

Correlations in Avian Influenza prevalence between poultry farms, backyard poultry and wild birds as a hallmark of failing farm biosecurity in Bangladesh

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Introduction

- Globally avian influenza is one of the most potent zoonotic diseases
- Over the past decade outbreaks of highly pathogenic avian influenza (HPAI) H5N1 have greatly impacted on poultry and human health worldwide
- HPAI H5N1 is now endemic in Bangladesh
- Commercial poultry of Bangladesh suffered the most
- Wild birds are considered to play a role as a vector for dispersal of HPAI

Aims

In this study we assessed the consequences of currently prevailing bio-security practices in Bangladesh by:

- sampling commercial poultry, backyard poultry and wild birds in and around farms where a supposed AIV outbreak had just taken place and comparing these birds' AIV and AIV sero-prevalence with those of birds sampled around putative non-outbreak farms
- assessing the correlations in the AIV and AIV antibodies between the three bird groups. These analyses were both done using broad detection of AIV and AIV antibodies and for AIV subtypes H5, H7 and H9 in isolation

Methodology

- Duration of study:** November 2014 till March 2015 and November 2015 till March 2016
- Sampling in Bangladesh**
 - 28 suspected AI outbreak and 25 non-outbreak commercial poultry farms (Fig 2)
 - Backyard poultry in vicinity
 - Resident wild birds in vicinity
- Samples:** Cloacal and tracheal swabs and Blood
- Diagnostic techniques:** c-ELISA, HI, rt-PCR (using AAHL protocol)
- Statistical analysis** using R-software
 - GLM
 - Spearman rank correlation

Result

Fig 1. Correlations of AIV prevalence between commercial poultry and household chickens. The lower-left panel contains the correlation plot between the two bird groups, where data points are jittered to facilitate visual interpretation. Solid line indicate a significant positive correlation between bird groups (reduced major axis line is drawn). The panels along the diagonal contain names and box and whisker plots of AIV prevalence in commercial poultry and household chickens in and around putative outbreak (dark grey) and non-outbreak (light grey) commercial poultry farms. Depicted are medians, 25 and 75 percentiles (box), outliers (dots), and non-outlier maximum and minimum values (whiskers). Upper-right panel contains sample size (number of farms, N), Spearman rank correlation (Rs) and P value.

Fig 2: Map of the study sites. Circular points indicates putative outbreak (dark grey) and non-outbreak (light grey) commercial poultry farms.

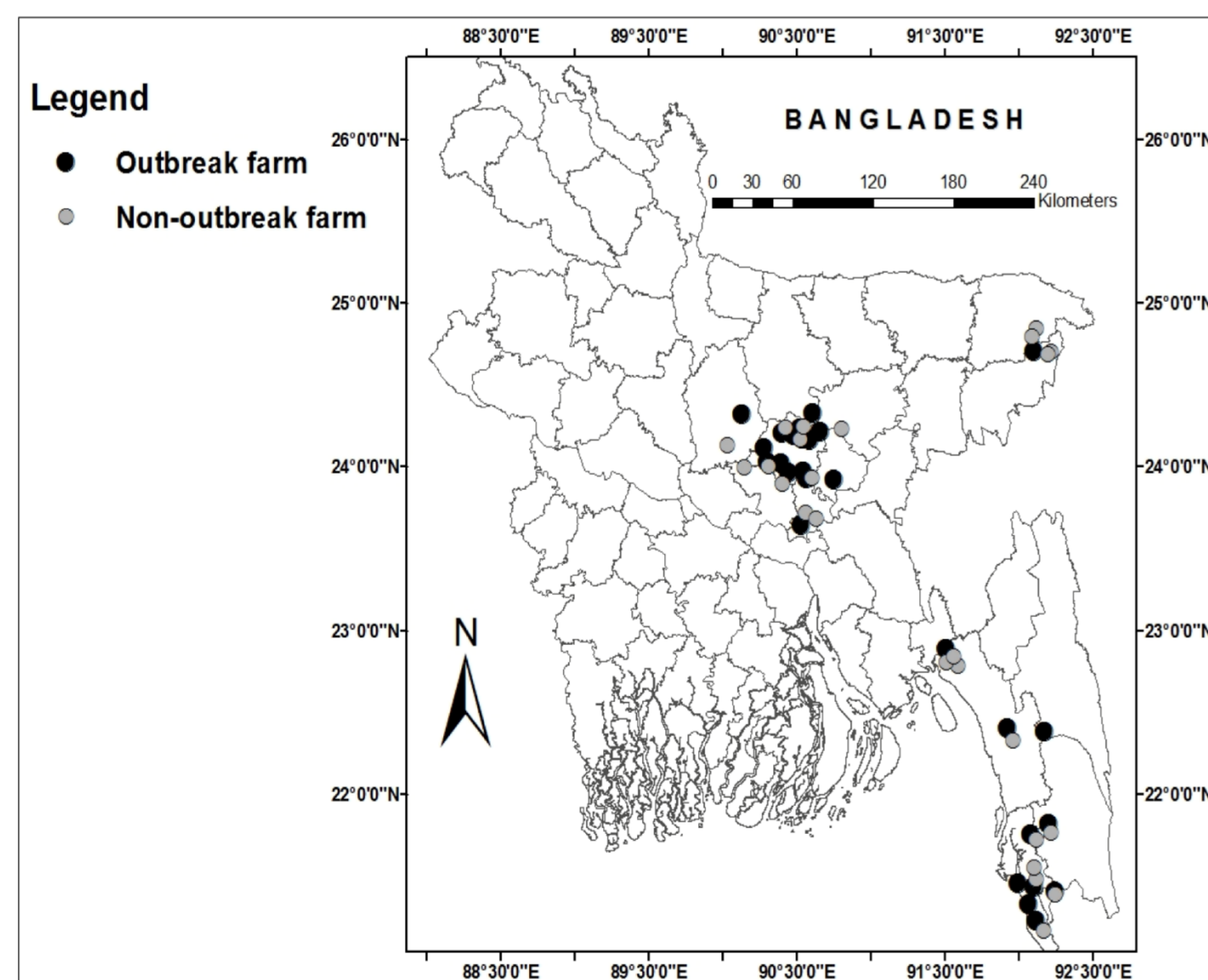
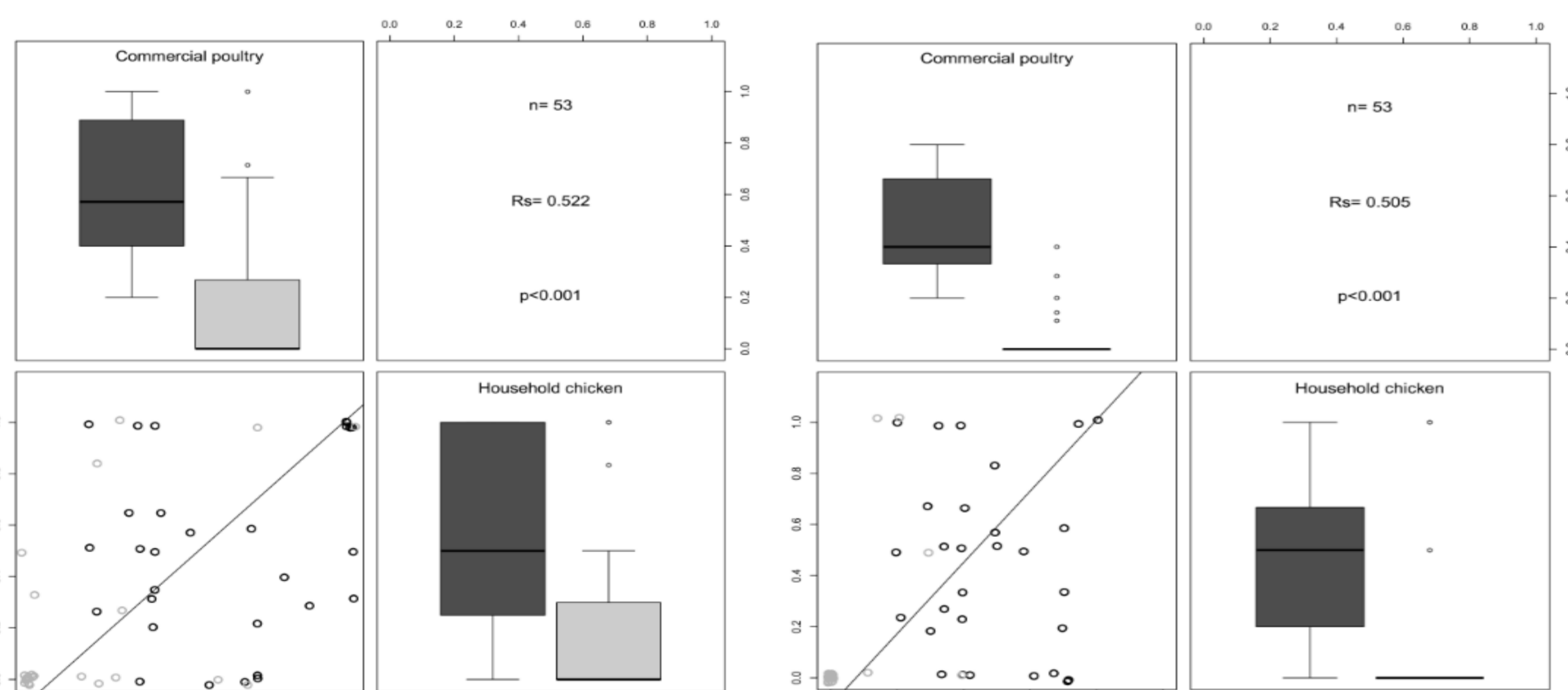


Fig 3: Correlations of AIV H5 prevalence between commercial poultry and household chickens. (layout following layout in Fig. 1)



Result (continued)

Fig 4. Correlations of AIV antibody prevalence between commercial poultry and backyard poultry (i.e. household chickens and household ducks) and Asian pied starlings. (layout following layout in Fig. 1)

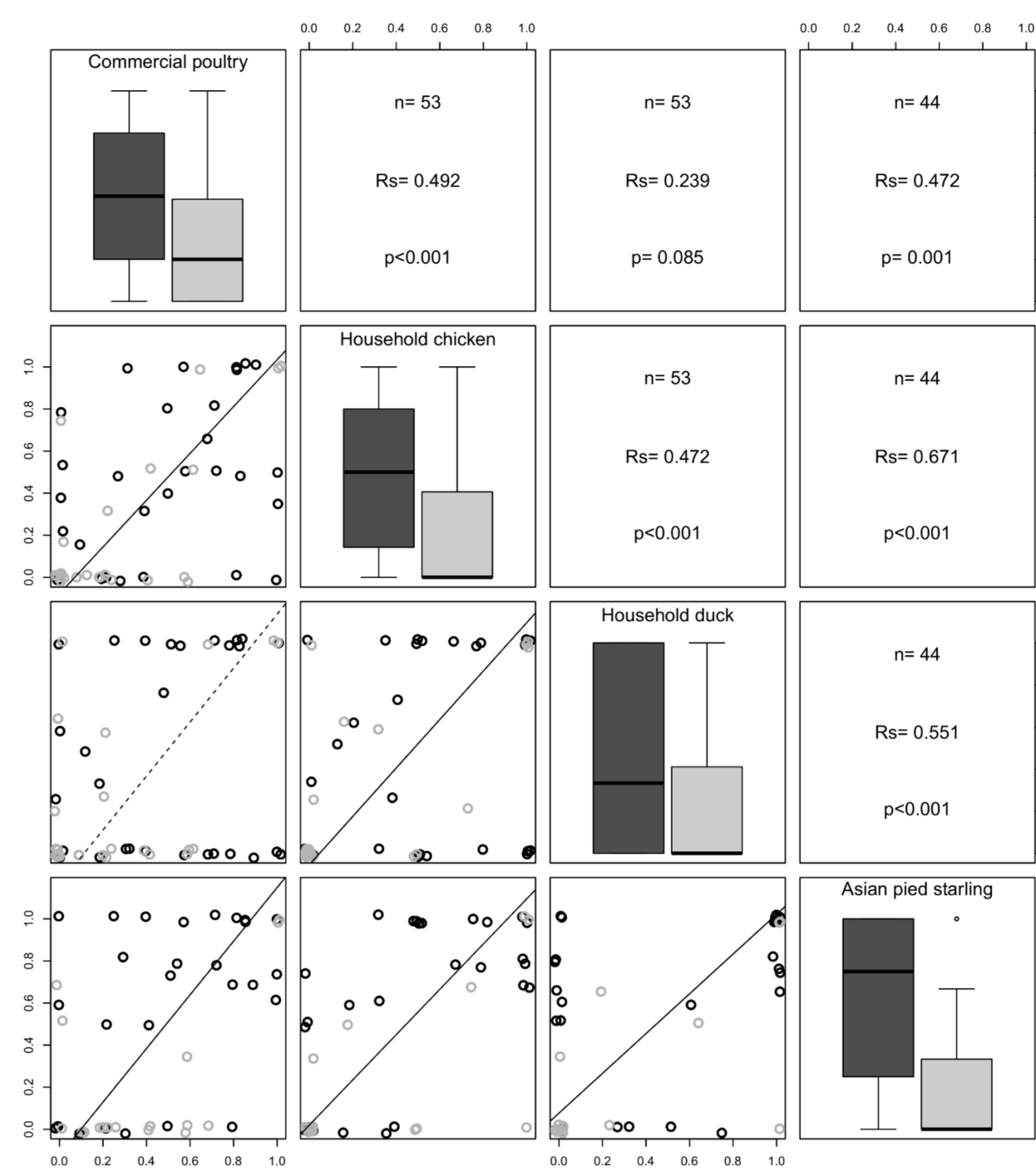
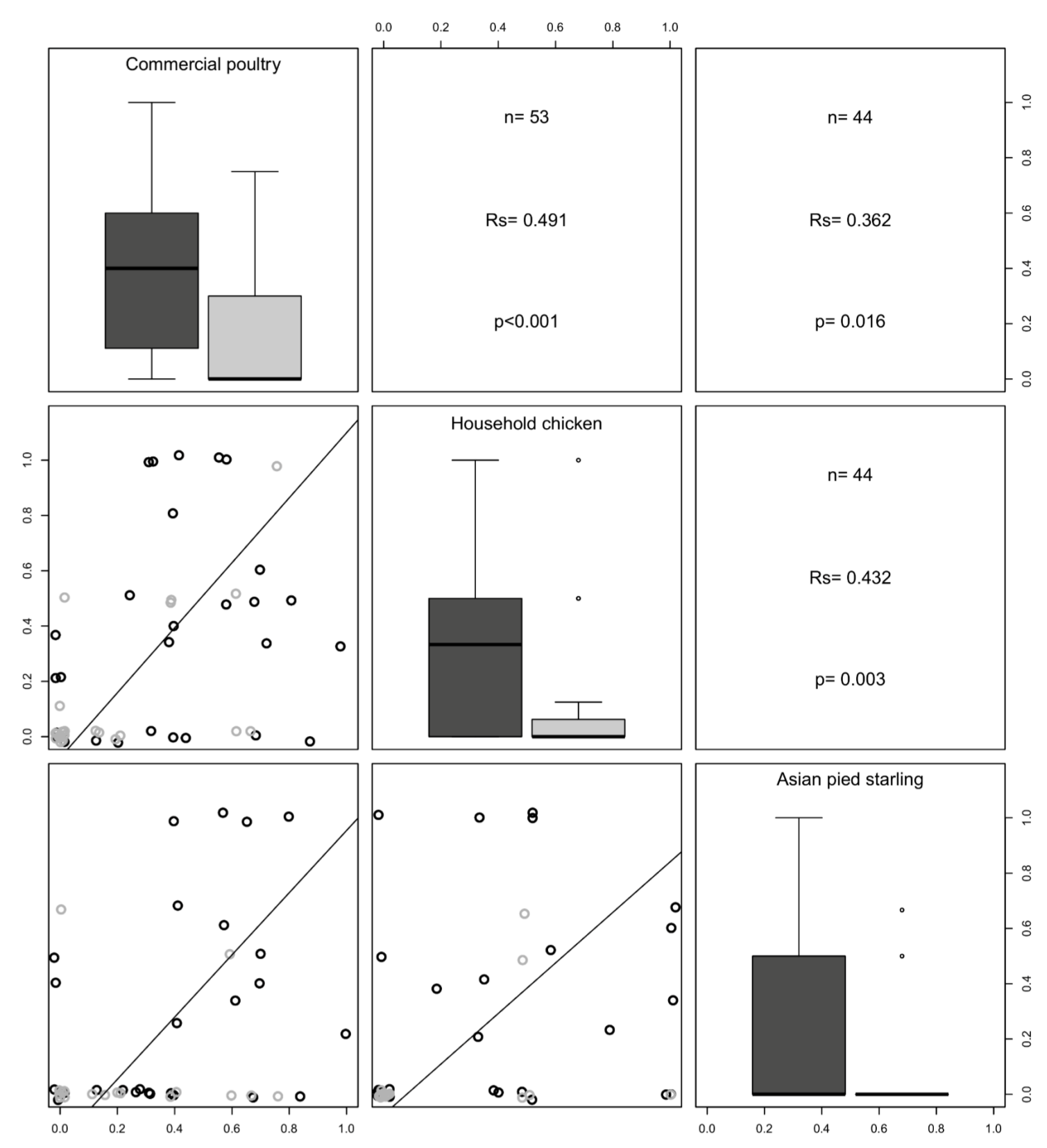
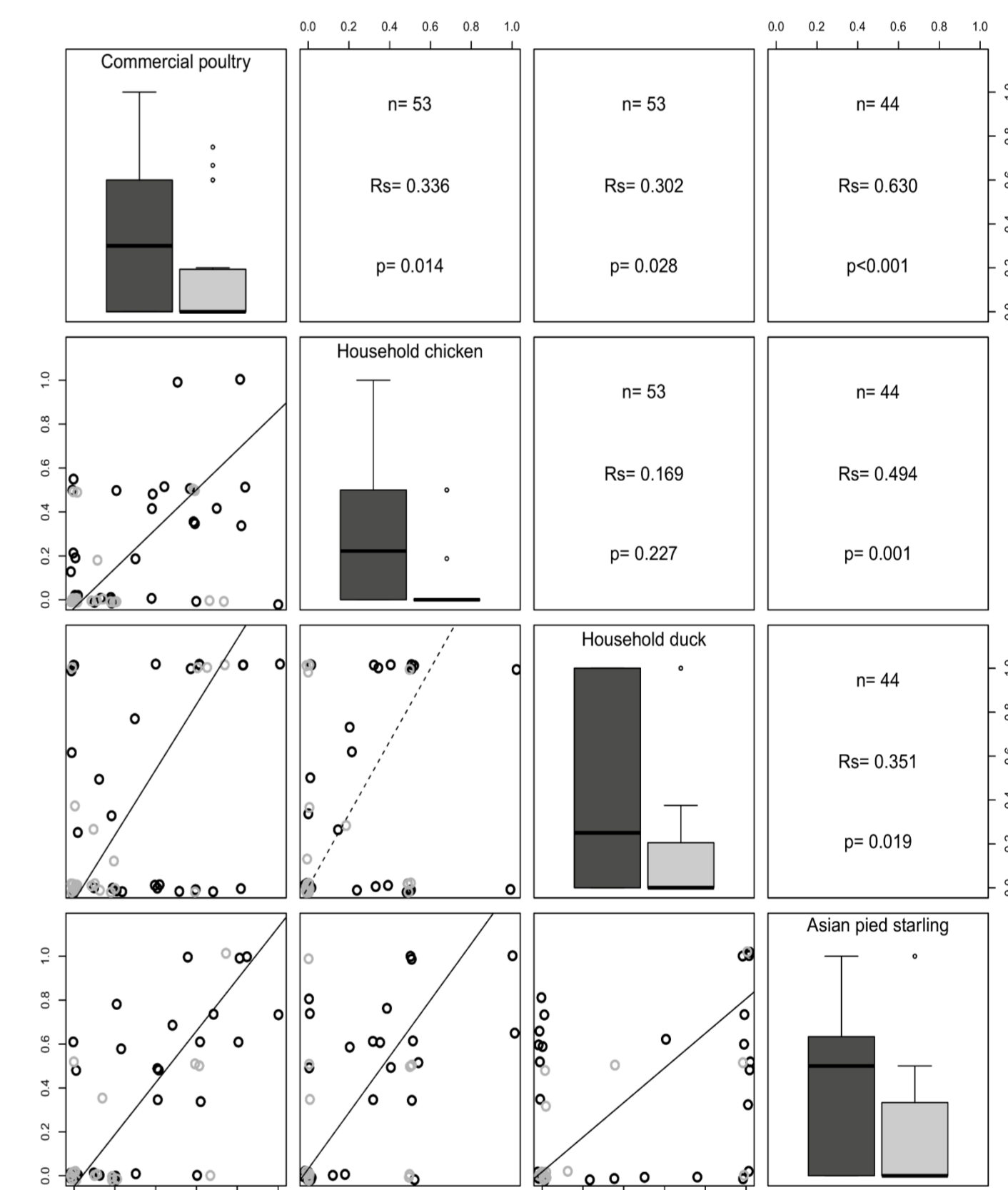


Fig 5. Correlations of AIV antibody H5 prevalence between commercial poultry and household chickens and Asian pied starlings. (layout following layout in Fig. 1)



Results (continued)

Fig 6. Correlations of AIV antibody H9 prevalence between commercial poultry and backyard poultry (i.e. household chickens and household ducks) and Asian pied starlings. (layout following layout in Fig. 1)



- We generally found significantly higher AIV and AIV antibody prevalence levels in commercial poultry in outbreak compared to non-outbreak farms
- Similar differences were found in both backyard poultry and wild birds living in the direct vicinity of outbreak compared to non-outbreak farms
- Along with this we found significant correlations of AIV and AIV antibody prevalence between commercial poultry, backyard poultry and wild birds living in the direct vicinity of the farms
- Our data suggest considerable exchange of AIV between these three bird groups

Conclusion

Our study highlights that almost a decade after key biosecurity flaws responsible for the frequent outbreak of AIV were identified in poultry keeping in Bangladesh, the situation is as serious as ever. Reported cases are only identifying the tip of the iceberg. Many here called "non-outbreak farms" also harbour AIV infected poultry and apparently suffer from failing biosecurity. Thus, AIV appears to be readily circulating in both poultry and wild birds, including a large proportion of the potentially dangerous H5 subtype of AIV.

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