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The Politics of Pine Tree Disease: Interspecies Politics in the Inter-Korean Borderlands

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Abstract
This study explores the politics of interspecies relationships in the inter-Korean borderlands. Pine trees (Pinus) are regarded as significant national symbols in both North and South Korea, making them a relevant topic in inter-Korean politics. As a result, diseases affecting pine trees have come to be viewed as an enemy of the state for the two Koreas. The spread of pine tree disease from the southern regions of South Korea to the northern parts of the Korean Peninsula has prompted both states to implement biosecurity measures. This research demonstrates how these biosecurity measures are enforced despite restrictions on human access to the Demilitarized Zone (DMZ) between the two Koreas. To better understand this, I propose a framework of more-than-human territoriality, which analyzes how biosecurity measures shape and are shaped by interspecies interactions, highlighting the geopolitical implications of these dynamics. This dual process emphasizes how biosecurity measures mediate species mobility, reflecting geopolitical priorities while challenging conventional notions of sovereignty in the Korean DMZ. By framing inter-Korean politics within the context of interspecies dynamics, this paper challenges the conventional view of the DMZ as a "pure" and "untouched" natural area. This study reframes the DMZ as a politically contested and ecologically dynamic space where interspecies relationships actively influence territorial practices and state sovereignty.

Keywords interspecies politics, inter-Korean borderlands, Demilitarized Zone, pine tree nematode, more-than-human territoriality, biosecurity

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1. Introduction

The pine tree (*Pinus*) is one of the most prevalent tree species on the Korean Peninsula and holds national symbolic significance for North and South Korea; these trees heavily populate the Demilitarized Zone (DMZ). However, various deadly diseases, such as pine wilt disease (PWD) and pine gall midge (*Thecodiplosis japonensis,* PNGM), regularly afflict pine tree species and lead to widespread mortality. In response to the spread of these diseases, both Korean governments have taken steps to combat pine tree pests. Both sides have implemented biosecurity measures, including chemical prevention and biological control, and have studied the ecology of the natural enemies of the pine tree beetles.

The pine tree diseases and efforts to combat them also mirror territorial practices in the inter-Korean borderlands. During relaxed geopolitical tensions, forest and tree disease experts engage directly between the two Koreas, particularly in the symbolic national park, Mount Kumgang, near the northeast DMZ. When geopolitical tensions escalated, however, the suspension of expert exchanges and the implementation of territorial practices facilitated the mobility of natural enemies across the border into North Korea to combat the pine disease-carrying species.

This study explores how interspecies relationships, particularly those involving pine tree diseases and their vectors, mediate and reshape the geopolitical and territorial practices of the inter-Korean borderlands. It offers a novel lens to understand the DMZ as a site of more-than-human interaction. It begins by reviewing the theoretical framework of biosecurity strategies, particularly in the context of territoriality. Then, it delves into an analysis of the inter-Korean borderlands and the geo-biopolitical situation, focusing on strategies employed by both Koreas in response to pine diseases within interspecies and geopolitical conditions.

To this end, I aim to expand the understanding of conventional geopolitics between the two Koreas through the lens of interspecies relationships (Graddy-Lovelace & Ranganathan, 2024) involving pine tree species. In doing so, this study seeks to contribute to theorizing the more-than-human geopolitics of biosecurity, along with a case study of the inter-Korean borderlands. To achieve this, I examined official state documents, including presidential speeches, diplomatic records in national archives, and scientific reports produced by various state agents from both South and North Korea. The study emphasizes how pine trees and other related species become subjects of the state's biological and ecological strategies. It reveals the biosecurity regimes that govern interspecies relationships and either facilitate or hinder the movement of species near the borderland. It also highlights the potential for interspecies relationships to shape and create a new geopolitical condition.

2. Political Ecologies of the Inter-Korean Borderland

Previous human geography and international politics literature investigates territorialities as socially constructed subjects (Elden, 2013; Sack, 1986). Here, I draw theoretical attention to the possibilities of including nonhuman agencies in conventional concepts of territoriality (Dalby, 2021; Hung, 2024). I then situate the condition of the inter-Korean borderlands into environmental politics and territorial imagination.

2.1 More-Than-Human Territoriality and Bordering Practices

Territoriality is "a powerful geographic strategy to control people and things by controlling area" (Sack, 1986, p. 5). It seeks to analyze a variety of social, physical, and discursive strategies and observe the territory resulting from these processes. This conceptual definition of territoriality or territorialization originated as a critique of attempts to view human territoriality as simply a biological concept (Ardrey, 1966; Dyson-Hudson & Smith, 1978), which sought to denaturalize and then repoliticize territoriality as socially constructed (Delaney, 2008, p. 53). However, territoriality can be conceived as a result of human political, social, and economic action and as something tied together, revealing the limitations of assuming territory as finished and completed (Elden, 2013). Therefore, border studies focus on the significance of the nation-state territory and its territorial practices (Jones, 2016; Mezzadra & Neilson, 2013; Passi, 1996). The territoriality of a nation-state is not completed by establishing the boundaries of statehood but is constantly reshaped and reaffirmed (Kobrin, 1998; Newman, 1999; Newman & Paasi, 1998). In this context, Mezzadra and Neilson (2013) use the notion of borderscapes to emphasize the conflicts encountered

while constructing, traversing, and inhabiting borders and the tensions and struggles that play a crucial part in their formation.

Nonetheless, accepting anthropocentric territoriality falls into a new territorial trap, assuming that humans are the only actors in state territorial formation. Youatt (2020, p. 45) argued that "the border has always been a multispecies border involving the interaction of various kinds of life that produce specific kinds of border areas, create different kinds of opportunities and risks for human and nonhuman actors, and generate and challenge border infrastructure. Other species are vehicles of state power but also frustrate state ambitions." The territory of the nation-state and its bordering practices confirm the biosecurity practice of what can be transposable and what cannot (Barker & Francis, 2021; Dobson et al., 2013) and where certain species ought to be placed or not allowed (Clancy, 2021; Philo & Wilbert, 2004).

The notion of more-than-human territoriality inevitably brings up the question of biosecurity that has been interpreted across various geographical and political-economic contexts: bioterrorism and laboratory biosafety (Ryan, 2016; Salerno & Gaudioso, 2015), protecting native plants or animals for environmental conservation (Tomlinson & Potter, 2010), establishing the livestock industry, or preventing the spread of pests and diseases related to agriculture (Enticott et al., 2012). Various definitions of biosecurity challenges are analyzed using the concepts of state governmentality and biopolitics (Collier et al., 2004), which imply that territorial conditions and biopolitics intermingle and shape bordering practices, utilizing a biopolitical imaginary of the species (Dillon & Lobo-Guerrero, 2009; Ingram, 2009). For instance, the nation-state's biosecurity practices to introduce species can bring confusion in and out of the borderland (Donaldson, 2008; Sheridan, 2023) because of a lack of familiarity. Introduced species can lead to particular forms of scientific knowledge production (Braverman, 2015; Marris, 2013) and even raise the ontological question of invasive alien species (Everts & Benediktsson, 2015).

In such a context, more-than-human territoriality refers to how different species move in and out of boundaries not limited to human-made territories such as nation-states. In the Korean DMZ, the concept of *more-than-human border textures* (Fleischmann, 2022) materializes through the interaction of state-led biosecurity measures with nonhuman actors like nematodes, beetles, and parasitoid wasps. These practices reveal the DMZ as an active site of multispecies negotiation rather than a static geopolitical boundary. Thus, bordering processes occur at the margins of states and territories and through various actions that bring together humans and nonhumans (Donaldson, 2008; Gibbs, 2018; Sheridan, 2023). Interspecies relations not only regard human and nonhuman relationships but also include various forms of relationships among nonhumans, such as parasitism, commensalism, and symbiosis, which can be the object of the state's biosecurity gaze on the borderland (Braun, 2021; Hinchliffe et al., 2013).

Anthropologists and science and technology scholars have investigated more-than-human territoriality in the inter-Korean borderland. For instance, E. J. Kim (2022) investigated a variety of nonhuman agents at the border. She looked at objects like landmines, birds, and ponds in the DMZ and tried to reveal the hidden Cold War geopolitical threads passing through the DMZ today. J. S. Kim (2019) also examined a more-than-human territoriality case involving the propagation of the African swine fever virus (ASFV) in the DMZ. The South Korean government initiated bordering strategies to prevent the influx of deadly animal diseases from North Korea. However, the biological and ecological properties of ASFV lie beyond the state's intended and physically coordinated quarantine boundaries. In a similar context, this study investigates interspecies relationships surrounding pine trees and how these relationships engage with and shape inter-Korean politics at the border.

2.2 Politics of the Inter-Korean Borderland

The North-South Korean DMZ reflects its geopolitical situation. Military, almost exclusively ideological, and geopolitical factors dominated pre-2000 inter-Korean relations. After 2000, these ties increasingly included social, cultural, economic, and ecological aspects. Korea's environmental cooperation has grown from being neglected to having a significant place in the bilateral relationship. In such efforts, the two Koreas stressed forestry cooperation. The September 2018 Pyongyang Joint Declaration states: "Both sides agreed to actively promote south-north environment cooperation to protect and restore the natural ecology, and as a first step to endeavor to achieve substantial results in the currently on-going forestry coop-

eration." It demonstrates that a new geo-biopolitical vision of the Korean nation as an ecological community has increasingly occupied the central place in imagining inter-Korean relations (Republic of Korea, 2021).

President Moon Jae-in's speech at the 75th Session of the United Nations General Assembly is as follows:

> The South and the North are bound by *a single community of life* [emphasis added], 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.[1]

He envisioned a new imaginary of the two Koreas as a life-safety community, and this may be the first time inter-Korean relations have been envisioned beyond the ethnocultural representation of "a 'single race nation' of 'ethnic homogeneity'" in the government's official narratives. It was hoped that this new approach would help repair the two Koreas' worsened relationship and relax geopolitical tensions through health and environmental cooperation.

Instead, the DMZ unwittingly unveiled the complicated and fragmented nature of the Korean territorial governance system (Kim & Lee, 2024). After the 1953 Armistice Agreement of the Korean War, the United Nations Command controlled the DMZ, and South Korea's territorial sovereignty has been postponed until today. The two Koreas have never achieved a complete form of territorial sovereignty in the borderland. In its place, the DMZ has been idealized or celebrated as no one's land, where new ecological-geopolitical imaginaries such as "Eco-Peace-Oriented Discourses" are presented (Shin, 2021). This perpetuates unfulfilled fantasies of ecologically sustainable and peaceful geopolitics. The geopolitical regimes of the inter-Korean borderland encompass biopolitical considerations in the context of environmental cooperation between North and South Korea. In such a geopolitical-biopolitical situation, the pine tree and its related species have also produced intended and unintended dynamics of inter-Korean politics.

3. Politics of Pine Trees

The pine tree has been recognized as a significant symbol in inter-Korean politics. The shared regard for the pine tree as a representative of the nation has made it a useful tool in diplomatic negotiations. However, a deadly plant disease threatens the pine tree population and has been deemed an enemy of the state. Both Koreas implemented a range of biosecurity measures to eliminate the threat posed by a common enemy (Clark, 2013). These efforts included producing scientific knowledge (Goldman et al., 2019) regarding pine tree diseases and the encompassed territorial practices in the borderlands (Barker & Francis, 2021; Youatt, 2020).

3.1 Material-Symbolic Politics of Pine Trees Between Two Koreas

The pine tree family (*Pinus*) includes various different species. In East Asian countries, including Korea, Japan, and some parts of China, the pine tree is referred to by one common name, but the pine tree species include *Pinus densiflora*, *Pinus thunbergia*, *Pinus koraiensis*, and *Pinus parviflora*.[2] The pine tree is a ubiquitous tree species on the Korean peninsula and is a unique national symbol. Conversely, the two Koreas have consistently underscored to one another their status as unclaimed territories; simultaneously, the two Koreas share national and ethnic identities.

The pine tree species has emerged as a national form of nature mobilized in inter-Korean politics. The second inter-Korean summit was held in 2007 in Pyongyang. After the summit meeting, South Korean President Roh Moo-hyun (2003–2008) visited Pyongyang's Central Botanical Garden and donated and planted one individual pine tree species (*Pinus densiflora for. multicaulis Uyeki*) named the "Reunification pine tree." Roh and North Korean executive committee leader Kim Yong-nam planted it together and prepared the soil using water from the national sacred mountain, Baekdusan (Roh Moo-hyun Archive, 2018).

At the opening ceremony of the third inter-Korean summit, South Korean President Moon Jae-in and North Korean leader Kim Jong-un planted a pine tree together on the Military Demarcation Line (MDL). On this occasion, nature's symbolism signified much in politics. The pine tree used in the planting ceremony was first born in 1953, representing the year of the

Armistice Agreement of the Korean War. The soil used in the event came from two well-known landmarks: Mount Baekdu in North Korea and Mount Halla in South Korea. Similarly, the water was sourced from the Daedong River in Pyongyang and the Han River in Seoul. With such a common affirmation of the pine tree in inter-Korean relations, the nonhuman (pine tree) became a geopolitical ecological subject between the two Koreas.

During a post-summit working meeting at the eighth inter-Korean general-level military talks, An Yong-ik, the North Korean military delegate, showed the South Korean delegation a photograph. The photo showcased a pine tree planted by former South Korean President Roh Moo-hyun in 2007 at the Central Botanical Garden in Pyongyang; it showed that the tree was thriving (Park, 2019).

The pine tree holds significant symbolism in the geopolitical relationship between the two Koreas. Inter-Korean politics can be mediated by pine trees because both Koreas share an affective sentiment toward the pine tree species. North Korean propaganda employs the official symbolic representation of the pine tree to reinforce nationalistic sentiments, cultivate loyalty toward the leadership, and highlight the nation's cultural heritage (Kong, 2006). This is often done by associating the pine tree with other emblematic national symbols, particularly the revered Kim family. South Korea also deploys various conservation strategies to protect pine tree species. The South Korean government is actively involved in managing pine trees through various levels of intervention, focusing on afforestation, conservation, cultural heritage preservation, and recreational activities (Yun, 2004). As such, both Koreas have different reasons for designating pine tree species as national symbols, but both express their national identities through the pine tree. This demonstrates that nonhuman species can be representative symbols that drive the actions or political strategies of the nation-state (see Hwang, 2021).

3.2 Emergence of the Enemy of the State

The pine tree, which facilitated the inter-Korean geopolitical relationship, faced an ecological and biological crisis in the mid-80s. PWD was transmitted from Japan to adjacent East Asian countries, including China and Korea, during the years 1982 and 1988, respectively (Futai, 2008; Yi et al., 1989). The two countries have exerted significant efforts to eliminate the disease by implementing control strategies comparable to those employed in Japan. However, these efforts have not succeeded. When it first emerged in Busan, the southern part of South Korea, PWD was named "Pine AIDS" because of its devastating effects on the health of pine trees; the mortality of infected trees nearly reached 100% (Han et al., 2008).[3] The emergence of PWD in South Korea brought about various state mobilizations of biosecurity measures to stop the spread of the disease (Clark, 2013). It conveyed the scientific knowledge produced to identify PWD and its life cycles and to transmit related species relationships.

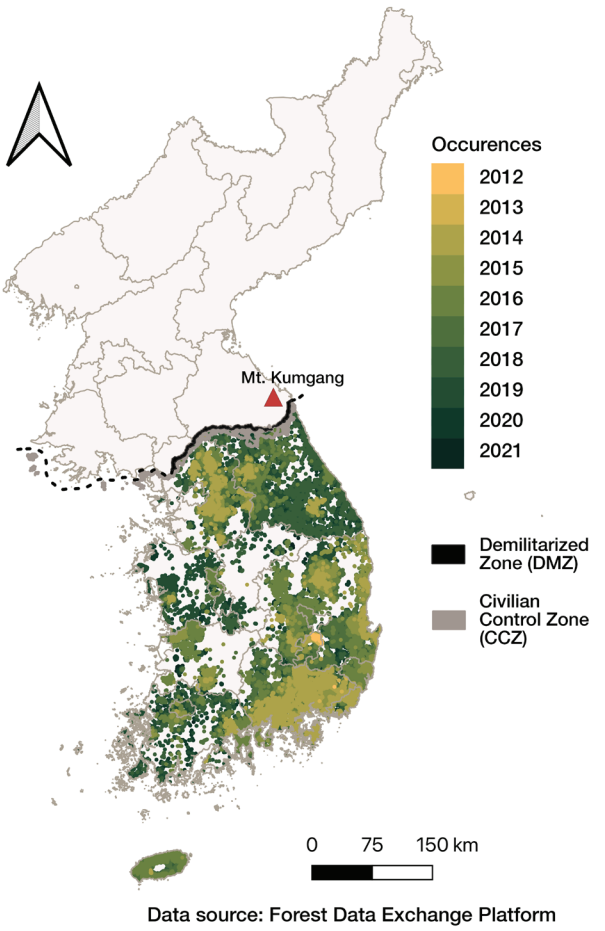
Pine wood nematodes (*Bursaphelenchus xylophilus*), classified within Metazoa, Eumetazoa, Bilateria, Pseudocoelomata, and Nematoda (Nemata), are threadlike animals less than a millimeter long. Their fecundity is remarkable; a single pair can produce up to 200,000 individuals within 20 days (Yeo & Park, 2007). However, nematodes cannot independently invade or move between trees and instead rely on insect vectors for transmission (Hyun et al., 2007). In Korea, the primary vectors are the pine sawyer beetle (*Monochamus alternatus*) and the Sakhalin pine sawyer beetle (*Monochamus saltuarius*), both belonging to the longhorn beetle family (*Monochamus*). These beetles typically select weakened or recently felled pine trees to lay their eggs. Nematodes gather around the developing larvae when the eggs are deposited in infested trees. Upon hatching, the larvae penetrate the host tree, and nematodes attach to their bodies as they mature. Emerging adult beetles, active from mid-May to late July, then carry the nematodes to new trees (Kawazu et al., 1996). During feeding, the adult beetles create wounds on healthy trees, introducing nematodes into the plant's xylem and initiating infection. Infected pine trees usually exhibit complete browning of foliage and die within a year (Yeo & Park, 2007).

Biosecurity measures primarily focus on controlling these beetle vectors, whose size and visibility make them central targets of the state's attention (Braun, 2021). Prevention strategies emphasize eliminating the intermediate insects to disrupt the transmission cycle. While *M. alternatus* is mainly distributed across East Asia, *M. saltuarius* has a broader range, extending into Russia and parts of Europe (EPPO, 2023). Both species are critical to the spread of PWD in Korea (Kwon et al., 2006).

Tackling and engaging with interspecies relationships involving PWD is a primary focus of the state's biosecurity measures. To prevent the spread of PWD, various control methods were developed and adopted, including physical controls (cut and crush, burn, and bury), chemical controls (aerial insecticides, ground spraying), and biological controls (breeding the pine tree species for resistance to *Bursaphelenchus xylophilus*, development of pathogens to vector insects, locating, mass breeding, and releasing natural enemies). Combining these various PWD management methods is called *integrated pest management* (Kamata, 2008). However, recent limitations on physical control and concerns about the broader environmental impacts of chemical control have focused attention on biological controls. The South Korean Forest Service announced, "in order to minimize environmental impact, it has been decided that aerial chemical prevention will no longer be used for PWD" (Kim, 2023). In this situation, developing a mitigation network that identifies natural enemies of both beetle species, massively breeds them, and releases them into the wild is becoming more important. It shows that the state actively produces knowledge of interspecies relationships (Tomlinson & Potter, 2010) and the ambition to engage in those interspecies relationships (Clark, 2013).

Since 1988, the forests in South Korea have been significantly impacted by the spread of PWD and its mediating beetles despite the state's efforts to mitigate their proliferation. The movement of the Sakhalin pine sawyer beetle (*Monochamus saltuarius*) in the northern region of South Korea, as well as the northward migration of the pine sawyer beetle (*Monochamus alternatus*) from the southern part of Korea, has resulted in the expansion of the habitat range for these two beetle species and the spread of PWD infection (see Figure 1). The occurrence of climate change (An et al., 2019; Hirata et al., 2017; Kim et al., 2016) and the impacts of human activity (Choi et al., 2017) have increased the movement of the two beetle species and PWD. Thus, biosecurity measures in South Korea focused on the biopolitics of biosecurity (Braun, 2021; Hinchliffe et al., 2013) as *make it stop moving* strategies, simultaneously developing and releasing the natural enemies of the two beetle species and *let-it(them)-move* strategies.

Figure 1 Spread of Pine Wilt Disease Occurrences (2012–2021) Across South Korea



Note. PWD was first observed in the southern part of South Korea and gradually expanded northward, eventually reaching the DMZ and North Korea. Based on QGIS 3.16.11 (Cartography by Yeryun Hong).

Kim Jong-un encountered this situation when he came to power in 2012 in North Korea and initiated a national forest strategy called "Total Plan for Forest Construction (2013–2042)" as a long-term forest management plan, which included integrated pest control (Choi, 2018b). In this vein, Kim Jong-un said:

> In the post-war restoration and construction period, our nation rose from the ashes, and just like that time, we must view forest restoration as *a battle against nature* [emphasis added]. It is imperative that the entire party, army, and people come together to mobilize and fight for it. (Korean Central News Agency, 11 November 2014)

Since then, the North Korean government has adopted the term "Forest Restoration Combat Campaign" as the official national reforestation strategy (Workers' Party of Korea Press, 2015). In this context, the PWD and related beetle species moving northward from South Korea are considered a threat to the "battle against nature" in the Total Plan for Forest Construction in North Korea.[4] In this regard, several PWD infection cases have been confirmed in the inner DMZ and inside North Korean territory. According to forest studies from North Korea, PWD expanded from 2007 to 2009, became a regional outbreak from 2010 to 2015, and has gradually increased since 2016 (Baek, 2016; Choi & Park, 2022, p. 7; Woo, 2014). Furthermore, studies on preventing and controlling PWD are being extensively analyzed in the field of forest management in North Korea (Choi & Lim, 2021, p. 94). Thus, PWD control and prevention became the subject of negotiation of inter-Korean forest cooperation as common enemies of the two Koreas.

This illustrates how a state's territorial practices encompass interspecies relationships and territorial coordination (Youatt, 2020). More-than-human territoriality interacts with state efforts to control the movement of the beetles and facilitate the movement of their natural enemies, leading to both intended and unintended outcomes (Clancy, 2021; Hinchliffe et al., 2013). The entanglements of biopolitics to move and stop particular species, along with geopolitics that pass through inter-Korean relationships, demonstrate the complicated relationships of more-than-human territoriality in the inter-Korean borderlands.

The third inter-Korean summit in 2018 drastically shifted inter-Korean forest cooperation. The post-summit working-level meetings were conducted in various fields, including military, sports, transportation, and economic and environmental cooperation between the two Koreas. Following the post-summit meetings, the talks on inter-Korean forestry cooperation were held on 4 July 2018 (Inter-Korean Summit Preparation Committee, 2018). For the talks on inter-Korean forest cooperation, the joint inter-Korean forest disease and pest control team conducted an on-site survey on Mount Kumgang on 8 August 2018. As a result, the South Korean forest authority decided to deliver the PWD chemical pesticide to North Korea (Ministry of Unification, 2018a). The second talks on inter-Korean forestry cooperation were held on 22 October 2018. This second meeting led to an on-site survey in Pyongyang on 11 to 13 December 2018, where they agreed to initiate the "modernization of ten tree nurseries" in North Korea along with collaborative pest control initiatives in the borderland (Ministry of Unification, 2018b). This cooperation between the two Koreas demonstrates territorial practices beyond national boundaries (Jones, 2016; Paasi, 1998). As a preventive measure, South Korean forest authorities tried to secure the biosafety of North Korean forests as potential future resources during the geopolitical relaxation (Kim & Lee, 2024).

As part of inter-Korean forest cooperation, the South Korean forestry authority built two Inter-Korean Forest Cooperation Centers near the borderland: Paju in 2020 and Cheorwon in 2022. These two centers offered a Green Détente policy toward North Korea. Primarily, the Paju Inter-Korean Forest Cooperation Center aimed to establish seed production for an inter-Korean forest cooperation nursery with technical training, while the Cheorwon Inter-Korean Forest Cooperation Center aimed to develop forest pest diagnosis and cross-border pest monitoring. These centers are expected to be "Outposts of the Inter-Korean Forestry Cooperation Advancement" (Korean Forest Service, 2023, pp. 137–144).

This inter-Korean forest cooperation involves dual territorial practices. On the one hand, it promotes debordering by easing geopolitical tensions and facilitating exchanges of forest expertise and other forms of cooperation between the two Koreas. But simultaneously, it reinforces bordering practices to prevent the entry of pests from the other side. These dual territorial practices demonstrate the biosecurity practice of what can be transposable and what cannot, as well as ways of seeing the other (Braun, 2021; Dillon & Lobo-Guerrero, 2009). Inter-Korean politics regarding pine tree diseases laid out a significant geopolitical agenda. The biosecurity measures to control the disease and species movement produced specific politics between the two Koreas. As the common enemy of the state, PWD and its related interspecies assemblage fall under the gaze of bordering practices.

To explore interspecies territorial practices in the inter-Korean borderland, in the following section, I will examine how the state mobilized scientific knowledge production and applied it to the territorial practices regarding PWD and its related species. These more-than-human territorial practices are entangled with geo-biopolitics that make particular species move or stop beyond the borderland.

4. Interspecies Territorial Practices

The geopolitics of the inter-Korean relationship produced common grounds for controlling the PWD and its related species. Meanwhile, both Koreas adopted integrated pest control programs, including biological control practices, especially South Korea. To this end, both states use reterritorialization strategies to stop the spread of the pine wood nematode (*Bursaphelenchus xylophilus*) and its insect carriers.

Conversely, the states also adopt deterritorialization strategies to let their natural enemies move. Because the two Koreas considered each other as unclaimed territory and their biopolitical practices toward the PWD intertwined with each other's territorial ambitions, these territorial practices covered the geopolitical situation between the two Koreas. By understanding the interplay between geopolitics and biopolitics (Ingram, 2009; Kivelä & Moisio, 2017), we can gain insight into the complex dynamics determining which species are allowed to traverse the border and which are restricted. This examination will shed light on the more-than-human territoriality of the interplay of geo-biopolitics in the borderlands.

4.1 Make Insects Stop Moving

The Special Act on the Extermination of PWD was enacted in 2005 and amended several times in South Korea. Article 9 (Designation and Cancellation of Areas Prohibited from Removal of Trees) stated that "To eradicate pine wilt disease and prevent the spread thereof, shall designate an infected area (and an area within a certain distance prescribed by Presidential Decree) within five kilometers from the infected area as a prohibited zone from removing trees thereof." In addition, Article 10 (Restrictions on Movement of Pine Trees) shows more solid enforcement of prohibiting moving the pine tree itself; it also regulates the movement of pine trees by an urgent standstill order for 48 hours, in case of a nationwide spread of PWD (Ministry of Government Legislation, 2005).

The Special Act on the Extermination of PWD designated the Korean Forest Service as a state organization to control and prevent the PWD. The PWD prevention guidelines from the Korean Forest Service define the two beetle species, pine sawyer (*Monochamus alternatus*) and Sakhalin pine sawyer (*Monochamus saltuarius*), as pests, and it runs the annual outbreak forecast system, opening its monitoring centers in 2016 (Korea Forest Service, 2021). The aim of the prevention and control of the PWD focuses on controlling the movement of the infested pine tree itself as the carrier of the eggs of the two beetle species; it also directly controls and monitors the populations of the two beetle species.

According to the guidelines, the PWD-infected individual pine trees should be cut down and buried with chemicals or fumigation. Plus, there are "cut-all subregions" when an infection emerges in an area and reaches 20 m from each pine tree. "Cut-all subclusters" strategies are triggered when more than 50% of pine trees are infested in certain clusters but limited to 0.3 hectares. "Cut-all" strategies occur when a PWD infection is repeated or economic profits are expected by selling the land (Korea Forest Service, 2021, pp. 78–80).

Chemical pesticides can be injected directly into pine trees to prevent the beetles from laying eggs inside the trunk or by aerial spread to kill the beetles (Korea Forest Service, 2021, pp. 72–75). Controlling the movement of pine trees and the two species of beetles is closely tied to the economic value of forest products such as pine nuts and mushrooms, as well as the value of the land. These pine tree measures highlight the relationship between ways of seeing nature through state biosecurity and economic considerations. The direct control of the infected areas and pine trees themselves demonstrates that the territoriality of a nation-state is not complete but is constantly reaffirming, constructing, and forming the nation-state boundaries for biosafety as borderscapes (Fleischmann, 2022; Mezzadra & Neilson, 2013).

The National Institute of Forest Science has produced scientific knowledge about nematodes and the two beetle species. More recent studies on PWD prevention and control from the National Institute of Forest Science focus on the geographical distribution and mutation level of nematode (*Bursaphelenchus xylophilus*) DNA and the analysis of the flying capacity of the two beetle species (Han et al., 2022). They demonstrated that the habitat of the two beetle species expanded (Han et al., 2022, p. 15), and the average flying capacity of the Sakhalin pine sawyer beetle (*Monochamus saltuarius*) is 2.48 km in a two-year lifespan, while that of the pine sawyer beetle (*Monochamus alternatus*) is 8.01 km (Han et al., 2022, pp. 19–22). This report shows that the two species of beetles are now

inhabiting a larger overlapping area on the Korean peninsula compared to their previously limited habitats (Han et al., 2022, pp. 14–18).

Thus, the biosecurity measures for the pine wood nematode and its related species include regulations on the movement of timber through the special act and the production of scientific knowledge about the mobility of the two beetle species and their control and prevention by the South Korean government. In this context, more-than-human territoriality plays a vital role in the biopolitical evaluation of infections, enabling a continuous assessment of infection (as reterritorialization) and significantly incorporating scientific knowledge production (Braverman, 2015; Everts & Benediktsson, 2015). It highlights the interspecies relationships between the two beetles and nematodes while examining their flight capabilities and living conditions.

Similarly, North Korea initiated biosecurity measures toward agroforestry management (Ministry of Land and Environment Protection, 2015). Even though there is limited data access to the North Korean government's PWD prevention and control measures, the North Korean government submitted a glimpse of the Voluntary National Review (VNR) on the Implementation of the 2030 Agenda for Sustainable Development Goals in 2021 to the UN. According to the Democratic People's Republic of Korea's (DPRK's) VNR, North Korea set 17 goals for a sustainable implementation plan; the 15th goal is the "sustainable management of forests, reverse land degradation, maintenance of biodiversity" (DPRK, 2021, pp. 44–45). The national goals for North Korea's forest management strategies also stress the economic value of the forest and the selection of species to eliminate or introduce by adopting integrated pest management.[5]

Both Koreas' biosecurity measures encompass biological safety in their own territory. This enhancement of the biosecurity measures is conducted as a reterritorialization process (Besky & Padwe, 2016). The reterritorialization processes were accompanied by scientific knowledge production about particular species (Goldman et al., 2019) and guidelines for securing the boundaries (Kim, 2019): for example, regularly surveying the forest, confirming the existence of the PWD and its related species, and preventing them from moving around inside the nation-state's territorial boundary. This reterritorialization process makes particular species stop moving within their territory or beyond the boundaries of the territory, enforced by legal regulation and biological prevention and control. On the other hand, this reterritorialization strategy also brings about the deterritorialization process. Certain other species were encouraged and facilitated to move around and beyond the national territory.

4.2 Let the Insects Move

When the first PWD infection was confirmed in 1988 in South Korea, the Korean Forest Service (formerly the Korean Forest Research Institute) tried to embrace a biological control method from China using natural enemies of the two beetle species. In 2004, the scientist Xu Fuyuan from the Jiangsu Provincial Research Institute of Forestry Science in China was invited to South Korea for a symposium to introduce the natural enemy of the pine sawyer beetle (*Monochamus alternatus*), the parasitoid wasps (*Sclerodermus guani),* and to show that the parasitism rate of *Monochamus alternatus* by releasing this species in China was 41.9%–82.3% in the first generation and 73%–92.3% in the second generation (Xu et al., 2004).

After the symposium, the South Korean Forest Service signed a joint research agreement with China on 28 May 2005. It imported 10,000 parasitoid wasps (*Sclerodermus guani*) from China on 26 July 2005 and distributed them to nationwide field experimental forests to test the parasitism in the two beetle species (Choi, 2005). In 2005, the Korean Forest Service conducted a field test on 10 nationwide experimental forests using malaise traps to verify the presence of native natural enemies of the two beetle species (Hong et al., 2008). During the experiment, the Korean Forest Service found a new parasitoid wasp species, *Sclerodermus harmandi*, living nationwide; later, it was found to be synonymous with *Sclerodermus guani* (Urn et al., 2006). Consequently, finding the new natural enemy of the PWD-transmitting beetles demonstrates that the state's biosecurity included the contesting processes of scientific knowledge production (Kirksey, 2015), whether based on native or introduced binaries (Marris, 2013) and concentrated on particular forms of knowledge (Braverman, 2015).

Since then, the forestry authorities of South Korea have initiated a research endeavor centered on identifying natural enemies of the pine sawyer beetle (*Monochamus alternatus*) and Sakhalin pine sawyer beetle (*Monochamus saltuarius*). They looked at preda-

tion, parasitism, and entomopathogenic fungi (Jeong et al., 2015; National Institute of Forest Science, 2020). More than 30 species were verified to have interlinked relationships with the two beetle species (Korea Forest Research Institute, 2010). Fifteen species were selected for field experiments to verify the potential parasitism to the larval stage of the two Monochamus beetle species. Finally, two species were adopted for mass breeding and released (National Institute of Forest Science, 2020, pp. 259–260). The *Spathius verustus Chao* and *Cyanopterus flavator* (Fabricius) were the selected biological control species for the two Monochamus beetle species to help prevent and control the pine tree nematode (*Bursaphelenchus xylophilus*) and PWD (Kim et al., 2022; Kim, 2023). The mass production and release of these two biological control agents should help to control the population of the two beetle species. The process was part of a biosecurity strategy to identify new natural enemies, mass-breed them, and release them by analyzing their parasitic relationships, and incorporating them into the nation's biosecurity strategy (Hinchliffe & Bingham, 2008).

Using natural enemies to control the pests is not a new practice, especially in the context of inter-Korean forest cooperation. Before the PWD emerged as a subject for inter-Korean forest cooperation, the PNGM (*Thecodiplosis japonensis*) was the first significant issue between the two Koreas. PNMG is an endemic forest pest on the Korean peninsula, severely damaging Mount Kumgang and other parts of both Koreas.

The development of the natural enemy of PNGM started in South Korea in the 1960s (Chosun Daily 9 October 1966). As a result, nine different parasitoid wasp species that attacked *Thecodiplosis japonensis* were identified during the 1980s. Among them, *Inostemma seoulis* and *Platygaster matsutama* were bred *en masse* indoors and released into the wild in the late 1970s (Korean Federation of Science and Technology Societies, 1979), and it became a conventional biosecurity practice to release these species into PNGM-affected areas. For natural enemies of PWD, the subsequent course of action would involve the execution of biosecurity procedures akin to those established for PNGM. Therefore, it would be advantageous to thoroughly comprehend the adoption and implementation of PNGM biosecurity measures in the inter-Korean border area.

At the third inter-Korean summit, one of the outcomes was the establishment of the two Inter-Korean Forest Cooperation Centers near the borderline. The Cheorwon Inter-Korean Forest Cooperation Center had a groundbreaking ceremony in 2021 and was completed in 2022. During the groundbreaking ceremony, the chief of the Korea Forest Service, Byung-Am Choi, and principal attendees, including the fifth military division commander, released *Inostemma seoulis* to the inter-Korean borderland. This performative action of releasing the species demonstrated the territorial ambition to send *Inostemma seoulis* flying over the borderland, parasitize the PNGM, and control the population inside the DMZ and North Korean territory. Even though releasing certain species in borderlands may seem like a performative action of the state, these "let the insects move" strategies demonstrate South Korea's territorial practices towards North Korea as unclaimed territory. They show the state's ambition to secure the biosafety of pine trees in North Korea and potentially revitalize them as a future resource for South Korea.

The release of a natural enemy to combat the pine tree disease from South Korea to North Korea underscores the biopolitical imaginary surrounding borderlands (Ingram, 2009; Sheridan, 2023). In this context, more-than-human territoriality highlights the dynamic movement of various nonhumans across nation-state boundaries (Clancy, 2021). Consequently, bordering processes manifest at the peripheries of states and territories, fostering interactions between humans and nonhumans. These interactions demonstrate the crux of South Korea's biosecurity concerns in the borderland.

Meanwhile, North Korea has also actively embraced pest control using natural enemies. Attempts are underway to mitigate forest damage resulting from infestations by implementing pest preventive and management initiatives and undertaking research projects. The State Academy of Sciences in the DPRK is studying PWD's origins and preventative measures. Additionally, the Academy and Institute of Forest Conservation are investigating the efficacy of biopesticides and chemical agents to control PWD by exploring potential remedies using natural enemies. In parallel, it has intensified its research on biopesticides to manage PWD, using a fungal infection that leads to withering and demise (Choi & Kang, 2015; Korea Forest Research Institute, 2010).

In North Korea, biological control using natural enemies was also considered earlier, especially in food production agriculture. *Trichogramma spp.* was one of the most successful mobilized parasitoid wasp species in North Korea (Choi, 2018a). This species is called "biopesticide," and the North Korean Forest authorizes active production of this species and also deployed a nationwide "parasitoid wasp production base" (Korean News, 1 October 2021). North Korea announced that "Every local afforestation station has created parasitic wasp breeding grounds, solved the breeding parasitoid wasp and feed issues on their own, and released lots of parasitic wasps to minimize damage by forest pests. They have also set up a biological insecticide production process and regularized production" (Ryomyong, 3 October 2021). There is a lack of information on North Korean biological control technologies using natural enemies, but at least the North Korean government and forest authorities' pursuit of biological pest control by breeding and releasing the natural enemies of pests is part of their integrated pest management strategy.

The biosecurity measure of letting the parasitoid wasp move encompassed finding new natural enemy species and breeding and releasing them into the wild. These practices occur in territories where humans cannot pass, like the DMZ and unclaimed territories of each Korea. When the Cheorwon Inter-Korean Forest Center opened in 2022, inter-Korean relationships were strained again after the South Korean conservative president Yoon Suk-Yeol came into power with his North Korean policy regime known as the "Audacious Initiative." It was also coined "peace by overwhelming force" (Ministry of Foreign Affairs, 2023), which escalated the geopolitical tension between the two Koreas again.

The interspecies biosecurity and its territorial practices have intermingled with the geopolitical ecological situation (Hung, 2024; Youatt, 2020). When the inter-Korean relationship was relaxed, and the two Koreas practically shared forest cooperation, the experts were directly engaged with each other. In addition, the biopolitics of making insects stop moving in and out of their own territory worked. However, as geopolitical tension escalated again, the expert exchange ceased, and biosecurity measures were mobilized. As such, the deterritorialization of interspecies relationships that lets species move on and over the border will continue until the geopolitical condition is altered. This shows that the geopolitics of the inter-Korean relationship shape the interspecies relationship in the borderland; at the same time, interspecies relationships contribute to the construction of the inter-Korean relationship.

5. Conclusion

This study investigated interspecies politics in the context of the inter-Korean borderland. The geopolitical dynamics between the two Koreas shaped inter-Korean cooperation mediated by the pine tree as a symbol of a single community of life. Meanwhile, PWD emerged and spread as the common enemy of the two Koreas. Both Koreas vigorously engaged themselves in counteracting pine tree disease, specifically PWD and PNGM. This common interest of the states led to inter-Korean forest cooperation and dual biosecurity measures as part of integrated pest management.

The biosecurity gaze of the state encompassed the intervention in interspecies relationships among the PWD vectors beetle species. Under the make-it(them)-stop-moving biosecurity practices, the two beetle species became a target to eliminate or control the northern movement from the South. To do that, special acts by law and prevention control guidelines were enforced, and various spatial strategies were adopted in South Korea. On the other hand, North Korea also decreed reforestation as a significant national goal and adopted strategies to eliminate harmful insects by prioritizing certain species. In these biosecurity measures aimed at stabilizing movement, the state's territorial practices demonstrated how to coordinate the biosafety of the national territory while considering potential future natural resources aligning the two Koreas. Interspecies biosecurity measures have also been applied to let the species move in particular ways. Various scientific prevention and control methods were developed, and one of them was the massive introduction of new species through indoor breeding, a natural ally of the state, and the release of the parasitoid wasp into the wild. This way, various new species were identified, field experiments were conducted, and the state selected several species.

These dual biosecurity practices are in accordance with the geopolitical situation between the two Koreas. This study highlights how *more-than-human geopolitics* in the inter-Korean borderlands interweave with biopolitical practices, producing new territorial dynamics mediated by interspecies relation-

ships. By examining the DMZ as a site of interspecies relational borderlands, this research expands the theoretical boundaries of anthropocentric perspectives embedded in the notion of geopolitics and territoriality. It demonstrates that geopolitical and biopolitical conditions simultaneously produce interspecies relationships and geopolitical and biopolitical situations.

The ambitions of the South Korean government to stop the PWD eventually failed as North Korea confirmed the infestation of PWD in its territory. In such a process, the state mobilized the nonhuman agents as natural enemies of the pest-arbitrating beetles. It facilitated territorial ambitions toward the North Korean forest as a place for potentially irredenta territory with its natural resources.

Understanding territoriality encompasses new ontological questions of human-nonhuman and native-nonnative binaries in the borderlands. As Fishel and Agius (2024) argued about the requirement of ontological reframing of the state's control of borderlands, a more-than-human understanding of territorial practices will bring a new lens for understanding the entangled realities of the geopolitics of ecologies in the borderlands. The borderlands, as a place for interspecies relations, have the potential to produce new geopolitical orders, even in the area known for being one of the most restricted human-access borderlands, the DMZ in the Korean Peninsula.

Nevertheless, it is necessary to note that due to limited access to North Korea's scientific reports on the PWD and other geographical data, this study has limitations that reflect and focus mainly on the South Korean side. Various objects, including pine tree diseases and other interspecies relations that cross the border, pass through the DMZ toward the Korean Peninsula. Thus, further study is required to investigate the various geopolitical ecologies of the more-than-human borderlands.

Notes

[1] In his speech at the Oslo Forum in June 2019, South Korean President Moon Jae-in first asserted, "North and South do not just face the border but make up a 'life community' that should live together." (Yonhap News Agency, 23 September 2020; https://en.yna.co.kr/view/AEN20200922010300315)

[2] I have mentioned a group of species known as pine trees. In Korea, the common name used for this group is "pine tree," so I will also use this term.

[3] The Korean Forest Service has estimated that PWD has caused total damage of 8.4 billion won ($6,263,048) in the past decade. The annual average of 75.6 billion won ($56,359,027) spent on pest-control systems also underscores the massive economic losses caused by the PWD (Korean Forest Service, 2017).

[4] Several North Korean media outlets express the fear of the spread of PWD in and from South Korea. On 24 September 2013, Korean News published the article "Extension of PWD Damaged Area in South Korea." On 29 April 2015, the Korean Central News Agency and the Korean News published the same article titled "Crisis of Extinction of Pine Tree in South Korea." On 27 June 2017, Korean News and the Korean Central News Agency published articles titled "PWD damage in South Korea." On 22 October 2022, the state journal press, Ryomyong (2022), published "The spread of PWD in South Korea." On 23 October 2022, the state journal press Uriminzokkiri (2022*)* published the article "State Emergency of South Korea because of PWD spread." These North Korean news articles introduced the PWD news quoted from South Korean media and commented on the blame for the incapacity of PWD control by the South Korean government, especially during the power of the conservative party in South Korea.

[5] On this goal, the North Korean government set action plans: a) Achieve 2015–2024 forest recovery targets, b) Implement the national forest construction strategy, biodiversity strategy, and action plan, c) Strengthen sustainable forest management, and d) Strengthen hi-tech research and knowledge dissemination for sustainable protection, management, and use of ecosystems, forests, and biodiversity.

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