



Systematic risk assessment comparing seven emerging vector-borne animal diseases

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Background

- Preparedness for vector-borne animal diseases warranted after recent incursions in the Netherlands
- Risk = *probability* of introduction AND *impact* of disease
- Structured approach for risk assessment
 - Comparison of diseases
 - Identification of targets for risk management



Seven vector-borne animal diseases

- African horse sickness (AHSV)
- Bovine babesiosis (*Babesia divergens*)
- Crimean-Congo haemorrhagic fever (CCHFV)
- Epizootic haemorrhagic disease (EHDV-6)
- Rift Valley fever (RVFV)
- Tularaemia (*Francisella tularensis* subs. *holarctica*)
- West Nile (WNV)

Results

Introduction

- Combined probability of entry and establishment
- Trade in animals contributes most, either by infected animals or carriage of infected vectors (Table 1)
- Establishment most likely when entry occurs
 - In the vector season
 - In a region where host and vector populations overlap
- Establishment of CCHFV is inhibited by absence of its tick vector

Table 1. Pathways contributing to the probability of introduction with the top ranking pathway or pathways indicated by a darker fill colour

INTRODUCTION PATHWAY	BAB	EHD	AHS	CCHF	RVF	TUL	WN
Infected host animals							
Legal trade in livestock	X			X	X		
Illegal trade in livestock	X	X	X	X	X		X
Trade in exotic animals							
Trade in pet animals							
Migration of wildlife						X	
Migratory birds							X
Infected vectors (eggs, larvae, nymphs, adults)							
Active flight							
Passive flight (wind, air currents)							
Transport vehicles (aircraft, ship, road transport)		X	X		X		X
Containers on aircraft or ship					X		X
Imported products (plant material, tires)					X		
Traded animals (livestock, pets)	X	X	X	X			X
Migration of wildlife	X					X	
Migratory birds	X			X		X	
Contaminated products							
Products for consumption (meat, milk, eggs)		X					
Genetic material (semen, ova, embryos)			X				
Biological material (serum, plasma)							
Vaccines	X		X				

Conclusions

- Overall risk scores can be similar despite different risk profiles
- Risk profiles provide useful information for risk management
- AHS, EHD, and RVF have a low probability of introduction, but high to very high impact
- WN, tularaemia and bovine babesiosis have a high probability of introduction, but low to moderate impact
- The risk of CCHF is very low as long as its tick vector is not present in the Netherlands
- Improved knowledge on (illegal) trade volumes, vectorial capacity and overwintering opportunities will narrow the uncertainty intervals of the estimated risk

Objective

- Risk assessment of seven vector-borne diseases for the Netherlands
- To prioritize diseases for preparedness
 - To identify common parameters contributing most to the risk

Material and methods

MINTRISK¹ is a calculation tool for risk assessment of animal diseases in Microsoft Excel and VBA

1. Input via questions
 - Qualitative answer categories with underlying quantitative explanation
 - Indication of uncertainty
2. Monte Carlo simulation
3. Output: Semi-quantitative risk scores with uncertainty interval

Impact

- Depends on extent of spread and likelihood of persistence
 - No large outbreaks expected in the first year after entry for all evaluated diseases
 - Overwintering is a critical point for persistence and fraught with uncertainty for AHS, EHD, RVF and WN
- Includes economic, socio-ethical and environmental impact
 - Economic losses due to trade restrictions are an important component of the impact of AHS, EHD and RVF
 - Socio-ethical impact is high for RVF and WN because of potential severe human cases, and for AHS because of high morbidity and mortality in horses
 - Environmental impact is low to negligible for all evaluated diseases

Overall risk score

- Combined outcome of introduction and impact
- Moderate to high for all evaluated diseases but CCHF
- Not informative for prioritization in contrast to risk profiles (Fig. 1)

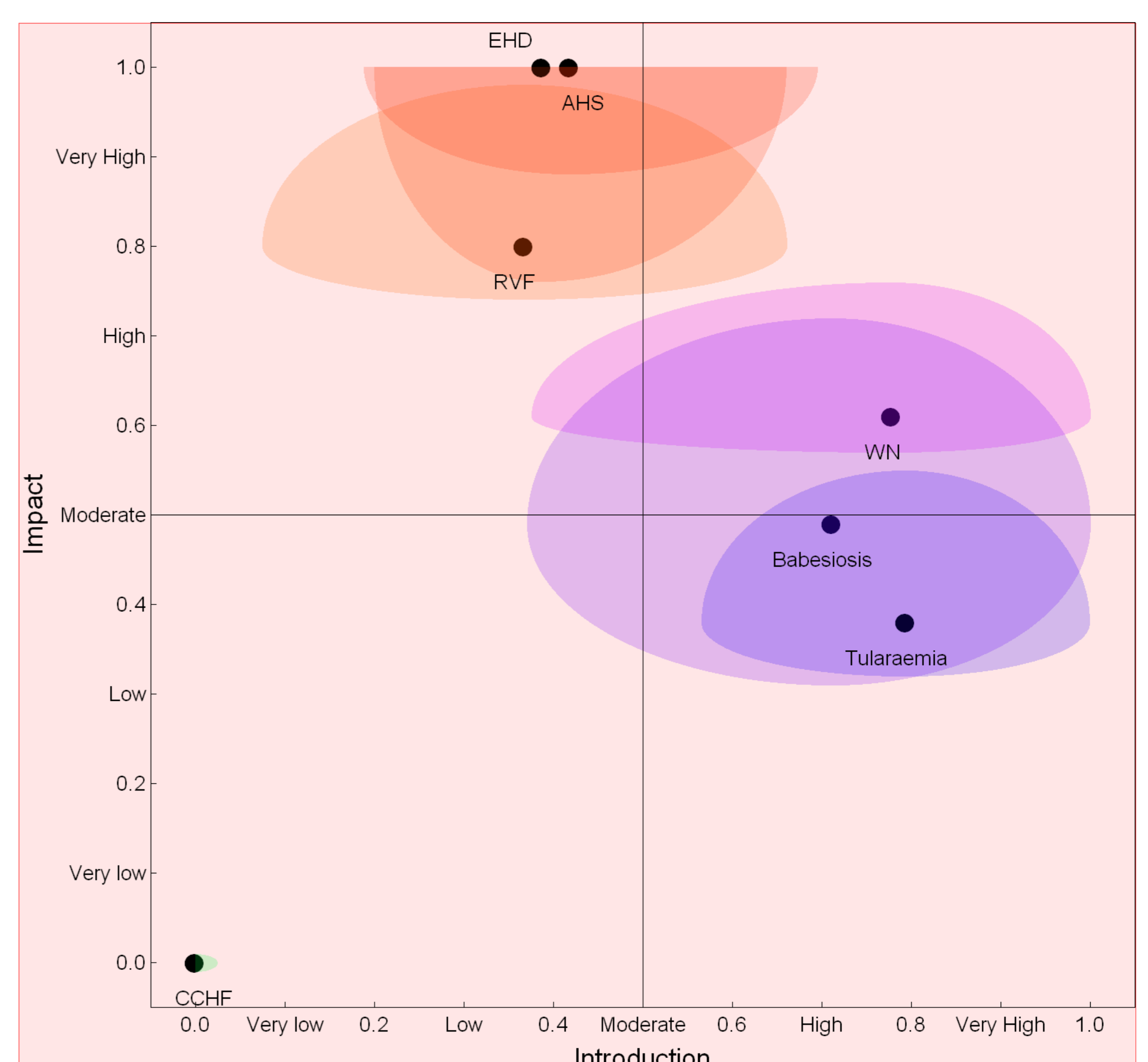


Figure 1. Risk profile of seven vector-borne animal diseases for the Netherlands

¹ De Koeijer et al., 8th Annual Meeting EPIZONE, September 2014, Copenhagen, Denmark



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