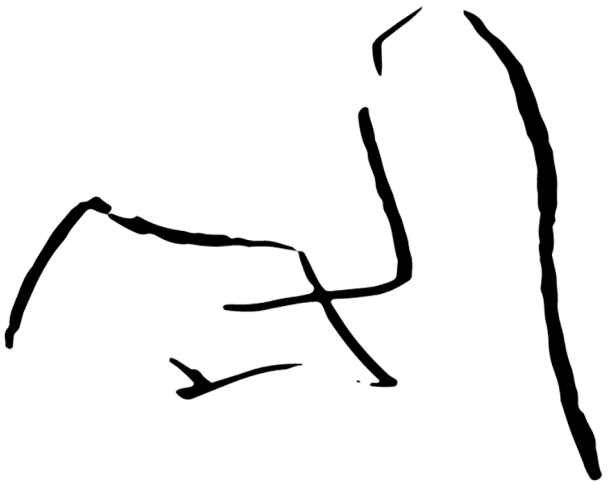
When it trots, it looks like a dog. Once being caught for pleasure, it started declining in measure. From the estuary to the fish tank, its paddling crank. You have one more chance to free the dogfish from the tank!

31 All drawings are created by the authors.

Note: A diagonal curly path depicts what we might see as a fish, but its movements create another relish. Its being has been put at risk. What can we do to reinstate this fish anew?

Where the Danube rests still is where the blockage is near. The Iron Gate shows the stats: "You shall not pass!" It is not only the popular cultures crass. The We Pass stays in the past and there are sturgeons left trapped. Would you advocate for the walls to collapse?

Note: The horizontal placement of the path questions the ways in which humans place barriers. Whoever has the right of passage has two straight legs.

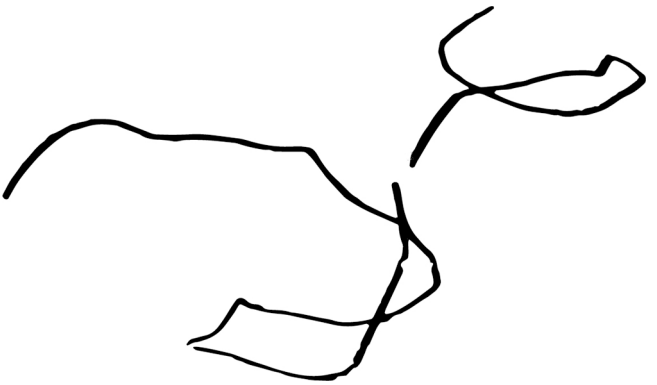


If you want to walk, you have to hop. Otherwise, you might stop on a war prop. Be careful of the land that lies ahead, it has secrets left unsaid. And so it goes, a land full of mine crops, shifted by nature into your course. So better watch out for the remorseless flood, as landmines play in the moving mud!

Note: Slight corrosion in the path position makes the marks juxtaposition. This message comes with a warning from the past. What humans have left in the 1990s' bloodshed, comes to hunt their future thread.

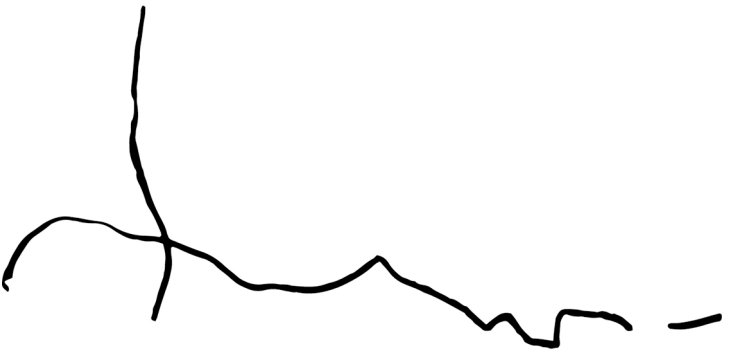
An underwater coal mine makes the ecosystem frail. Ghostly shadows, aquatic kin, bear witness to the lignite sin. In their silent gaze, the ecosystem's plea, as the coalfield claims the stream. A warning they bring, a dire request, to preserve the Danube, its waters blessed.

Note: Dark circle raises questions about riverbed exploitation. It changes the topography, and within, its inhabitants.



There is an event, trying to save one's own head from the fear of the regime's gear. A group of people swim across the cold gate. Across the river, a new life begins to deliver.

Note: It is the first time since 1977 that these circles are in the loop again. There is a need for deep transformation and people are forced to flee with water.

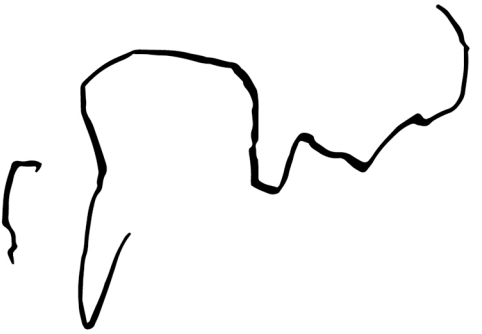


You think it's a wonder, as you smack its legs with hedonic hunger. Its scientific name '*Pelophylax kl. esculentus*' points to a delectable treat, if one can identify it. Sharp your ears to hear its growling call: "re-re-re-re-re-re" to catch the prey. But be aware! Everyone who wants to have this little snack should know that its legs are dismembered while still alive and left to beg. Would you plead to change the prologue for the edible frog?

Note: Bouncing lines bring troubles from a stranger. But besides all the damages humans are capable of inducing, the *Pelophylax kl. esculentus*'s faith is commemorated with the saddest song of the wailing frog of a different descent: "Ooh. . . ooh . . . ooh . . . ooh . . ." sings the fire-bellied toad. The sound floods all over the wetland.

If you strike, *Bombina bombina* puts out its spike. It is not what you think, it is not sharp and clink. Orange, bright, yellow, and light, is a fiery reflex you shouldn't ignite. Once it scares you, it tears your eyes. So you better leave this toad in the sludge!

Note: A path is interrupted, and *Bombina bombina* may be extinct on the other side. When threatened, it scares with the 'unken reflex'.



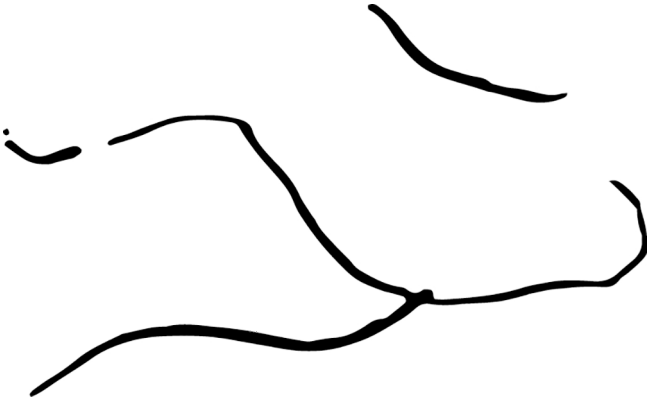
With all the new scorching heat, there are no more secrets left to keep. You can find a cowards fleet, just below your swimming feet. After so many years following their last battle, they lie still underneath the gravel. Be careful how you stroke, there is a rumour that their hull carries heavy smoke.

Note: A scalloped trail retraces armours along its path. Deep down there are fleets of ships left intact. As the tides suck in, there is a real danger of the still existing ill.

Among the all-seeing eyes of this planet, there are artificial ones that are like gadgets. They trick the river into digital leaks and disrupt its flow by using its generous growth.

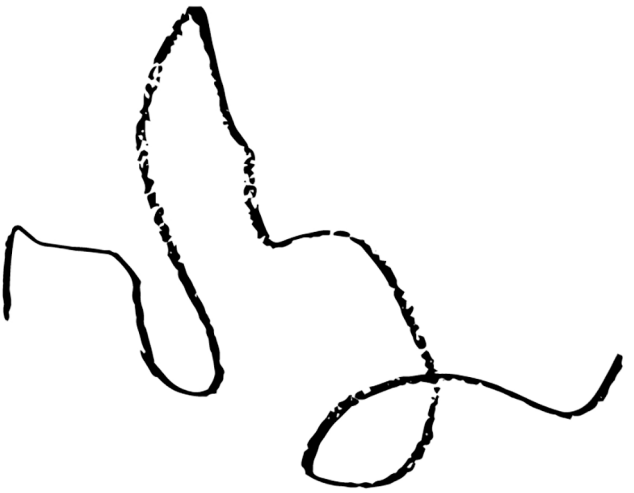
Data centres thrive when the tide is high and relapse when the tide is low. This is a two-edged sword – no one likes it when their movements are accurately stored. What would you rather do: have no water, or be watched up close?

Note: A combination of the spiral and interruption makes this an intriguing conjunction. To explain this contradiction, we would need to use Wi-Fi precision. It is a paradoxical path, in which clouds are water-cooled.



Somewhere along the way, bodies are shot on a winter day. You may find them on the riverbed, as carp peck on the lead-head! Don't let them bathe in the stream, in a long-forgotten dream!

Note: The line of the impending doom is about to bloom. History repeats itself as humans forget the winter of 1942.



Untethered by traditional roots, the vigorous coontail floats free almightily. Its flowers appear inconspicuous, but it might also grow too densely. The virtue of its trick is to be thick. Do not stay under its brick! You better learn from its ethics: swiftly adapt and do not attach!

Note: A quirky, curled line with a single loop establishes the uncanny nature of the coontail and its adaptive mechanisms. When there is too much of it, it can be, for others, a suffocating neighbour.

Live, Think and Die with Mussels

Let us take you on a little detour. Dolphins are known to communicate and co-ordinate their fishing actions with fishermen at Praia da Tesoura in Laguna, Brazil. As dolphins ingeniously realized where the fishermen cast their nets, they began herding fish towards that place. This strategy causes fish to break into formation, making it easier for the dolphins to catch them. They even signalled the fishermen regarding the approaching direction, unintentionally training them in this cooperative strategy (Cantor et al. 2023). This *thinking with* helps both of them catch more fish, but only if they are sensitive, actively listening and paying attention to one another.

What is at its core here is a question about collaboration; how can we think together and work together for a better catch? But what if there is no catch involved? What if the catch is our shared existence? Humans have certainly been engaged in mutual evolution with other species throughout history. They have never been isolated or abstracted from their ecological and relational correspondence with others. But thinking and doing with *woodiana* is far more difficult than with dolphins. And it is not because they are one foot short. Instead, we are short in understanding the advantage of attuning to *woodiana* paths. The understanding of the Danube with *woodiana* is, of course, shaped by their unique sensory perceptions, biological characteristics and evolutionary history, which offers a perspective that is fundamentally different from our own. Nevertheless, it is informed by our coexistence. What we let go, they catch. And eventually, we catch it back.

But there is another catch in this story: we both do great harm in this world.

Being shipped from long distances between continents, without being migratory species themselves, these mussels were soon declared as one of the most invasive aquatic macroinvertebrates found in the river Danube. As a species with exquisite survival skills, *woodiana* can cause harm to other species, posing a potential threat to biodiversity. They are considered generalists because they are in direct competition with other Danubian mussel species, excessively exploiting fish as their hosts (Paunović et al. 2006). As a result of this, *woodiana* are often represented, both by the popular media and within academic discourse, as an invasive species dominating over the native species (Benko-Kiss 1995; Douda et al. 2012; Paunović et al. 2006; Popa et al. 2007). *Woodiana* are certainly faster to reproduce, bigger in size and more resilient than the other mussel species. But, perhaps, this is what it takes for life in the Danube, which is rapidly changing by anthropogenic ecological degradation, to continue.

Animals (and plants) that have been labelled invasive species are the bad guys, evil villains, invaders, killers, pests, aliens or monsters for the wildlife conservation world (Elton 1958; Strayer and Waldman 2013; Subramaniam 2001). We are urged not to perceive these creatures as an essential part of the natural ecosystem, but as invaders, who even require military strategies and lethal measures to be dealt with:

> […] I have described some of the successful invaders establishing themselves in a new land or sea, as a war correspondent might write a series of dispatches recounting the quiet infiltration of commando forces, the surprise attacks, the successive waves […] of attack and counter-attack (sic!) and the eventual expansion and occupation of territory. (Elton 1958)

The language used in discussions about invasive species tends to create bias in people being against the animals, fostering a perception that the killing of these creatures is not only morally justifiable but also deemed necessary. However, such claims are highly controversial (Inglis 2020). Certain members of the academic community have endeavoured to advocate for invasive species asserting that "the vast majority do no harm at all or are positively useful" (Thompson 2014: 6), or suggesting that these species are here to stay instead of the endangered or extinct ones, that they might even represent our best hope for replenishing wildlife populations in the Anthropocene (Pearce 2015). On the other hand, we must also acknowledge that, in terms of the Earth's history, humans are "The Most Invasive Species of All" (Marean 2015).

So, how do we change the invasive species and non-native narrative around *woodiana*? How can we change our viewpoint to envision a potentially positive future where we acknowledge the value of *woodiana*? How can we comprehend the interactions between the *Danubian* species and us humans, especially in the face of swift environmental changes? Well, perhaps by training our minds to "go visiting" (Haraway 2015: 11).

Through our visits and *speculative fabulation*,[32] we have engaged with pressing questions that the Danube compelled us to explore, telling stories about alternative futures with the aim of changing those troublesome in the present. Perhaps not the *world* per se but, at least, to start changing our manners, what we read and how we speak. We are trapped in languages entirely created by humans, and our planet is desperately in need of unheard *voices* and unknown *lines* (lives!). However, to hear them, we have to be brave enough to ask them the right questions: so, *What Would Woodiana Say If We Asked the Right Questions?*[33] (Despret 2016)

In our intricate nature and continuous existence, both *woodiana* and we humans are simultaneously inflicting significant damage and supporting entire ecosystems: "The devil is truly in the details of response-able nature-cultures inhabited by accountable companion species. They – we – are here to live and die with, not just think and write with" (Haraway 2016: 125).

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32 Haraway describes speculative fabulation as a "mode of attention, a theory of history, and a practice of worlding" (2016: 230).

33 The original title of the book by Vinciane Despret is *What Would Animals Say If We Asked the Right Questions?* (2016).

But, until we die, we must sow worlds. As our esteemed President of the *Therolinguistics Association* once noted, narrating these stories allows us to embody the concept of *Staying With the Trouble* (Haraway: 2016) And after ants, penguins, dolphins and mussels, there are others to be heard:

> And with them, or after them, may there not come that even bolder adventurer – the first geolinguist, who, ignoring the delicate, transient lyrics of the lichen, will read beneath it the still less communicative, still more passive, wholly atemporal, cold, volcanic, poetry of the rocks; each one a word spoken, how long ago, by the earth itself, in the immense solitude, the immenser community, of space. (Le Guin 1988: 175)

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