



# Aplikovaná ekologie hmyzu 2014 – 3b invazní hmyz // Invasive Alien Species (IAS)

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Entomologický ústav BC AV ČR



# Pojmy invazní ekologie

- Adventive
- Alien
- Exotic
- Foreign
- Non-indigenous
- Non-native
- Escaped
- Imported
- Introduced
- Established
- Naturalized
- Spreading
- Expansion
- Impact
- Noxious
- Nuisance
- Pest
- Invasive



# Způsoby šíření

- Vector
- Pathway
- Donor vs. Recipient region

– Intentional transport

– Unintentional transport

- Zboží
- Sazenice
- Balastní voda
- Zvířata (koně)



– Intentional transport

- Potrava
- Bylinky
- Lovná zvěř
- Okrasa
- Biocontrol
- Věda

- Známe vlastnosti
- Hlídáme únik



# Způsoby šíření

## – Letecká doprava

- Podobnost klimatu
- Načasování klimatu



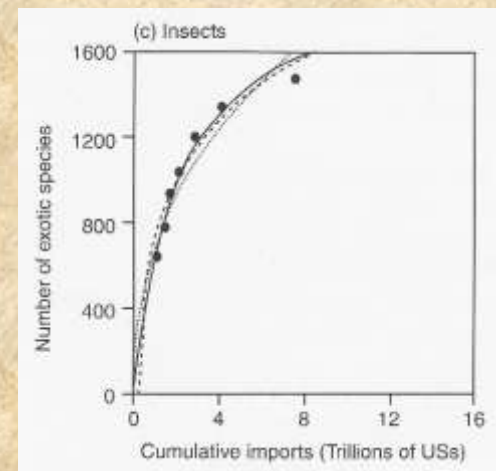
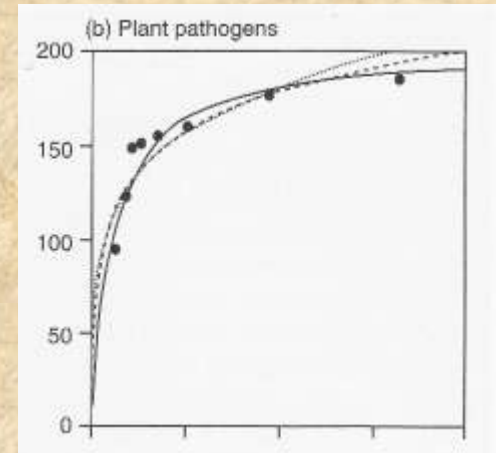
# Zdomácnění

## – Established

- Rozmnožují se mimo lidská sídla
- Exponenciální kumulativní nárůst počtu druhů
- Dnes lineární
- Dříve záměrně vysazené
- Dnes náhodně převážené
- Dříve záměrné užitkové
- Později okrasné
- Význam válek

## – Intenzita obchodu

- Species accumulation curve



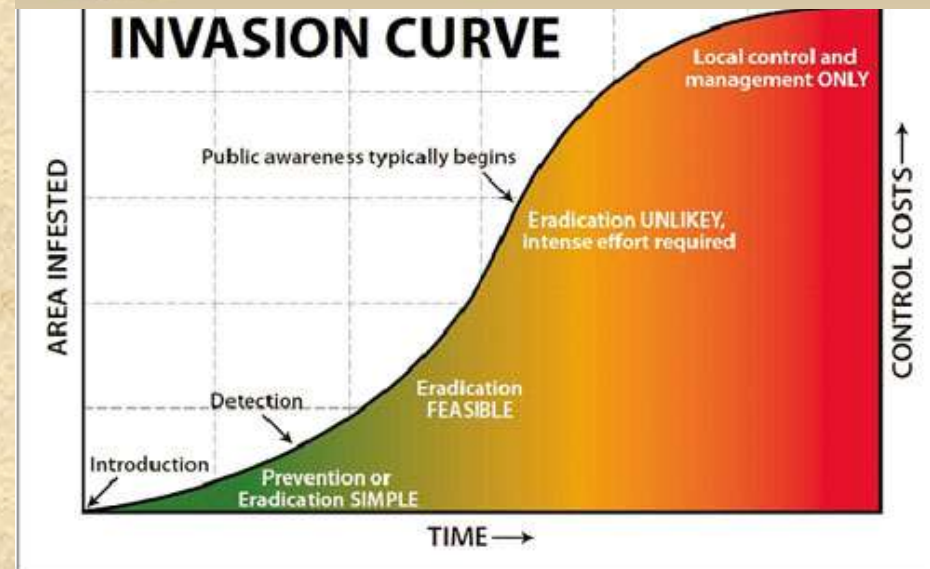
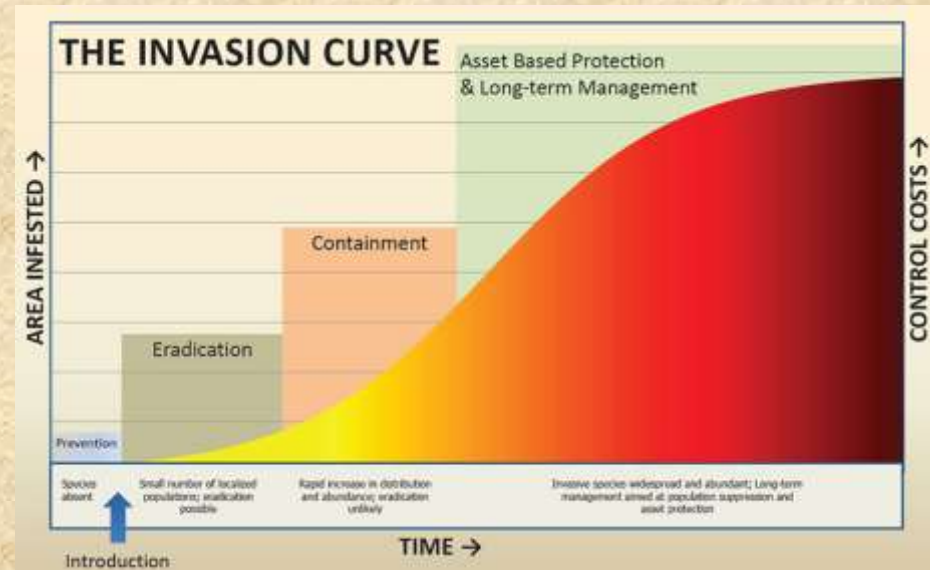
# Establishment

- Biotic interactions
  - Resistance
  - Facilitation
  - Competition
  - Predation
  - Mutualism



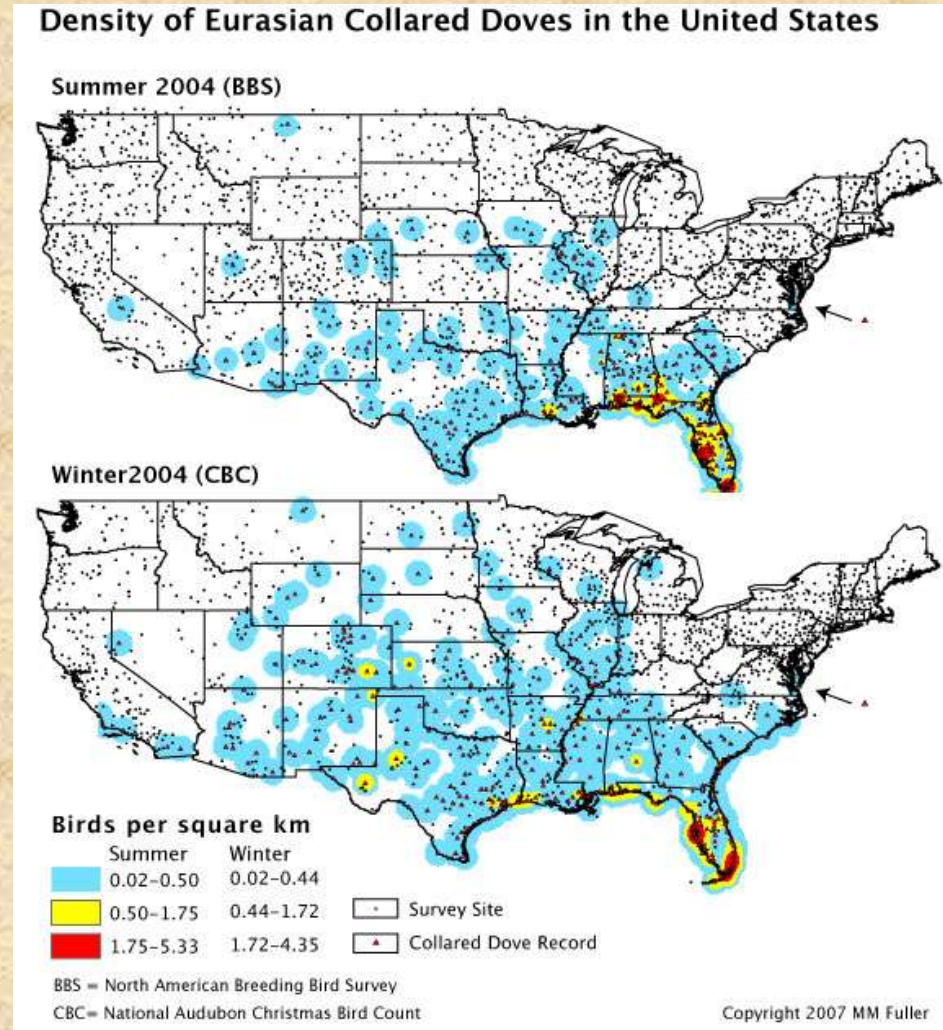
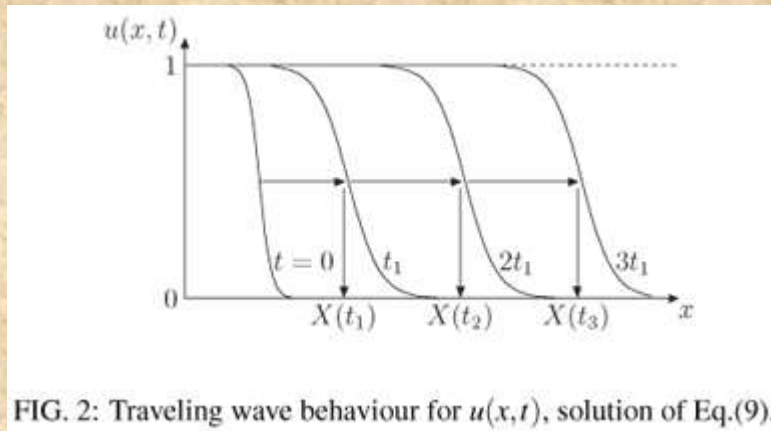
# Průběh šíření

- Detekce
- Šíření
- Náklady na kontrolu



# Průběh šíření

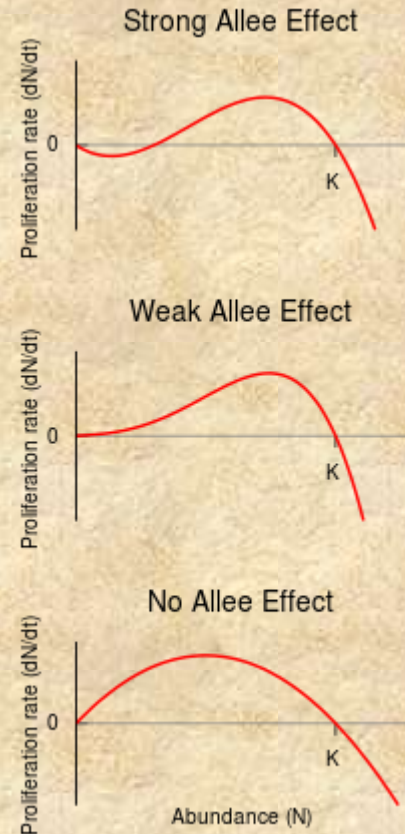
- Wave and satellites
  - Stratified dispersal
- Travelling wave front





# Faktory vzniku invaznosti

- Propagule pressure
- Minimum viable population size
  - Alee effect
- Lag period
  - Local x unnoticed
  - Genetic adaptation
  - Bridgehead effect
- Climatic conditions



# Propagule

- Propagule pressure
  - Size
  - Number
  - Health
  - Frequency or sites
    - $10 \times 100 > 1000$
- Aktivní jedinci
- Semena, spóry

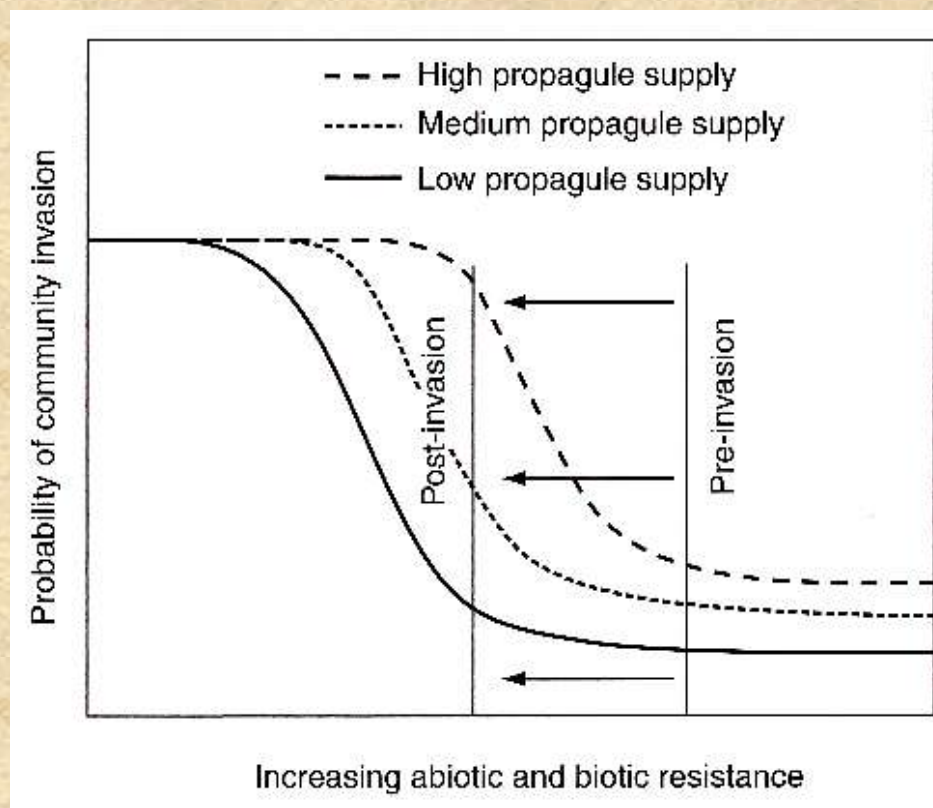


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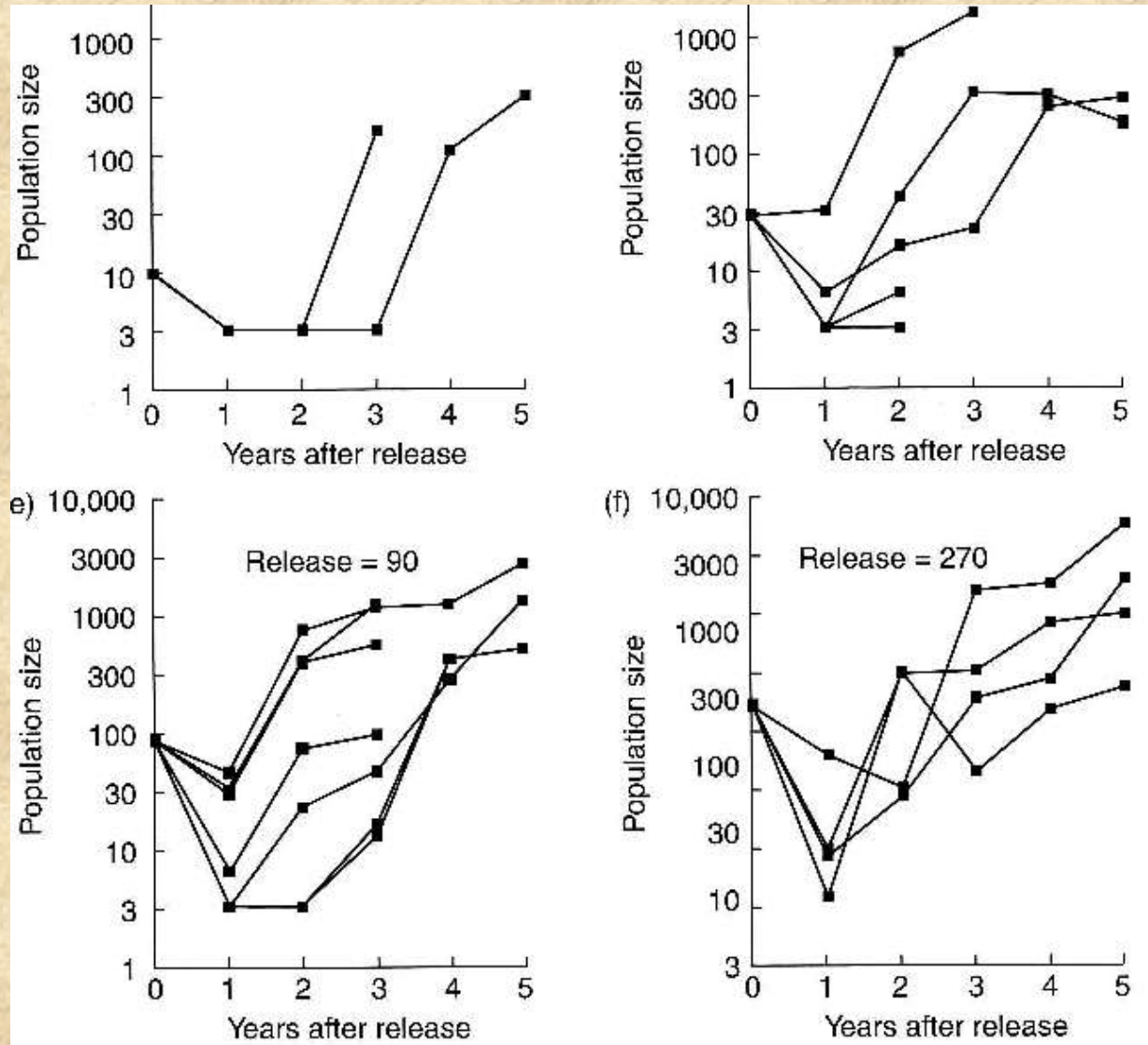
# Invasion facilitation

- Biotic resistance
- Synergistic interaction

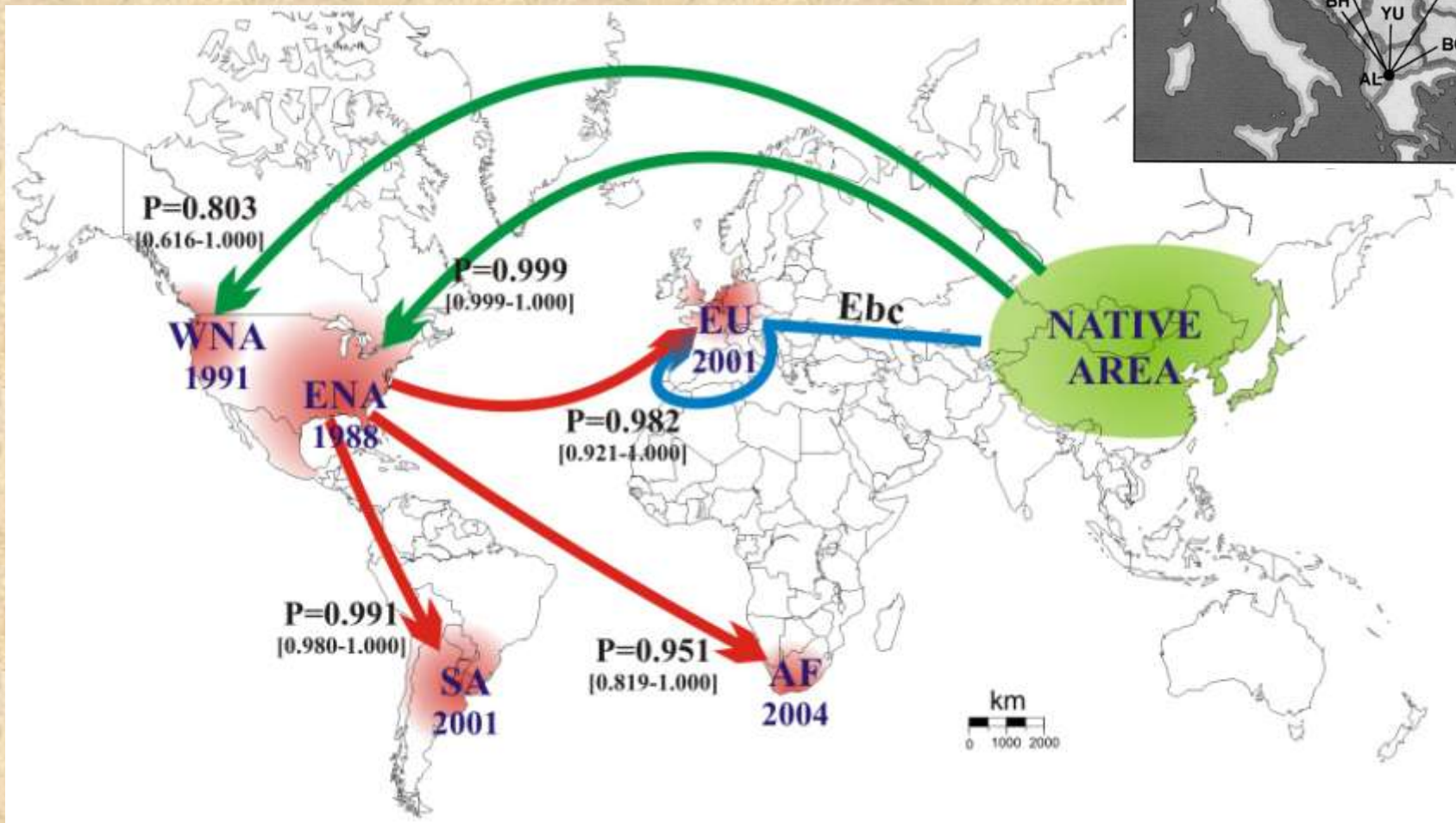
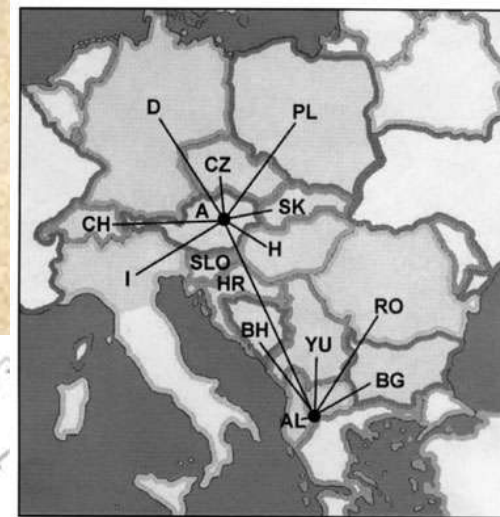


# Populační dynamika

- Lag period

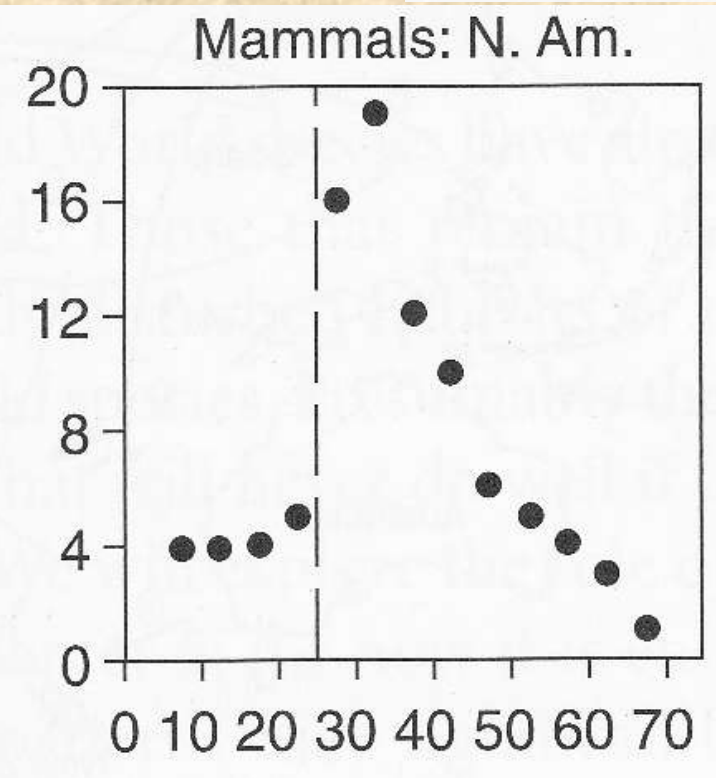
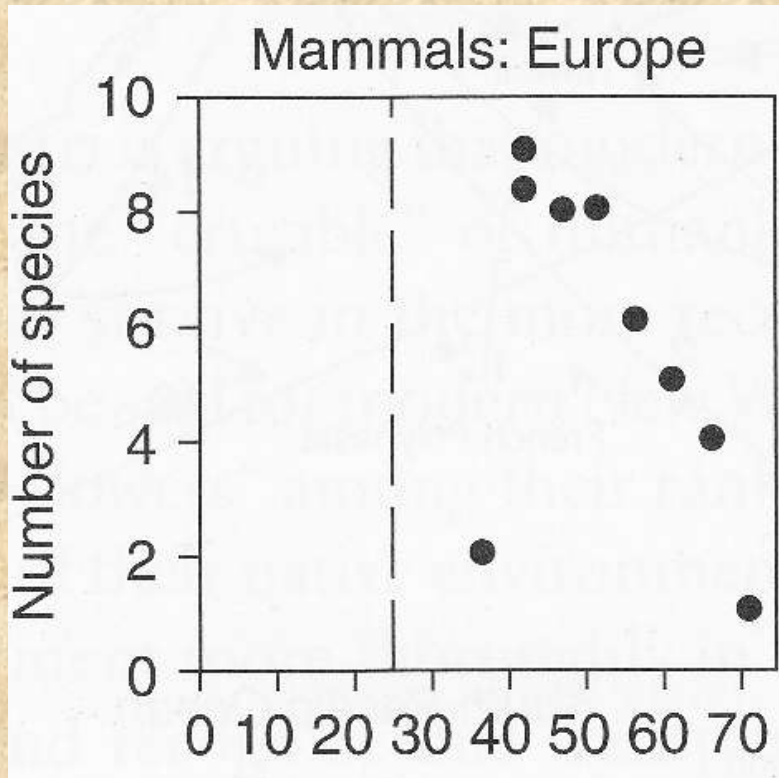
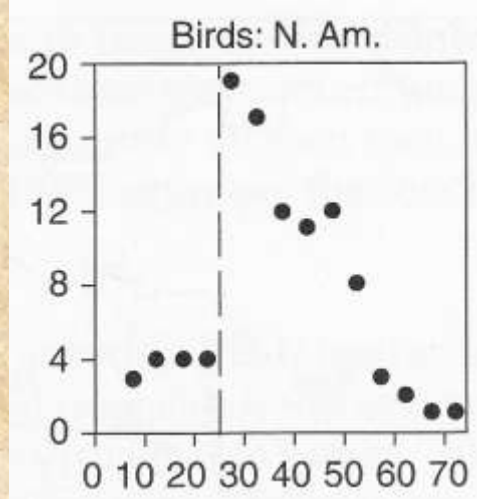


# Bridgehead efekt a křížení



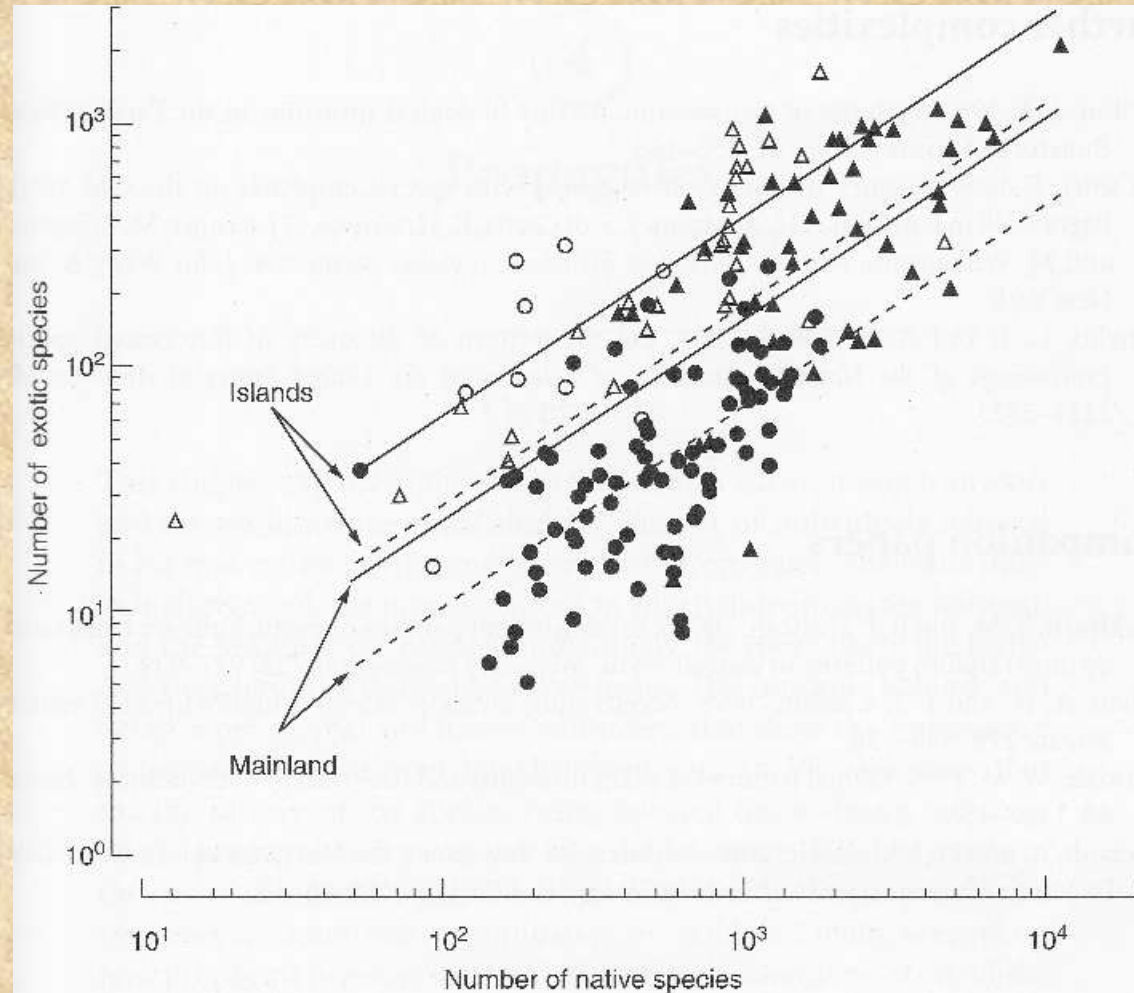
# Klimatické podmínky

- Zeměpisná šířka cíle



# Geografické podmínky

- Ostrovy vs. pevnina



# Důvody vzniku invaznosti

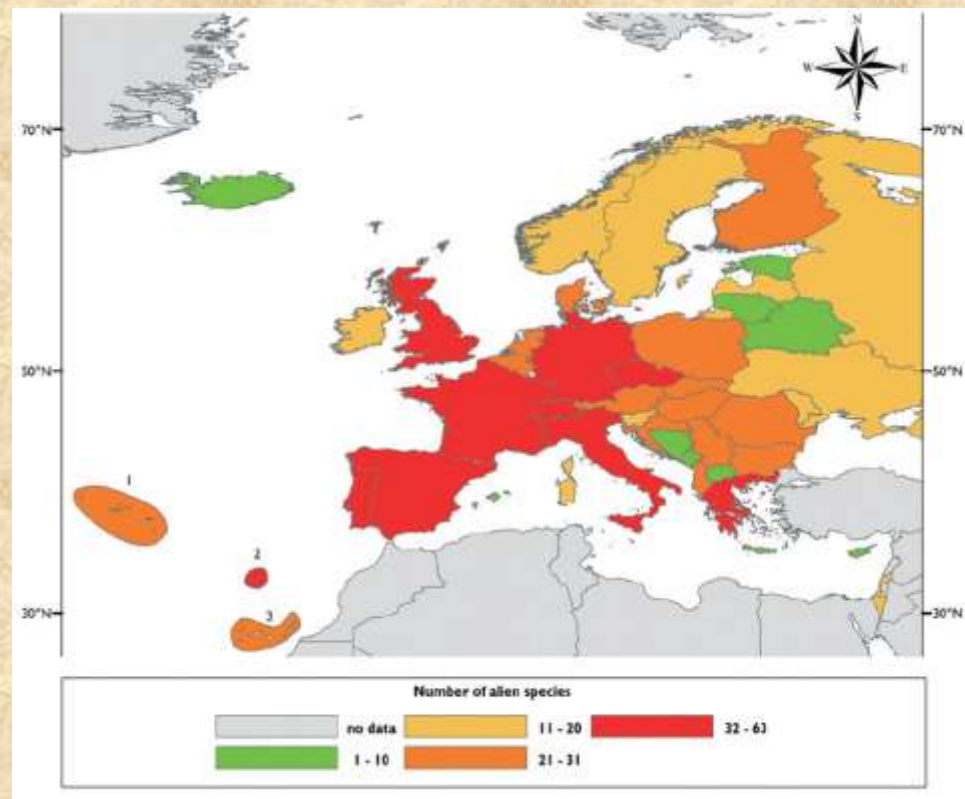
- Hypotézy
  - Free niche
  - Enemy free space
  - Superorganism
    - Počet potomků
    - Rychlost vývoje
    - Generalisté
    - Synantropie
    - Kompetiční zdatnost
  - Původ
    - kontinentální
  - Schopnost šíření





# Invazní mšice

- The European aphid fauna currently includes 1,373 species and about 7.4 % of them are invasive species originating from another continent. Most of the alien aphid species in Europe originate from temperate regions of the world and in particular Asia and North America have contributed the largest numbers. Only few alien aphid species in Europe are of African origin and no alien aphids has yet been introduced into Europe from Australasia or South America.



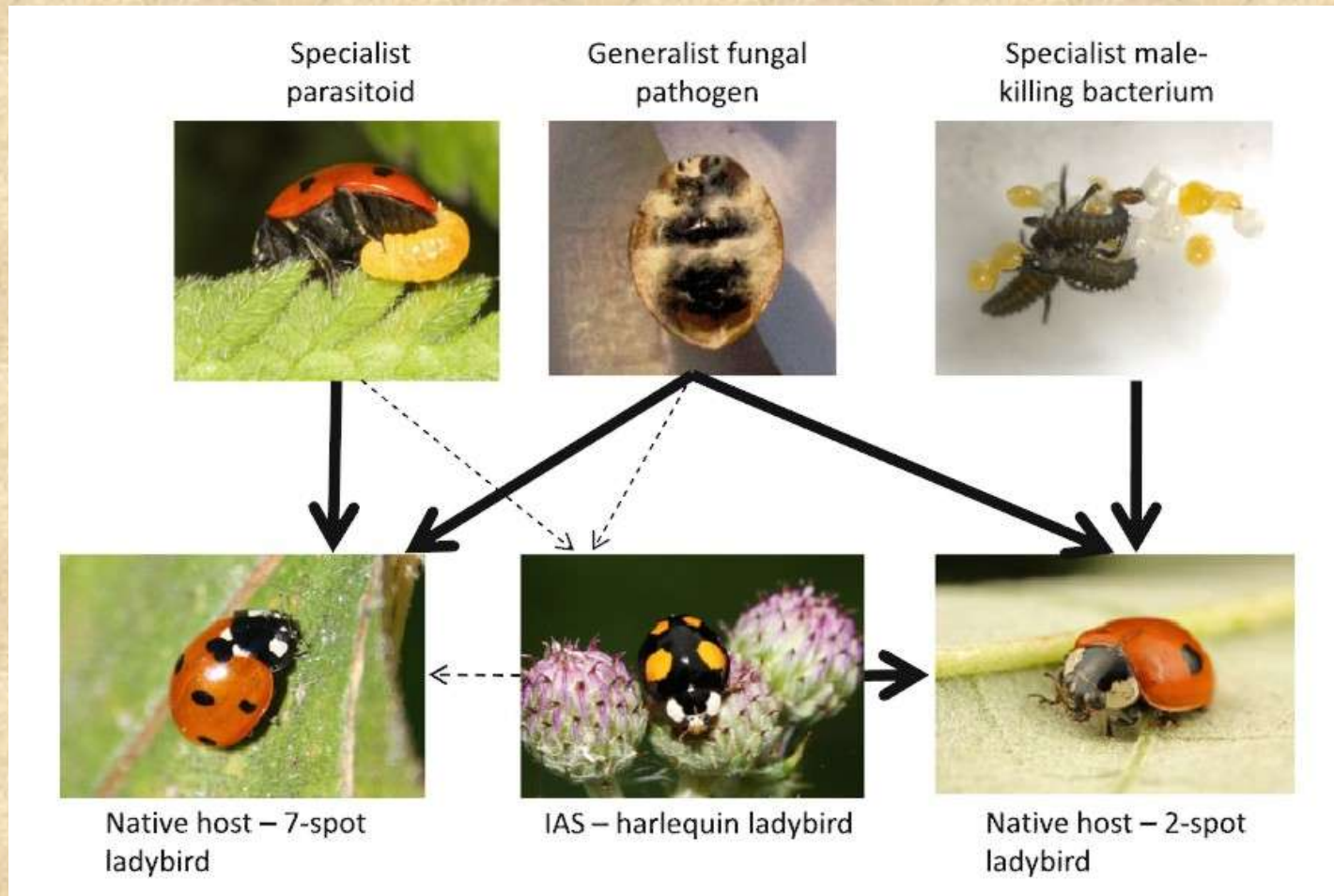
# Původ cizinců

## – V České republice

- Evropa
- Ameriky
- Asie
- Austrálie
- Afrika
- = počet i čas
- Cryptogenic

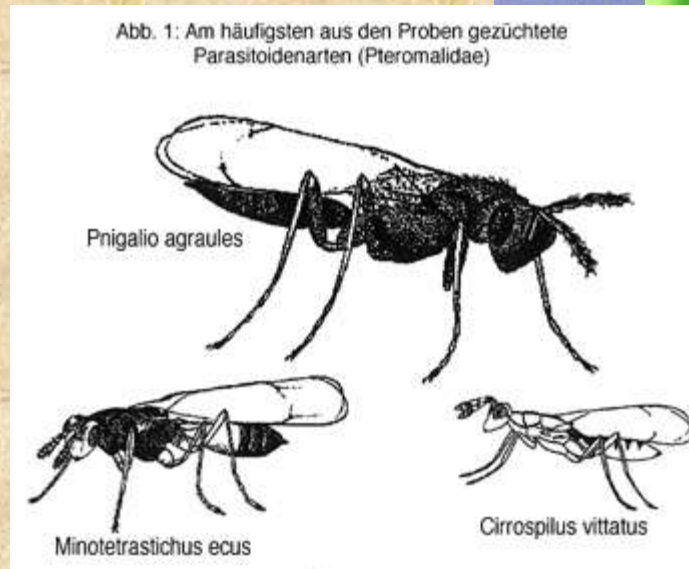


# Enemy release hypothesis



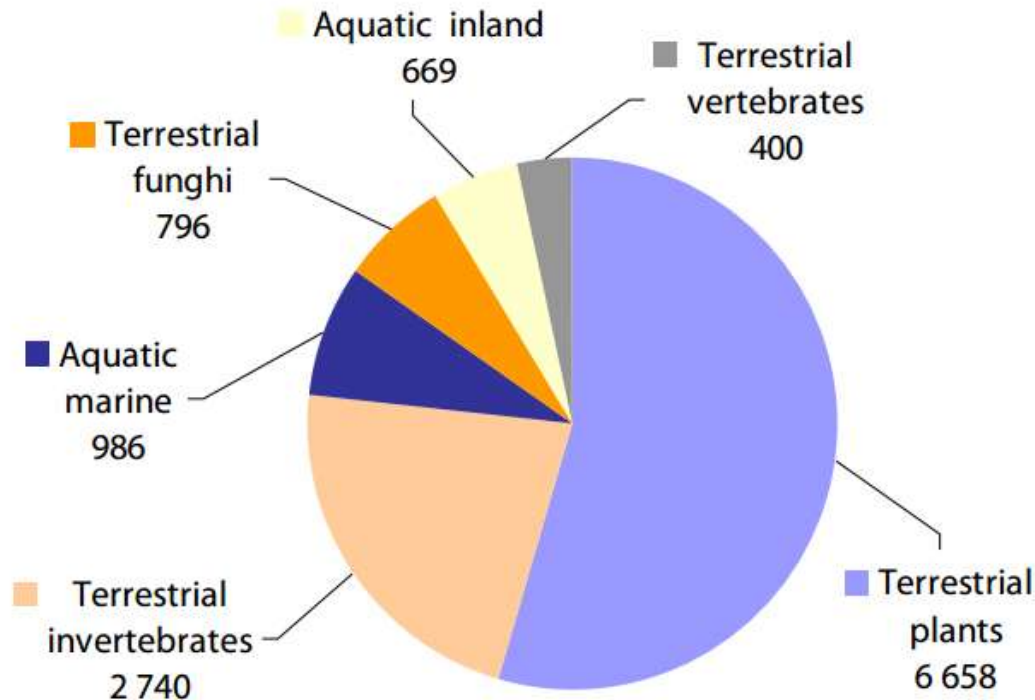
# Enemy release hypothesis

- klíněnka jírovcová
- přirození nepřátelé
  - pouze nespécializovaní, nepůvodní, druhotně adaptovaní parazitoidi
  - obvykle 5-15 %, i po letech
    - nelákavé kairomony a allomony
    - imunita proti paralyzujícím látkám?
    - uhýbají před kladélkem
  - sýkorky se naučily vyzobávat larvičky z min



# Taxonomická příslušnost

**Alien species in Europe (2012)**



Data source: [DAISIE](#) (Delivering Alien Invasive Species Inventories for Europe), research project funded by the European Commission, and the Centre for Ecology and Hydrology ([CEH](#)).



# Náklady na kontrolu

## Estimated economic losses due to invasive species across the globe

Country	Estimated losses
Globally	€1 trillion/year
US	€90 billion/year
EU	€12 billion/year
China	€11 billion/year
New Zealand	€2 billion/year
UK	€2 billion/year

Data source: [European Commission](#) (2013)

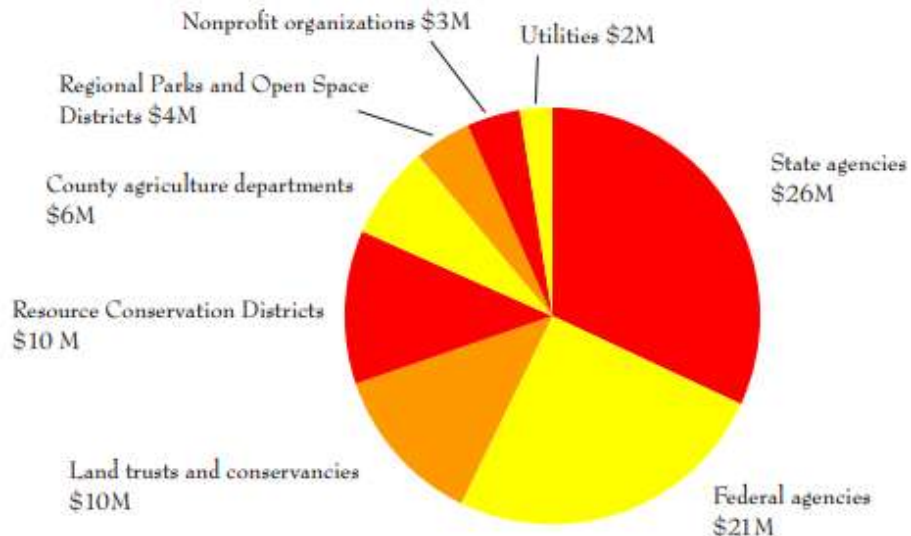


# Invasive Plants Cost California \$82 Million Every Year.

**At least.** Estimates of actual impacts reach into the \$ billions. \$82 million represents current costs of control, monitoring, and outreach. This investment repays itself many times over by addressing major impacts. Invasive plants:

- Increase wildfire potential
- Reduce water resources
- Accelerate erosion and flooding
- Threaten wildlife
- Degrade range-, crop- and timberland
- Diminish outdoor recreation opportunities

## Estimated Annual Cost of Invasive Plant Work in California



# Management and control

- Proactive management
  - Prevention
  - Exclusion
  - Early eradication
    - *Caulerpa taxifolia*
  - Evaluation of invasiveness
- Reactive management
  - Do nothing
    - National parks
  - Cultural control
    - Resistant cultivars
  - Chemical control
    - Repeated
    - Large areas
  - Biological control
    - Permanent control
    - Another invader
  - IPM





# Evaluation of invasiveness

- Ecological impact assesment
- Spread x Effect
- Spread = invasion potential
  - Lifetime
  - Expansion rate
- Ecological effects
  - Native sp.
  - Landscape changes
  - Transmitting diseases

