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Can Mosquitoes (De)Border? Geopolitical Ecologies of Malaria in the Inter-Korean Borderlands

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This article investigates the entanglement of ecology and geopolitics in the Korean Demilitarized Zone (DMZ) through the lens of mosquito-borne malaria. Against the backdrop of intensifying climate change, infectious diseases, and the geopolitical tension between the two Koreas, this study examines how mosquitoes act as agents of bordering and debordering between North Korea and South Korea. Revisiting the Anthropocene's implications for geopolitics and border studies, we critique rigid notions of sovereignty and fixed borders and propose a shift toward understanding borders as elastic, polymorphic spaces. The reemergence of malaria in the DMZ since the 1990s highlights these dynamics, challenging conventional geopolitical narratives and revealing new intersections of geopolitical ecologies. Through the framework of geopolitical ecology, this article analyzes the role of mosquitoes as cross-border vectors, reshaping the boundaries of political and ecological sovereignty and influencing inter-Korean politics. This article argues that mosquitoes, as nonhuman actors, challenge human-centric geopolitical frameworks. This study highlights the DMZ's dual identity as a site of both division and connection, questioning the role of disease in shaping interspecies politics and offering a novel perspective on borders as sites of geo-biopolitical intersection. **Key Words: Anthropocene geopolitics, demilitarized zone (DMZ), Inter-Korea politics, malaria, more-than-human, mosquito.**

This article examines bordering and debordering practices and the role that nonhuman agents play. Specifically, we ask what significance malaria and mosquitoes have in the complex geopolitics around the borderlands between North Korea and South Korea. In 1979, the World Health Organization (WHO) declared malaria completely eradicated in South Korea as part of the National Malaria Eradication Service (NMES), a collaborative initiative with the South Korean government following the Korean War in 1953 (Ree 2000). The disease reemerged near the inter-Korean borderland demilitarized zone (DMZ) in 1993, however, leading to annual malaria infection cases reported near the border. The resurgence has prompted inter-Korean cooperation on malaria eradication, and this cooperation itself has become significant.

Here, we investigate this issue and the underlying geopolitical ecologies of malaria in the DMZ. We do this against the background of inter-Korean relations that became worse than ever in 2024 when North Korea declared a new definition of the two-Korean relationship as a "hostile two-state" regime (Ng 2024). This political statement was followed by further bordering actions in the DMZ, including strengthening border fortifications and installing new barriers on the North Korean side (Horton, Ma, and Palumbo 2024). The conventional view of this "zone" is that it consists of territories unclaimed by either South or North Korea. The area is also considered an ecologically thriving region, however, due to more than seventy years of restricted human access (K. Kim 2013). Yet despite recent studies that shifted the focus to nonhuman or more-than-human perspectives in the borderlands (E. Kim 2022; Fedman, Kim, and Park 2023), exploring the geopolitical relationships of the DMZ through nonhuman approaches remains underdeveloped (J. Kim and Lee 2024). With our study of malaria in the DMZ, we aim to illustrate what issues are at stake from a more-than-human geopolitical perspective.

Previous approaches to the geopolitical ecologies of the DMZ were built on what Dalby (2020) saw as the until-now prevalent generic assumption of "stable geography as the backdrop to political order" (14). Acknowledging the rapidly changing geo-biopolitical situation of the Anthropocene, however, adds a new and previously unrecognized nonhuman dynamic to questions of geopolitics, borders, territories, and sovereignty (Dalby 2020, 69). Here, we challenge the assumption of a stable physical geography of borderlands by taking the nonhuman geopolitical agency of malaria and mosquitoes seriously (cf. Youatt 2020, 56). In doing so, we explore how mosquitoes relate to bordering and debordering practices and the geopolitics of the inter-Korean borderlands.

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Literature Review

Geopolitical Ecologies in the Borderlands

Within critical geopolitics, the Anthropocene is discussed as a planetary dynamic destabilizing the current geopolitical situation. Dalby (2014) noted "the growing disjunction between traditional geopolitical specifications of territorial and spatial categories of politics and the new geological circumstances" (3), and stressed that "the sheer scale of contemporary transformations challenges the taken-for-granted geopolitical assumptions that have structured modern social sciences and political practice" (3). Acknowledging the fluidity of the physical world raises concerns about the spatial integrity of the current territorial order. In that context, Anthropocene geopolitics are shifting from a focus on maintaining territorial sovereignty by guarding delineated borders (Dodds 2021). Instead, states govern and manage sprawling and topologically networked borderlands where new connections challenge sovereign power in new and unforeseen ways (Jones et al. 2017). In this vein, Graddy-Lovelace and Ranganathan (2024) proposed the approach of geopolitical ecology to uncover factors that drive state-led territorial and economic expansion. Meanwhile, Hung (2024) broadened the concept of geopolitical ecology to encompass a broader range of state territorial practices, focusing on geopolitical ecologies within volumetric state spaces (see also Battaglia 2020). Furthermore, regarding territorial practices of geopolitical ecologies, Youatt (2020) suggested a focus on interspecies politics in the borderlands by demonstrating how biopolitics and geopolitics are intermingled and produce the material and symbolic politics of human–nonhuman relationships. He also claims that biopolitical security is a productive behavior whereas geopolitical security is a protective behavior (Youatt 2020, 55); other species can be vehicles of state power but also frustrate its ambitions (Youatt 2020, 45).

In this article, we draw on geopolitical ecology to highlight how ecological processes, such as mosquito migration and climate change, intersect with state spatial practices. Interspecies politics captures the more-than-human entanglements that challenge sovereign control. Biopolitical security focuses on how public health systems govern life through surveillance and prevention, and geopolitical security represents territorial protection. These overlapping yet distinct lenses allow us to analyze the DMZ as a hybrid space of human–nonhuman negotiation.

For this study, we focus on malaria and mosquitoes as geopolitical agents in the Anthropocene, where physical geographies are as much in flux as are politics and societies. Taking a cue from Mitchell's (2022) provocative chapter "Can the Mosquito Speak?" (19), where he argued that the political and economic development of Egypt in the 1940s can only be told by giving the agency of nonhumans like dams, mosquitoes, malaria, fertilizers, DDT, and panzers their full credit, we conceive of nonhumans to be just as active as humans in constantly building the sociomaterial world.

In paraphrasing Mitchell with the question "Can mosquitoes (de)border?," we are asking specifically how nonhuman actors play an active role in bordering and debordering practices. We are well aware that a full account of all nonhuman agencies involved in such (de)bordering would also entail the analysis of other nonhuman entities such as rivers, trees, fences, landmines, and so forth (E. Kim 2022). This is beyond the scope of this article. We hope, however, to demonstrate in our case study the particular role of mosquitoes and malaria.

Mosquitoes in the Borderlands

Malaria's life cycle famously involves mosquitoes (Anopheles) and vertebrate intermediate hosts. Infected female Anopheles feed on blood to get animal protein for oviposition, and sporozoites from their salivary glands enter the host (Eckhoff 2011). Hypnozoite oocysts (sleeping parasites) remain quiescent in liver cells for about a year before dividing. Sporozoites divide in the liver cell, bursting it. When released into the bloodstream, they invade red blood cells and develop (Tuteja 2007); then the mosquito ingests the blood, and the life cycle continues. Infected persons experience symptoms such as headache, fatigue, abdominal pain, and muscle aches. These symptoms can progress to include fever, chills, intense headaches, diarrhea, joint pain, chest pain, and abdominal discomfort (Song et al. 2003). There is no vaccine against malaria, but measures such as chloroquine make malaria a treatable disease, especially in developed countries (WHO 2021, 1).

The native type of malaria in the Korean Peninsula is *Plasmodium vivax*, and the well-known vector mosquito responsible for its transmission is *Anopheles sinensis* (Korea Disease Control and Prevention Agency [KDCA] 2024c). The ecologies of Anopheles in the Korean Peninsula are relatively well known. Eight species of Anopheles have been identified in the Korean Peninsula, and six species are known to carry *P. vivax* (W.-J. Lee et al. 2007; Yoo et al. 2013).

According to studies on Anopheles' larval stage in South Korea, the highest populations of Anopheles larvae were found primarily in rice paddies, irrigation ditches, ponds, stream margins, inlets, and pools (Rueda et al. 2010, 5). The population of Anopheles is also affected by seasonal factors. Ree and Lee (1993) found a correlation between summer air temperature and *Anopheles sinensis* adult population size, and D. K. Lee and Kim (2001)

identified temperature and precipitation as the primary factors affecting *Anopheles sinensis* populations. This breeding habitat and seasonal figures of *Anopheles* are interconnected with environmental factors in the DMZ and bordering regions as favorable places for thriving (Hwang et al. 2020; Jang and Chun 2020).

In addition, Anopheles' flight capacity extends beyond the DMZ's territorial boundaries. According to S.-H. Cho et al.'s (2002) experiment on the capture and release of marked females of *Anopheles sinensis* in the northern part of the bordering region in South Korea, a total of 194 individual mosquitoes were recaptured, with seventy-two (37.1 percent) moving 1 km, fifty-seven (29.4 percent) moving 1 to 3 km, forty-one (21.1 percent) moving 3 to 6 km, twenty (10.3 percent) moving 6 to 9 km, and four (2.1 percent) moving 9 to 12 km. Furthermore, more recent studies have demonstrated that the distribution of Anopheles mosquitoes has increased at a rate of 4.7 km annually toward higher latitudes due to climate change (Carlson et al. 2023). Thus, the flight capacity of *Anopheles sinensis* and the increasing habitat range due to climate change provide insights into how geopolitical ecologies in the borderlands operate through the movement of mosquitoes. As the DMZ along the 4 km between the two Koreas formed wetlands, ponds, and various unknown environmental conditions, the inner DMZ is suspected of favoring Anopheles mosquitoes' habitation and passage (S.-H. Cho et al. 2002, 146).

Nevertheless, since malaria became a manageable disease, research on its political ecology has increasingly engaged with debates on the geopolitical dimensions of disease management and its broader sociopolitical ramifications. This is linked to the responsibilities associated with risk landscapes and the process of territorialization (Kelly and Lezaun 2013; Butterworth et al. 2015; Andreucci and Zografos 2022).

The WHO classifies malaria as a cross-border disease and offers specific guidance for managing border malaria. This presents a challenge for malaria eradication, as varying public health systems and measures among different nation-states can lead to confusion in treatment and vulnerability to geopolitical issues (Cohen et al. 2022; WHO 2023, xxi). The significance of malaria in borderlands is evident in the increasing number of regional elimination initiatives that often include cross-border coordination (Lover et al. 2017; Sinha and Liang 2021).

The geopolitical ecology of malaria has led to the emergence of new narratives among nation-states. This situation has also created an "imagined ecology" that reflects the interconnectedness of all life forms in the borderlands (O'Gorman 2017; Gandy 2022). As climate change expands the habitat range of mosquitoes, coupled with geopolitical conditions, the notion of Anthropocene geopolitics has led to new narratives in the inter-Korean borderlands. In the following section, we examine how the imagined ecology of the DMZ, particularly as it concerns malaria and mosquitoes, influences the actual geopolitical dynamics between North Korea and South Korea. In this context, we argue that mosquitoes are not just carriers of malaria; they also play a significant role in shaping inter-Korean politics and contribute to the formation of new real and imagined geopolitical ecologies in the DMZ.

To investigate how the malaria situation shapes inter-Korean politics, we conducted a semistructured interview with Hong Sang-Young, the Secretary General of the Korean Sharing Movement[1] and former director of the Inter-Korean malaria cooperation project. The interview was conducted on 11 November 2024. Additionally, from 2 to 4 November 2024, we conducted a field trip to local public health centers in the bordering region of South Korea. During the field trip, we conducted comprehensive interviews with the General Officer of Malaria at the Goyang City Ilsan Dong-gu Public Health Center and the Malaria Vector Control Manager at the Goyang City Deokyang-gu Public Health Center. Through these meetings, we gathered educational materials aimed at malaria patients and collected geospatial data on the locations and functions of mosquito vector surveillance devices. We also carried out field observations and documented our findings with photographs, capturing various mosquito control infrastructures (see Table 1). These included mosquito trap devices and mosquito repellent devices, as well as public awareness campaigns displayed on sidewalks and government buildings. These visual materials highlight how biosecurity infrastructures are integrated into the everyday life of the border regions.

Notably, through conversations with health officials, we identified mosquito traps managed not only by public health authorities but also by military institutions. Although the precise coordinates of military-operated mosquito traps remain classified for security reasons, officials provided general information about their presence, allowing us to distinguish between civilian and military surveillance infrastructures in our spatial analysis. We used this geospatial information to map mosquito monitoring sites across Seoul, Incheon, Gyeonggi-do, and Gangwon-do, covering all of South Korea's bordering regions. This mapping visualizes the territorial distribution of biosecurity efforts and their entanglement with national security concerns.

By integrating various materials, including interviews and data collected during field work, we highlight the interconnectedness of ecological, infrastructural, and geopolitical processes. Instead of viewing mosquitoes merely as passive carriers of disease, this perspective acknowledges their active role in shaping narratives around borders and biosecurity

Table 1 *Summary of empirical materials used in the study*

Type of data	Collection method and date	Interviewee/location	Key content/materials	Purpose in analysis
Interview 1	Semistructured interview (11 November 2024)	Hong Sang-Young's (Korean Sharing Movement) office (Mapo-gu, Seoul)	Process and experience of the inter-Korean malaria cooperation project	Historical reconstruction of state cooperation logic
Interview 2	Field interview (2 November 2024)	Malaria Prevention Officer/Ilsan Dong-gu Public Health Center	Vector surveillance systems, public malaria educational materials in the bordering cities	Grounding local (bordering cities) biosecurity infrastructures
Interview 3	Field interview (3 November 2024)	Malaria Vector Control Manager/Deokyang-gu Public Health Center	Military–KDCA cooperation on mosquito surveillance in the DMZ and its geodata of location	Identifying spatialized biosecurity regimes
Geodata	Provided by health center (3 November 2024)	Information provided by the Malaria Vector Control Manager at Deokyang-gu Health Center	Estimated locations of mosquito surveillance devices (Figure 2), including limited data on military-operated sites	Mapping of vector control infrastructure near the DMZ
Field data	Observational data (2–4 November 2024)	Goyang City (bordering region)	Photographs of mosquito surveillance devices, public health signage, and associated infrastructure in cities near the inter-Korean border (Figure 3)	Visualizing the material aspects of everyday biosecurity in South Korean border cities

Note: KDCA = Korea Disease Control and Prevention Agency; DMZ = demilitarized zone.

measures. In this context, mosquitoes become significant players in the geopolitical dynamics of inter-Korean politics and everyday life in the borderlands, challenging traditional notions of territorial control and security.

Situating Mosquitoes in Inter-Korean Politics

Malaria (*Plasmodium vivax*), endemic to the Korean Peninsula, was widespread before and after the Korean War (J. Y. Chai 2020). According to national surveys of NMES's positive-case detection of malaria, the highest rates during the 1960s were in the southeastern part of South Korea (Ministry of Health and Social Affairs 1966; Paik, Ree, and Shim 1988). Due to various malaria eradication programs from NMES, infection trends continuously decreased from the mid-1960s, nearly disappearing by the late 1970s, and outbreaks completely stopped by 1979 (Soh et al. 1985).

In 1993, however, it was confirmed that one military person stationed at the DMZ contracted malaria, and since then, malaria has resurfaced in the DMZ (I. H. Chai et al. 1994; J. Y. Chai 1999). In May and June 1994, two malaria cases were reported from military bases near the first infection case, indicating that this was not merely a transient phenomenon (S. Y. Cho et al. 1994). The number of patients with resurgent *P. vivax* malaria has continued to increase since then and steadied at around 500 cases annually in South Korea (see Figure 1). The primary outbreak area of malaria resurgence extended from northern Gyeonggi-do to the east and west along the DMZ (see Figure 2), with most patients living within 10 km of the DMZ (J. Y. Chai 1997, 2020; J. H. Kim et al. 2019). It demonstrates that the DMZ is not only a militarized border but also a site for breeding malaria and its vector mosquitoes.

North Korea also proclaimed malaria eradication as early as the 1970s, but according to reports, the disease reemerged there in 1997 (Chol, Suwannapong, and Howteerakul 2005; WHO 2021). In 1998, 2,100 cases were confirmed (WHO 2000). Infections drastically increased to nearly 300,000, then dropped to about 20,000, and stabilized at about 2,000 (Figure 1).

The WHO estimated that the alarming rise in malaria cases in North Korea was due to the massive floods that occurred in 1995 and 1996, which created breeding grounds for mosquitoes (WHO 2000). Since then, international initiatives, including those by the WHO, have sought to provide diagnosis, treatment, and preventive measures for mosquito control, but the malaria rate in the country remains a significant public health issue (H. O. Kim et al.

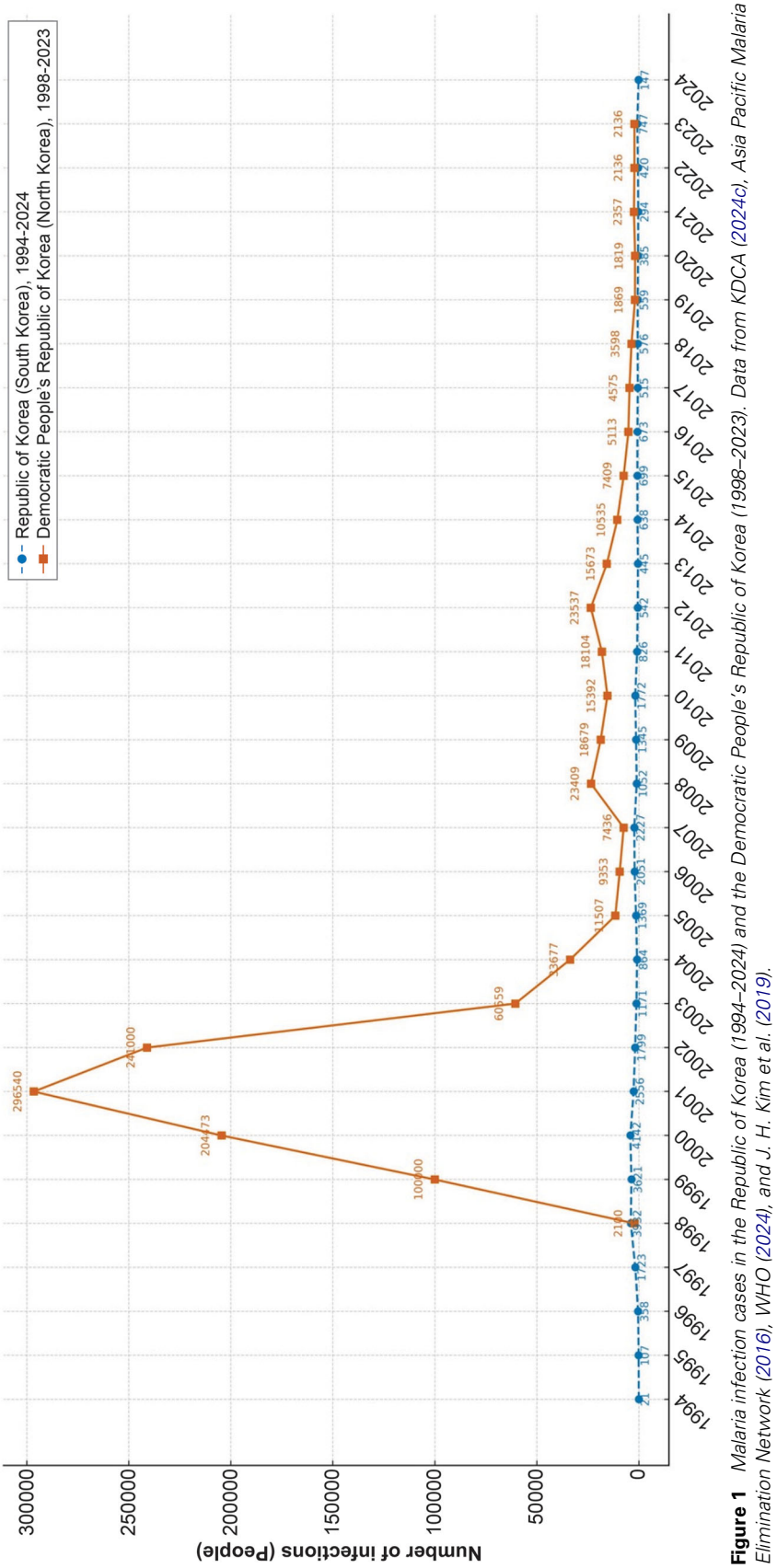

Figure 1 *Malaria infection cases in the Republic of Korea (1994–2024) and the Democratic People's Republic of Korea (1998–2023). Data from KDCA (2024c), Asia Pacific Malaria Elimination Network (2016), WHO (2024), and J. H. Kim et al. (2019).*

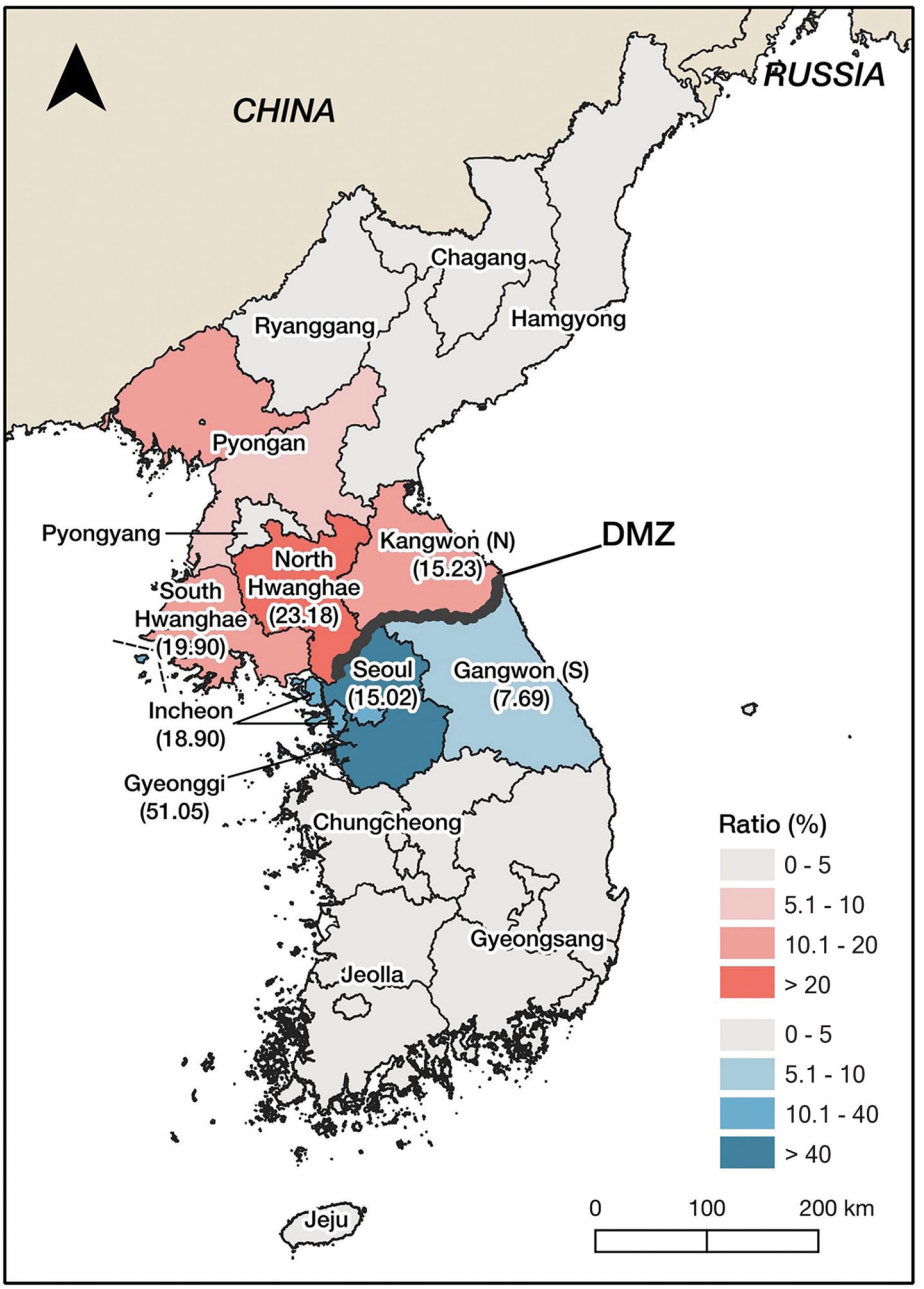

Figure 2 *Geographical distribution of malaria infection proportions by region based on the total number of infections (2004–2016) in each Korea separately. Note: DMZ = demilitarized zone. North Korean geodata collected (2004–2016) by J. H. Kim et al. (2019), combined South Korean KDCA (2024a) yearbook of Malaria, with period adjusted (2004–2016), QGIS 3.16.11.*

2018; Sung et al. 2020). Although geographic data on malaria infections in the DPRK are incomplete, J. H. Kim et al. (2019) showed that cases are also concentrated in the DMZ area, which has become a significant hot spot for mosquitoes (J. H. Kim et al. 2019).

The reemergence of malaria within and near the DMZ affects both Koreas. As a result, the South Korean government's malaria eradication projects primarily target cities close to the DMZ and military personnel (Kwon et al. 2020). Recently, the KDCA has initiated two comprehensive plans for malaria reeradication: the First Comprehensive Plan (2019–2024) and the Second Comprehensive Plan (2024–2028). These plans include spatial coordination strategies for border areas (KDCA 2024c).

According to the plans, the government will designate a special danger zone near the DMZ areas and extend it to the potential danger zones when a particular malaria vector mosquito (*Anopheles sinensis*) number is confirmed. The plans include vector mosquito surveillance systems for cities near the DMZ (S. Y. Lee et al. 2024). Monitoring malaria vector mosquitoes in the bordering regions shows that the KDCA assumes the mosquitoes cross over from the DMZ areas (see Figure 3).

The KDCA, in collaboration with military institutions, operates malaria vector mosquito surveillance systems near the DMZ and bordering cities to monitor Anopheles mosquito activity. Due to national security regulations, the exact locations of these devices are confidential. During field work at two public health centers in Goyang City (conducted from 2–4 November 2024), however, we were able to estimate the locations of several surveillance devices with the assistance of the Malaria Vector Control Manager, who also provided geodata (as of 2024) on KDCA-operated devices. According to this official from the Deokyang-gu Public Health Center in Goyang City, the KDCA plans to expand the number of devices annually and has introduced an early warning system for malaria based on detection thresholds for *Anopheles sinensis*. Although detailed spatial data remain fragmented, the developing surveillance infrastructure offers insight into how national biosecurity measures aim to anticipate and prevent the introduction of *Anopheles sinensis* from the DMZ and to spatialize these measures along the inter-Korean border, shaping a vector-based epidemiological geography that intersects with national security priorities.

Furthermore, Jeon et al. (2025) conducted a comprehensive genetic analysis of insecticide resistance mutations in Anopheles species within and near the DMZ. They identified elevated frequencies of insecticide resistance alleles (including organophosphates, carbamates, and pyrethroids) among *Anopheles sinensis* and *Anopheles kleini* populations collected from several inner DMZ areas. Notably, natural hybrids of *Anopheles sinensis* and *Anopheles kleini* were found in the DMZ settlement, indicating ecological overlap and ongoing interbreeding. These results suggest that the spatial patterns of shared insecticide resistance mutations under common selection pressures and the presence of hybrid forms collectively imply the ecological permeability of the inter-Korean border. These findings provide strong indirect evidence of cross-border mosquito dispersal. The intertwined malaria situation between the two Koreas shows that the border has always functioned as a multispecies zone, where nonhuman actors have frustrated state ambitions and challenged border infrastructure (cf. Youatt 2020, 45).

Each side's malaria eradication projects have so far failed, and malaria infections continue through the DMZ, where vector mosquitoes breed. This geopolitical and ecological entanglement of the two Koreas' malaria situation brought unique political cooperation from 2008 until 2011. In 2008, former South Korean President Lee Myung-bak was voted

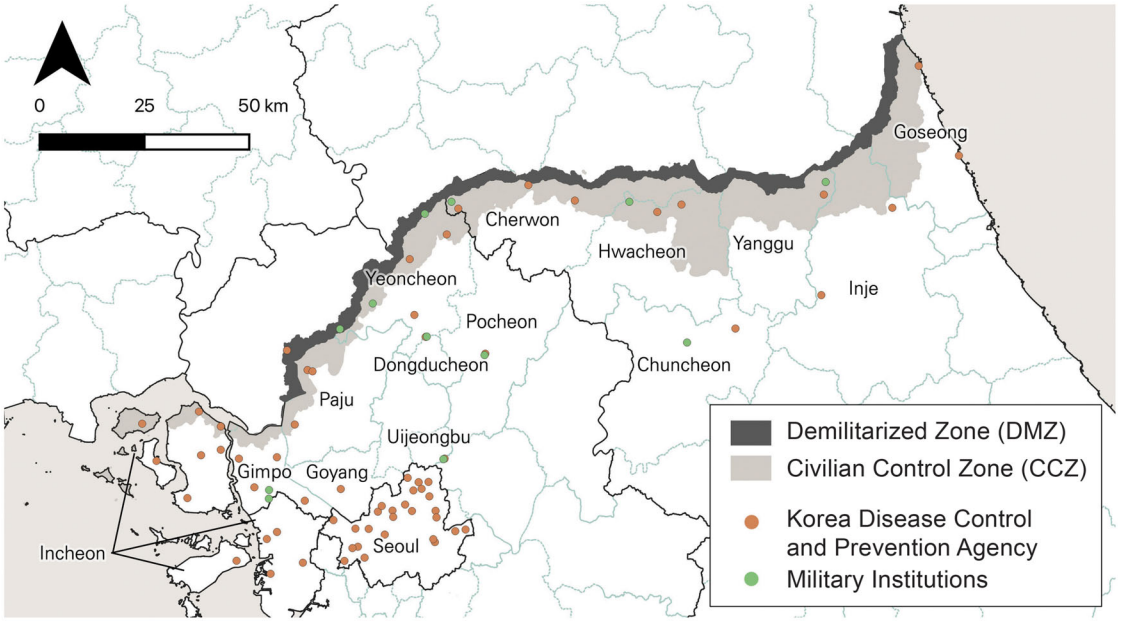

Figure 3 *Locations of malaria vector mosquito surveillance sites near the demilitarized zone. Estimated from field interviews and geodata provided by the Malaria Vector Control Manager, Deokyang-gu Public Health Center, Goyang City (November 2024), QGIS 3.16.11.*

into power to lead a neoliberal-conservative regime. During his time, military conflicts between the two Koreas occurred more frequently.[2] The geopolitical tension brought South Korea's "May 24 measures," sanctions that prohibited all civic cooperation with North Korea.

The malaria cooperation between the two Koreas continued, however, even during the May 24 measures as the only permitted inter-Korean cooperation during heightened geopolitical tension.

Hong Sang-Young explained the detailed process of the inter-Korean malaria cooperation project from 2008 until 2011:

> The Korean Sharing Movement agreed upon malaria prevention: the South Korean Gyeonggi Province government, the North Korean National Reconciliation Council, and the Kaesong Provincial Office on March 12, 2008. The South Korean side supplied northern Gyeonggi-do, northern Kaesong, and its neighbors with malaria prevention equipment, medicines, and supplies.

After the first malaria coprevention activities were conducted in the summer of 2008, both Koreas opened the performance review meeting at Pyongyang, held from 12 to 15 March. During the evaluation, both Koreas agreed on measures to decrease infections and to conduct prevention activities on both sides. A moment of misunderstanding over insecticide quantities revealed fundamentally different epistemologies of disease control: North Korea's household-based spraying required far more insecticide, whereas the South relied on targeted vulnerable zones. This encounter shows how the two Koreas take different public health approaches to malaria precautions and regulation of drug usage. The cooperation required a more concrete understanding of each side beyond abstract ways of knowing each other.

In May 2009, however, North Korea conducted its second nuclear explosion test, resulting in the withdrawal of cooperation from its partners in the South Korean government. The geopolitical situation worsened in 2010 when military conflict occurred in the border areas. The Ministry of Unification in South Korea, however, authorized the transfer of antimalarial supplies to North Korea in connection with the project, given that malaria control in the border area is necessary for the health of both Koreas (Moon 2024). This is the only approval of inter-Korean cooperation from the South Korean government under the May 24 measures, which otherwise prohibited civic cooperation until 2018. The ongoing inter-Korean malaria cooperation amid sanctions highlights that the movement of mosquitoes and malaria infection between the two Koreas fosters a shared understanding of public health priorities in each region, as a debordering agent.

Between 2010 and 2011, discussions occurred regarding inter-Korean malaria cooperation, highlighting the mutual benefits of expanding this cooperation to the DMZ border region. On 23 May 2011, the Incheon local government agreed to participate and signed an agreement with the National Reconciliation Council of North Korea on a malaria control project for Southern Hwanghae Province as a malaria cooperation initiative (Park 2011).

In 2012, though, North Korea refused further cooperation. Hong Sang-Young explained:

> When we met North Korean experts in 2011, they told us, "It's a burden that the North-South is only focused on malaria prevention." Other organizations and projects in the inner DPRK have raised complaints like, "Why are you only doing this?" They insist, "It's not a deadly disease that kills people," and continue to ask, "Why do we have to do this in a way that helps the South?" They feel they are not obliged to provide assistance that appears like propaganda benefiting the South.

Under the May 24 measures, malaria cooperation proceeded as an exceptional case in the shared interest of public health for both states. After four years of collaboration, both Koreas gradually developed and agreed on unified prevention measures applicable to the DMZ and surrounding areas. Additionally, the medical expertise of both Koreas shared and figured out the more concrete realities of the barriers to long-term cooperation plans. The experience of the inter-Korean malaria cooperation proved that mosquitoes in the borderlands shape the geopolitical realities of the two Koreas and vice versa.

In 2018, the liberal former South Korean president, Moon Jae-in, came to power. A series of inter-Korean cooperation initiatives were conducted, and as part of that, malaria cooperation was again on the political agenda (G. Lee et al. 2020). Representatives from the Korean Sharing Movement visited Pyongyang in November 2018 and agreed to reinitiate the malaria cooperation (Hong, unpublished personal memo). During the preparation of the project, however, the negotiations of the 2019 U.S.-North Korea Hanoi Summit failed and halted all discussions regarding inter-Korean malaria cooperation.

Can Mosquitoes (De)Border the Two Koreas?

Despite the lack of political legitimacy for inter-Korean malaria cooperation after the May 24 measures and the suspension of direct malaria cooperation, indirect funding for malaria eradication

continued from South Korea to North Korea through international organizations. The funding for the North Korean malaria eradication project was raised with support from South Korea in 2001. The South Korean government provided materials, including malaria drugs, laboratory equipment such as microscopes, mosquito nets, and insecticides, to support the North Korean malaria control program with training and education of North Korean personnel with about $791,000 in support through the WHO (KDCA 2005). Then, indirect support through the WHO, the Global Fund to Fight AIDS, Tuberculosis, and Malaria (The Global Fund), and others continued and increased the amount of funds by various routes. From 2001 to 2009, the South Korean government raised US$8.28 million (KDCA 2009) for antimalaria programs in North Korea. From 2010 to 2019, this amount increased to US$38.8 million. Additionally, from 2023 to 2025, the South Korean government pledged US$200 million to The Global Fund, contributing US$112.82 million to support the North Korean malaria eradication projects (The Global Fund 2024).

Efforts to provide indirect support through international organizations and funding illustrate the realities of the inter-Korean border, where public health concerns are deeply interconnected but constrained by geopolitical conditions. A funding proposal submitted by North Korea to The Global Fund in 2017 noted that 70 percent of malaria infections in North Korea were concentrated in the DMZ area. Due to the impossibility of international access to the border, North Korea insisted that antimalaria activities could only be carried out by the Ministry of Public Health in North Korea (Democratic People's Republic Malaria Proposal 2017, 17–20). In the same funding proposal, North Korea suggested that one implementation strategy for the preelimination of malaria is to hold a cross-border regional forum with South Korea (Democratic People's Republic Malaria Proposal 2017, 40). "A cross-border initiative between the DPRK and ROK recognizes that malaria transmission transcends geographic borders and may contribute to each country's disease burden. This collaboration will allow for the exchange of senior-level management skills from various country approaches that could apply to DPRK malaria control measures" (Democratic People's Republic Malaria Proposal 2017, 45).

This inter-Korean politics of public health was also demonstrated in the speech of former South Korean president Moon Jae-in (2017–2022) at the seventy-fifth session of the United Nations General Assembly (Yonhap News Agency 2020).[3] He envisioned the inter-Korean relationship as a single community of life, departing from the conventional ethnocultural representation of a "single race nation" defined by "ethnic homogeneity" in the government's official narratives by emphasizing the biogeographical connection of the two Koreas. Plus, the new security crisis contradictorily offered the chance to open new political dialogues.

The biogeographical connection of cross-bordering nonhumans in the borderlands validates the unstable and porous geographies in the Anthropocene, shifting our attention to nonhuman agents like malaria and mosquitoes that significantly destabilize the conventional understanding of security. The cross-bordering mosquitoes and the inter-Korean border region's malaria infection, however, will open the possibilities of coproducing a new inter-Korean regime and imagined ecologies of the DMZ as full of interspecies relationships.

In 2024, the KDCA expanded the "malaria danger zone" to include fifty-three cities, including Seoul, Incheon, Gyeonggi-do, and Gangwon-do, which covers every bordering region in South Korea. Then, the KDCA issued a nationwide warning for malaria infection in June 2024 (KDCA 2024b). The temperature, rainfall, and high humidity cause larval development, mosquito survival, and parasite development rates that directly affect malaria infection (Shapiro, Whitehead, and Thomas 2017; WHO 2023, 94–96). South Korea's KDCA's national goal for total reeradication of malaria by 2030 and North Korea's national goal for malaria eradication by 2025 now seem far-fetched for the two Koreas. The human–nonhuman relationships in the Korean borderlands frustrate the state's ambition (cf. Youatt 2020, 45).

Nevertheless, the state's efforts to achieve its national goal of malaria eradication have been visibly manifested in cities bordering the DMZ. During our field work, we observed how malaria-related biosecurity measures were rendered visible to the public through various street-level interventions. These included sidewalk projections warning of mosquito-borne malaria, instructional posters for insecticide spraying, and mosquito vector traps installed in public parks, streets, and health facilities (see Figure 4).

These practices indicate that national biosecurity is not only coordinated across borders but also embedded in the material fabric of everyday life in the border cities. The visibility of these devices and warnings transforms vector surveillance from a technical measure into a shared public concern, integrating biosecurity logics across human and nonhuman actors and infrastructures. As illustrated in Figure 4, these infrastructures demonstrate how local health authorities mediate risk communication and implement vector control. Collectively, they form part of the KDCA's broader effort to spatialize biosecurity through public engagement and multispecies surveillance.

Figure 4 *Public warning messages and mosquito surveillance infrastructure observed in Goyang City. Photo by authors (November 2024).*

These spatialized practices coexist, however, with a persistent absence of ecological data from within the DMZ. This lack of direct ecological data from within the DMZ has given rise to various imagined ecologies in both Koreas. As malaria risk zones expanded across all border regions in South Korea, culminating in the first nationwide warning in 2024, South Korean media increasingly attributed the resurgence of malaria to mosquito influx from North Korea (Goo 2024; Ki 2024). This suspicion—framing North Korea as a source of "dangerous things"—is emblematic of how ecological threats are interpreted through geopolitical anxieties. Similar narratives have emerged regarding the spread of African swine fever from the North (J. S. Kim 2019) and the alleged transmission of COVID-19 through South Korean propaganda leaflets (Oh 2022).

Yet despite these mutual suspicions, both Koreas share a vital interest in the public health of bordering regions, where ecological entanglements transcend state territory. This shared concern has enabled rare forms of inter-Korean cooperation, even amidst geopolitical tensions. These moments of collaboration reveal not only the differences in how each state governs public health but also the concrete realities of the borderlands. Although mosquitoes do not intend to cross borders, their biological movement

produced public health responses that reshape state behavior, rendering them unintentional yet effective agents of debordering.

Meanwhile, North Korea declared a "hostile two-state" relationship with South Korea and dissolved the Central Committee of the Democratic Front for Reunification of Korea on 23 March 2024 (Rodong Sinmun 2024a). As a follow-up measure, the North Korean army took physical action to cut off the East-to-West section of the southern border of DPRK as part of the phased complete separation of its territory (Rodong Sinmun 2024b). In the same vein, South Korean President Yoon Suk-Yeol maintained the "Audacious Initiative," seeking inter-Korean relations under the principle of "peace by overwhelming force." (Ministry of Foreign Affairs 2024). Thus, the geopolitical relationship between the two Koreas appears to be hardening, and the inter-Korean borderlands are increasingly fortified. Given the situation, the prospects for inter-Korean malaria cooperation seem bleak.

In our interview, however, Hong Sang-Young said:

> Mosquitoes have no border. When I first began the inter-Korean malaria cooperation project, I had this idealistic vision in my mind. I thought we could simply apply mosquito control insecticides simultaneously across the DMZ, and that would be the cooperation. However, I quickly realized that my understanding of the DMZ was too abstract. As we began tackling challenges together, I came to appreciate the different realities each side faced. When we started setting out the long-term plan, it wasn't just about spraying insecticide. We argued for planning for the self-production of malaria rapid test kits in North Korea, collaborating on basic malaria research, and even planning for building a hospital in Kaesong. Everything ended, but this experience really opened my eyes to the concrete realities of the DMZ, and the cooperation is not just overcoming the physical borders but stepping back and understanding each side by setting common goals for both sides.

The experience of inter-Korean malaria cooperation during the heightened tension illustrates that the two Koreas operate differently in malaria prevention with different political and biopolitical systems. In this process, the abstract idea of the DMZ, along with the ways the Koreas perceive one another, evolved into a more concrete and realistic understanding of the borderlands and their respective biogeographies. As Youatt (2020) demonstrated, biopolitical security denotes a productive way of life in the borderlands, generating meaning and symbolic representations of existence. In contrast, geopolitical security is a protective mode of action in the borderland (55). The two Korean regimes primarily engage in geopolitical and military conflicts; however, their efforts to safeguard public health from malaria infections resulted in a more concrete understanding of biogeographical realities of the DMZ, portraying the two Koreas as interconnected and sharing specific forms of life. Malaria, as a cross-border disease, produced the common interests of the two Koreas and even created a unique moment of cooperation when geopolitical tension grew.

The DMZ continues to function as an incubator for vectors—mosquitoes—that move across the North and South, however, Affecting public health on both sides of the border. Climate change facilitates expansion of the range of habitation of malaria vector mosquitoes and their movement (Mafwele and Lee 2022; Carlson et al. 2023). It frustrates the national goal of total reeradication of malaria for each Korea. The DMZ is not merely a demarcated line and zone; it is an oozing, amorphous space that expands and contracts biogeographically, aligning with a topological understanding of contemporary security issues. As the northern regions of South Korea are designated as malaria danger zones, the nationwide malaria warnings demonstrate that the DMZ and the health security of both Koreas are deeply entangled. This situation illustrates how geopolitics and public health on the Korean Peninsula are inseparable. At the same time, the shifting dynamics of the geopolitical situation fuel the spread of malaria, and malaria outbreaks reciprocally influence inter-Korean tensions.

This mutually reinforcing relationship answers the core question of this study: Mosquitoes in the borderlands coproduce inter-Korean relations and shape the geopolitical ecologies of the DMZ. These findings suggest that mosquitoes in the inter-Korean borderlands act as more-than-human agents in three ways. First, their seasonal and climate-driven mobility triggers national biosecurity measures, including expanded surveillance and coordination. Second, ecological dynamics like insecticide resistance and hybridization arise from the shared environments of the DMZ. Third, mosquitoes have enabled rare inter-Korean cooperation, even amid political tension. Together, these dynamics reveal how mosquitoes can shape geopolitical and ecological landscapes, challenging state-centric views of borders, sovereignty, and security in the Anthropocene.

Conclusion

The geopolitical ecologies of malaria in the inter-Korean borderlands are evolving. Given that geopolitical relationships are closely tied to malaria, which traverses the DMZ, South Korea's recent political shifts and changes in U.S. leadership will likely introduce new dynamics in the geopolitical ecologies of the borderlands. The interplay of political

instability on the Korean Peninsula and unpredictable global geopolitical conditions will affect malaria in the borderlands, illustrating how meta-unstable geopolitics operates in the Anthropocene (Dalby 2020).

Malaria infection will persist in the Korean Peninsula, primarily concentrated in the borderlands between the two Koreas. This shows that, unlike the idealized and celebrated DMZ, which restricts human access and is envisioned as a romanticized potential natural resource for ecological thriving (Shin 2021), the DMZ is fostering mosquitoes, malaria, and other life forms that could threaten public health. This highlights the realities of borderlands concerning human relationships that challenge the anthropocentric view of these areas. The more-than-human geopolitical ecology suggests a new vision of the DMZ and inter-Korean relationships, as mosquitoes have no border.

This study illustrates that mosquitoes and malaria, as nonhuman entities, undermine conventional concepts of political sovereignty by functioning as agents of transboundary ecological and geopolitical interactions. Examining malaria in the DMZ illustrates the intersection of geopolitical tensions and ecological dynamics, complicating traditional perceptions of borders. The DMZ presents ecological intricacies that foster both collaboration and conflict. The distinctive instance of inter-Korean malaria collaboration underscores the capacity for common ecological challenges to promote dialogue and mutual comprehension.

Through this study, we tried to broaden the analytical scope of borderland studies by positioning mosquitoes within the context of Anthropocene geopolitics and more-than-human border studies. Future research could explore the influence of additional nonhuman agents in forming geopolitical ecologies or analyze the cumulative impacts of climate change and emerging diseases on disputed borders such as the DMZ. The discussions surrounding the Anthropocene in border studies highlight that these issues are not solely human constructs; instead, they are shaped and redefined by the interconnected existence of humans and nonhumans. The mosquitoes in the DMZ serve as a reminder that they can (de)border the inter-Korean relationships. ■

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Notes

[1] With the consent of Hong Sang-Young, we use the interviewee's real name in this Article. Korean Sharing Movement (KSM) is in Special Consultative Status with the Economic and Social Council of the United Nations (UN ECOSOC). KSM was founded in 1996 when severe food shortages in North Korea became known to the global community, and the North Korean government appealed to the outside world for assistance. From its early role of providing disaster relief aid, KSM expanded its mission to structurally improve North Korea's humanitarian situation by focusing on development projects in agriculture, public health, and more. (See more details at https://ksm.or.kr/?charity-project=aboutksm).

[2] In 2010, significant military confrontations occurred between the two Koreas in the marine border region of the Yellow Sea, specifically at the Northern Limit Line (NNL). On 26 March 2010, the South Korean Navy warship *Cheonan* sank as the result of an attack by North Korea. Later, on 23 November 2010, North Korea bombarded Yeonpyeong Island, which is part of South Korean territory (see more details at International Crisis Group 2010).

[3] "The South and the North are bound by a single community of life, intertwined by mountains, rivers and seas stretching across the two sides. When one is exposed to infectious diseases or natural disasters, so is the other, requiring the two to cooperate to overcome these challenges. Inter-Korean cooperation in disease prevention and control and public health will also trigger dialogue and cooperation in the process of building a peaceful Korean Peninsula. Today, the world is expanding the concept of security from traditional security of preserving territorial integrity to comprehensive security. The world has been joining forces to respond to non-traditional security threats" (Yonhap News Agency 2020, italics added).

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