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Changing human-ecosystem interactions during COVID-19 pandemic: reflections from an urban aquatic ecology perspective

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The COVID-19 pandemic has led to over 17 million infections worldwide since December 2019 (dd. July 30, https://www.ecdc.europa.eu/en/geographical-distribution-2019-ncov-cases), with besides the immediate repercussions for human health in terms of morbidity and mortality, also both voluntary as well as government-enforced changes in human behavior. In our 2019 paper [1] we reviewed the impact of a range of urban pressures on ecological health of urban waters and identified different steps towards restoring urban waters. We recognized in this paper the need for an integrative assessment of human-ecosystem interactions, building on the OneHealth approach [2]. In the current paper, we reflect upon the COVID-19 implications for urban aquatic ecology, and focus on two topics, i.e. changing human-nature interactions, and a OneHealth approach towards restoring urban waters.

Changing human-nature interactions

Urban waters exist on a clear socio-ecological interface, and provide numerous ecosystem services, including water for drinking, sanitation and recreation, micro-climate regulation, storm water retention and habitat for wildlife. As nearly 60% of the human population resides in cities (data.worldbank.org), urban waters often offer a first interaction of humans with aquatic ecosystems. Although government response measures to contain the pandemic differed on a country-by country basis, most people faced some kind of restriction in their mobility, ranging from near complete home confinement to restrictions regarding the radius and timing of their movements (http://www.bsg.ox.ac.uk/covidtracker). These mobility restrictions have created positive feedbacks for biodiversity as some pollution levels decreased drastically, leading e.g. to unprecedented human-induced decreases in GHG emission[3]. Whereas reduced industrial activity during COVID-19 has been linked to improvements in water quality due to decreases in industrial pollutants [4], domestic pollution levels may have likely stayed the same or worsened due to intensification of home-based activities.

For urban dwellers, these mobility restrictions might however, also change the way they interact with urban waters. During COVID-19, the intensified use of urban green-blue spaces (Fig. 1) challenged governments to balance the need for outdoors for mental and physical health[5] with the risks on increased disease transmission (see below, and also [6,7]). At the same time, a renewed appreciation of local green-blue spaces in a time where more remote natural areas might be inaccessible, could also trigger opportunities for conservation of urban biodiversity and ecosystem functions[8]. A narrative focusing on human-nature interactions seems to hold great promise for enhancing conservation policy support under COVID-19[9].

A OneHealth approach towards restoring urban waters

For a considerable amount of human viruses, water plays an important role in transmission either directly through being waterborne, or more indirectly through infections by insects that depend on water in their life-cycle, or through human and animal waste entering surface waters[2,6]. COVID-19 has been detected in untreated wastewater as well [10,11]. Waste-water based epidemiology has already proven its use as an early warning indicator for infection risk by COVID-19[11,12]. Potentially, discharge of untreated wastewaters through e.g. sewage overspills during intense precipitation could lead to COVID-19 presence in urban surface waters as well[6]. Fortunately, a recent meta-analysis indicated that enveloped viruses such as COVID-19 seems to be less persistent and sensitive to the presence of oxidants than waterborne diseases, with no current evidence for COVID-19 transmission through contaminated water[13]. The increased use of urban green-blue spaces, however, could potentially increase human-human COVID-19 transmission due to crowding of public spaces[7].

Through linking the health of human, animals and their environment, the OneHealth approach on management of urban waters could be useful in mitigating and preventing pandemics (Fig. 2). Healthy ecosystems offer less opportunities for animal-animal transmission, as well as human-animal transmission[2] and at the same time increase human health[5]. The current COVID-19 pandemic reveals that not only assessment of pollutant pathways should be an integral part of restoring urban aquatic ecosystem health[1], but also critical pathways of disease transmission between humans, aquatic animals and the environment. Given the intimate relationship urban ecosystems have with humans, application of such an OneHealth approach to urban waters should be a priority as we may enter an era of high incidence of pandemics.

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Figure captions:

Figure 1: Government enforced social distancing in green-blue spaces in the Netherlands

Figure 2: Managing for OneHealth through including critical disease transmission pathways, adapted from [2]

Figure 1

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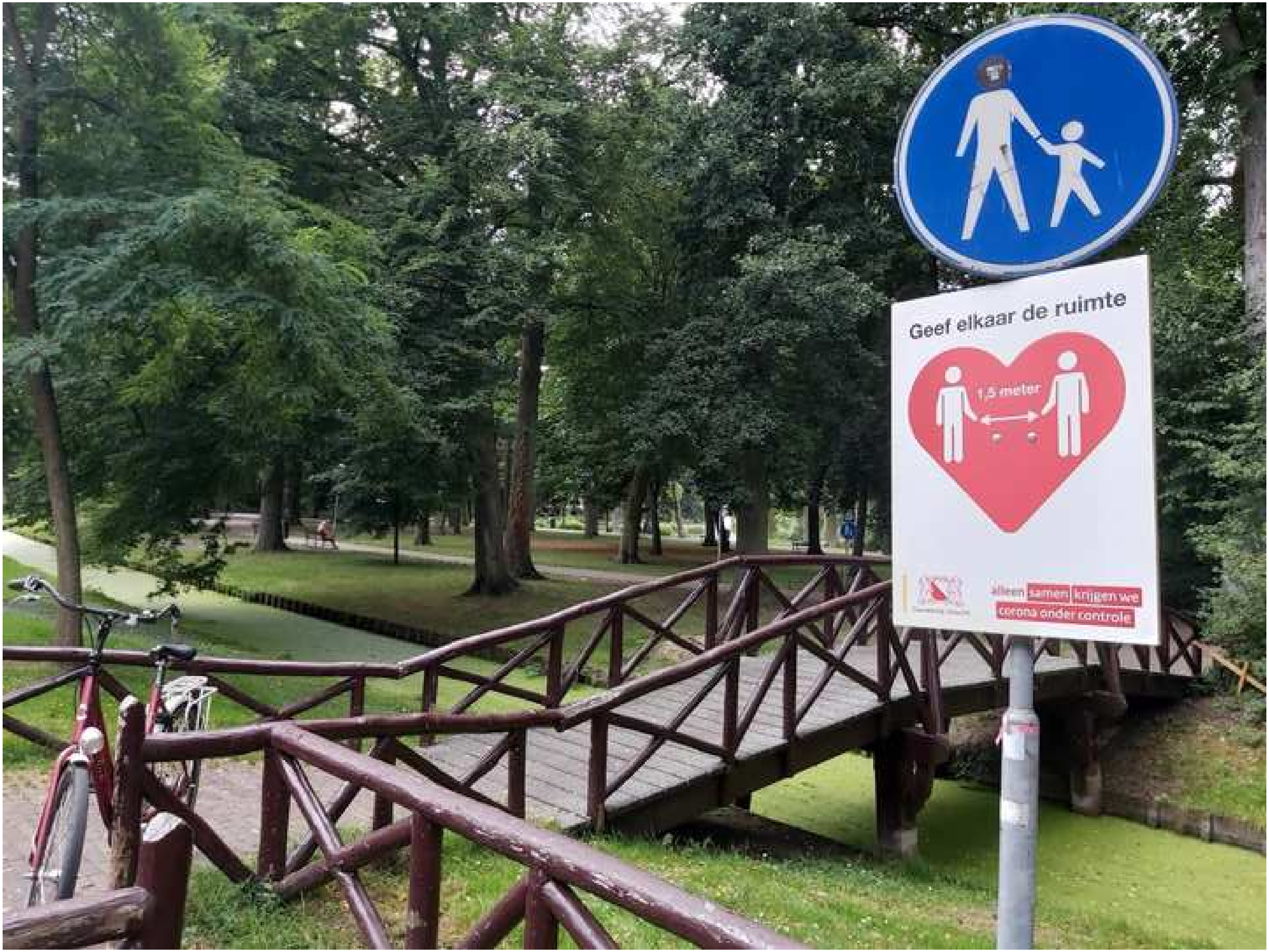

Figure 2 Click here to access/download;Figure;Figure 2.jpg