

« SOS invasions » 2006

**Effects of landscape structure on
population dynamics of invasive plants
species in Belgium**



Belgian
Science Policy



**N. PIERET
Pr. G. MAHY**



Aims...

I. Landscape structure impact on population distribution ???

- **Landscape structure**
- **Habitat selection of the target species**
- **Role of micro habitats**
- **Role of habitat structure**
- **Role of linear networks**

II. Study the populations dynamics after two years ???

Target species...



Senecio inaequidens



Heracleum mantegazzianum



Impatiens glandulifera



Solidago gigantea



Fallopia sp.

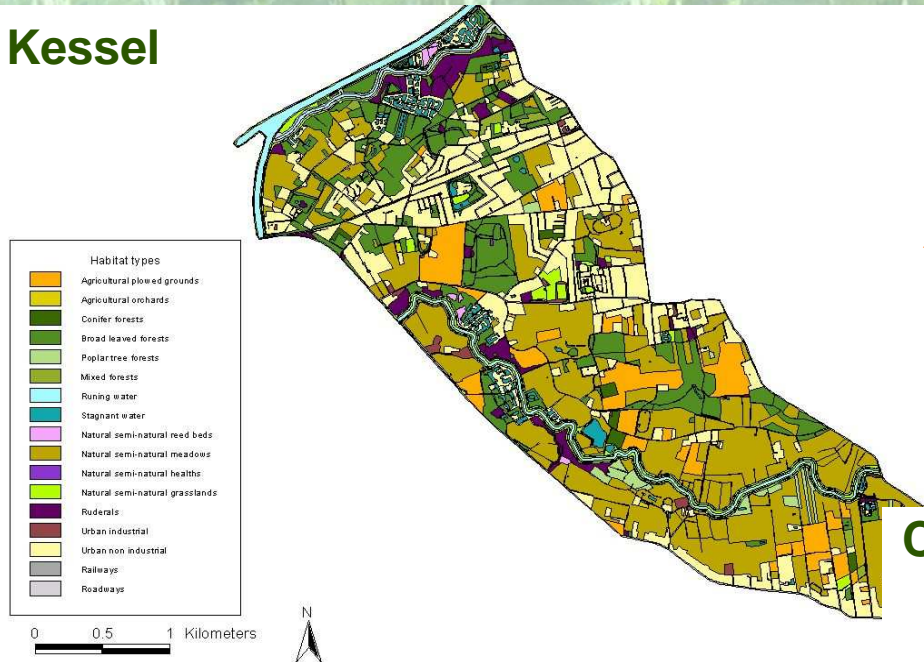
Methodology...

When, where and how ???

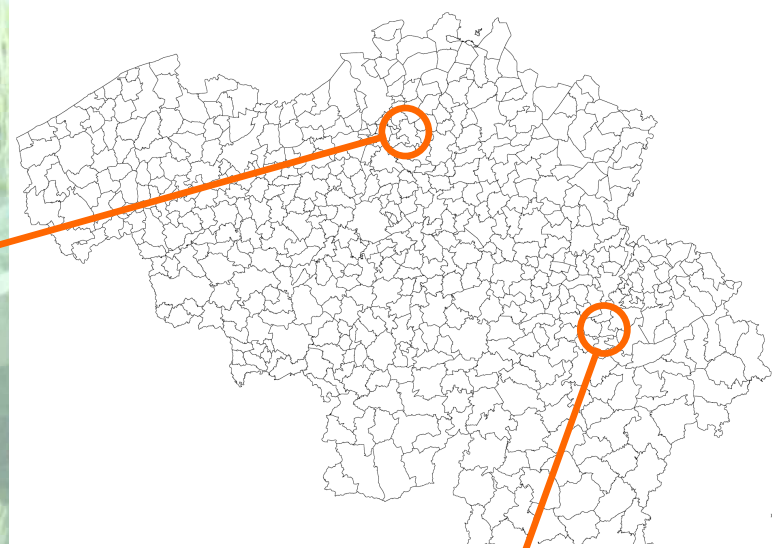
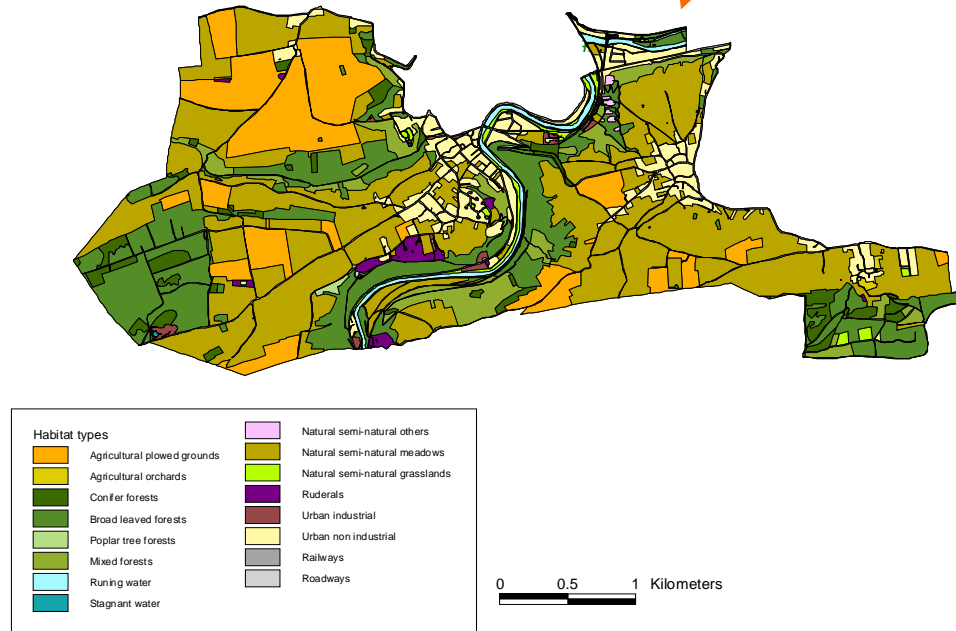
- **2003 and 2005**
- **Two landscape units, 10 km²**
- **Monitoring during flowering season, population description**
- **SIG, database**

Landscape units...

Kessel



Comblain-au-Pont

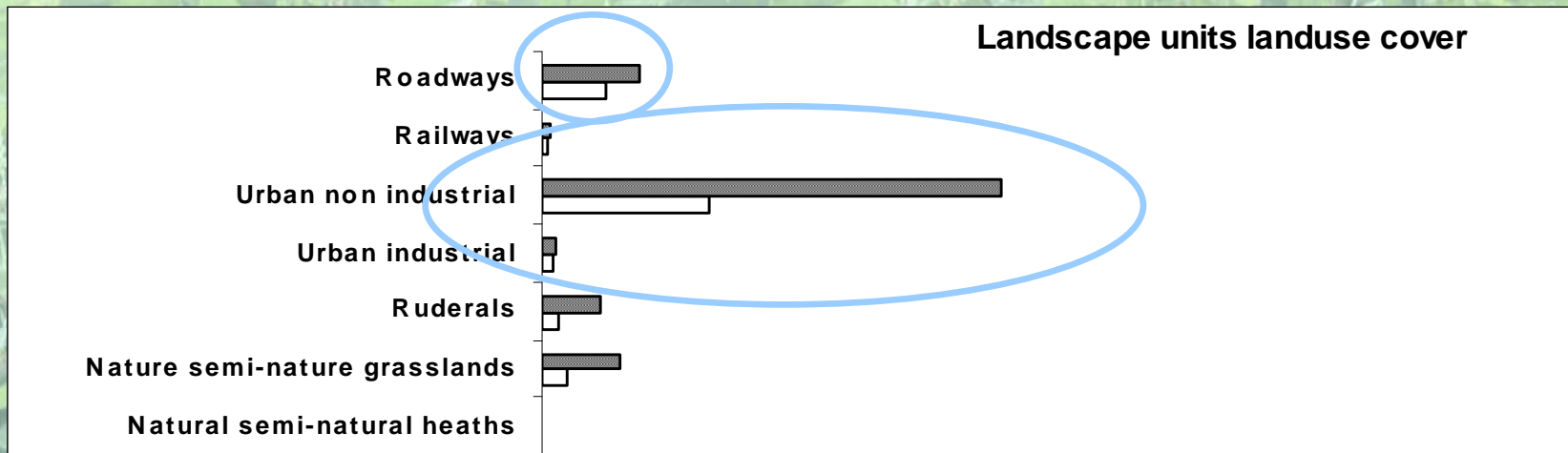


Methodology...

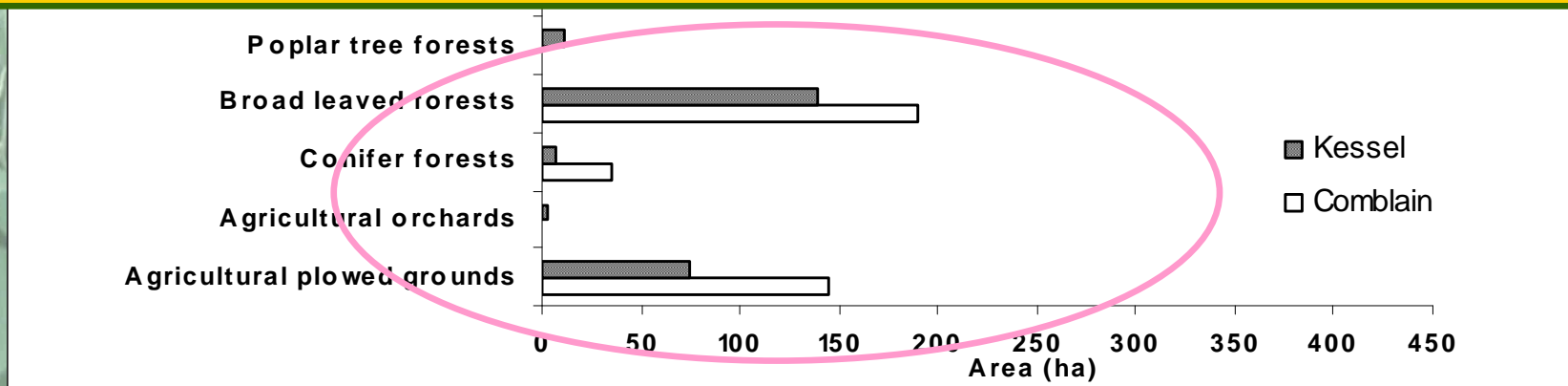
When, where and how ???

- **2003 and 2005**
- **Two landscape units, 10 km²**
- **Monitoring during flowering season, population description**
- **SIG, database**

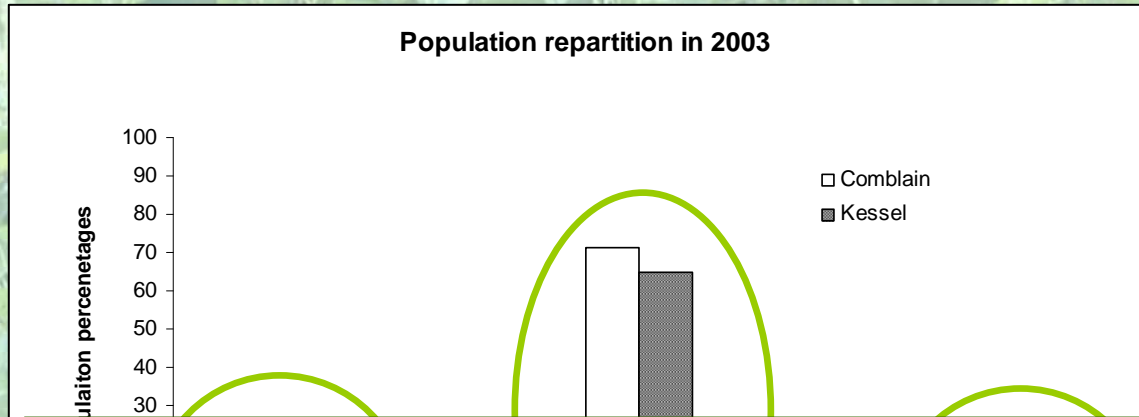
Landuse description...



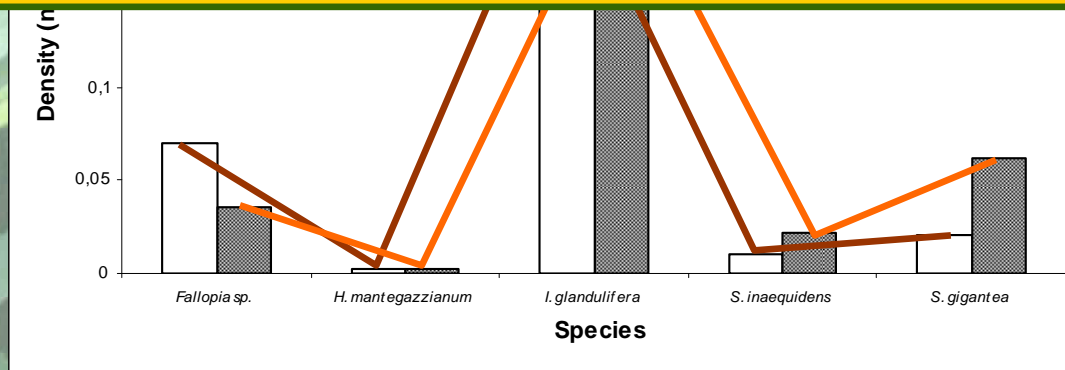
...Two different landscapes, an urban and an agricultural/forest one...



Populations...



**...*Impatiens glandulifera*, *Fallopia* sp. and *Solidago* sp.
Same invasions pattern in the two landscapes.**



Habitat selection...

Comblain-au-Pont

Selection index : $SI = [(n/N)/(A/T)]$

| Habitat type | <i>All species</i> | | <i>I. glandulifera</i> | | <i>F. complex</i> | | <i>S. inaequidens</i> | | <i>S. gigantea</i> | | <i>H. mantegazzianum</i> | |
|---------------------------------|--------------------|------|------------------------|------|-------------------|------|-----------------------|------|--------------------|------|--------------------------|------|
| | % | SI | % | SI | % | SI | % | SI | % | SI | % | SI |
| Agricultural plowed grounds | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Agricultural orchards | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Conifer forests | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Broad leaved forests | 19,3 | 0,9 | 0,3 | 0,8 | 32,9 | 1,6 | 30 | 1,5 | 0 | 0 | 0 | 0 |
| Poplar tree forests | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mixed forests | 1,1 | 0,2 | 0 | 0 | 5,7 | 1,1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Runing water | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Stagnant water | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Natural semi-natural others | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Natural semi-natural meadows | 5,6 | 0,1 | 0,0 | 0,1 | 4,3 | 0,1 | 20 | 0,5 | 19,0 | 0,5 | 50 | 1,2 |
| Natural semi-natural grasslands | 62,0 | 50,4 | 24,0 | 61,2 | 30 | 24,4 | 30 | 24,4 | 28,6 | 23,2 | 0 | 0 |
| Ruderals | 1,1 | 1,1 | 0 | 0 | 4,3 | 4,1 | 0 | 0 | 4,8 | 4,5 | 0 | 0 |
| Urban industrial | 4,7 | 7,8 | 2,0 | 5,1 | 7,1 | 11,7 | 10 | 16,4 | 9,5 | 15,6 | 50 | 81,8 |
| Urban non industrial | 6,1 | 0,7 | 0, | 0,1 | 15,7 | 1,7 | 10 | 1,1 | 38,1 | 4,1 | 0 | 0 |
| Railways | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Roadways | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Populations number | 358 | | 255 | | 70 | | 10 | | 21 | | 2 | |
| Populations density | 0,356 | | 0,253 | | 0,070 | | 0,010 | | 0,021 | | 0,002 | |

Habitat selection...

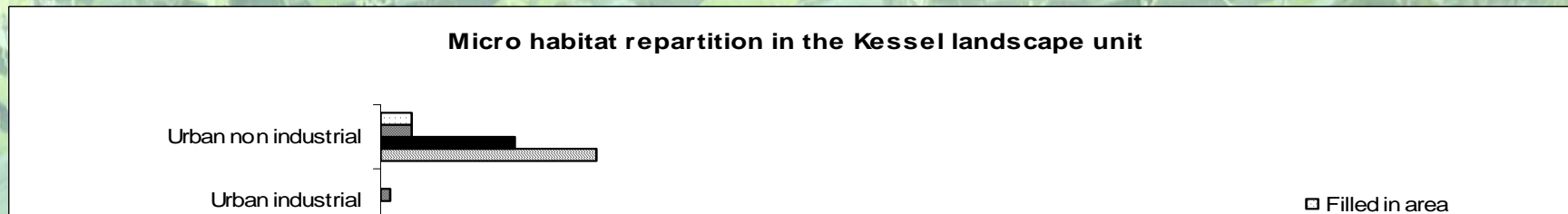
Kessel 2003

| Habitat type | <i>All species</i> | | <i>I. glandulifera</i> | | <i>F. complex</i> | | <i>S. inaequidens</i> | | <i>S. gigantea</i> | | <i>H. mantegazzianum</i> | |
|-----------------------------|--------------------|-----|------------------------|-----|-------------------|-----|-----------------------|-----|--------------------|-----|--------------------------|----|
| | % | SI | % | SI | % | SI | % | SI | % | SI | % | SI |
| Agricultural plowed grounds | 1,8 | 0,2 | 1,4 | 0,2 | 0 | 0 | 0 | 0 | 4,9 | 0,6 | 0 | 0 |
| Agricultural orchards | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Conifer forests | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Broad leaved forests | 32,4 | 2,4 | 34,5 | 2,5 | 40 | 2,9 | 13,6 | 1,0 | 27,9 | 2,0 | 0 | 0 |

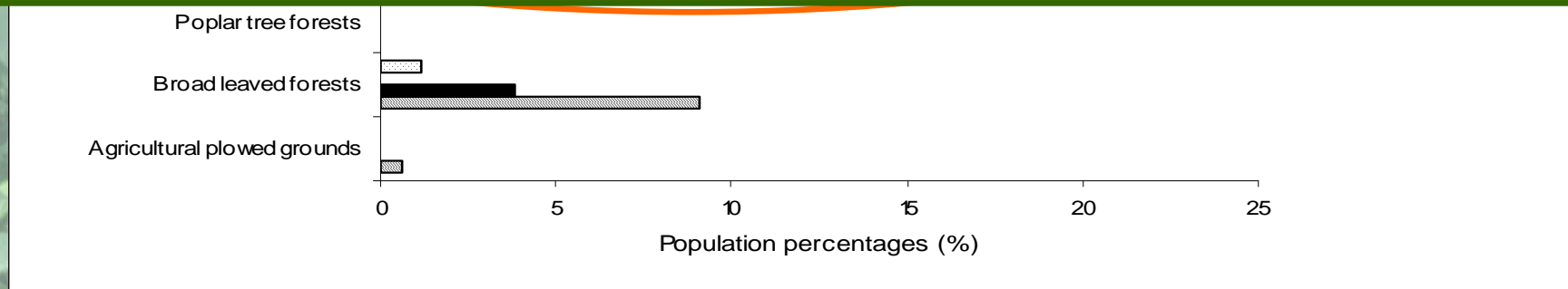
... Mostly grasslands and industrial habitats. Two different landscapes but rather the same invasions pattern ...

| | | | | | | | | | | | | |
|-----------------------------|-------|-----|-------|-----|-------|-----|-------|-----|-------|-----|-------|------|
| <u>Ruderals</u> | 6,2 | 1,8 | 6,4 | 1,9 | 0 | 0 | 9,1 | 2,7 | 4,9 | 1,5 | 100 | 29,9 |
| <u>Urban industrial</u> | 0,3 | 0,3 | 0 | 0 | 0 | 0 | 4,5 | 4,4 | 0 | 0 | 0 | 0 |
| <u>Urban non industrial</u> | 25,9 | 1,0 | 1,4 | 0,5 | 42,9 | 1,7 | 54,5 | 2,2 | 59,0 | 2,4 | 0 | 0 |
| <u>Railways</u> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| <u>Roadways</u> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Populations number | 340 | | 220 | | 35 | | 22 | | 61 | | 2 | |
| Populations density | 0,344 | | 0,223 | | 0,035 | | 0,022 | | 0,062 | | 0,002 | |

Landscape structural elements...

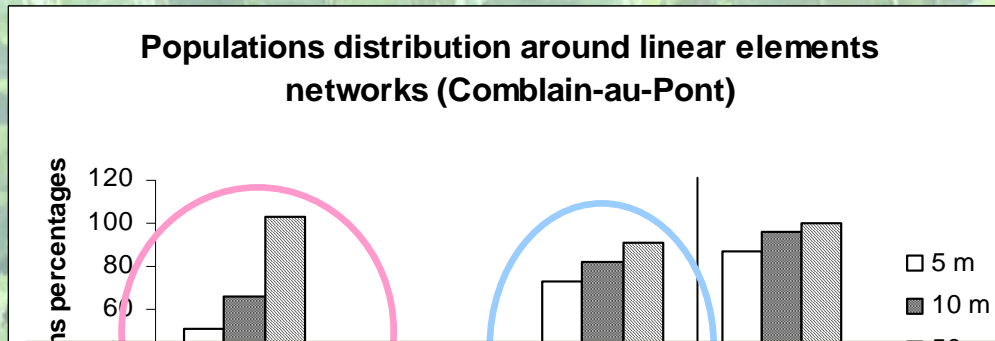


... Important role of micro habitats like river banks ...

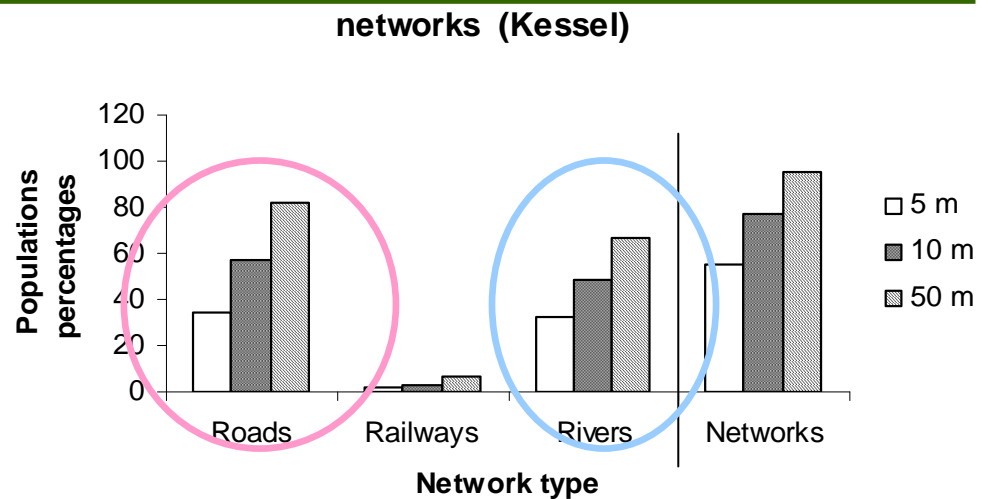


Linear networks impact...

Comblain-au-Pont



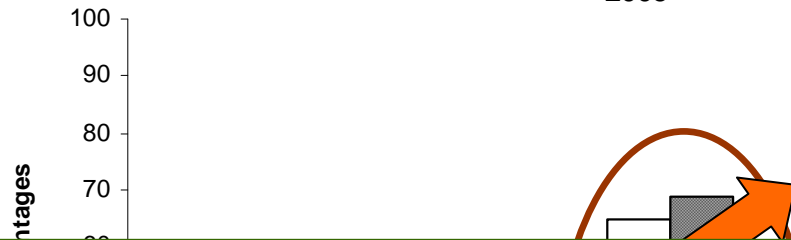
... Important role of roads and rivers ...



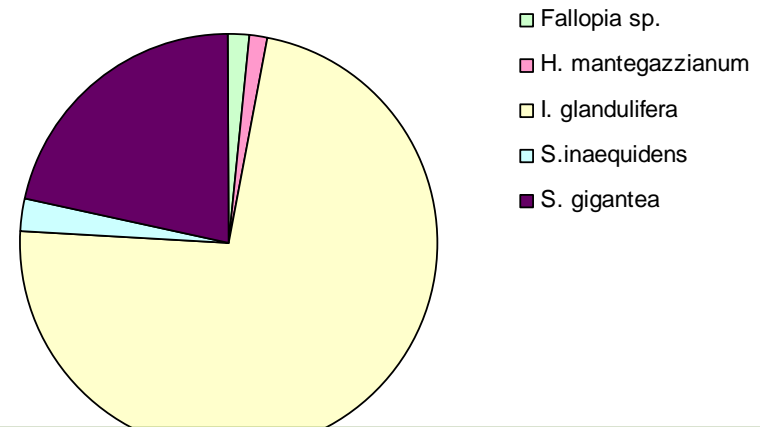
Kessel : evolution in 2005...



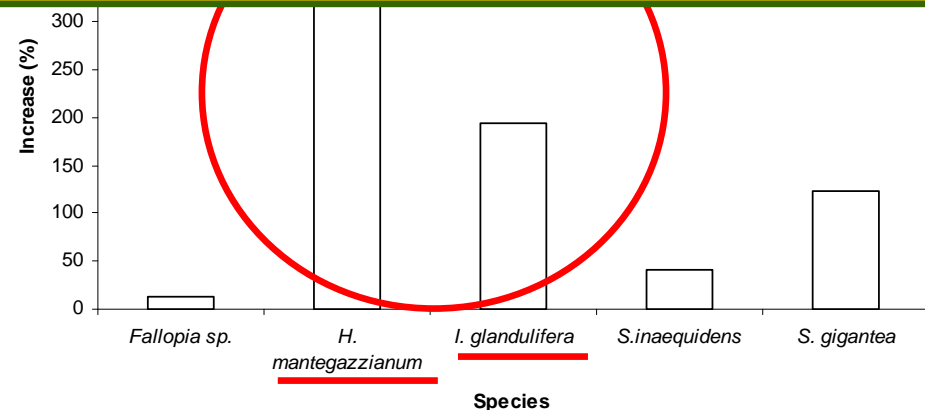
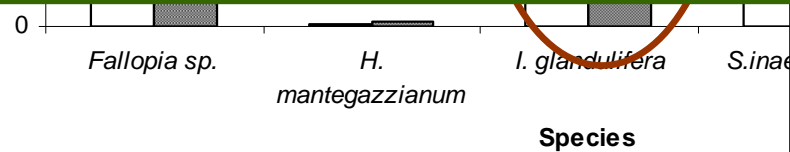
Invasives species populations in landscape unit K 2005



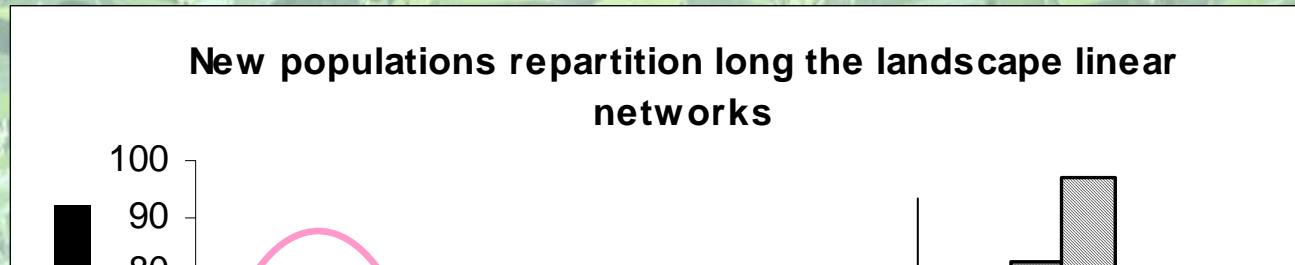
Species repartition for the new populations in 2005



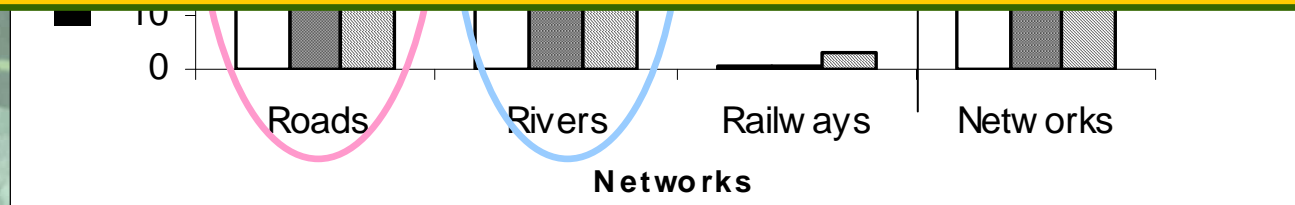
... Important increase, *I. glandulifera* and *H. mantegazzianum*...



Networks as corridors...



...Important role of roads and rivers networks, 74 % in the 5 m area...



Conclusions for management...

- **Difficult to find guidelines because of human activities.**
- **Linear networks like roads, rivers, railways networks play an important role as dispersal corridors. Very often disturbed → sensible areas, information.**
- **Monitorings are very informative and useful for plannification → prevention.**
- **Some species are only at the beginning of the invasion like *H. mantegazzianum* → eradication, information.**
- **Some species are introduced by gardening → information.**

And...

Thanks for your attention

