



The Shape of Repetition

2026
SUMMER

Special Issue

**In-Between Forest and Cities:
Forefront to Deal with LoveBug
Outbreaks**

Biodiversity Issue

**Muju, Where Firefly, a Light that Brightens
Forests on a Summer Night, Stays**

Bio News

**Latest Research and
Patents**

생물지키

2026 SUMMER

Vol. 16

The National Institute of Biological Resources (NIBR)
National Institute of Wildlife Disease Control and Prevention (NIWDC)

National Institute of Ecology (NIE)

Nakdonggang National Institute of Biological Resources (NNIBR)

Honam National Institute of Biological Resources (HNIBR)

A Joint Newsletter

Biowebzine is where the National Institute of Biological Resources (NIBR) under the Ministry of Environment, the National Institute of Wildlife Disease Control and Prevention (NIWDC), the National Institute of Ecology (NIE), the Nakdonggang National Institute of Biological Resources (NNIBR), and the Honam National Institute of Biological Resources (HNIBR) gather together and dream of a future of harmonious coexistence of all living things. Let us get useful information and knowledge about biodiversity, ecosystems, and wildlife diseases in Korea from Biowebzine!



A Joint Newsletter, Biowebzine

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Translator Hye-kyung Woo

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Biodiversity Issue

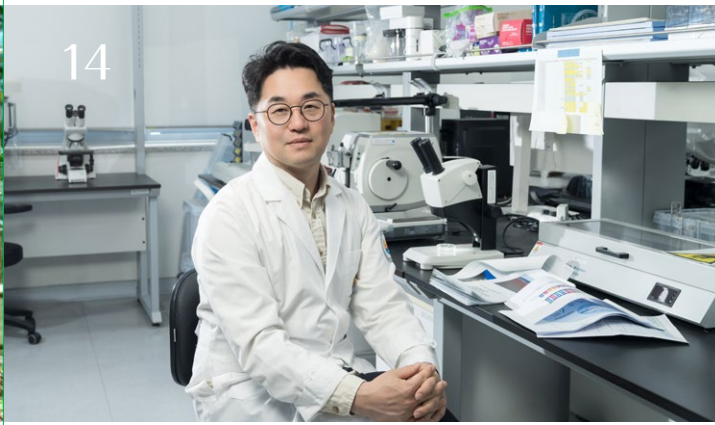
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The Shape of Rep



An aerial photograph of a large body of water covered in a thick, vibrant green algal bloom. The water's surface is textured with various shades of green, from bright lime to deep forest green, indicating different concentrations or types of algae. Several thin, brown sticks or twigs are scattered across the surface, some partially submerged. The overall scene conveys a sense of natural, albeit potentially disruptive, ecological change.

Competition

Accumulated Signals of Changes
: Coincidence or Repetition

Some changes pass by like a single event.
However, some other changes return in the same form.
As observations and records accumulate,
we look once again at the signals that nature sends us.
The 2026 Summer Edition records ecological changes
that reveal themselves through repetition.

In-Between Forest and Cities: Forefront to Deal with LoveBug Outbreaks

Visit the LoveBug Larva Experiment Site



Q. Recently, massive outbreaks of lovebug have been reported across the metropolitan area. What do you think about the current situation?

A. Over the last few years, lovebug has been rapidly appearing mostly in Seoul, Incheon and Gyeonggi-do areas. In particular, since the massive outbreak in Eunpyeong-gu, Seoul, it has been spread to entire Seoul and some Gyeonggi areas near Seoul. The NIBR considers that such situation is highly likely not a temporary thing but multifaceted consequences of various causes such as climate change, urban environment change and invasive species coming from other countries. Actually, as citizen's grievances related to the insect have dramatically increased a need for systematic responses is growing more than ever.

Q. Is lovebug native to Korea?

A. It is assumed that lovebugs, known scientifically as *Plecia longiforceps*, are not native but introduced species from other countries. The NIBR research team obtained samples from the central and southern parts of China, Shandong Peninsula, Japan, and Taiwan and conducted genetic analyses while comparing domestic populations. They confirmed that the lovebugs that occur in Korea are genetically close to the population in the Shandong Peninsula and assumed that they were highly likely introduced from other countries, rather than natural spread, given that they were firstly found in the metropolitan areas, not discovered while they move north from the southern areas.

Q. What kinds of environments that lovebugs live in?

A. Lovebug larvae live in wet soil under the litter layer. Since they look like pieces of fallen leaves or dead branches it is not easy for laypersons to discover them with the naked eye. However, once you discover its egg cases there is a good chance to find from dozens to hundreds of larvae there. A female lovebug lays about 300 to 500 eggs and after hatching the larvae grow for 11 months into pupae and finally, adults emerge.

Q. Introduce the on-site verification experiment more specifically.

A. Since the NIBR research team realized that capturing imagoes is not enough to control their population, we have conducted the on-site verification experiment to reduce the population from the larval stage. Until now, by using its habit of being attracted by light researchers focused mostly on capturing the imagoes, but our research team verifies on site whether *Bacillus thuringiensis israelensis* (Bti)-type microbial control agents can reduce the larvae density. Now, the team prepared two experimental sections (Mt. Gyeongangsan in Incheon and some areas in Seoul) and has continuously monitored changes in larvae density by conducting comparative observations of the two sections.



Researcher Sunjae Park testing a microbial control agent

The National Institute of Biological Resources (NIBR) has conducted a microbial control agent application experiment for the purpose of lovebug larva population reduction. It is the first on-site verification experiment to test preemptive measures for dealing with larvae hiding under fallen leaves before they become imagoes. Let us check the status of the lovebug spread and visit the research sites dealing with biological distribution changes with Sun-Jae Park, senior researcher in the Climate, Environment and Biology Research Team at the NIBR.

Q. How does the Bti agent work?

A. The microbial control agent that we used in the experiment has selective effects on the larvae of certain fly species. The research team conducted a prior indoor test targeting bibionids, which are similar to lovebugs, and found that the agent is effective for controlling larvae. After that, the team proceeded to field applicability research. During the field experiment, the researchers sprayed a power-type microbial control agent on the litter layer through sprinkling water and allowed it to be absorbed into the soil layer and the leaf mold. When larvae consume it, they experience trouble with their bowel function, leading to a reduction in their population.

Q. Does the agent have any impact on other insects or ecosystems?

A. Before the experiment the team conducted safety verification of the agent on and springtail, a soil insect, and foreign researches also reported that the agent does have barely any serious impact on fish, human body and other animals. However, to check its impact on ecosystem more thoroughly we plan to study its impact on other insects and the side effects continuously as well.

Q. How do they verify how the agent is effective on site?

A. Before the experiment the team conducted safety verification of the agent on and springtail, a soil insect, and foreign researches also reported that the agent does have barely any serious impact on fish, human body and other animals. However, to check its impact on ecosystem more thoroughly we plan to study its impact on other insects and the side effects continuously as well. Furthermore, it plans to install emergence traps before the larvae grow into imago and compare the amount of imago development and the number captured in the two sections. And the team analyzed various reduction effects by operating insect light traps together.



Researchers collecting and examining lovebug larvae in the field

Q. Should lovebug be completely exterminated?

A. Instead of extermination we focus more on controlling in a sustainable way. Lovebugs do not transmit diseases to human beings and rather, contribute to creation of the leaf mold by decomposing fallen leaves. However, as it is an introduced species sudden increases in its population might impact on the current ecosystem and citizens' daily life, meaning that adequate population density management is necessary. On the other hand, since indiscriminately removing them without considering the flow of the natural ecosystem might produce other organisms as well, it is important to find realistic balances between the two.

Q. How should we deal with lovebug issues in the future?

A. Beyond taking simple reactive measures only after massive outbreaks, we have expanded research on preventive approaches by implementing preemptive control measures from the larval stage and developing eco-friendly mitigation technologies. In addition, we have been developing preventive monitoring systems and occurrence prediction models by using e-DNA, and preparing joint responding systems together with local governments as well. Instead of considering lovebugs as the target of total extermination, it is more important to establish balanced management systems that can mitigate citizens' inconveniences and minimize impacts on ecosystem.

Wild Animal Diseases Spreading Amid Climate Change and Urbanization

New Transmission Routes Created By Human Movement

Constantly Spreading Wild Animal Diseases

The first case of ASF that occurred in domestic wild boars was reported at Yeoncheon-gun, Gyeonggi-do, in October. Since then, ASF has gradually moved south from Gyeonggi to Gangwon, Chungbuk, and even Gyeongbuk, following the Baekdudaegan Mountain Range. As of April 2026, 4,485 ASF cases in 45 regions in Korea had been reported.

To mitigate the spread, the NIWDC has been conducting full-scale ASF inspections on wild boars nationwide. In the early stages, it focused mostly on dead bodies or neighboring individuals, but since the disease spread into Chungbuk and Gyeongbuk regions in 2022, it has tightened the surveillance system, assuming the whole country is in danger. The research team, in particular, has kept a close eye on the pattern of ASF spread. As wild boars are sedentary animals that generally stay within about a 5 km range, they seldom make a sudden long-distance move unless they get extraneous interferences. Thus, "natural spread," — the way that the disease slowly spreads while wild boars make contact with each other — is common.



Current Status in Korea

● ASF Contaminated (Suspected) Area: 5 km Radius from the Outbreak Site



Progression of ASF Outbreaks (2019–March 2026)

Months **77** Since the First Detection in Korea (Oct. 2019)

Cases **4,485** As of April 2026 (45 Cities and Counties)

Spread Direction **Southeastward Spread Along the Baekdudaegan Mountain Range**

Unexpected Route Brought by Human Intervention

The real problem starts when the disease spread is aided by human movement. Wild boars' natural movement cannot explain all the outbreaks. One example is the case in Busan in December 2023. The case occurred as far as 108 km away from the closest outbreak site (Pohang, Gyeongbuk), and the main causes were revealed to be illegal poaching and unauthorized movement of dead animals. In other words, illegal activities of human beings spread the virus. Because of this case, the NIWDC broadened surveillance targets beyond wild boars since, while

The National Institute of Wildlife Disease Control and Prevention (NIWDC) has been tracking wild animal disease emergence trends and transmission routes and monitoring how diseases spread. Recent African swine fever (ASF) cases that occurred repeatedly clearly showed that wild animal diseases are not limited to animals. Mixed with human and logistics movements, diseases spread in a way that is very different from what they used to be. Let us look into warnings that wild animal diseases are repeatedly sending to us and follow the tide of changes.

the virus cannot make people ill, it can follow people everywhere through clothes, cars, and equipment. Based on the calculation that humans and equipment can port the virus, the institute began to widen its investigation to man-made transmission more thoroughly.

ASF cases seemed to subside from the second half of 2024, but since 2026, it has spread nationwide again. In the first quarter of 2026, 139 cases, including 87 in Gangwon regions, were reported, suggesting that there are still huge risks that the virus could locally spread from areas where it usually occurs.

Human Beings Are at the Center of the Spread

The ASF outbreak in pig farms in 2026 proved much trickier to deal with than previous ones because it simultaneously emerged on a national scale for a short period and the number of cases per year broke all existing records. The research team focuses on the results of the genotype analyses of the virus strains. It was confirmed that most pig farms, except the ones in some Gyeonggi and Gangwon areas, have a subtype (IGR-1) different from the previous one that circulated between wild boars. After that, however, the same subtype of the virus was detected in wild boars in Buk-gu, Ulsan, and Goryeong, Gyeongbuk.

This means that the boundary between farms and the wild has blurred and diseases are transmitted both ways, and humans stand on the pathway. Viruses, which are invisible, penetrate faster and more deeply than expected through the movements of humans and equipment at any time. Research by the Animal and Plant Quarantine Agency (APQA) also estimated that the process of transporting feed and the entrance procedures at pig farms were the main cause of the virus influx.

The Last Warning Sent by Wild Animals

The NIWDC stresses that ASF responses should not be a sprint. The facts that 70% of land is mountainous and there are few natural enemies are optimal conditions for disease spread. Additionally, with increasing movement of people and equipment, risk factors are becoming more complicated.

The NIWDC researchers advised that disease control policies should have mid- and long-term perspectives. In other words, in addition to basic measures that include controlling wild boar populations and removing contamination sources, software-wise strategies that include relevant personnel education and information sharing should be strengthened. Currently, the Ministry of Climate, Energy and Environment and the APQA are working closely together to share occurrence status and genotype information in real time after signing a memorandum of understanding.

Overall, the key to wild animal disease management is "one health," which regards human, animal, and environmental health as one. We urgently need to realize that the current signals are not just screams of wild animals but an SOS from the whole ecosystem, and we should endeavor to respond to them in a timely manner.



Inspection of Biosecurity Measures to Prevent Human-Mediated Transmission

Swaying Alpine Coniferous Trees Amid Climate Change

A Crisis of Alpine Ecosystems Recognized by Genes First

Disappearing Alpine Coniferous Trees Become a Warning Signal of Climate Change

Climate change is a major threat to natural ecosystems. In particular, environmental changes, including abnormal temperatures, damage by blight and harmful insects, invasion of competing species, and draughts in winter, have perniciously affected vulnerable alpine ecosystems. The best example is Korean fir (*Abies koreana*). It is native to Korea, inhabiting only alpine regions in the southern parts of the Korean Peninsula, such as Mt. Hallasan, Mt. Jirisan, and Mt. Deogyusan. The habitats of Korean fir had decreased by about 34% on Mt. Hallasan (for 15 years from 1988) and by about 18% on Mt. Jirisan (for 27 years from 1981) (Kim and Lee, 2013).

The NIE considered that these changes are mainly the result of accumulated environmental stresses. Domestically, as the research on alpine coniferous trees has focused mostly on visible phenomena, including changes in vegetation structures and growth and development, the NIE went a step further and started gene-level research to find out what kinds of changes are occurring inside the trees.



Withered Korean fir around Mt. Hallasan



Withered Korean fir around the Banyabong Peak of Mt. Jirisan



Field investigation for gene analysis of Korean fir on Mt. Hallasan

reponses by collecting samples from areas where growth and development are relatively good and vulnerable areas where growth is declining on Mts. Hallasan, Seoraksan, Deogyusan, and Jirisan. The trees in the vulnerable areas showed certain genomic responses that were strong in common, and this was discovered in Korean fir, Khingan fir (*Abies nephrolepis*), and spruce (*Picea jezoensis*). The team selected genomic responses that increased repeatedly and finally identified two critical genes. Based on the results, it developed multiple diagnostic genes (MDG) for alpine vulnerability technology.

Repeated Changes Left Traces on Genes

The NIE research team created culture facilities in labs that can simulate environments undergoing climate change. It analyzed the genomic responses of Korean fir under conditions such as high temperatures, carbon dioxide increases, and an arid environment. By doing so, the team identified genes that showed huge responses under environmental stress.

After that, the team conducted field investigations in the alpine areas and carried out a comparison analysis of genomic

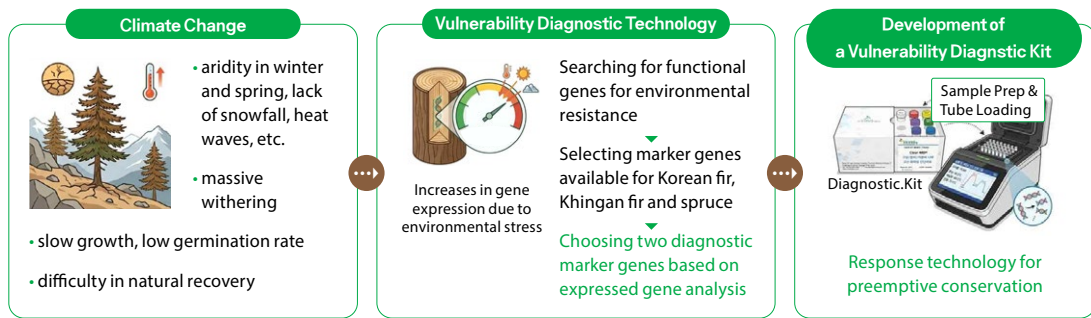
The National Institute of Ecology (NIE) has been monitoring how climate change affects alpine ecosystems by analyzing the genomic responses of alpine coniferous trees. Repeated environmental stress has caused abnormal reactions in trees, and the ensuing consequences start to appear invisibly inside genes. Let us look into warning signals from alpine ecosystems following changes in forests, which are barely noticeable.

Technology to Read Conditions of Trees Through Genes

MDG is a technology that diagnoses the stress levels of trees using genomic responses. Existing methods for this are limited to checking changes in appearances, so damage cannot be discovered until it accumulates to serious levels. However, MDG technology can accurately detect changes inside trees, even from an early stage of stress, which is hard to detect with naked eyes.

The research team selected genes that strongly responded to environmental changes in common and used them as a standard for analysis. When stresses such as aridity and high temperatures are repeated, trees show various genomic reactions for their own survival. In the meantime, certain genes become more active and even become involved in the creation of plant hormones for adaptation to environmental changes. In other words, such responses are crucial signs of how trees can react and adapt to stresses. The team could more objectively determine how vulnerable the trees are to stress by analyzing the genomic responses of trees. Currently, the team has been developing a kit to diagnose the vulnerability of Korean fir, Khingan fir, and spruce using technology. In particular, it has already developed a technology to genetically distinguish Korean fir from Khingan fir and has been widely using it.

A process of Developing a Kit for Diagnosing the Vulnerability of Alpine Ecosystems



Warning Signs from Alpine Ecosystems

Changes in alpine ecosystems are not limited to a decrease in tree species. Habitat environments have been transformed due to the physiological activities of climate change, and the genomic responses of trees have been deeply affected. As a result, alpine ecosystems are still experiencing slow transformation in an invisible way.

The NIE plans to elaborate on ways to conserve the ecosystem better by adopting genome-based diagnostic technologies in the future. By sorting out individuals vulnerable to climate change and centering restoration strategies on trees with highly adaptable genes, it intends to change the management framework into a more preemptive one.

The team stresses that the changes we are facing now are not something that will come in a distant future, but they are happening now. As alpine areas are the most sensitive to environmental changes, a small genomic response observed there could be the beginning of a much bigger change in the future. Perhaps forests might be sending signals to us for a long time. Now is the time for us to read them before it is too late.

Repeating Algal Blooms: Rivers Have Been Changing

A Change in the Aquatic Ecosystem Told by Microorganisms

Microalgae are the First to Recognize the Changes in the Aquatic Ecosystem

Microalgae are the organisms that respond to environmental changes very quickly in the aquatic ecosystem because the community structure and dominant species are rapidly changed because of changes in water temperature, nutrients, and flow velocity. Naturally, microalgae are representative biological indicators that show the health conditions of aquatic ecosystems.

In particular, for rivers such as the Nakdonggang River, where climate change and man-made disruptions occur at the same time, it is important to monitor the changes in microalgae communities over the long term. In general, we barely feel the changes in aquatic environments until a visible phenomenon, such as algae bloom, appears; however, even before that, researchers monitor ecological signals, including changes in dominant species, decreases in certain groups, and changes in the appearance periods. Recently, due to a rise in water temperature and nutrient accumulation, community structures of the Nakdonggang River have been changing more rapidly and complicatedly.

Repeating Changes in Communities and Algal Bloom Patterns

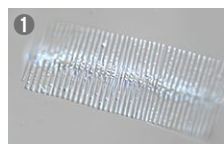
Algal bloom is not a simple, temporary phenomenon but a repetitive phenomenon related to environmental changes. According to the long-term monitoring of

the NNIBR, when water temperature rises, microalgae stay longer, and more nutrients accumulate in certain microalgae and become repeatedly dominant at some point.

Actually, microalgae communities in some parts of the Nakdonggang River have changed in a regular pattern by season. In spring, for example, when the water temperature is low, diatoms such as *Aulacoseira* and *Ulnaria* increase, whereas in a high-water-temperature season, summer, cyanobacteria such as *Microcystis* become repeatedly dominant. Lately, due to climate and freshwater environment changes, algal blooms tend to come earlier and cyanobacteria dominantly stay longer than before. Rising water temperature and eutrophication are the main causes of community structure changes. Normally, various microalgae keep the balance, but when increases in water temperature, nitrogen, and phosphorus are repeated, communities are reorganized, centering cyanobacteria, which are highly adaptable to environmental changes. As these processes continue, community diversity would decrease, community structure would be simplified, and whole aquatic ecosystems would be affected (e.g., low oxygen levels, possibilities of appearance of harmful cyanobacteria, food web changes). Overall, aquatic ecosystems repeatedly respond to environmental changes in a constant direction.

Predictive Signs Coming Before Algal Blooms

Representative microalgae inhabiting freshwater



Bacillariophyceae



Chrysophyceae



Chlorophyceae



Euglenophyceae



Cyanophyceae

Even before rivers turn green, something is already happening underwater. Such changes, which are mostly invisible, start with microorganism communities. The Nakdonggang National Institute of Biological Resources (NNIBR) has conducted long-term analysis of changes in microalgae, centering on the Nakdonggang River, and observed how constant environmental changes have affected the aquatic ecosystem.

Even before rivers turn green, changes in aquatic ecosystems have already begun. Before algal blooms appear in earnest, the balance inside the community of microalgae starts to change first. For example, in some environments, as the cell density of cyanobacteria increases and the proportion of existing dominant species—diatoms and green algae—decreases, the community structure starts to change. Such changes are hard to see with the naked eye; however, microscopic observation and molecular biological analysis can help detect them at a relatively early stage.

After that, when environmental conditions that are favorable for cyanobacteria to be dominant are created, the light penetration rate decreases, and the variability of dissolved oxygen increases, leading to visible algal blooms. As such, algal bloom does not occur suddenly; rather, it is the result of changes accumulated in aquatic ecosystems.

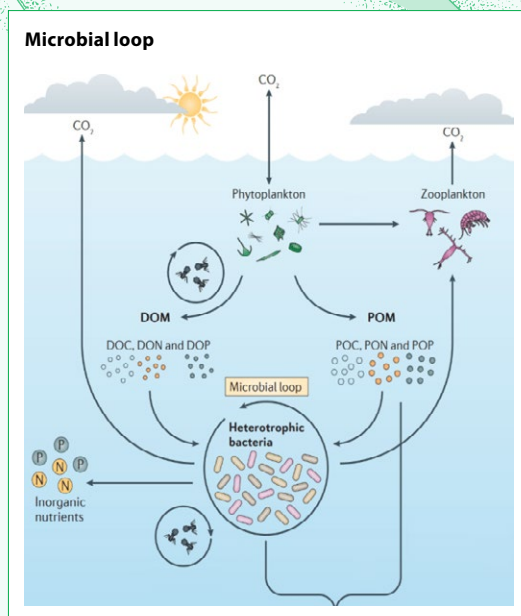
The Future of Aquatic Ecosystems that Microorganisms Present

The NNIBR research team has made an effort to discover ecological evidence to interpret algal blooms not as a simple surface phenomenon but as the result of community structure changes in microorganisms. In particular, the team analyzed the correlation between community changes made before algal blooms occur, along with environmental factors, and confirmed the possibility that changes in microalgae communities can be used as a biological “early-warning system” to predict algal bloom outbreaks in an early stage. This implication demonstrates that for algal bloom management not only the removal of algal bloom after its occurrence but also preventive management are all significant. In this regard, long-term monitoring—which checks changes in water temperature, nutrients, and even microorganism

community structure—and comprehensive aquatic environment management by basin have become more critical.

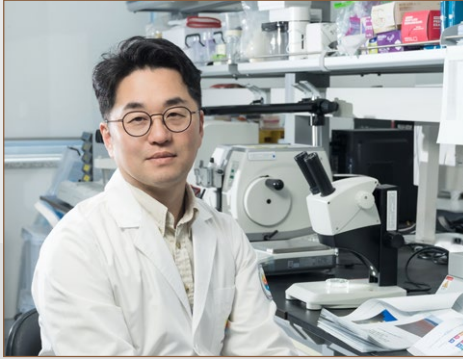
The team explained that a river is not a simple water resource but a single ecosystem that reflects climate change and human activities sharply. They also stress that under repeated high water-temperatures and eutrophication environments, monitoring biological signals, including microalgae community changes, is just as important as monitoring water quality indicators.

What we need to do now is take care of both visible consequences and a small signal of changes that start first underwater.



Source: Pablo Aguilar 2019 (“Bacterial diversity and community composition in high elevation aquatic ecosystems,” Thesis for: PhD in Biology)

Invisible Symbiosis that Protects Mudflat Amid Climate Change



Q. Introduce your research on the discovery of the symbiotic bacteria of halophytes

A. Halophytes are strong plants that can survive in high-salinity soils or waters. Reed, East Asian seepweed (*Suaeda japonica*), *Suaeda glauca*, *Suaeda maritima*, *Salicornia europaea*, and *Staticobium loochoense* live in mudflats; *Carex kobomugi*, *Calystegia soldanella*, and *Salsola komarovii* naturally grow in dunes; and *Aster spathulifolius* takes root in rocks on the coasts. They overcome salinity stress by accumulating minerals or thickening leaves. Thanks to abundant minerals, halophytes are highly valuable as edible and medicinal resources, and recently, they have played a crucial role in responding to climate change as “blue carbon,” which absorbs carbon, drawing growing attention. Since 2021, the HNIBR has studied microorganisms isolated from the roots of halophytes and collected approximately 1,000 bacteria until now. In particular, some of them produce auxin, a hormone that helps growth, and 46 other species are value resources that stimulate plant growth-promoting activity, which the HNIBR’s research discovered for the first time.

Q. Why did you focus on the relationship between halophytes and microorganisms?

A. As the climate change crisis deepens, the secret of vitality of halophytes that can survive even in barren environments is receiving growing attention. Halophytes have high viability on their own, but evidence that they overcome harsh environments with help from microorganisms has been repeatedly revealed. However, research on the interactions between them has not been systematically conducted in Korea. That is why our team started the research to figure out the symbiotic system in earnest.

Q. What kinds of roles do they play in mudflats?

A. Halophytes and microorganisms are perfect partners that can help each other’s survival in unstable mudflat environments. While microorganisms help ease plant stresses by reducing salinity and substances that hinder growth, halophytes, in return, provide safe habitats and nutrients for microorganisms. Such cooperation can expand the habitats of halophytes, consequently creating more places for various animals to live and enriching sources of organic matter. As a result, it becomes the foundation for keeping the entire mudflat ecosystem healthy.



Plants that can survive in mudflats and dunes

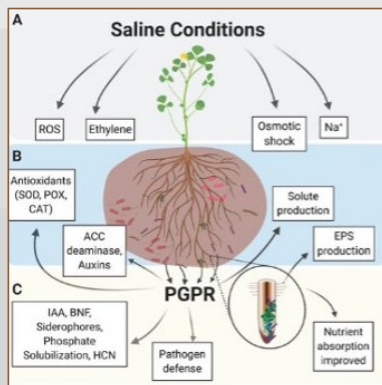
① *Calystegia soldanella*, ② *Suaeda maritima*,
③ *Salsola komarovii*, ④ *Salicornia europaea*



Behind the vitality of halophytes that endure a barren environment of mudflat lie their unseen supporters, microorganisms. To find clues to respond to the climate change crisis, the Honam National Institute of Biological Resources (HNIBR) has been tracking the close interactions that they have made and the ecological patterns hiding behind them. Let us meet Jaeho Song, senior researcher in the Division of Taxonomy, and hear about the mysterious world of symbiosis that holds the mudflat ecosystem.

Q. How do symbiotic bacteria help plants more specifically?

A. Bacteria isolated from roots play various supporting roles, helping plants establish their roots more firmly by secreting growth hormones and providing nutrients by transforming nitrogen in the air into something that plants can easily consume. In addition, they provide a full range of supports that enable plants to grow well through complicated actions, such as blocking pathogens' invasion.



Interaction between halophytes and symbiotic bacteria (Source: Miller and Nielsen, Analysis of Gene Expression Changes in Plants Grown in Salty Soil in Response to Inoculation with Halophilic Bacteria, Int J Mol Sci. 2021)

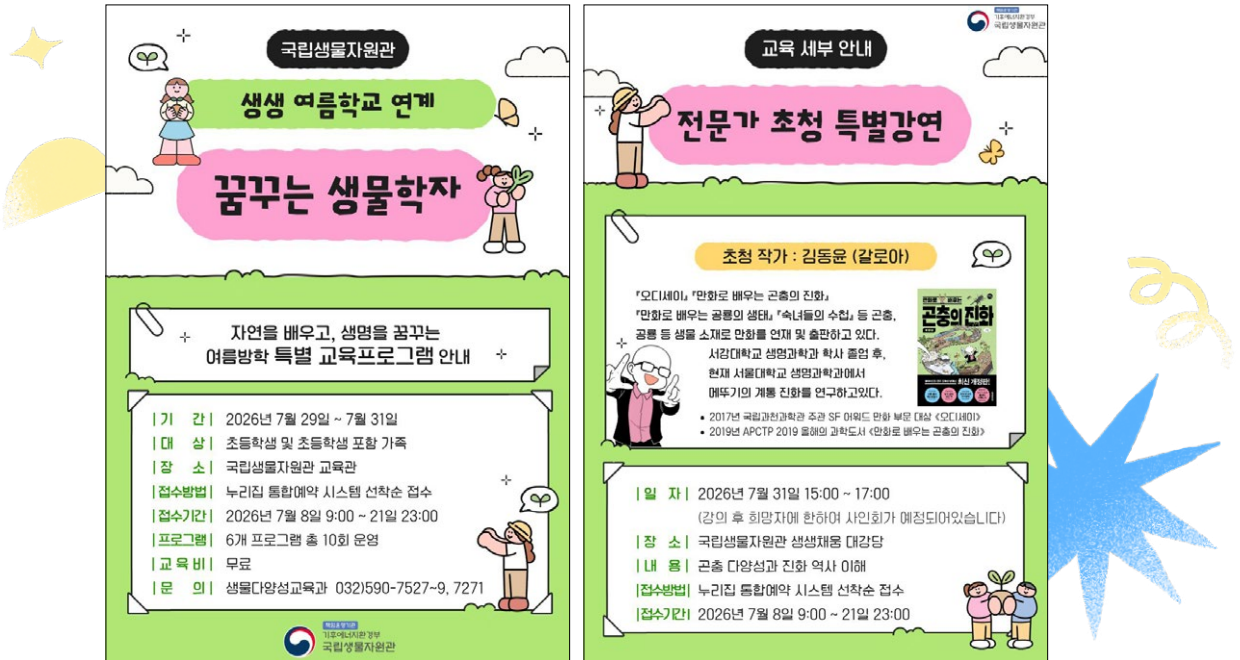
Q. Could climate change shake their relationships?

A. Definitely. I think it will have a massive impact. When sea level rises and salt concentration level changes, where halophytes live is directly affected. The composition and function of microorganism families naturally change when the places in which they live change. A temperature rise transforms the metabolic activities and growth velocity of microorganisms as well. Sometimes, such changes could boost the ability to help plants, but at other times, they could weaken the symbiotic loop. That is why we are keeping a close eye on the changes.

Q. What kinds of new aspects of mudflat ecosystems did you discover through this research, and how will you use them?

A. We confirmed that mudflats are a very delicate interaction system where even microorganisms are tightly intertwined. The phenomenon of microorganisms with similar features flocking together near certain halophytes becomes a single ecological pattern as they adapt to environments. Overall, small microorganisms that we cannot even see are unsung heroes that support the ecological order of mudflats while communicating with plants. Such a discovery can have real-life applications. Microorganisms that are strong in salinity can revive farmland or increase the productivity of reclaimed land. If microorganisms that fit perfectly with plants are used for ecological restoration, it could be more successful. Furthermore, there are many possibilities that they can be used as new functional materials in the bioindustry as well.





Summer Vacation, A Time to Get Closer to Living Things: Meeting Nature and Learning Life

National Institute of Biological Resources (NIBR)

Summer Vacation, A Time to Get Closer to Living Things: Meeting Nature and Learning Life

Application Period: July 8 (from 9 a.m.) to July 21, 2026 (until 11 p.m.)

Date: July 29 — July 31, 2026

Application Website: www.nibr.go.kr

Celebrating summer vacation, the NIBR prepares an education program for children to experience and learn the value of nature and life. This program, targeting elementary school students and their families, is aimed at experiencing and learning diverse living things. Participants can understand ecology and biodiversity more deeply and grow

interests and inquisitive mind on life science while observing nature. A guest lecture is also scheduled: Do Yoon Kihm (Pen name: Galois), a writer of *The Evolution of Insects Taught in Manga*, will deliver a story of the evolution of insects and biodiversity with cartoons in an easy and interesting way.



Recording Endangered Wildlife through Paintings

The NIE is hosting the 3rd Endangered Wildlife of the Month Painting Contest to raise social awareness of biodiversity loss and increase public interest and participation in endangered wildlife conservation activities. Anyone residing in Korea who is a high school student or older can participate in this contest. The contest features 249 endangered wildlife species designated by the Ministry of Climate, Energy and Environment. The contest period runs from April 29, 2026, to October 12, 2026, and interested individuals can apply

National Institute of Ecology (NIE)

The 3rd Endangered Wildlife of the Month Painting Contest

Application Period: September 7, 2026 to October 12, 2026 (until 5 p.m.)

Application Website: 멸종위기야생생물세밀화공모전.com

through the contest website from September 7, 2026, to October 12, 2026 (5 p.m. deadline). The contest aims to familiarize the public with endangered wildlife through the creation of detailed paintings. By observing and illustrating the forms and characteristics of organisms, applicants are encouraged to reconsider the value of biodiversity and the importance of ecosystem conservation.

국립낙동강생물자원관
**생물다양성·환경
 교구대여서비스**
 대여료 무상, 최대 70일 대여 가능
 종류별 1세트 신청 가능 (1세트당 6개 구성)

세부 안내
 자원관 누리집에서 신청시 택배 발송되며,
 70일간 이용하고 반납 (반납 택배비 대여자 부담)

교육대상
 초·중·고등학교 및 단체

대여 교구 ※ 바이오다이버시티 하반기 서비스 예정

역이그를 잘린지	멸종위기 생물 구출왕	재루의 생물모방 어드벤처
다양하고 슬기롭게 생물다양성 지키기(다슬기)	벌's DAY: 위기에 처한 벌을 구하라!	재루의 달이의 탄소발자국 일기장

신청방법
 국립낙동강생물자원관 통합예약시스템 ▶ 교육예약 ▶ 원하는 교구 신청

통합예약시스템 QR



Meeting Biodiversity through Teaching Equipment

Nakdonggang National Institute of Biological Resources (NNIBR)

Teaching Equipment Rental Service

Date: Until September 2026

Venue: NNIBR

Reservation: NNIBR Website (www.nnibr.re.kr)

The NNIBR operates the "Biodiversity Education Kit Loan Program" for schools and organizations, helping learners engage with biodiversity education in a more accessible and enjoyable way. This program, launched in 2021, provides educators with board game-based education kits developed by NNIBR, enabling them to incorporate biodiversity education directly into their classrooms.

In 2026, a total of seven education kits focusing on biodiversity and climate change are available through the service. In particular, three award-

winning education kits from the 2023 and 2024 Educational Kit Development Contests are being introduced for the first time this year.

Applications for the "Biodiversity Education Kit Loan Program" can be submitted through the NNIBR Integrated Reservation System until September 2026. Borrowed education kits may be used for up to 70 days before being returned.

The NNIBR hopes that this program will contribute to raising public awareness of biodiversity and encouraging environmental actions through engaging educational experiences.



Exploring the Microorganism World under a Microscope

Honam National Institute of Biological Resources (HNIBR)

Special Exhibition: The World under the Microscope

Dates: April 29, 2026 – April 21, 2027

Venue: Digital Exhibition Corner in the Lobby of HNIBR

The HNIBR has prepared a special digital exhibition, “The World under the Microscope,” featuring electron microscope images from April 29. This exhibition aims to visualize microorganisms that cannot be seen with the naked eye using a scanning electron microscope and to introduce the diversity of microorganisms and the value of biodiversity, which we have not fully recognized.

At the exhibition, visitors can observe a wide range of micro-creatures, including uniquely shaped diatoms and mushroom spores that evoke various

forms and imagery. Enlarged microscope images reveal the hidden world of living things, such as a new landscape, suggesting that even a single drop of seawater teems with numerous creatures. Through these images, visitors can naturally understand the complexity of microorganism-based ecosystems and the importance of biodiversity. By combining microscopy with imagination, the exhibition allows visitors to experience the invisible world of life in a more vivid and engaging way, while appreciating the value of biodiversity.

Muju, Where Firefly,



a Light that Brightens Forests on a Summer Night, Stays

On a summer night, after the sun completely goes down, small green lights fly up at the edges of forests one by one. The green lights, which slowly fly through leaves, whisper that our ecosystem is still healthy while shining the times of forests and valleys that have been protected for a long time.



When the Light Comes Up Summer Is in Full Swing



When the sun goes down and the warmth of forests cools down slowly, the valleys of Muju are gradually tinged with the night colors. At a moment when only the sound of water fills the forest trails, a small light is sliding by. After a while, another light slowly moves under the trees, and traces of dim green lights start to come out from the darkness near the valley.

Forests where fireflies appear are not beautiful because they are bright. Rather, they are places where darkness survives before light. In forests where artificial lights barely reach, valleys are filled with long-lasting sounds of water, and on the damp soil under the trees, fireflies complete the landscape of summer nights.

Fireflies are sensitive to environmental changes. Fireflies can stay for long only when there are clean water and food sources for larvae and the right structure of forests for imagoes. In other words, where you see fireflies, forests, water, and wetland environments are in balance. Muju Gucheondong, Jeonbuk, is where such conditions are relatively preserved.

Lights Emerging When Forests Get Dark

In Muju Gucheondong, cold water in the valley from Mt. Deogyusan passes through the forest. Near the valley, broadleaf forest stretch moisture seldom dries up, even in the summer. The thick litter layer provides a good environment for small organisms to hide and live, and the shade under the trees keeps the forest temperature consistent.

In particular, the forest in Muju does not have artificial lights, so it becomes very dark at night. For fireflies, darkness is not just background but an important condition required for them to recognize the light of each other. When there is relative darkness between forests, and forests and valleys are naturally connected, fireflies can live safely.

Around the valley, we can meet aquatic organisms, including caddisflies' larvae and stone flies, and moss and mushrooms grow on the damp forest floor. The edges of forest tree frogs and brown frogs are croaking. Fireflies cannot live alone; they can only survive when water, forest, and small organisms coexist harmoniously.

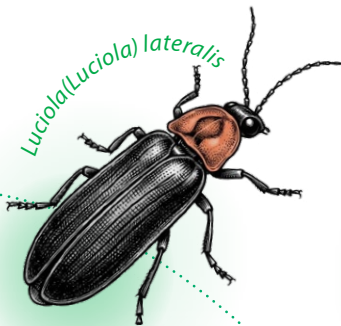
Fireflies Illuminating Summer Nights in Muju



Luciola (Luciola) lateralis and *Pyrocoelia rufa* are the fireflies that we can observe most frequently in Muju. The two species live where clean water and damp forests exist, but their activity periods and the way they emit light are slightly different. That is why summer nights in Muju are decorated with different landscapes of fireflies, depending on when you visit there.

Luciola (Luciola) lateralis is active at night in the early summer between June and July, and they are relatively small and fly low and slowly. They are mostly seen in the grass thicket near valleys or the edge of forests, and move blinking green light. The lights passing by the lower parts of the forest seem to be a signal letting us know the beginning of quiet summer nights.

However, *Pyrocoelia rufa* appears more frequently from the end of July to August, when summer is in full swing. It is slightly bigger than *Luciola (Luciola) lateralis* and has different ways of emitting light and flying. The light of *Pyrocoelia rufa* flying in the dark forest slowly creates a landscape of summer nights different from those in early summer.



Muju Summer Shining with Green

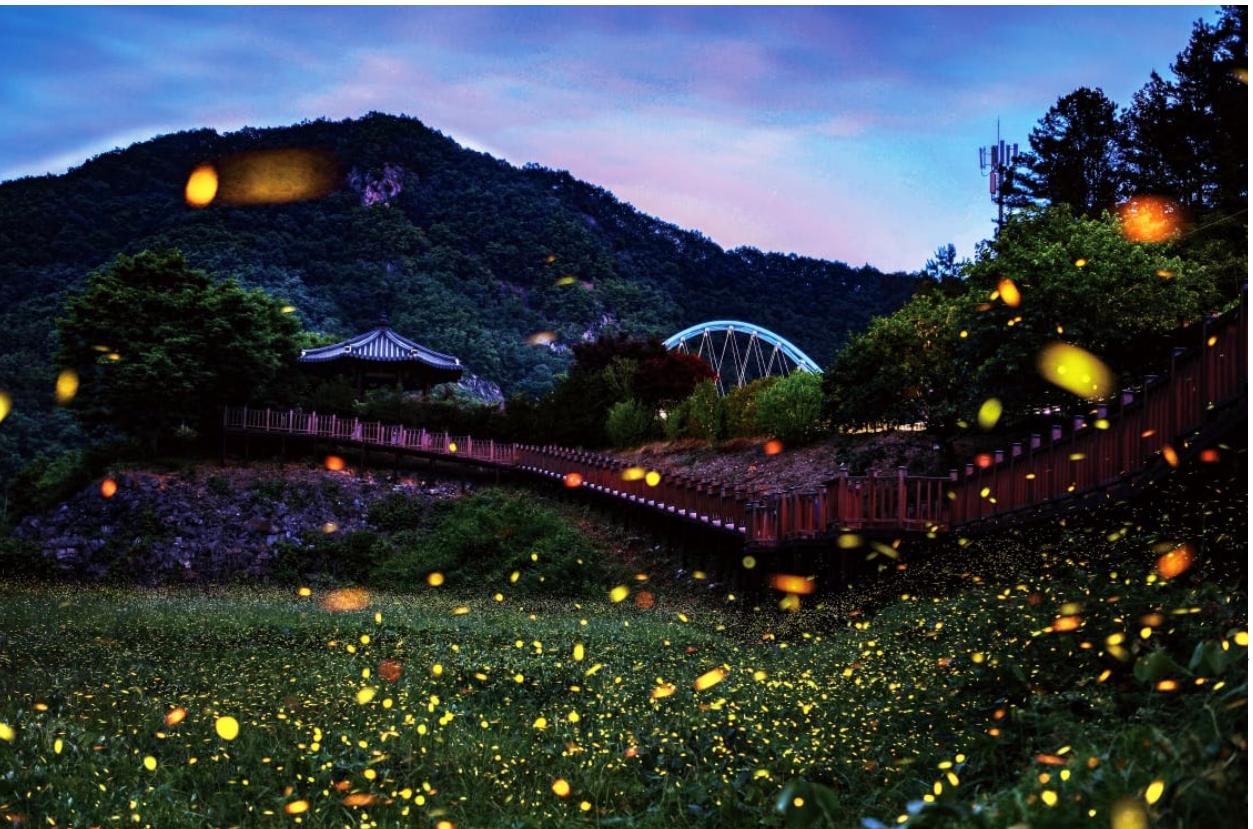


Summer in Muju goes especially slowly. Toward the forest trail, where night is falling and only the sound of valley stays, people start to gather one by one. They say less as much as possible and wait for the forest to become darker. At some point, a small green light quietly comes up from the edge of the forest.

The Muju Firefly Festival, which is held every summer, is not a festival filled with glamorous lights or loud sounds. Rather, it is a time to look into darkness for long, listen to the sound of the forest carefully, and make eyes linger on a single small light. Fireflies appear shortly and disappear, and another light slowly passes between the trees. Visitors stand in the middle of the forest before they know and feel the flow of the summer night.

As the night grows deeper, the Namdaecheon Stream and the whole area of Gucheondonggyegok, where the festival is held, unfold a more fluorescent landscape. The chilling air descending on the valley, the sound of water from a distance, and green light slowly moving between the forest are laid over as a single scene.

While walking Muju in the summer nights, all of a sudden, you might recall the sense of summer you had in your youth, the memory of the landscape of the forest, as you looked up listening to the sound of water from the valley when you were more familiar with dark than light. Fireflies disappear after shining briefly; however, a short moment like that keeps the summer of Muju lingering for long.





The Journey of Fireflies that Started in Muju Leads to Other Regions

There are quite a lot of forests and waterways in Korea where fireflies still live. Valleys flowing deep in the mountains, villages with rice paddies and wetlands, and forests without artificial lighting show slightly different lights of summer nights by region.



©Seoul Danurim Accessible Tourism Center Website

Gildong Ecological Park in Seoul: Meet Fireflies in Downtown

Gildong Ecological Park, located in Gangdong-gu, Seoul, is the representative ecological space where we can meet fireflies in the city. In the park, a small wetland, waterways, and forest trails under the shade of trees were created, thus providing a favorable environment for fireflies to live. Firefly ecology programs are operated by season so that visitors can experience forest ecosystems more closely, even in the city.

Okcheon in Chungbuk: A Night of Fireflies Shining Between Lake and Forest

Okcheon in Chungbuk which embraces Daecheongho Lake in the upstream of the Geumgang River is a representative ecological region where clean water and forests are in harmony. In particular, Anteo Village near Daecheongho Lake is well known for clean natural environment where fireflies live so that it hosts a firefly festival every year. During the festival, visitors can see *Luciola (Luciola) unmunsana* and *Luciola (Luciola) lateralis* more closely and join a night exploration program together with a village commentator.



©Monthly Okine



©eonbuk Ecotourism Promotion Support Center

Ungok Ramsar Wetland in Gochang, Jeonbuk: A Summer Light Spreading Like the Milky Way

Ungok Ramsar Wetland, which is located in Ungok-ri, Asan-myeon, Gochang-gun, presents us the mystique of nature where numerous *Luciola (Luciola) lateralis* appear around the willow habitat. This area is a wetland that formed as nature naturally restored itself after residents relocated in the early 1980s. Often called "South Korea's DMZ", it is home to various protected plants and endangered wildlife, including fireflies, otters, leopard cats, yellow-throated martens, and Oriental storks

NIBR

Spatial and temporal dynamics of wintering waterbird communities in South Korea along the East Asian–Australasian flyway

This study analyzed nationwide mid-winter counts from the Winter Waterbird Census of Korea (WWCK) to resolve spatial and temporal dynamics of wintering waterbird communities across South Korea from 2010 to 2020. Using a self-organizing map (SOM), it classified 208 sites into six ecologically interpretable assemblages spanning coastal, riverine, lacustrine, tidal-flat, and Jeju Island/southern mosaic. Indicator species were identified using the Indicator Value (IndVal) method, which quantifies species' associations with specific assemblages, and assemblage-level trajectories were quantified with Multispecies Indices (MSIs; 2010 = 1.0). According to the result, trajectories diverged among assemblages. Coastal, seabird-dominated sites (cluster 1) declined steadily ($-2.8\% \text{ yr}^{-1}$; -41.3% overall), whereas large river–lake systems (cluster 4) and the Jeju/southern mosaic (cluster 6) increased ($+5.0\% \text{ yr}^{-1}$; $+60.1\%$ overall and $+3.0\% \text{ yr}^{-1}$; $+30.4\%$ overall, respectively). Tidal-flat communities (cluster 5) were broadly stable ($+0.1\% \text{ yr}^{-1}$; $+3.6\%$ overall). Generalized linear models related MSIs to human and environmental factors, revealing negative associations with aquaculture (cluster 1), salt pans (cluster 5), and streams & rivers (cluster 4), and a positive association with rice-field extent in inland systems (cluster 4). These results show that wintering community change is structured by habitat context and human use. This study recommends habitat-tailored actions with the consideration of characteristics of habitats.

Nam, H. K., Choi, H. I., Lee, S., Lee, J. Y., Kim, H. J., Kim, D. W., Kwak, M. H., & Choi, Y. S. (2026). Spatial and temporal dynamics of wintering waterbird communities in South Korea along the East Asian–Australasian Flyway. *Global Ecology and Conservation*, e04191.

NIWDC

Evaluation of the Vaccine Candidate ASFV-MEC-01: Safety, Efficacy, Transmission Dynamics, and Assessment of Reversion to Virulence

African swine fever (ASF) is a highly contagious and often fatal disease that poses a serious threat to global pig farming and food security. Despite decades of research, a safe and effective vaccine has not yet been widely implemented. In our previous study, we introduced ASFV-MEC-01, a novel live attenuated vaccine candidate developed through serial passaging of a field isolate in CA-CAS-01-A cells, and subsequently characterized it. In the present study, we further evaluated the safety parameters of ASFV-MEC-01. Specifically, we reaffirmed the safety and protective efficacy of ASFV-MEC-01 against a highly virulent Vietnamese ASFV strain, and safety assessments were also conducted in pregnant sows. ASFV-MEC-01 showed no evidence of horizontal transmission to sentinel pigs and did not revert to virulence after consecutive *in vivo* passages, confirming its phenotypic stability. The vaccine also induced a sustained immune response in vaccinated pigs. Collectively, these findings demonstrate that ASFV-MEC-01 is a promising and safe live attenuated vaccine candidate, offering a valuable tool for effective ASF control.

Tran, L. H., Bui, A. N., Kwon, H. I., Dao, T. D., Weerawardhana, A., Tran, T. M., Vu, H. T., Nguyen, Q. D., Gamage, Nuwan., Kim, M. H., Moon, J. Y., Hong, J. H., K. J., K. Y., Kim, Y., K. W., Kim, G., Lee, S. I., Kim, Y. S., Lee, H. S., Lee, J. Y., Yoon, I. J., Mo, I. P., Jheong, W., Yoo, S. S., Bui V. N., & Lee, J. S. (2026). Evaluation of the vaccine candidate ASFV-MEC-01: safety, efficacy, transmission dynamics, and assessment of reversion to virulence. *Emerging Microbes & Infections*, 15(1), 2608395

NIE

Machine Learning-Based Assessment of Invasive Crayfish *Procambarus clarkii* in Riverine Wetlands of the Yeongsangang River Basin, South Korea

This study developed a machine learning-based framework to assess the distribution and population size of *P. clarkii* in gravel-bar and abandoned-channel wetlands in southern Korea. Environmental and capture data were compiled for 86 wetlands along the Yeongsangang River and Jiseokcheon Stream, surveyed between 2021 and 2023.

The best model achieved an area under the curve of 0.836, with channel and pool density, available habitat area, total wetland area, and permanent surface water bodies identified as the most important predictors of occurrence. Population density was then estimated from baited umbrella-shaped hexagonal traps with six entrances in eight wetlands, assuming a 4 m effective capture radius and a capture probability of 0.265, and extrapolated to 36 wetlands classified as high or moderate suitability or with confirmed occurrence. Median estimates indicated that approximately 8.2×10^5 individuals (range: 6.1×10^5 – 1.6×10^6) inhabit these wetlands. In particular, dense populations were associated with large wetlands that maintained permanent surface water, making such sites priorities for control.

Overall, this study demonstrates that integrating habitat suitability modeling with trap-based density estimation enables effective tiered management of invasive crayfish despite resource limitations.

 Park, J., Cho, Y., Kim, S., Eum, S. J., Cho, Y., & Park, Y. (2026). Machine Learning-Based Assessment of Invasive Crayfish *Procambarus clarkii* in Riverine Wetlands of the Yeongsangang River Basin, South Korea. *Proceedings of the National Institute of Ecology of the Republic of Korea*, 7(1), 1-18.

NNIBR

Discovery of a Novel Bacterium That Can Conduct Heavy Metal Adsorption and Chlorinated Organic Compound Degradation Simultaneously

Environmental contamination caused by various types of heavy metals and chlorinated organic compounds poses a significant threat to global ecosystems. While bioremediation offers a sustainable solution, identifying microbial strains that possess the metabolic versatility to withstand metal toxicity and degrade persistent organic pollutants remains a major challenge. This study characterized strain TW-R-39-2, a novel bacterium isolated from a wastewater treatment plant. Phylogenomic analysis based on complete genome sequencing revealed that strain TW-R-39-2 represents a novel species within the genus *Dechloromonas*. Compared to its closest relative, *Dechloromonas denitrificans*, it showed average nucleotide identity and digital DNA–DNA hybridization values of 80.17% and 23.4%, respectively. Genomic insights revealed a 3.46 Mb circular chromosome containing a diverse array of genes associated with heavy metal resistance (e.g., predicted *czc* and *cadA* clusters) and chlorinated compound degradation (e.g., dehalogenases). Phenotypic assays validated these genomic predictions, demonstrating the strain's dual functionality: It exhibited high adsorption efficiencies for cadmium (Cd^{2+} , 78.0%) and zinc (Zn^{2+} , 75.1%), alongside a significant degradative capacity for trichloroethylene (83.6%) and chlorophenol (81.0%) within a seven-day incubation period, corresponding to the strain's active growth and early stationary phases. The stoichiometric release of chloride ions confirmed the complete dechlorination of organic pollutants. These findings demonstrate that strain TW-R-39-2 possesses versatile capacities for both the sequestration of toxic metals and the biodegradation of persistent organic compounds. This study highlights the potential of strain TW-R-39-2 as a promising candidate for the efficient bioremediation of diverse industrial wastewaters.

 Choi, A., Baek, K., & Chung, E. J. (2026). Genomic Insights into *Dechloromonas* sp. TW-R-39-2: A Dual-Function Bacterium for Heavy Metal Sequestration and Chlorinated Organic Degradation. *Microorganisms*, 14(2), 426.

HNIBR

Genetic Variety Evaluation of *Avena Fatua* L. (Wild Oat) in Island and Coastal Areas

This research collected *A. Fatua* from island and coastal areas in Korea and analyzed its genetic diversity and seed storage proteins to expand the genetic diversity of cultivated oats. *A. Fatua* grows wild in mountains and fields. Unlike cultivated crops, CWRs must survive in extreme environments, such as windswept and barren islands. Consequently, they have developed a stronger and more diverse array of survival genes.

The research team collected *A. Fatua* from eight sites on the southwestern coast of Korea, including Mokpo, Jindo, and Gunsan. Using the cutting-edge genotyping-by-sequencing technique, they identified 20,836 genetic variations. The analysis results showed that *A. Fatua* individuals collected on the southwestern coasts were largely divided into two genetic groups. Notably, individuals from Jindo differed genetically from those from other regions. Regional differences were also observed in seed storage proteins, which are essential for plant growth, demonstrating that the local environment and climate directly affect a plant's traits. This study provides valuable genetic information to develop new oat varieties capable of enduring changing weather patterns.

 Seo, H., Won, H., Lee, S. A., Jeong, J. S., Jo, J., Han, S., Ha, B. K., & Lee, K. J. (2025). Exploration of the genetic diversity of *Avena Fatua* L. (wild oat) through genotyping-by-sequencing and SDS-PAGE. *BMC Plant Biology*, 25(1), 1358.

Watch Out for Large-Billed Crow's Attacks Which are more Frequent in the Early Summer. Avoid Where Their Nests are Located and Protect Yourself with Umbrella or Hats

The NIBR and the Climate, the Ministry of Energy and Environment distributed the guidelines for and safety behavioral manuals for local governments to prepare for a rise in large-billed crow attacks during the early summer breeding season. The large-billed crow is a resident bird that has increasingly adapted to urban environments. Between May and July, while protecting their chicks, they may exhibit aggressive behavior by swooping down toward people's heads or necks.

To prevent the bird's attacks, the government recommends wearing hats or carrying umbrellas to protect the head, taking detours around nests, avoiding direct eye contact, not exposing food, and quickly passing through high-risk areas. In addition, it advises not to do the following actions: feeding the birds, touching nests or chicks, making threatening gestures, illegal capturing, and using poison. It uses its high learning ability and adaptability to breed in urban green zones, buildings, and power lines, and food waste and urban environmental changes are considered as reasons for its population growth. The government plans to operate a management system focused on non-lethal responses, such as blocking food sources, installing warning signs, and managing danger zones, rather than simple capture. Meanwhile, the NIBR, in collaboration with a research team from Seoul National University, is conducting a research project on the behaviors of large-billed crows in the Seoul metropolitan area and is gathering video submissions from the public.



A guide for participation in gathering information about the large-bill crow

Holding the 21st Biodiversity Detailed Paintings and AI Image Contest

The NIBR hosts the 21st Biodiversity paintings and AI Image Contest from May 22 to August 28. This year's contest newly adds the artificial intelligence (AI) image category to the existing detailed painting field, and has also expanded the target subjects from domestic native species to the internationally endangered species in the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

This contest, themed "Life Around Us," invites artworks that convey messages of coexistence and protection for native species and internationally endangered species. The detailed painting category features works that realistically depict the characteristics of plants and animals, while the AI Image category focuses on creative works utilizing generative AI.

The contest is open to all citizens, and the AI image category accepts entries from middle school students and older. A total of 42 works will be selected and in case of the adult section, winners will receive a prize of 5 million won for detailed painting category and 3 million won for AI image category.

Participants can submit their artworks online via the competition website. For the detailed painting category, participants who pass the preliminary round must submit their original artworks additionally. The winners will be announced in October.



The 21st Biodiversity Detailed Paintings and AI Image Contest

Distribution of Animal Disease Management Guidelines to 121 Zoos Nationwide

The NIWDC announced that it will distribute the Guidelines for Zoo Animal Disease Management to 121 registered zoos nationwide to help control diseases among zoo animals and respond to zoonotic diseases. The guidelines were prepared in accordance with the Act on the Management of Zoos and Aquariums to support the prevention of zoo animal diseases, control the spread of infections, and ensure animal health. The guidelines include response measures for disease outbreaks and detailed disease management procedures for zookeepers, veterinarians, and relevant personnel. Furthermore, they include an autopsy report form, a pre-inspection checklist, and an autopsy record template, as well as measures for securing and transporting samples, treating handling animal carcasses, disinfecting, and preventing diseases. They also include information on infectious disease alert systems, risk warnings, major measures according to disease outbreak severity, and institutional response procedures. Starting in November this year, the NIWDC will hold a regular working-level network forum on zoo animal disease management to promote the practical use of the guidelines and strengthen information exchange between zoos.



Guidelines for Zoo Animal Disease Management

At a Glance: Domestic and International African Swine Fever Response and Vaccine Development Status

At the ASF international academic symposium jointly hosted by the NIWDC and Avinext, experts from the U.S., China, Japan, and Thailand shared global African Swine Fever (ASF) spread patterns and response statuses. They diagnosed that ASF has evolved into a global disaster where wildlife, the livestock industry, and international movement are complicatedly intertwined, rather than an isolated national issue.

The United States has enhanced its ASF surveillance due to outbreaks in nearby Haiti. As Spain has experienced a re-emergence of ASF for the first time in over 30 years the potential for disease transmission through urban wild boars become a major concern.

In China and Southeast Asia, various variants are emerging and becoming endemic and Japan is also responding to the risk of ASF virus introduction through passenger baggage and international mail.

"In the Southeast Asian cases, an intensified disease control measure, 'Everywhere outside the pig farm is a contaminated zone' was introduced.

Choong Ang Vaccine Laboratories unveiled the ongoing field clinical trials for its ASF vaccine, being developed in collaboration with the NIWDC and Management and Chungnam National University. Safety and efficacy evaluations are currently underway at a test farm in Vietnam, and the research team announced that it plans to commercialize the vaccine by 2027.



ASF International Academic Symposium

The NIE Creates an “Ecological Garden” Using Forest Fire–Burned Trees for the 2026 Seoul International Garden Show

The National Institute of Ecology is preparing an ecological garden titled “Forest Reborn, Land Regenerated” using trees burned in forest fires for the 2026 Seoul International Garden Show(May 1–October 27, 2026). This 110 m2 garden was created with trees collected from forest fire sites in Gangwon-do and Sanncheong, Gyeongnam. Alongside charred tree remains, seedlings of Korean native *Quercus trees*, including *Quercus variabilis*, *Quercus aliena*, *Quercus acutissima*, *Quercus mongolica*, and *Quercus serrata*, were planted to support ecological recovery after the fire. The garden also features *Pteridium aquilinum*, *Lespedeza bicolor*, *Rosa multiflora*, *Stephanandra incisa*, *Ligustrum obtusifolium*, *Rhododendron mucronulatum*, and mosses to illustrate the natural process of ecosystem restoration. In particular, mosses covering the land symbolize the foundation of ecosystem recovery, while spreading acorns symbolize the expansion and sustainability of life. The garden space was designed to guide visitors from a damaged forest to a recovering ecosystem, using charred dead trees to represent both the scars of destruction and the promise of renewal. Through its native vegetation, the garden also signifies biodiversity conservation and climate change responses, while expressing the dynamic energy of an ecosystem capable of rising again after a devastating forest fire.



Ecological Garden for the Seoul International Garden Show

The NIE Launches a Coexistence Council for Little Terns in Andong

The National Institute of Ecology (NIE) held an inauguration ceremony for the Andong Little Tern Coexistence Council on May 6, 2026, at Gyeongbuk National University and announced the official launch of a private–public–research institute partnership dedicated to conserving little tern populations and their habitats in Andong. This council was formed in response to the growing need for the systematic conservation of little tern populations breeding near Andongho Lake, after the species was designated as a Class II Endangered Species in 2022. Andongho Lake is a well-known inland freshwater lake-type breeding ground for little terns, an internationally rare species. Relevant organizations attended the ceremony, including the NIE, Andong City, the Institute of Avian Ecology and Environment, Gyeongbuk National University, and the Andong Council for Sustainable Development – Citizens’ Headquarters for Loving Little Terns. The participants signed a joint declaration formally committing to little tern conservation efforts. The council plans to focus on information sharing about little tern habitats, long-term monitoring, research collaboration, risk factor management, education, public relations, and ecological tours. Since an artificial island was established in Andongho Lake in 2020, little tern breeding has been observed there, and research on habitat management using drones and artificial intelligence–based monitoring technology has been conducted as well.



1. Joint statement for Andong little tern conservation
2. Little terns at Andongho Lake
3. Bird observatory for Andongho Lake Little terns; inauguration ceremony of the Andong Little Tern Coexistence Council

The NNIBR Operates a Full-Sensory Exhibition Experience Program for Underserved Communities

The NNIBR has been operating the “Full Sensory Exhibition Experience in 2026” program to provide accessible and vivid experiences of biodiversity to underserved community members. On April 17, the first program was delivered to the members of Sangju City Federation of Organizations of Persons with Disabilities at the Sangju Civic Stadium. The program consists of a hands-on session in which participants can directly touch large specimens of rare creatures, including the Ezo brown bear and Malayan tapir, with various interactive elements that allow participants to perceive organisms’ shapes and characteristics through multiple senses. In addition, professional curators explained the taxidermy exhibition through the theme of animals in children’s stories to promote deeper understanding and immersion among visitors.

The Full Sensory Exhibition Experience runs through October 2026, targeting people with disabilities, multicultural families, seniors, and group visitors. Tailored to the needs of each participating group, exhibition commentary, hands-on programs, ecological classes, and cultural performances are provided free of charge, ensuring equitable access to biodiversity and ecological culture. For more information about the program and how to participate, please visit NNIBR website.



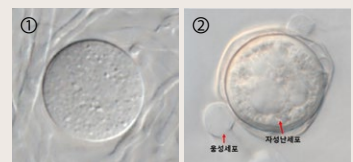
Visitors participating in an interactive, multisensory exhibition program

The NNIBR Identifies 78 Freshwater Oomycete Species in Korea, Laying the Foundation for Fundamental Research on Oomycete Ecology

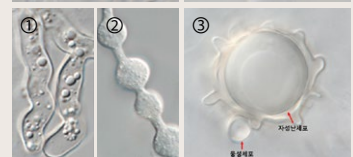
The Nakdonggang National Institute of Biological Resources has confirmed 78 species of water mold (Oomycota) in various freshwater environments, including rivers, reservoirs, and valleys nationwide, since 2016. Among them, eight are internationally unrecorded species, and 22 are domestically unrecorded ones. The remaining 48 have been reported, but few studies have been conducted on their ecological traits. Oomycota, commonly known as water molds, decompose fallen leaves or plant debris and recycle organic matter in the freshwater environment. Until recently, research on Oomycota has mostly concentrated on pathogenic fungi, such as those causing potato blight and fish diseases, and as a result, systematic studies on the diversity and ecological functions of Oomycota in freshwater environments have not yet been sufficiently conducted. In this regard, the NNIBR has conducted survey and investigation studies on freshwater fungi in cooperation with the research teams of Professor Hyang Burm Lee at Chonnam National University and DR. Bo-Ra Nam and Professor Young-Joon Choi at Kunsan National University. The research team collected fungi from diverse freshwater environments, including rivers, reservoirs, and valleys, and conducted morphological characteristics and genetic analyses. As a result, they confirmed 78 species of Oomycota.

This research is the first case in Korea that systematically organizes the diversity and ecological traits of freshwater Oomycota and is meaningful in that it widens the understanding of the diversity of fungi inhabiting freshwater environments. The findings will serve as baseline data for bioresource discovery and further ecological studies.

Morphology of *Phytophythium lacustre* (a new species of Oomycota)
1. Sporangium
2. Oospore
Scale bars: 20µm, 400x



Morphology of *Pythium aculeatus* (a new species of Oomycota)
1. Thread-shape sporangium
2. Chain-shape
3. Hypha oospore
Scale bars: 20µm, 400x

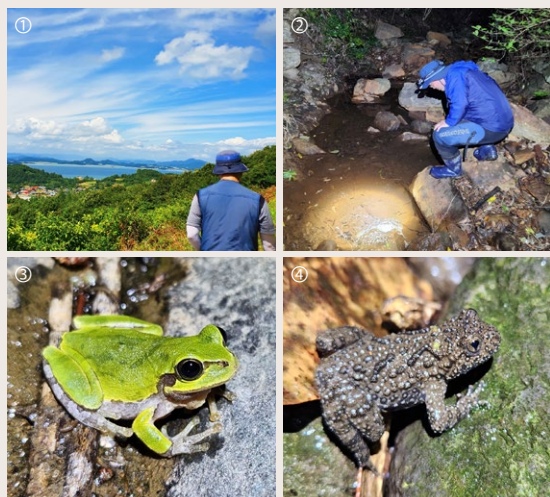


The HNIBR Has Investigated Island Anurans for Five Years and Confirmed the Presence of 12 Frog Species Across 156 Islands

The HNIBR announced that a five-year study (since 2021) of amphibians across 263 islands in Korea confirmed the presence of 12 frog species on 156 of them—approximately 60% of the islands surveyed. The study aimed to determine the distribution and characteristics of island frogs, which had not yet been systematically investigated. Based on a literature review and field studies, the research team surveyed anuran populations across islands in the West and South Seas, including Jeju, Baengnyeongdo, Ulleungdo, and Geoje. Of these islands, 32 islands—including Sonjukdo and Yuldo—were newly identified as anuran habitats.

The species found on the greatest number of islands was *D. japonica*, recorded on 143 islands, followed by *P. nigromaculatus*, recorded on 113 islands. Additionally, the endangered species *D. suweonensis* (Class I), *K. borealis* (Class II), and *P. chosonicus* (Class II) were identified on several of the surveyed islands.

The research team analyzed the genetic structures of *D. japonica* and *B. orientalis*, and some island anurans showed genotypes distinct from those in terrestrial areas, suggesting that island anurans may have developed independent genetic traits through long-term geographic isolation.

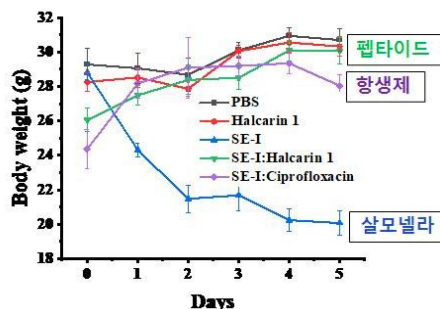


Field studies of island anurans and target species for genetic analysis (①day ②night surveys ③*D. japonica* ④*B. orientalis*).

The HNIBR has discovered a new substance with therapeutic effects against antibiotic-resistant *Salmonella* using AI

The Honam National Institute of Biological Resources (HNIBR) announced the recent confirmation that a new peptide, discovered using AI technology, is effective in treating inflammatory bowel disease caused by *Salmonella* strains resistant to existing antibiotics. This study was jointly conducted by the Advanced Research Center for Island Wildlife Biomaterials of the HNIBR, Chonnam National University, Insilicogen, Inc., and the Korea Food Research Institute. Using large-scale genetic data collected from island and coastal wildlife, the research team applied artificial intelligence (AI)-based analytical methods to identify peptides with predicted strong antimicrobial activity. The team then conducted stepwise experimental validation based on the AI predictions. This approach enabled the researchers to identify new drug candidates more quickly and accurately than conventional discovery methods. This study confirmed that the peptide effectively alleviates infectious colitis caused by *Salmonella*. It has also been shown to regulate the secretion of inflammatory mediators and to protect the intestinal mucosa. Consequently, the peptide reduced *Salmonella*-induced intestinal disease by 89.17%, exceeding the 87.78% reduction achieved by ciprofloxacin, an existing antibiotic.

(1) 체중 변화



In mice infected with *Salmonella* (blue line), body weight decreased over time. In contrast, body weight was maintained in both the peptide-treated group (green line) and the antibiotic-treated group (purple line).

21st

생물다양성 세밀화 · AI 이미지 공모전

접수기간: 2026. 05. 22 (금) ~ 08. 28 (금) 18:00

공모주제

공존(Coexistence): 우리 곁의 생명

불법거래로 고통받는 국제적 멸종위기종(CITES)와
우리 곁에서 묵묵히 살아가는 자생생물과의 공존의 메시지를 전달해 주세요.

주제: 불법 거래로 고통받는 국제적 멸종위기종(CITES) 중에 대한 위로와,
우리 곁에서 묵묵히 살아가는 자생생물에 대한 애정을 불러일으킬 수 있는 주제

[세밀화 부문]: 생물의 특징을 사실적으로 묘사하되 주제가 담기도록 강조

[AI 이미지 부문]: 주제가 드러나도록 창의적으로 표현

* 제작 포인트: 생물의 눈망울이나 생동감 넘치는 움직임을 포착하여 관찰자로 하여금 정서적 유대감을 '지켜야 할 대상'으로서의 생명력을 강조

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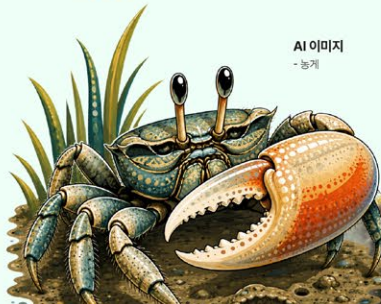
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