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Analysis of Wild Boars and Domestic Pigs Interface for African Swine Fever (ASF) Transmission in East Lampung District

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Abstract. The spread of African Swine Fever (ASF), a highly contagious virus affecting pigs. ASF emerged in Indonesia in 2019, leading to significant pig mortality. The disease was detected in wild boars in a Way Kambas National Park (WKNP), prompting investigations. Organ samples (spleen, bone marrow, liver, and lung) were collected from both bodies and tested for ASF using polymerase chain reaction (PCR). All organ samples tested positive for ASF. Concurrently, in domestic pigs, 27 ASF outbreaks were reported in South Lampung and 2 outbreaks in East Lampung. The outbreaks in East Lampung occurred in Braja Selebah, a buffer area for WKNP, and killed nearly 1000 pigs. The study explored the link between wild boar mortality and domestic pig outbreaks, finding evidence of ASF transmission. Poor farm biosecurity and waste management likely contributed to the spread via contaminated rivers. Authorities responded by educating communities, disinfecting farms, and involving various groups for swift case detection. The study confirms that ASF caused wild boar deaths and highlights the interface between domestic pigs and wild boars as a transmission route. Multisectoral measures were implemented to mitigate ASF risks from farms and enhance rapid response capabilities.

Keywords: African Swine Fever, interface, wild boar

INTRODUCTION

African Swine Fever (ASF) is a highly contagious disease in pigs that causes significant economic losses. All pig families (Suidae) are susceptible to ASF infection (FAO, 2017; OIE, 2020). In African wild boars or Warthogs (Pachochoerus aethiopicus and Pachochoerus africanus), ASF is asymptomatic and serves as reservoir hosts for the ASF virus. The virus is transmitted in African forests through the bites of ornithopods ticks in a natural sylvatic cycle. In Asia and Europe, wild boars (genus Sus) are highly susceptible to ASF (DIxon et al., 2020).

The clinical symptoms of ASF in domestic pigs and wild boars are nearly identical, with a Case Fatality Rate (CFR) of 90 - 100% (FAO, 2019), depending on the virulence of the infecting virus. The acute and peracute forms are characterized by severe bleeding, leading to almost 100% mortality. After a short incubation period of 3-7 days, pigs experience high fever, reaching up to 42°C, followed by a loss of appetite, immobility, weakness, and eventual death (OIE, 2020). The ASF virus is highly resilient in the environment and resistant to disinfectants (FAO, 2017), causing significant economic losses (Matsumoto et al., 2021).

The first cases of ASF in Indonesia occurred in North Sumatra in September 2019 (Primatika et al., 2022). The disease was declared an epidemic by the Minister of Agriculture's Decree No. 820/KPTS/PK.320/M/12/2019 on December 12, 2019, and it was announced on the OIE website on December 17, 2019 (OIE, 2020). The disease then spread to several regions in Indonesia, such as Bali, East Nusa Tenggara, and West Nusa Tenggara (Tenaya et al., 2023).

In Lampung, the first cases were reported in South Lampung Regency in July 2020, and it later spread to several other districts (In East Lampung, ASF-related deaths were reported in Way Panji Sub-district in September 2020 (Livestock Office of Lampung Province, 2021). The first cases of wild boars were reported in March 2021 at Way Kambas National Park.

ASF can disrupt forest ecosystems because the disease and resulting deaths lead to a decrease in the forest population, reducing prey for tigers and other predators (Gervasi & Guberti, 2021; Vergne et al., 2020; Bergmann et al., 2021). Environmental risk factors associated with increased ASF incidents in wild boars include seasonal patterns, forest cover, and wild boar habitat (Denstedt et al., 2021; O'Neill et al., 2020; Salazar et al., 2022). Therefore, when ASF has spread to wild boars, intervention and control become challenging (BVet Lampung, 2021; O'Neill et al., 2020).

ASF control is difficult due to multiple factors such as ecology, extensive wild boar habitats, and hunting (Tao et al., 2020). Reintroduction of ASF to domestic pigs can also occur due to

various factors that enable interaction between wild boars and domestic pigs (Vergne et al., 2020).

This study aims to examine the interface between domestic pigs and wild boars in the transmission of the ASF virus and the environmental risk factors contributing to the spread of ASF.

MATERIALS AND METHODS

Materials

- Data on pig profiling and population in the buffer zones around Way Kambas National Park.
- Data on wild pig mortality in Way Kambas National Park
- Laboratory test results data.

Methods

This study is a preliminary investigation aimed at examining the interface between domestic and wild pigs in the spread of ASF and identifying contributing risk factors. The research method involved collecting secondary data, conducting site visits, making observations, and holding focus group discussions (FGD) with stakeholder (Way Kambas National Park and the Livestock Office of East Lampung Distrit) to gather information on pig profiling, data related to Way Kambas National Park and its buffer zones, reports of pig mortality, interactions, and interfaces between domestic and wild pigs, as well as potential risk factors contributing to the spread of ASF.

RESULTS AND DISCUSSION

The results of the profiling data for domestic pig farming in East Lampung can be seen in Table 1.

Table 1. Domestic pig population and farming scale in East Lampung

No	Subdistrict	Pig Population (head)	Type/ Scale of Farm	
			Household Farm	Commercial Farm
1	Batanghari	230	√	√
2	Sekampung	78	√	
3	Marga Tiga	318	√	
4	Sekampung Udik	610	√	√
5	Waway Karya	590	√	
6	Pasir Sakti	100	√	

7	Marga Sekampung	187	√		
8	Labuhan Maringgai	840	√		
9	Way Jepara	523	√		
10	Braja Selebah	186	√		
11	Labuhan Ratu	62	√		
12	Sukadana	35	√		
13	Batanghari Nuban	521			√
14	Raman Utara	1.485	√		
	Total	**5.765**			

(Data Source : Dinas Peternakan East Lampung)

The pig population in East Lampung Regency is quite substantial, with the majority being small-scale community farms, typically owning an average of 2 to 5 pigs each. The pig farming practices are semi-intensive, with pigs sometimes confined but occasionally tethered or allowed to roam within the yards. Biosecurity measures are generally subpar, with traditional management practices.

In February 2020, pig deaths were reported in the districts of Sekampung Udik and Raman Utara in East Lampung. Furthermore, in September 2020, pig deaths were reported in the Braja Selebah district, with a death toll ranging from 684 to 1,000 pigs. In Way, Kambas National Park, in March 2021, 18 wild pigs were reported dead at various locations. Laboratory diagnostics conducted by the Lampung Veterinary Center using the RT-PCR method confirmed positive results for African Swine Fever (ASF). Further details on pig deaths are provided in Table 2.

Table 2. Report of wild and domestic pig deaths in East Lampung

No	Outbreak	Type of Pig	Number of Deaths (head)	Location
1	February 2020	Domestic Pigs	200-500	Subdistrict Sekampung Udik, Lampung Timur
2	February 2020	Domestic Pigs	100	Subdistrict Raman Utara, Lampung Timur
2	September, 2020	Domestic Pigs	684-1000	Subdistrict Braja Selebah, Lampung Timur
2	March, 2021	Wild Boars	18	Way Kambas National Park

(Data Source : Dinas Peternakan dan Kesehatan Hewan Province of Lampung and iSIKHNAS)

Analysis of the E183L gene revealed that ASFV isolates originating from South Sumatra and Lampung were identical to other genotype II ASFV isolates from Georgia, China, Vietnam, and Timor Leste. No difference was observed in the nucleotide sequences of ASFV in the target gene E183L between domestic pigs and wild-boar virus isolates. (Anggy et al., 2023). Considering the timeline of the ASF outbreak, it is likely that the outbreak in wild pigs originated from the outbreak in domestic pigs.

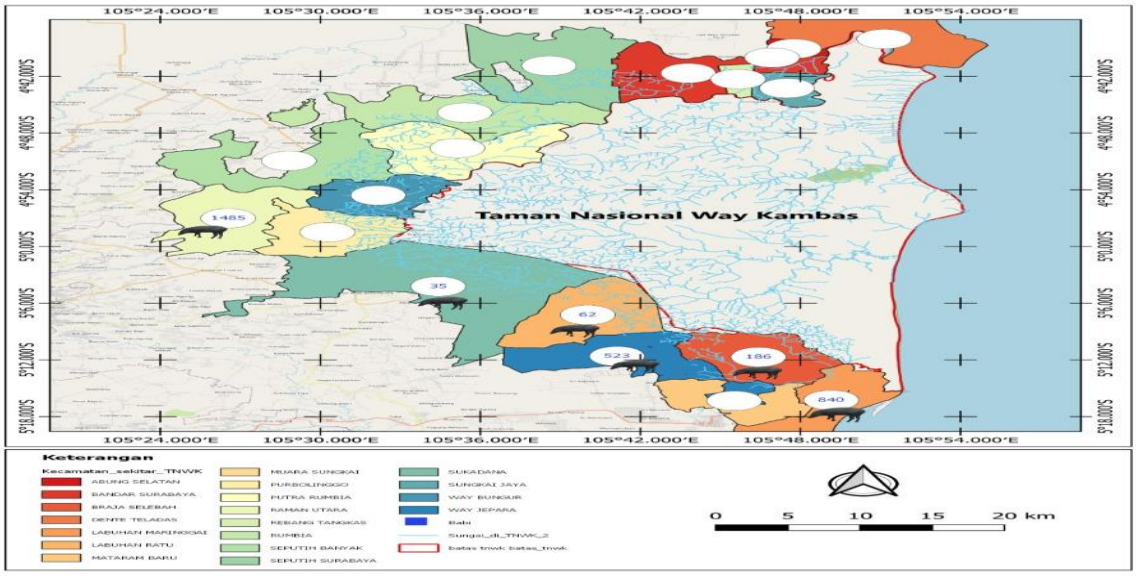

Figure 1. Map of Way Kambas National Park along with the subdistricts and surrounding villages near the National Park.

In East Lampung, the analysis results indicate a connection between ASF cases in wild pigs and domestic pigs. This happens due to environmental contamination through river streams, scavenging activities, or from hunters who had prior contact with ASF-positive domestic pigs. Scavenging activities can widely spread the ASF virus in the forest. Research conducted in Europe regarding these activities detected 13 mammals and 9 birds involved in spreading the ASF virus through scavenging activities (More et al., 2018).

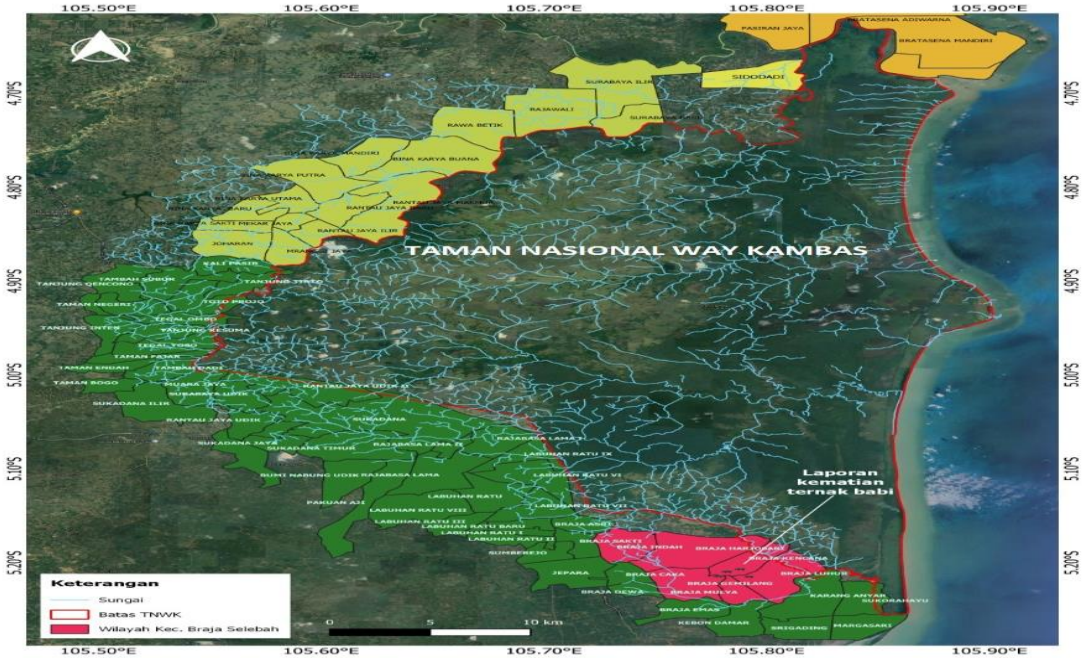

Figure 2. Map of reported cases of domestic pig deaths

From Figures 1 and 2, it can be observed that domestic pig deaths occurred in the buffer areas with a significant number ranging from 685 to 1000 pigs, and multiple river streams are flowing towards Way Kambas National Park. Some deaths occurred sporadically and were not reported for domestic pigs. In the case of wild pigs, there were sporadic deaths even before the reported ASF cases, as evidenced by the discovery of bone remains and carcasses of pigs during patrols within the Way Kambas National Park.

In addition to being found in organs, the virus was also detected in urine and feces in the environment (Saswiyanti, 2020), indicating viral shedding. This is a concern given the resilience of the ASF virus in the environment and its resistance to disinfectants (Vergne et al., 2020). The Food and Agricultural Organization (2017) states that the ASF virus can survive in feces at room temperature for 11 days, in boneless meat for 105 days, and in contaminated pens for up to one month.

The Case Fatality Rate (CFR) in wild pigs due to ASF is 90-95% (FAO, 2019). Compared to domestic pigs, wild pigs have a higher susceptibility, making them more likely to become infected when in contact with the ASF virus (Sánchez-Cordón et al., 2019). The risk factors for ASF occurrence in Medan are closely related to ports and are estimated at 57% (Primatika et al., 2022).

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Controlling ASF is challenging due to numerous contributing factors such as ecology, extensive pig roaming areas, habitat, and hunting (Tao et al., 2020; Ungur et al., 2022). The retransmission of ASF to domestic pigs can also occur due to various factors that enable the interface between wild and domestic pigs (Vergne et al., 2020). Research in Europe has shown the interface between domestic and wild pig density, allowing modeling for abundance indices of wild pigs in the wild to facilitate interventions in high-risk areas (ENETWILD consortium).

LIMITATION

Due to data limitations related to wild pig abundance indices, death data, and hunting activity data, the density of wild pigs cannot be predicted, and the spatial analysis of the interface is only qualitative. Modeling and mapping related to high-risk intervention areas cannot be conducted.

CONCLUSION

Based on the analysis results and data, it can be concluded that there is an interface connection between ASF cases in domestic pigs in the Braja Slebah district, East Lampung Regency, and wild pigs in Way Kambas National Park. The transmission of the ASF virus in both domestic and wild pigs can occur through direct and indirect transmission via carcasses of dead pigs, which can contaminate the environment and spread through river streams, scavenging activities, hunting, and the excretion of sick animals.

RECOMMENDATIONS

The study can be continued with a quantitative spatial analysis of the interface linkages with more comprehensive data availability, allowing modeling and mapping of high-risk areas for control interventions to be conducted.

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