

# DISEASE SURVEILLANCE AND REPORTING IN WILDLIFE

## -CASE OF ASF SURVEILLANCE IN WILD BOARS

National Institute of Wildlife Disease  
Control and Prevention (NIWDC)

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# WHY DO WE NEED WILDLIFE SURVEILLANCE 1

- Various human activities are “building bridges” between human/livestock and wildlife

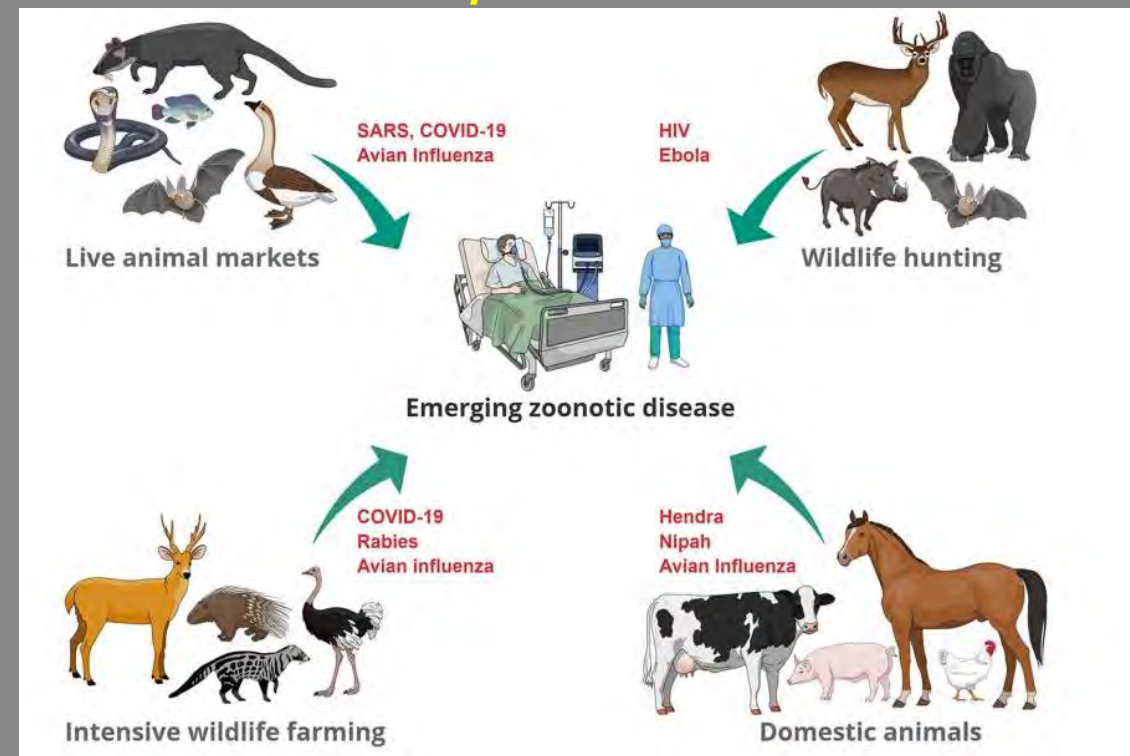
→ Microbes crossing host barriers in unprecedented rate, causing (re-)emerging diseases

- Most of our knowledge in diseases are based on human/livestock

→ Potential impact of microbes commensal to wildlife on human and livestock, or other wildlife/ecosystem are unknown

→ Difficult to predict, monitor, proactive management

- Need to better understand the relationship between the microbes and the wildlife to reduce potential health risks in human/livestock/ecosystem



(Magouras et al. 2020)

# WHY DO WE NEED WILDLIFE SURVEILLANCE 2

## 1. Understanding PATTERNS through baseline data

Wildlife disease management based on epidemiological patterns of pathogen prevalence of our interest → finding out drivers linked with outbreak

## 2. Unlike human/livestock, we have minimum access to wildlife samples

- Network, personnel and surveillance schemes needs to be established in advance
- Require channels and platform for experts from diverse backgrounds to contribute

# TYPES OF WILDLIFE SURVEILLANCE


- **PURPOSE OF SURVEILLANCE**

- is a disease of interest introduced in endemic population?
- is a certain response strategy having effect in the field?
- is there changes in the prevalence of certain pathogen/parasite  
(is there an outbreak? etc.)


- Surveillance design depends on the biological(ecological) character of **DISEASE/PATHOGEN**(pathogenicity, transmission mode, host range etc.) and **HOST**(distribution range, population density, social structure etc.)




# TYPES OF WILDLIFE SURVEILLANCE




Passive veterinary supervision and epidemiological investigation



Monitoring of the epidemiological situation of European bison infections in Poland



Veterinary supervision over the movement of European bison between metapopulations



Monitoring in European bison habitat

- Passive surveillance –regular effort, focusing on CARCASS samples(monitor health/disease related events affecting wildlife population)
- Active surveillance: target driven surveillance (pathogen, host, spatiotemporal unit)
- Different surveillance type most fit to the surveillance purpose are adapted (sometimes simultaneously)

# ASF SURVEILLANCE IN WILD BOARS-case of ROK

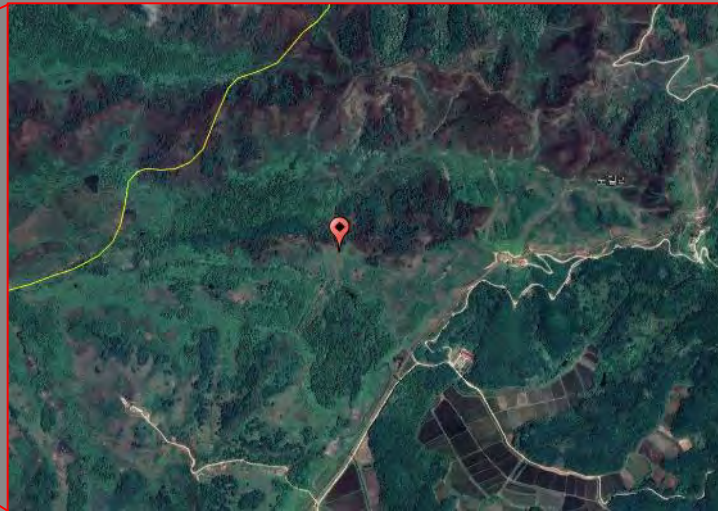




# FIRST OCCURRENCE OF ASF IN KOREA

**2019.10.2** Notification from a military unit of finding a wild boar carcass within DMZ area

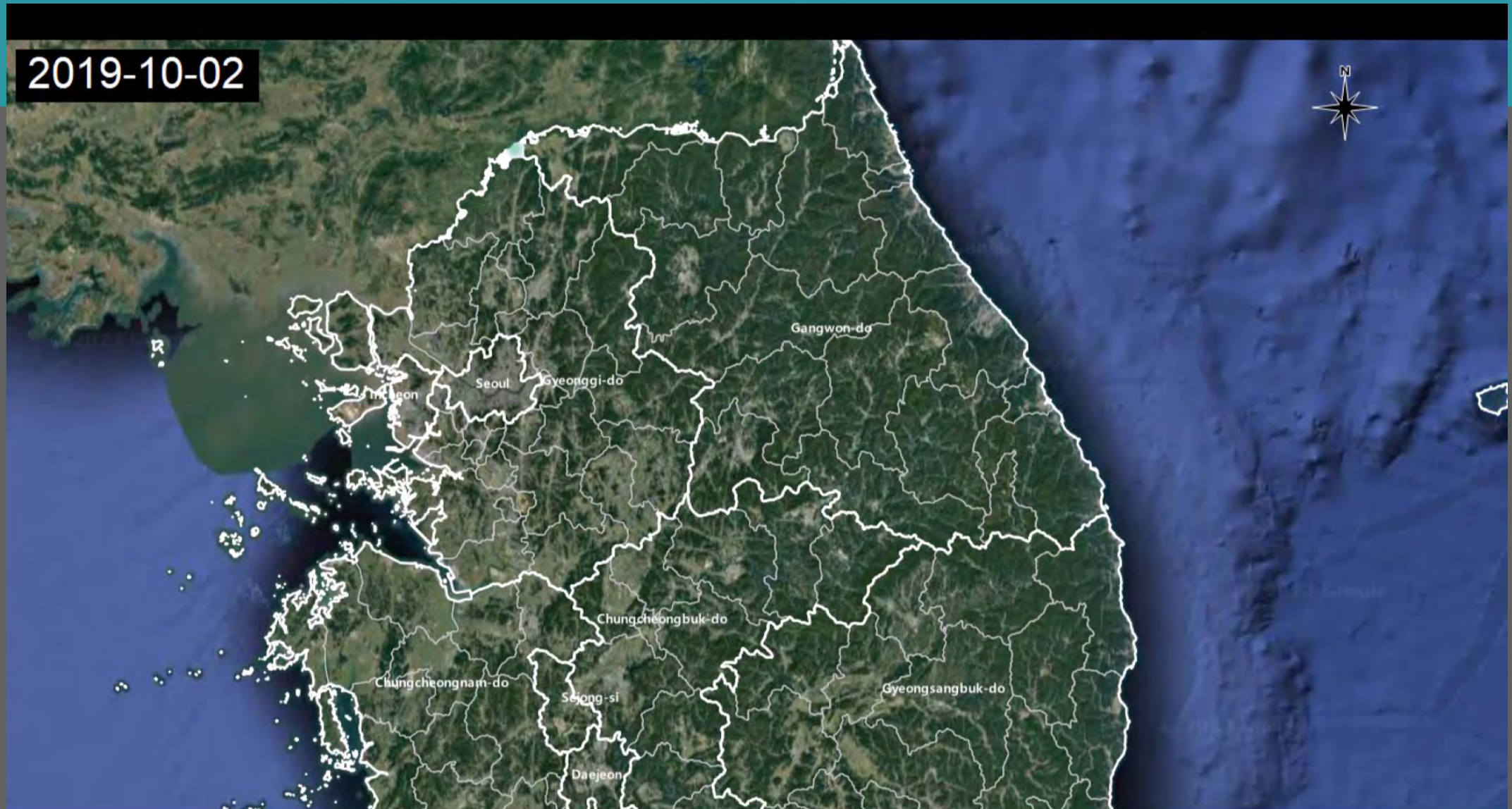
**2019.10.3** Confirmation of first ASF case by NIWDC



- Found on military surveillance trail
- Altitude approx. 172 meters
- 0.69km apart from the Northern limit line

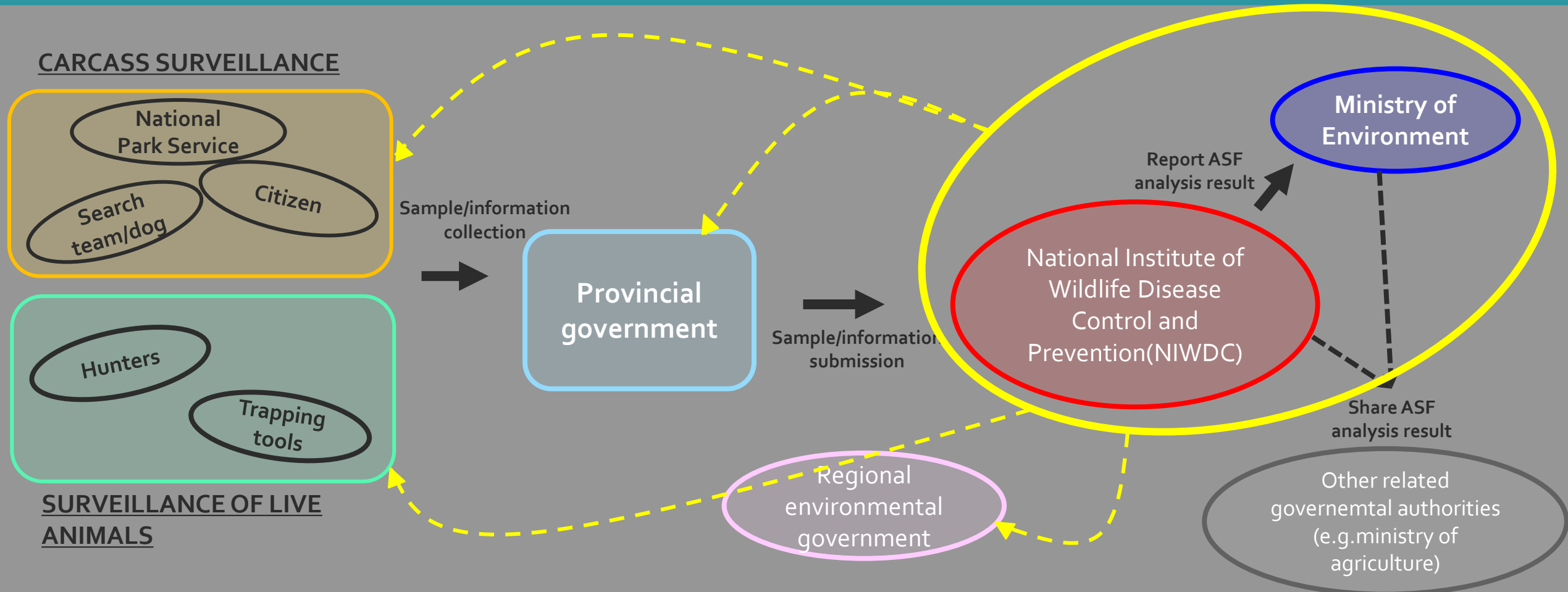


# Movement of ASF outbreak hotspot through 2019~2023





# SURVEILLANCE FLOWCHART





# SURVEILLANCE ROUTE 1 – Carcass search

**kworks** 유해야생동물 포획관리시스템

관경부수색14 관경합니다. 로고아웃  
고객센터 1588-4370

관리사명: 관리자  
지도: 기본  
정보수정: 정보수정  
포획신고: 포획신고  
피해지역: 피해지역  
예방시설: 예방시설  
수기등록: 수기등록  
상황통계: 상황통계

포획현황: 위치조회, 현장접수, 경로보고

기간: 관경부수색  
시군구: 전체  
읍면동: 전체

수렵관 검색: 대구지방환경청 / 올진2조

주기설정: 100m, 변형, 1km, 5km, 10km, 20km, 50km, 100km

연도	월	일	시간	위치
2023-09-08	00	00	00:00	기지국
2023-09-08	16	12	16:12:23	GPS
2023-09-08	16	09	16:09:23	GPS
2023-09-08	16	06	16:06:23	GPS
2023-09-08	16	03	16:03:23	GPS
2023-09-08	16	00	16:00:23	GPS
2023-09-08	15	57	15:57:23	GPS
2023-09-08	15	54	15:54:23	GPS
2023-09-08	15	51	15:51:23	GPS
2023-09-08	15	48	15:48:23	GPS
2023-09-08	15	45	15:45:23	GPS

경로보기, 전체경로보기

경북 올진은 2023년 초입에서 산 181, 우수면, 주소를 입력하십시오.

Push관리, 일반지도, **관경사노**



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338	(3.4) 화천군 화천읍 동산리 산42(사체) 분석 중	(3.4) 화천군 하천읍 대이리 산55-1(사체) 음성	(3.4) 화천군 화천읍 대이리 산56(사체) 음성	(3.5) 철원군 서면 자들리 산208(사체) 분석 중	(3.5) 화천군 화천읍 동산리 산267(사체) 분석 중	(3.5) 화천군 상서면 노동리 산104(사체) 분석 중
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344	(3.4) 화천군 화천읍 대이리 산56(사체) 음성	(3.4) 화천군 화천읍 동촌리 산11(사체) 분석 중	(3.4) 화천군 화천읍 동촌리 산11(사체) 분석 중	(3.5) 화천군 화천읍 대이리 산33(사체) 분석 중	(3.5) 연천 신서면 담곡리 산212(백골) 분석 중	(3.5) 연천 현천읍 내산리 409(백골) 분석 중
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350	(3.4) 화천군 화천읍 동촌리 산58-1(사체) 음성	(3.4) 화천군 화천읍 신술리 산205(사체) 분석 중	(3.4) 화천군 상서면 노동리 1078(사체) 음성			
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# SURVEILLANCE ROUTE 1 – Carcass search

## 멧돼지 아프리카돼지열병 확산 차단! 국민여러분의 적극적인 신고가 중요합니다!



**▲ 아프리카돼지열병(African Swine Fever, ASF)이란?**

- 돼지고기(사육돼지, 멧돼지)에서만 발생하는 바이러스성 열병으로, 바이러스의 생존성이 길고 치사율이 높음
- 멧돼지도 감염되어 폐사할 수 있으며, 폐사체는 바이러스 전파의 오염원이 될 수 있음
- 아프리카돼지열병은 사람에게 감염되지 않음

### 이럴 때 신고하세요!

1. 멧돼지가 살아 있으나 잘 움직이지 못하는 경우
2. 죽어 있는 멧돼지를 발견한 경우

※ 산행중 부패한 냄새가 심하게 나면 주변에 폐사체가 있을 가능성이 높음



(전형적인 증상 : 피부가 붉은색으로 변함)

### 야생멧돼지 폐사체 신고 시 포상금 20만원(양성·음성 동일 지급)

\* 멧돼지 폐사체 검사결과 확인 후 지급, 단 1일당 연간 60만원까지만 수령가능(불법 이물 신고 등은 처벌될 수 있음)

### 이렇게 신고하세요!

#### 발견했을 때

- 멧돼지에 접근 및 접촉 금지
- 발견지점 주소 및 주변 상황 확인
- 가능한 경우, 발견지점 나무 등에 표식
- 정확한 주소를 모르는 경우, 근접지 주소나 좌표 및 현장 사진 촬영

#### 신고하는 곳

- 정부민원콜센터 ☎ 110
- 시·군·구 환경담당부서
- 국립야생동물질병관리원 질병대응팀 ☎ 032-560-7141~7155 ☎ 062-949-4330-4334

#### 신고하는 요령

- 00일 00일 00시 경에
- 00(시군구) 00(읍면동) 00번지 000부근에서
- 죽은(질병이 의심되는) 멧돼지를 발견했습니다.
- ※ 신고자는 000000번 연락처는 000-000-0000입니다.

### 멧돼지 ASF 예방 행동 요령

1. 야외 활동 시 남은 음식물을 버리거나 야생동물에게 먹이지 않기
2. 의심개체 및 폐사체 발견 즉시 신고
3. 멧돼지 폐사체 및 의심개체 접촉 금지
4. 이동통제구역 출입금지
5. 폐사체 발견후 검사결과 확인전까지 농장출입 금지



## 아프리카돼지열병 Q&A

환경부에서는 아프리카돼지열병 신고 포상제도를 실시하고 있어요

### Q. 아프리카돼지열병(African Swine Fever, ASF)은 어떤 질병인가요?



증상 중 돼지-멧돼지 전염, 치사율 100%, 돼지 간 바이러스 전파가능

### Q. 아프리카돼지열병 바이러스 생존력은 어느 정도인가요?



### Q. 주요 임상증상은 어떻게 나타나는지 궁금합니다.



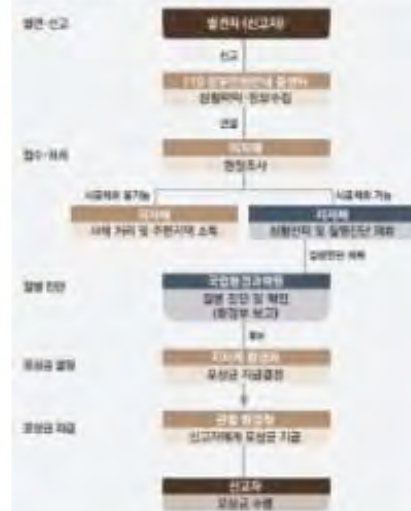
### ▲ 아프리카돼지열병 확진시 포상금 100만원

### ▲ 아프리카돼지열병 의심개체 신고시 10만원

\* 의심 증상이 있는 개체 신고 시 지급, 단, 불법으로 폐사시키거나 부패가 심해 검사가 불가능한 사체는 포상금이 지급되지 않을 수 있음. (예상 한도내에서 지급)

\* 의심동물, 피부발진(양측으로 발랄게 두어본 피부) 또는 출혈(코, 양안)이 발견되거나 무기력한 행동 등 잘 움직이지 못하는 경우.

### ▲ 포상금 지급 절차




## 멧돼지 아프리카돼지열병 신고 및 행동요령



정부민원콜센터 ☎ 110

환경부 국립야생동물질병관리원



# SURVEILLANCE ROUTE 2 – Population control

• Hunting

• Cage trap

• Net trap

**야생멧돼지 아프리카돼지열병 예방 관리를 위한 수렵인의 역할**

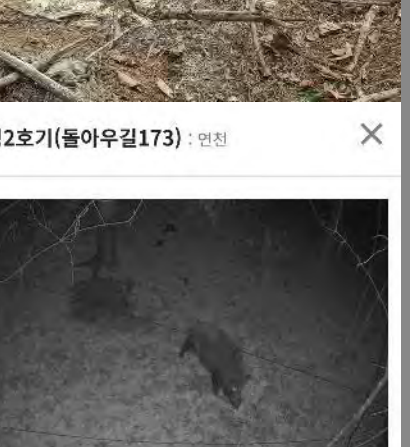
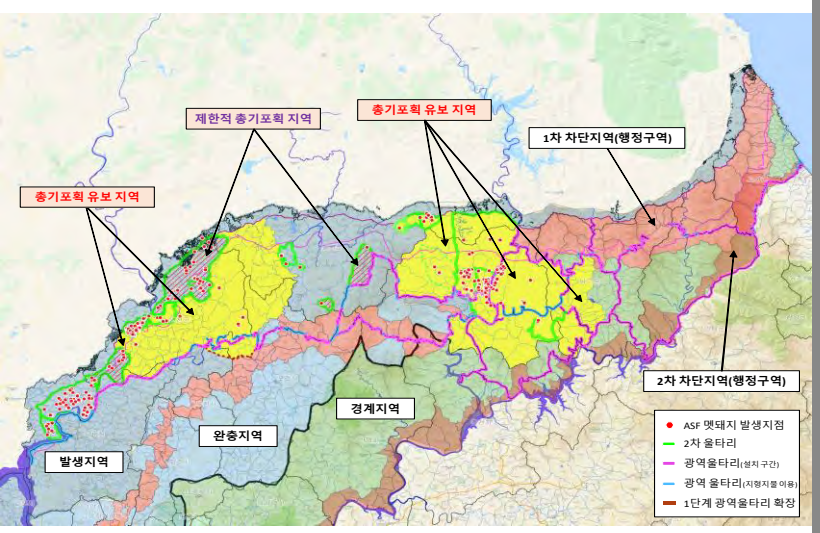
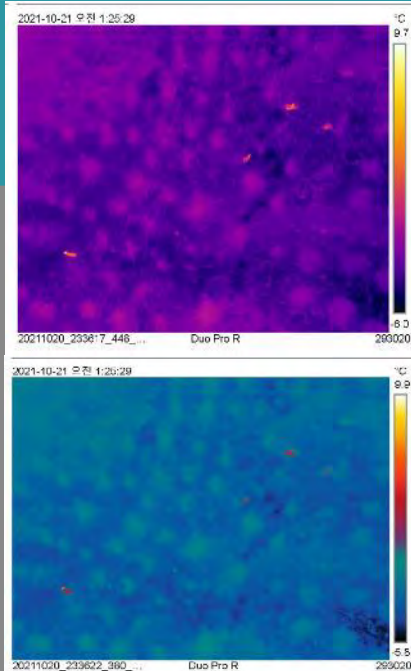
아프리카돼지열병(AFD) 발생은 국내 야생멧돼지의 수렵 활동 모두에 영향을 줄 수 있습니다. (Wildlife Swine Fever, ASF)

수렵인은 아프리카돼지열병의 초기 감시의 핵심 역할에 중요한 역할을 할 수 있습니다.

야생멧돼지 폐사체 및 야생멧돼지 발견 시 신고해주세요!

야생멧돼지 ASF 예방 행동 요령

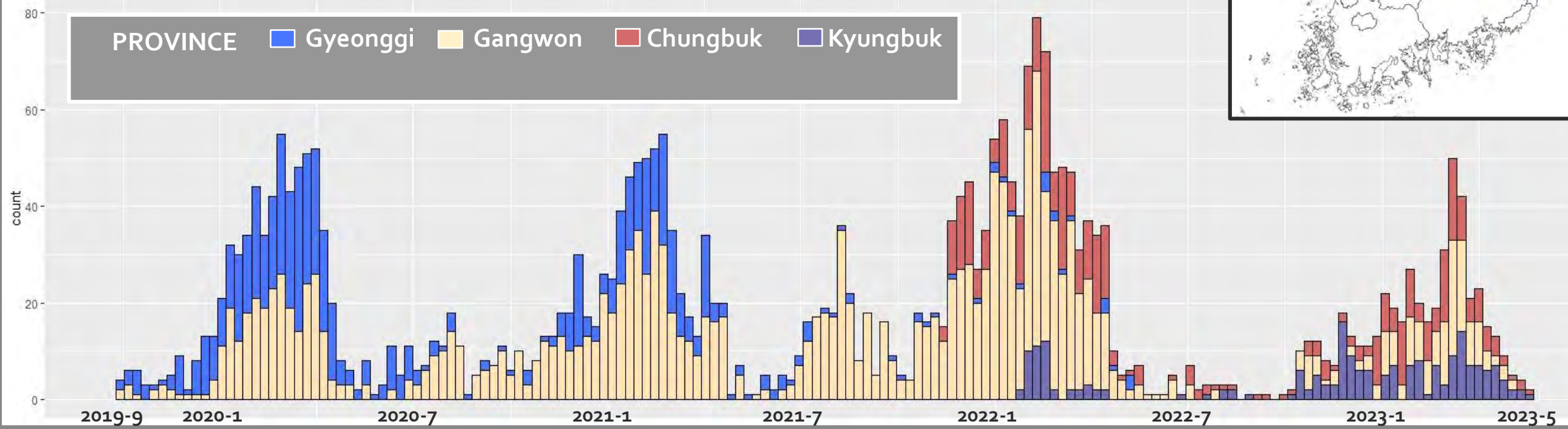
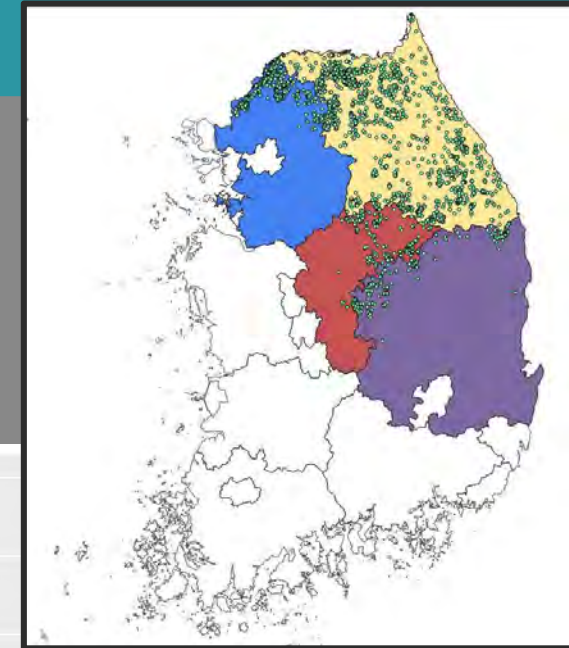
ASF 관련 야생 멧돼지 및 폐사체 신고





# Development of ASF outbreak(2019-2023.May)

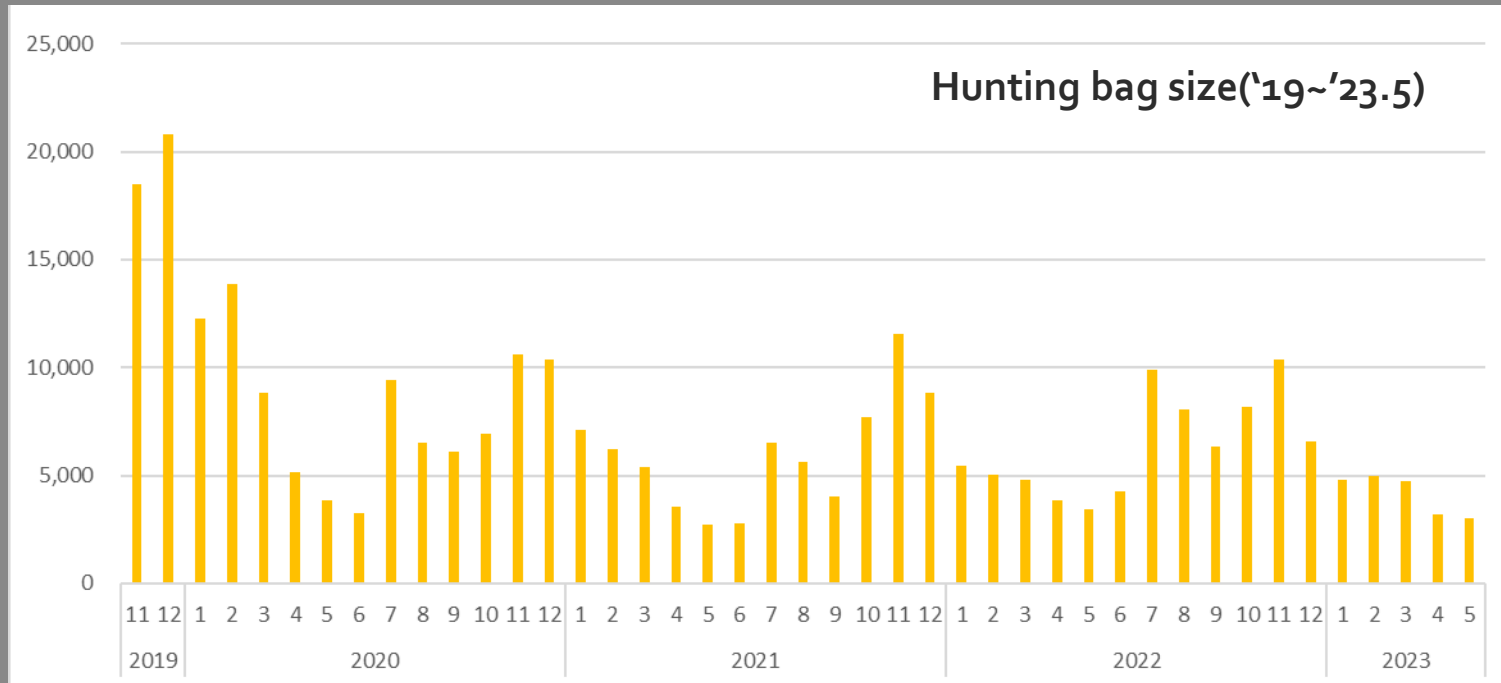
- 44 months since first detection of ASF case in wild boar
- Over 3133 cases reported as of 31<sup>st</sup> of May, 2023
- ASF outbreak spreading from near DMZ region to southern direction



# SURVEILLANCE RESULTS 1

CATEGORY		NO. OF SAMPLES (%)
YEAR	2019	4,760
	2020	12,361
	2021	17,136
	2022	<b>65,785</b>
	2023	22,001
SEASON	Spring (Mar.-May)	26,319 (21.6)
	Summer (Jun.~Aug.)	29,971 (24.6)
	Fall (Sept.~Nov.)	<b>35,204 (28.8)</b>
	Winter (Dec.~Feb.)	30,549 (25.0)
TYPE	Carcass	9,650 (7.9)
	Hunt	<b>104,619 (85.7)</b>
	Trap	7,771 (6.37)

- Samples from (31<sup>st</sup>, May, 2023);
  - Carcass search: 9,650 samples
  - Hunted/trapped individuals: 112,393 samples
  - \* 365,782 caught('19~'23.5)





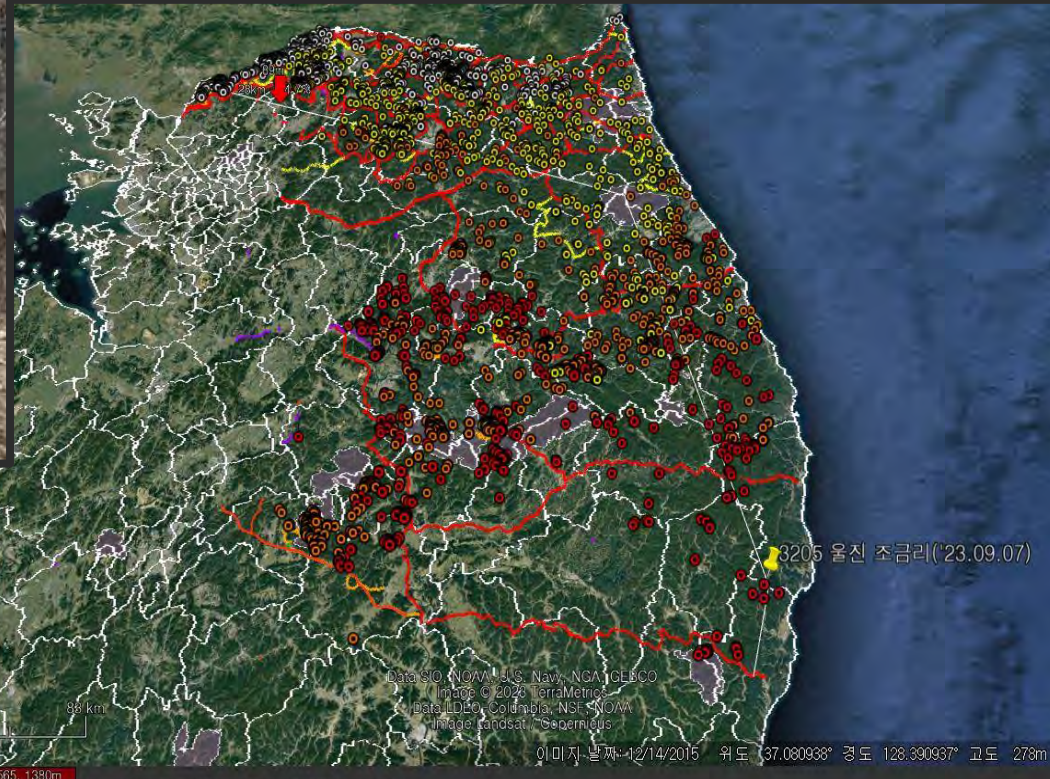
# SURVEILLANCE RESULTS 2

- **POSITIVE CASES**(31<sup>st</sup>, May, 2023);
  - Carcass: 2838 positives/ 9,650 samples (90.6% OF TOTAL POSITIVES)
  - Hunted: 238 positives/ 104,619 samples
  - trapped: 59 positives/ 7,774 samples

	No. of positives (total)				% of positives (CI 95%) from total sample size			
	Total	Carcass	Hunting	Trap	Total	Carcass	Hunting	Trap
<b>2019</b>	78(4,760)	73(836)	4(2,773)	1(1,151)	1.64[1.28-2.00]	8.73[6.90-1.08]	0.14[0.00-0.28]	0.09[0.00-0.26]
<b>2020</b>	874(12,361)	827(3,287)	24(6,953)	23(2,121)	7.07[6.63-7.53]	25.16[23.68-26.64]	0.35[0.21-0.48]	1.08[0.64-1.52]
<b>2021</b>	<b>966(17,136)</b>	853(2,454)	90(12,882)	23(1,800)	5.64[5.29-5.98]	34.76[32.88-36.64]	<b>0.70[0.55-0.84]</b>	<b>1.28[0.76-1.80]</b>
<b>2022</b>	<b>865(65,785)</b>	747(2,106)	110(61,848)	8(1,831)	1.31[1.23-1.40]	<b>35.47[33.43-37.51]</b>	0.18[0.14-0.21]	0.44[0.13-0.74]
<b>2023</b>	352(22,001)	338(967)	10(20,163)	4(871)	1.60[1.43-1.77]	34.95[31.94-37.96]	0.05[0.02-0.08]	0.46[0.01-0.91]
<b>Total</b>	3,135(122,043)	2,838(9,650)	238(104,619)	59(7,774)	2.57[2.48-2.66]	29.41[28.50-30.32]	0.23[0.20-0.26]	0.76[0.57-0.95]

# DIFFICULTIES AND LIMITATIONS

- Geographical factors
  - high altitude
  - mine fields/military sites

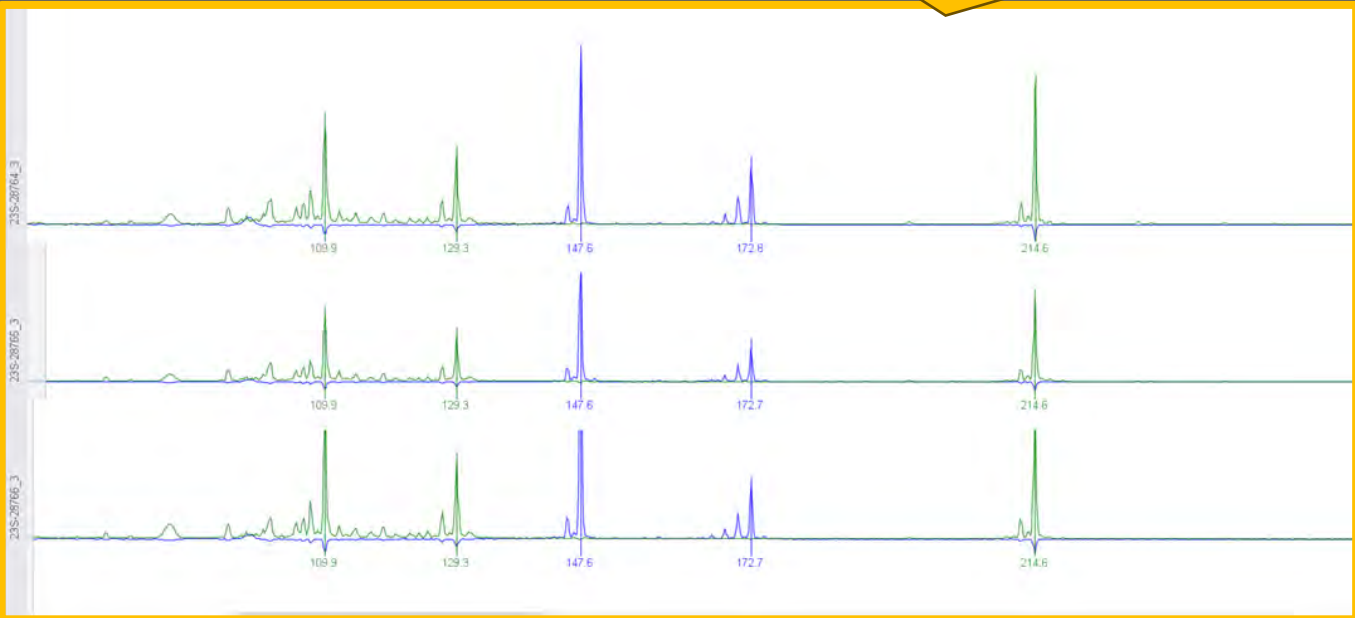




# DIFFICULTIES AND LIMITATIONS

- Human behavior
- replicate samples
- false report/information
- illegal use of hunting dog

*Different samples revealed as a single individual*



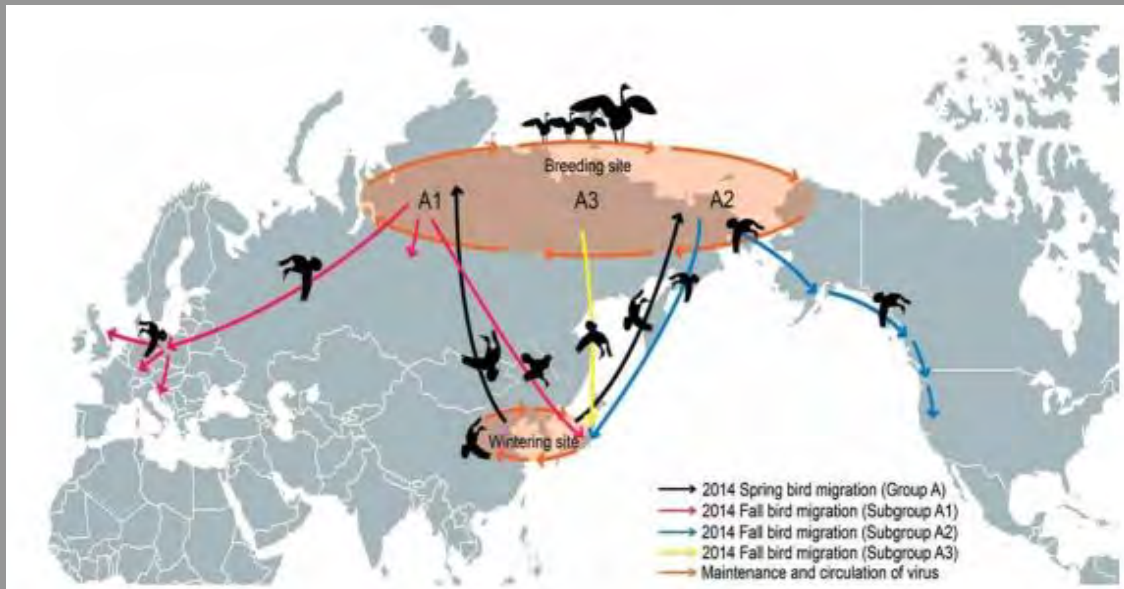
## Replicate sample analysis- Yeongdong province

기간	# of tested samples	% of replicate samples
'22.May-June	207	17.39(%)
July 1st~13rd	178	28.09(%)
Jusy 14th~22nd	144	30.5(%)
Total	529	26(%)



# AVIAN INFLUENZA IN WILD BIRDS 1

□ Overseas Surveillance: Enhance the Monitoring on Various Influx Routes of HPAI



< Flyways and Diffusion of H5N8 AI (2014-2015) >

*\*Source: Journal of Virology*

- (Before Influx) Monitoring overseas habitats & flyways
- (Influx Period) Monitoring early stopover of migratory birds & annual HPAI detected regions
- (After Influx) Strengthening regular and special monitoring on habitats for migratory birds in the nation

## Early AI Monitoring at Sentinel Station

- Operating field station at east border area of Mongolia

\* Ganga lake, Mongolia



< '23.8.14~19, AI Monitoring in Mongolia >



# AVIAN INFLUENZA IN WILD BIRDS 2

## Within country surveillance ('23/'24 season)

- Feces in wild birds : >10,670
- Live-captured wild birds : 1,020 birds
- Carcasses : Variable (1,034 for 2022-23)

FECES



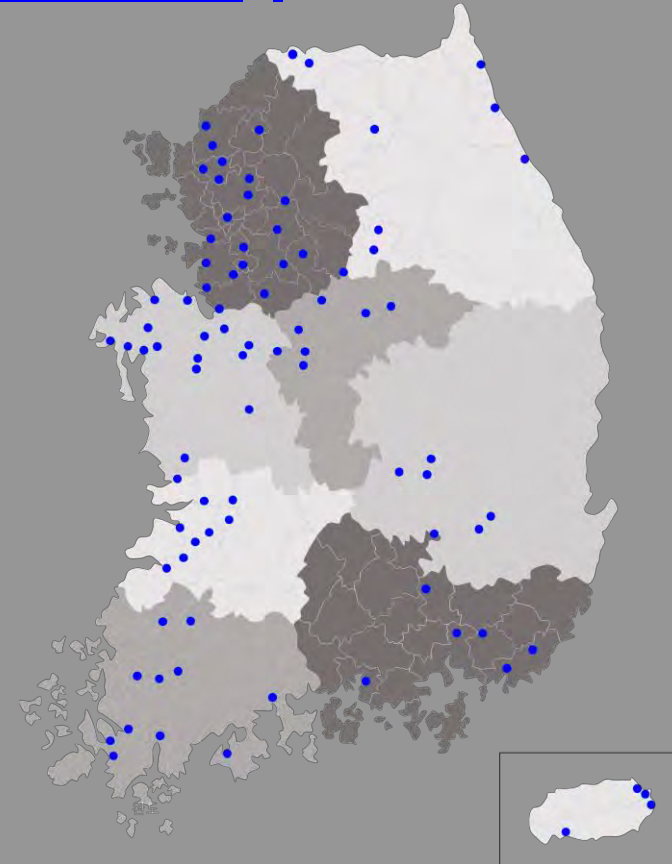
CAPTURED



CARCASS



Total 87 sites +  $\alpha$  (2 Preliminary sites)

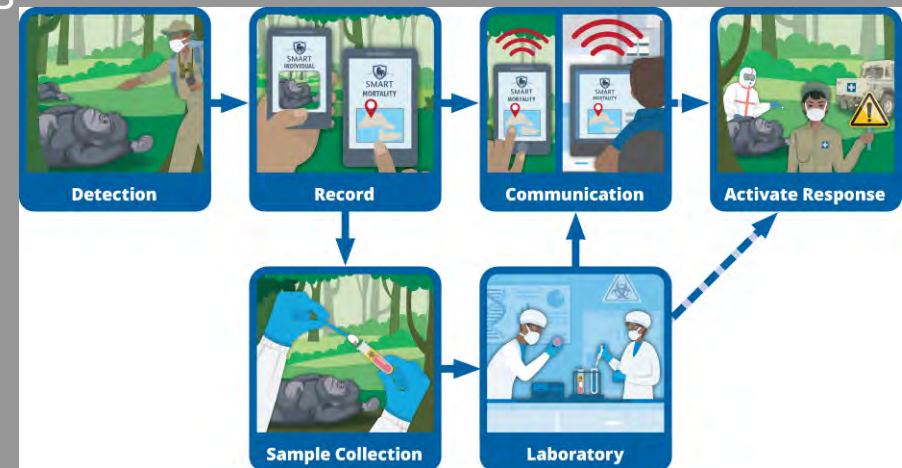


< Surveillance sites for wild bird feces >



# GENERAL WILDLIFE HEALTH SURVEILLANCE

- WILDLIFE SURVEILLANCE NETWORK SYSTEM
- Currently, samples from various source are collected and tested for selected high priority pathogens depending on the species (e.g. SFTS, AI, FMD, *Brucella* sp., *M. bovis*, q-fever, rabies, CPV, *T. gondii*, New castle virus)
- Nevertheless, national-level wildlife passive surveillance system to be established for better understanding of wildlife population health status
- Require network of field-work personnel and ecologists to acquire carcass sample of various wild animals: inherently difficult to find and to process
- Require long time and effort to educate and advocate the system
- Good progress on wild boars and waterfowls(esp. in winter), consistent effort being invested to set up system for other wild animals





# ZOO POPULATIONS

## • ACT ON THE MANAGEMENT OF ZOOS AND AQUARIUMS

(Ministry of Environment. Act no. 19086, Dec. 13<sup>th</sup>, 2022)

- zoological institutions must perform regular surveillance of zoo collection for diseases designated by the law\*.
  - positive animals must be reported to relevant governmental entities (Ministry of environment and NIWDC)
- 
- NIWDC is in process to establish zoo disease management protocols for disease of interest



### Outbreak of *Mycobacterium spp.* at Seoul Zoo('21~'22)

- 50 animals died or euthanized
- 43 animals from 7 species confirmed as *M. bovis* positive
- Affected animals include; llama, guanaco, collared peccary, giant anteater



# QUARANTINE

- WILDLIFE PROTECTION AND MANAGEMENT ACT

(Ministry of Environment. Act no. 18908, Dec. 11<sup>th</sup>, 2022)

- NIWDC(MOE) is in process of establishing quarantine system for imported wild animals (reptiles)-planned to initiate in year 2024



# CHALLENGES

- Field reporting network needs to be established → require long-term effort
- Difficulty of delivering samples –develop current system for wide range of animals
- Lack of wildlife population health (disease ecology, spatial epidemiology etc.) expert
- Absence of trained personnel in field work related to wildlife surveillance
- Disproportionate scale of national entities in charge
  - wildlife, agriculture, public health
- Acquiring constant budget for wildlife disease surveillance

# MOVING FURTHER



World Organisation  
for Animal Health  
Founded as OIE

Animal Diseases

Avian Influenza

Observatory

SEARCH

WHO WE ARE

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WHAT WE OFFER

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WAHIS

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Annual Report, 2022

## Protecting wildlife health by enhancing surveillance systems



- What is healthy ecosystem?
- How can wildlife disease surveillance contribute to maintain/improve ecosystem health?
- Can wildlife disease surveillance fill in the ECOSYSTEM piece of the ONE HEALTH pie?

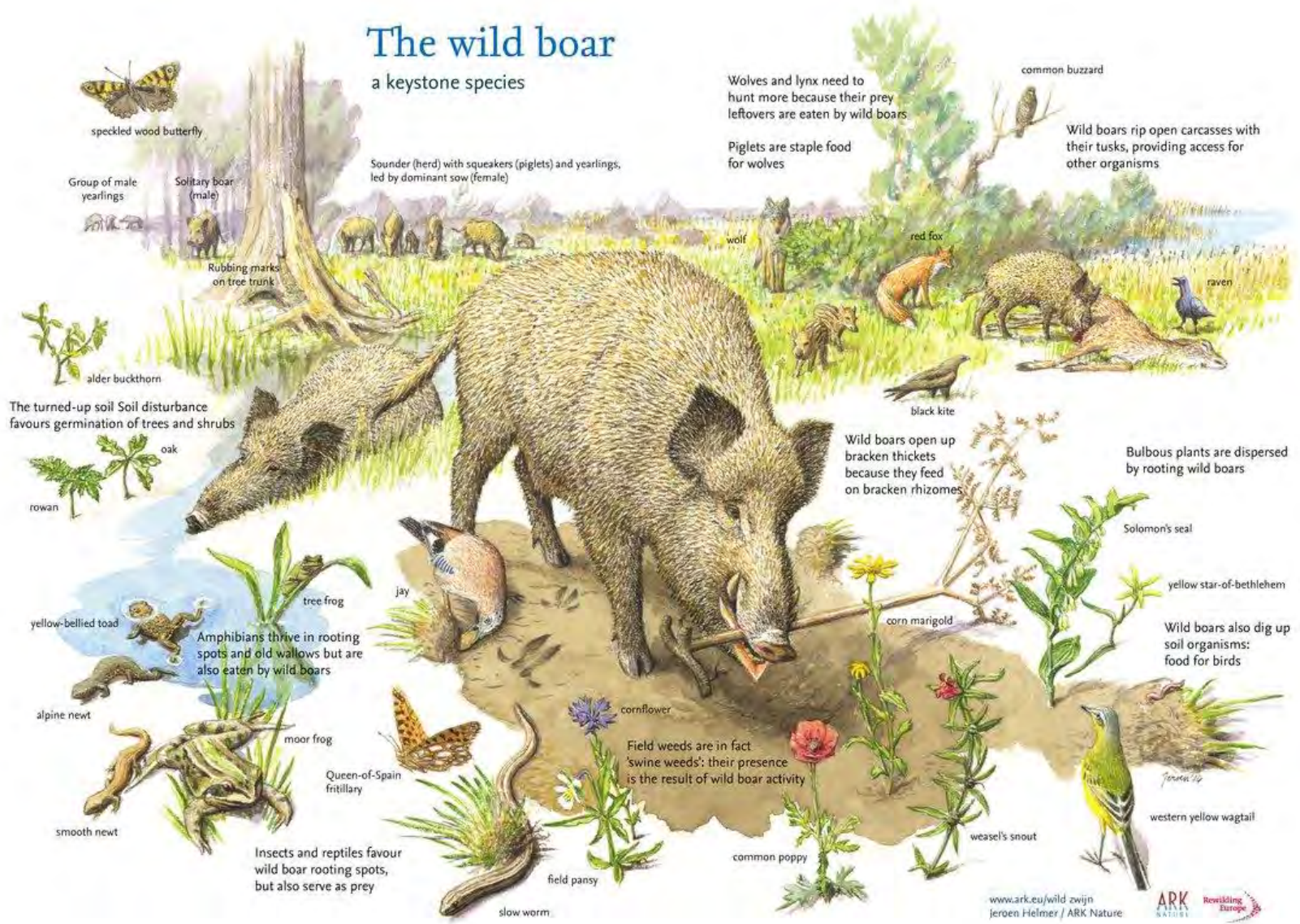
### ONE HEALTH





# The wild boar

a keystone species



# THANK YOU