On the occurrence of exotic species in Belgium: the tip of the iceberg?

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Mosquitoes: introduction

- **Taxonomy:**
  - Diptera
    - Nematocera
      - Culicidae
        - Anophelinae
          - 2 genera
        - Culicinae
          - 38 genera (taxonomic confusion)
        - Toxorhynchitinae
          - 1 genus
    - Worldwide = >3500 species

- **Medical importance:** vectors of parasites, viruses, bacteria, protozoan and nematodes
  - Malaria, Dengue, Yellow Fever, Chikungunya, Encephalitis, Filaria, …
• Knowledge of taxonomic and functional biodiversity of mosquitoes (Culicidae) is essential to understand the current risk of disease transmission
  – Taxonomic biodiversity:
    • Which species?
  – Functional biodiversity:
    • Interaction between species (endemic versus invasive)

• In Belgium: basic knowledge on mosquito is missing

• Ongoing climatic changes + increasing worldwide transport = creation of suitable conditions

• Start MODiRISK project in 2007
• Institute of Tropical Medicine
• Royal Belgian Institute of Natural Sciences
• Université Catholique de Louvain
• Avia-GIS
• Wageningen University
• Belgian Science Policy
Sampling strategy

• Sampling of >900 sites
  – Random selection (based on Corine dataset)
    • Urban
    • Agriculture
    • Nature

  – Manual selection
    • Import risk areas (ca. 60 sites):
      – Harbours, airports
      – Zoo, nature reserves
      – Specific companies (activities)
      – …

• 2007 & 2008: May-October
Importation pathways exotic mosquitoes

- International trade
  - Tyres
    - *Aedes albopictus* (USA, Italy)
    - *Aedes aegypti* (USA)
    - *Ochlerotatus j. japonicus* (USA)
    - ...
  - Lucky bamboo
    - *Aedes albopictus* (the Netherlands)
- Why? Desiccation eggs (biology)
Sampling strategy
### Results

- **Species found in ‘Import Risk Areas’**
  - 20 species
  - 7887 individuals
  - 1 exotic species
    - *Ochlerotatus j. japonicus*

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Ochlerotatus j. japonicus

- Found in 2 sites in Walloon province
  - Importing tyre companies

- Sites
  - “Isolated” location
  - Different adult and larvae collections
    - Mosquito magnet
    - Human landing
    - Larvae dipping & sieving
Ochlerotatus j. japonicus

- Settled species
  - Found as adult in 2007
  - Larvae collected in tyres
    - September-October 2007
    - Beginning of April 2008 (hibernation!)
  - Also data 2002-2004
    - French intercorrelated tyre trade

- No indications on dispersal
  - But: need confirmation

- Interaction with endemic fauna = not known
  - Ca. 5 accompanying endemic species found

- Multiple introductions?
The Asian tiger mosquito *Ae. albopictus*
- Successful invader in many countries
- Risk on human health (nuisance & vector)

Found in Eastern Flanders in 2000
- French intercorrelated tyre trade

2nd hand tyre company

Visits in 2007 and 2008 (MODIRISK)
- Not found

Reason of inability to establish?

Paper: Schaffner et al. 2004. *First record of Aedes (Stegomyia) albopictus* in Belgium
**Discussion**

- 2 important invasive species found in Belgium
  - ancient record of *Aedes albopictus*
  - 2 positive sites of *Ochlerotatus j. japonicus*

- Human mediated invasions

- International trade seems import pathway (global village)
  - Countries depending on trade = vulnerable
  - Correlated to import products
    - Lucky Bamboo in The Netherlands
    - Tyres in USA, Italy, Belgium

- Establishment?
  - origin,
  - biology (egg diapause),
  - climatic conditions,
  - founder populations
Significance

- Epidemiological
  - Competent vectors of numerous arboviruses
  - WNV-positive field collections in USA

- Ecological
  - Container-breeding mosquitoes
    - Interactions with native species
  - Shared resources
    - Interspecific larval competition
Need for

- Monitoring (medical importance)

- Increased knowledge on biology and ecology of exotic species
  - Survey of artificial and natural habitats
    - Understand ecological niche
    - Competitive predictions
      - Resources
      - Accompanying species

- Knowledge on functional biodiversity

- Improved development of Risk Assessment
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