



Australian Government

Department of Agriculture, Fisheries and Forestry

IDENTIFYING AUSTRALIAN POULTRY REARING REGIONS AT RISK OF AVIAN INFLUENZA FROM WILD BIRDS: A SPATIAL ANALYSIS



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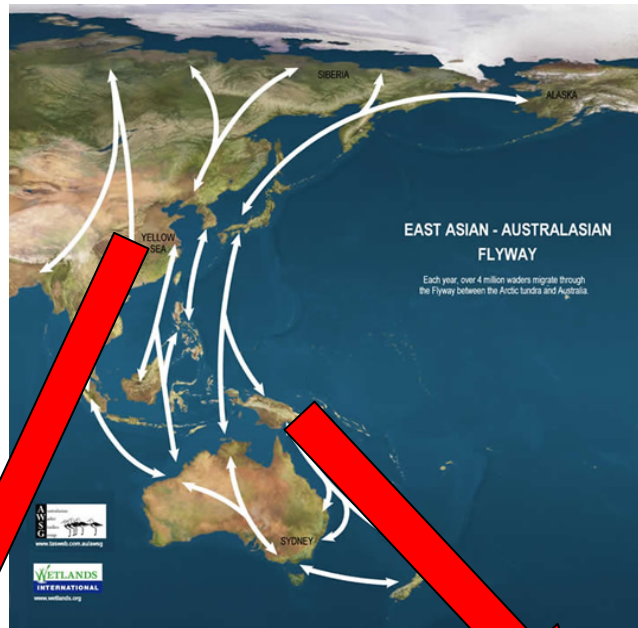
Introduction

- 1. H5N1 Highly Pathogenic Avian Influenza has been present in Asia since at least 1997**
- 2. H5N1 has since spread across Asia, Europe and Africa**
- 3. Both migratory birds and the poultry trade have been implicated in the spread of H5N1**
- 4. What is the risk to Australia?**
- 5. Where should we focus surveillance efforts?**

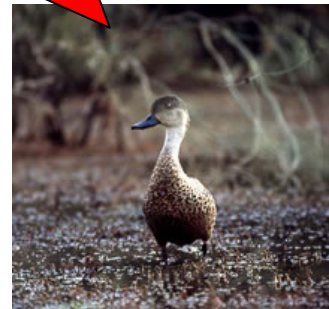
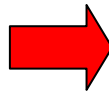
Routes of Introduction

1. Poultry trade – highly regulated and strict quarantine maintained
2. Poultry products – uncooked poultry products are not allowed entry into Australia
3. Illegal bird trade – uncertain risk but not likely to involve birds that will mix with poultry
4. Migratory birds

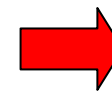
Possible routes of introduction of HPAI



Migratory shorebirds



Native ducks



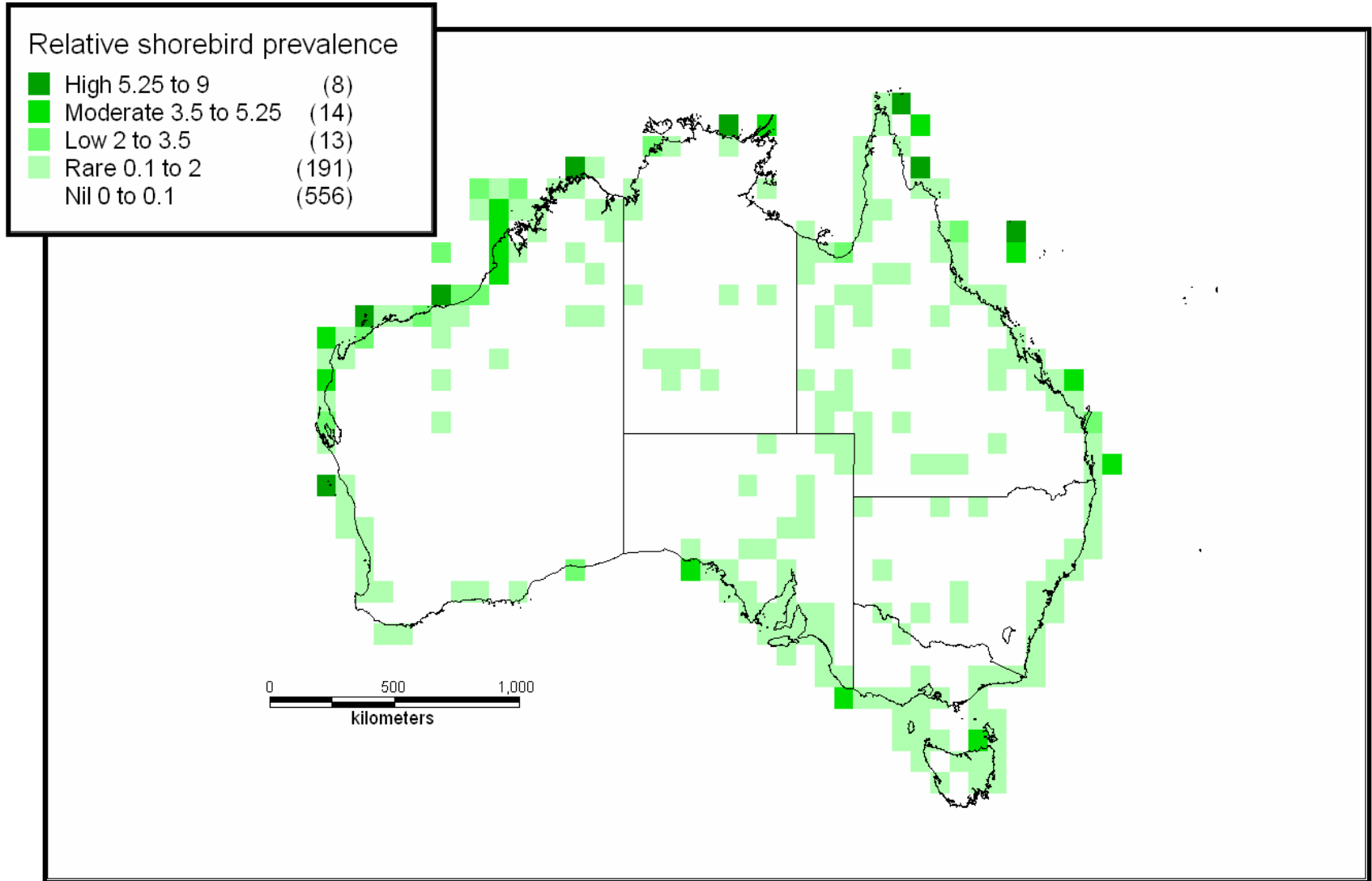
Poultry farms

Step 1. Risk of introduction by migratory shorebirds

- >80 species migrate to Australia in spring from Asia
- Avian influenza isolated from 7 species:
 - Common tern
 - Sooty tern
 - Ruddy turnstone
 - Red-necked stint
 - Red knot
 - Bar-tailed godwit
 - Sharp-tailed sandpiper



Step 1 – Relative risk of introduction - Where are migratory shorebird habitats?

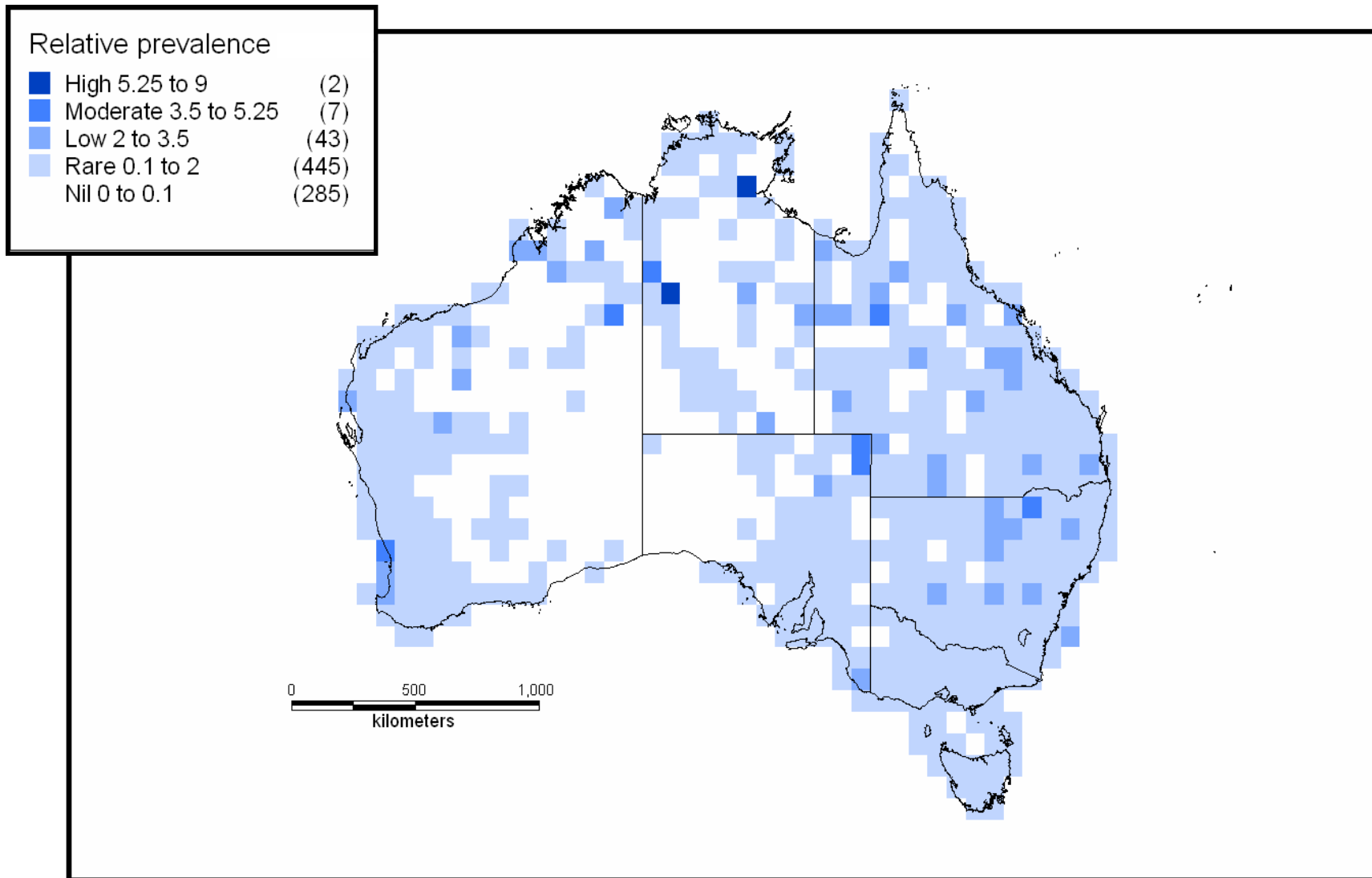


Step 2. Relative risk of establishment in native waterfowl

- **AIV isolated from 25 species of Australian birds including 13 that frequent farms and freshwater bodies**
- **4 most abundant species included in this study:**
 - Grey teal
 - Pacific black duck
 - Plumed whistling duck
 - Eurasian coot



Where are native waterfowl habitats?



Risk Modelling

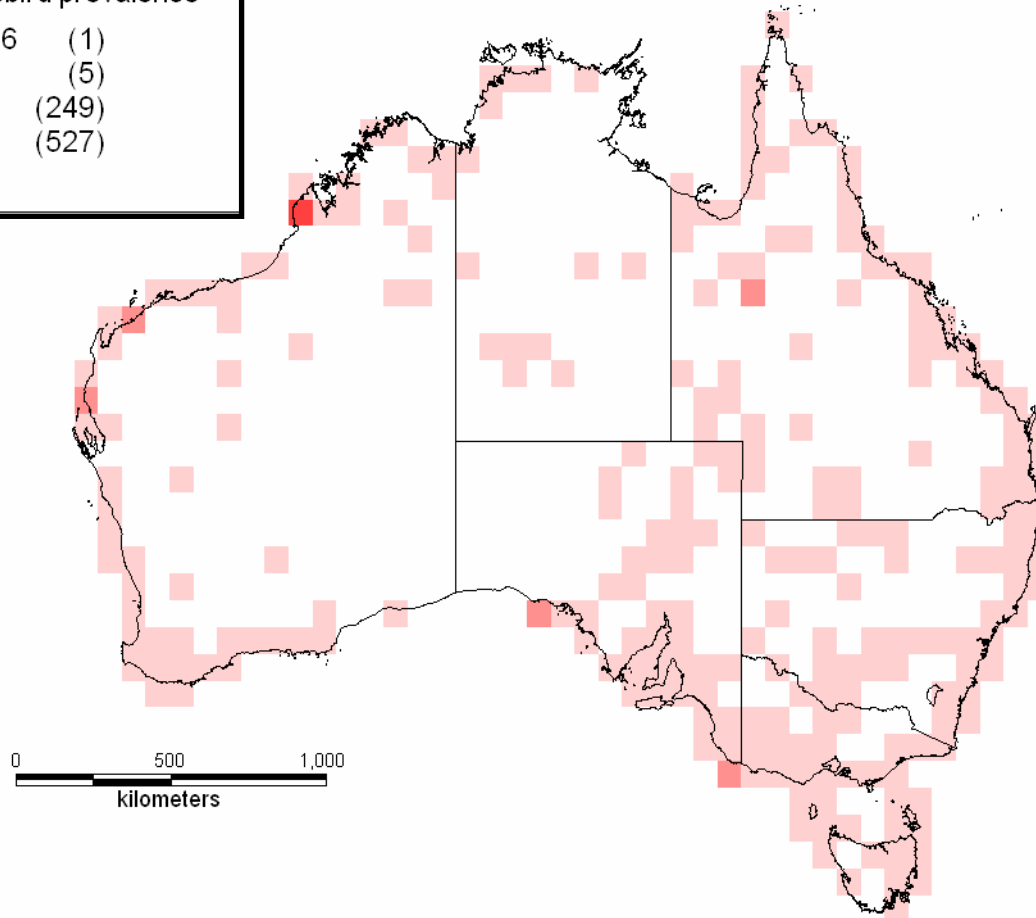
- Our major limitation is the absence of prevalence data because HPAI is not currently found in Australia.
- Thomas et al. (2004) has developed a modelling approach that identifies and uses risk factors to estimate the relative risk of different regions.
- Each risk factor is scaled from 0 to 9. The overall relative risk is the product of the individual risk factors in each region.

$$R(\text{establishment}) = \text{Prev}(\text{shorebirds}) * \text{Prev}(\text{waterfowl})$$

Step 2 - Relative risk establishment = Risk of transfer of HPAI from migratory shorebirds to native waterfowl

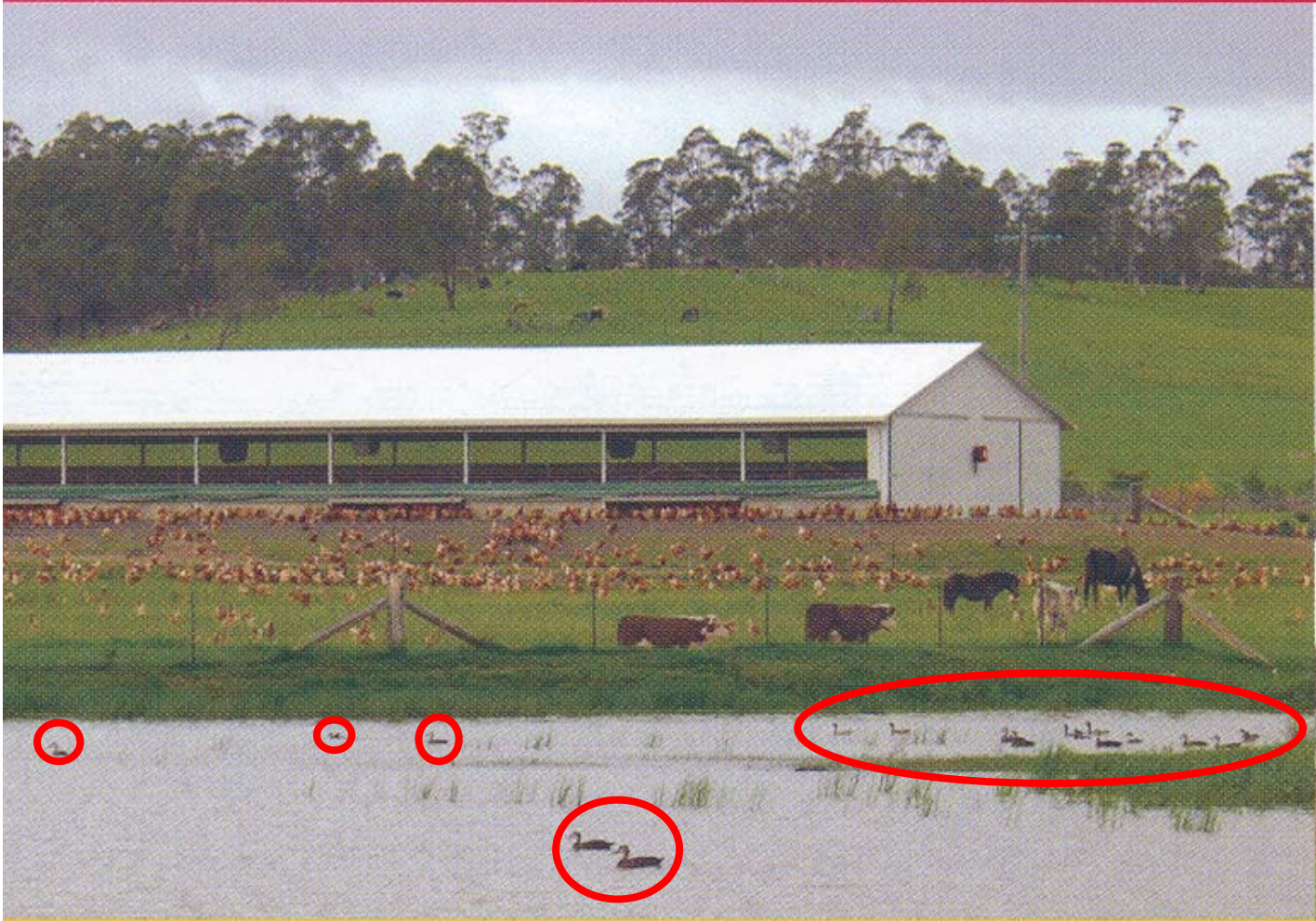
Multiplicative model
Combined duck and shorebird prevalence

■ Moderate	12.25 to 27.6	(1)
■ Low	4 to 12.25	(5)
■ Rare	0.01 to 4	(249)
■ Nil	0 to 0.01	(527)

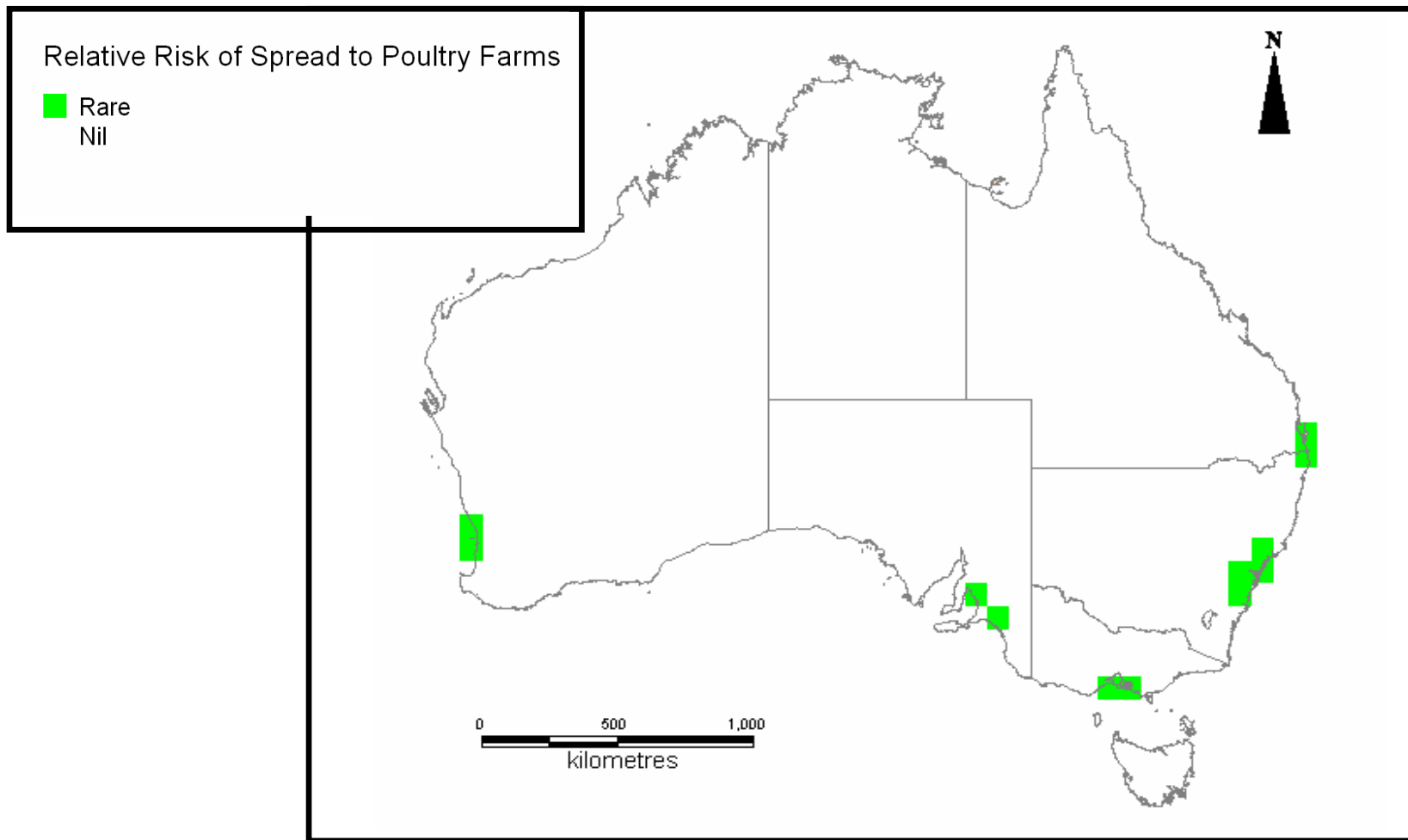


Free Range Eggs

Pasture based farming system



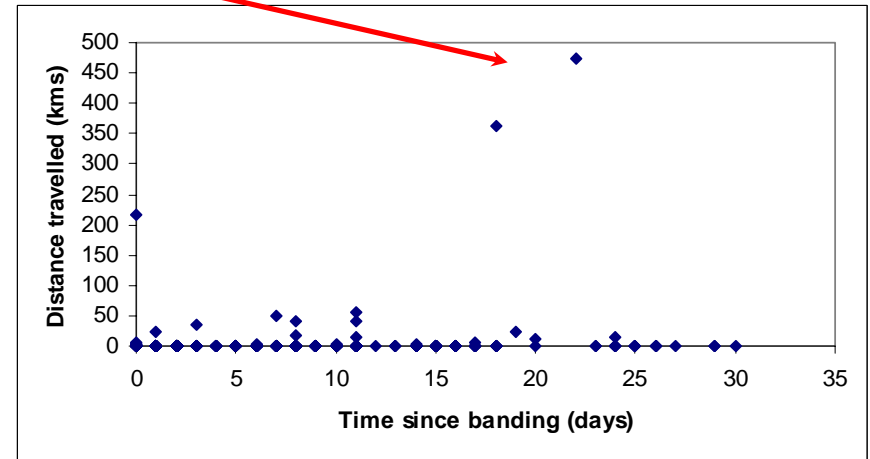
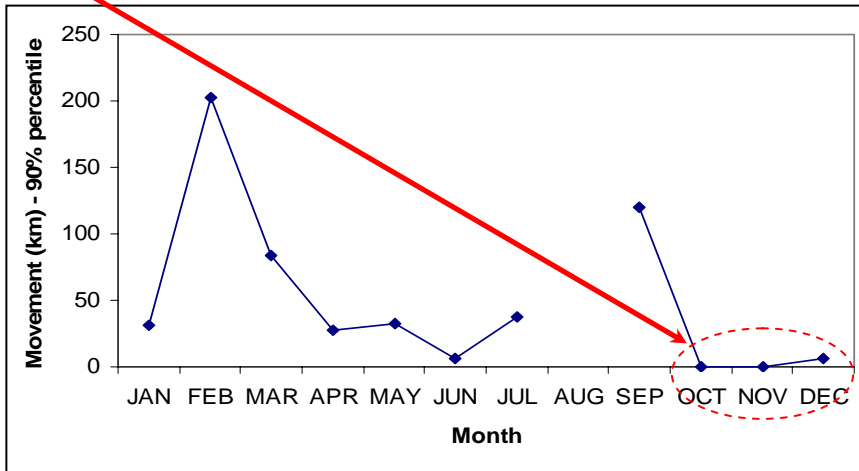
Step 3 – Relative risk of spread to poultry farms



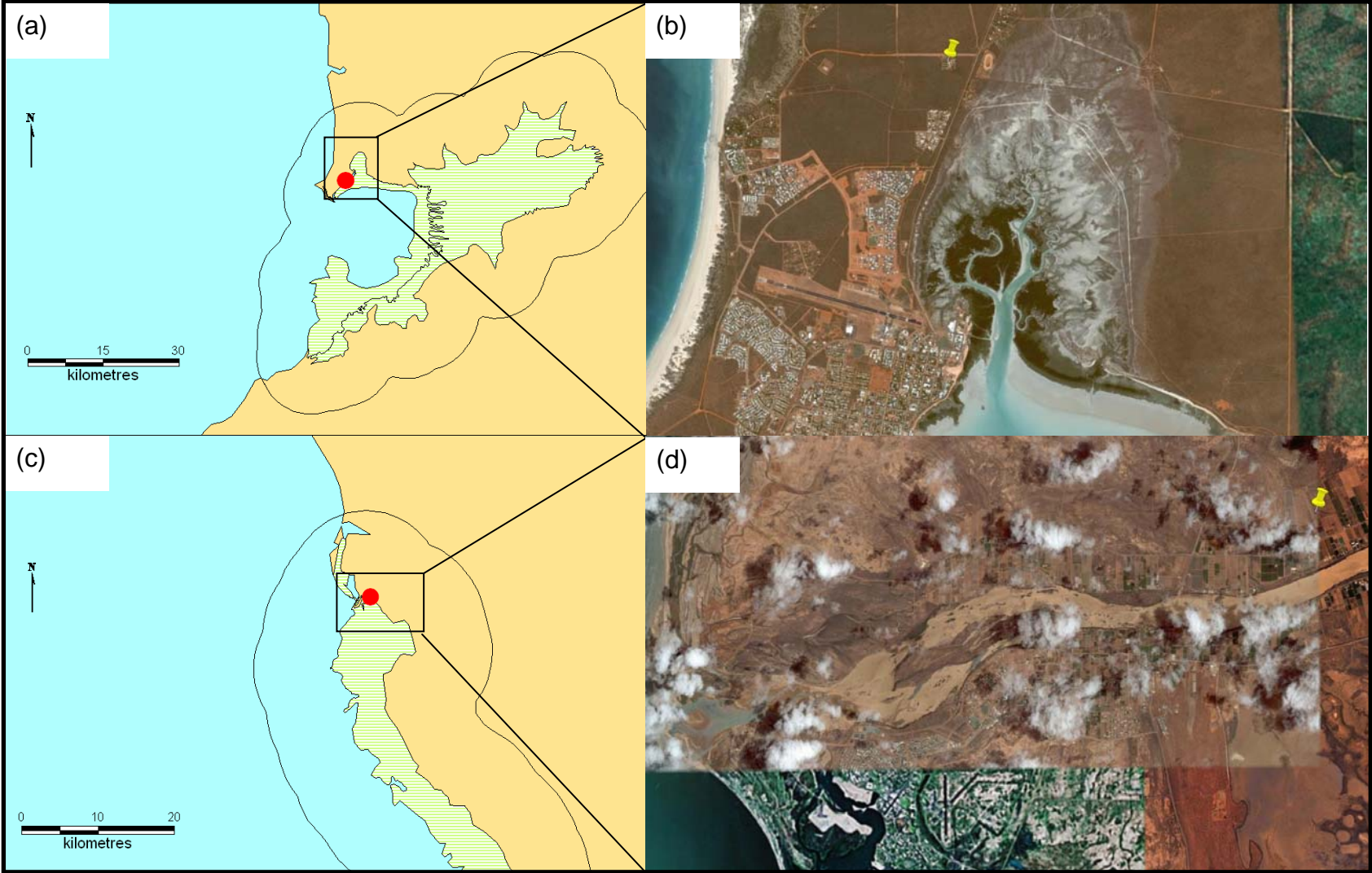
$$\mathbf{Risk}(\text{spread}) = \mathbf{P}(\text{shorebirds}) * \mathbf{P}(\text{waterfowl}) * \mathbf{P}(\text{poultry farms})$$

Additional Factors

- Risk scores are averaged out of 1° grid squares (approx 100 x 100 km) but waterfowl are concentrated around water bodies.
- Ducks are sedentary during spring (breeding season)
- They move less than 10 km from nesting sites (> 96% of 351 recaptures).



Farms near water bodies



Data: ERIN, Dept of Environment and Water Resources. WA Dept of Agriculture and Food

Conclusions

- **Risk of H5N1 HPAI introduction into Australia by wild migratory birds is very low**
- **This is confirmed by:**
 - Surveillance studies on wild bird populations in Australia
 - Surveillance studies on Australian poultry farms
 - The absence of Eurasian strains of AI within Australia
- **Further studies will examine the risk of introduction of HPAI from within the Australo – Papuan region by nomadic ducks .**

Thank You

