Regional perspective on invasive alien vertebrates in forests

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How many alien vertebrates in forests?

Vertebrates (66 000 species in total) include:

fishes	(33 000 spp.)
amphibians	(7 500 spp.)
reptiles	(10 000 spp.)
birds	(10 500 spp.)
mammals	(5 500 spp.)

66 000 vertebrate species is a considerable number…

…but among alien species, vertebrates are not the dominant group

How many alien vertebrates in forests?

Among alien species, vertebrates are not the dominant group

DAISIE www.europe-aliens.org

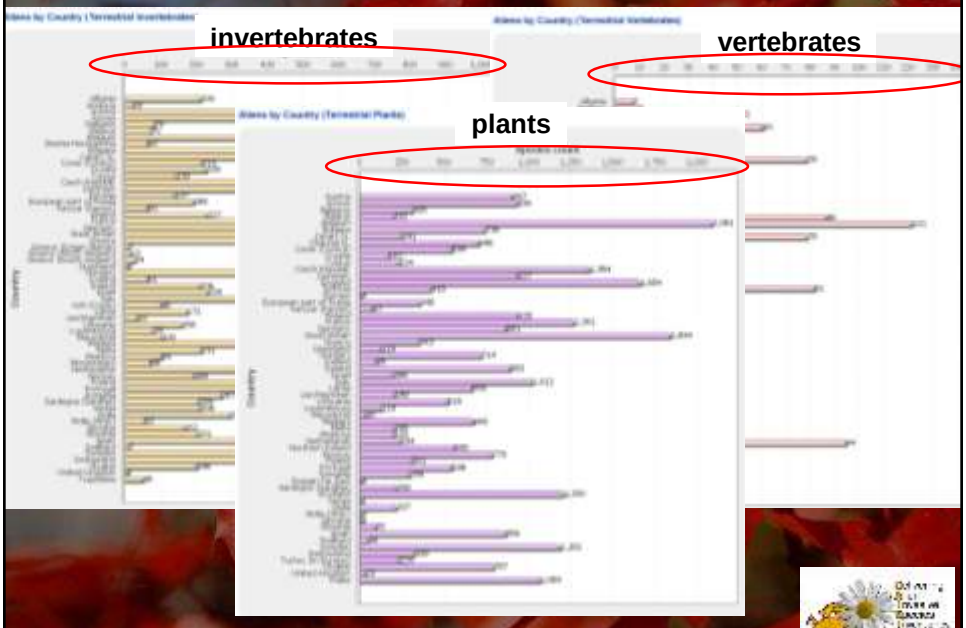
How many alien vertebrates in forests?

Among alien species, vertebrates are not the dominant group

DAISIE database includes 270 terrestrial vertebrate species

DAISIE www.europe-aliens.org

N of terrestrial alien intvertebrate vs vertebrate species per country



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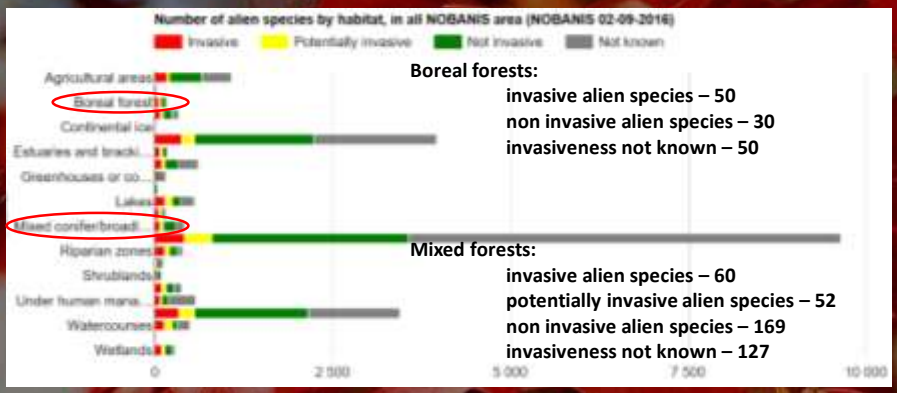
How many alien vertebrates in forests?

Belarus, Russia (European part), Estonia Latvia, Lithuania, Poland, Slovakia, Czech Rep., Austria, Germany, Belgium, Netherlands, Denmark, Norway, Sweden, Finland, Ireland, Iceland

NOBANIS www.nobanis.org

How many alien vertebrates in forests?



Boreal forests:
- **invasive alien species – 50**
- **non invasive alien species – 30**
- **invasiveness not known – 50**

Mixed forests:
- **invasive alien species – 60**
- **potentially invasive alien species – 52**
- **non invasive alien species – 169**
- **invasiveness not known – 127**

The sum of alien species in boreal and mixed forests is 538 (although some of these species may be counted twice – in each of the two forest types)

NOBANIS www.nobanis.org

How many alien vertebrates in forests?

The sum of alien species in boreal and mixed forests is 538

- this number includes all taxa, not only vertebrates

- considering that, in general, the share of alien vertebrates among all alien species is low, the number of vertebrates in forests among those 538 forest aliens is also low

In conclusion:

- estimates of the numbers of alien species in forest are difficult because precise data combining taxonomy and habitat are not easily accessible

- however, it can be reliably stated that in forests, alien vertebra are less of a problem than alien invertebrates, fungi or plants

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NOBANIS

How do alien terrestrial vertebrates find their way to forests?

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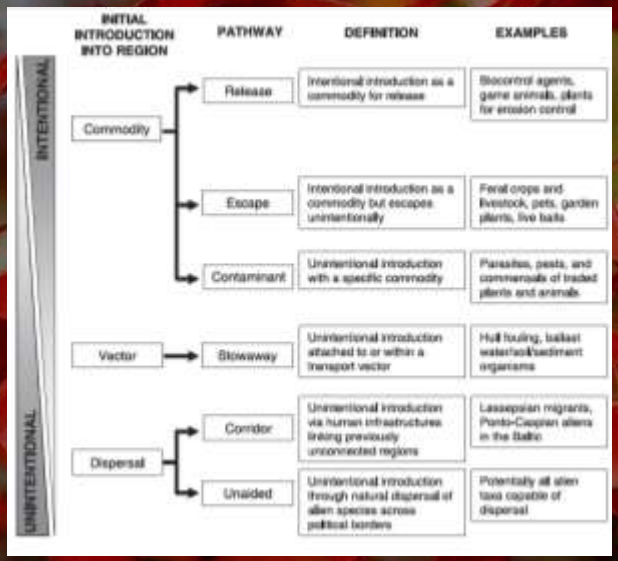
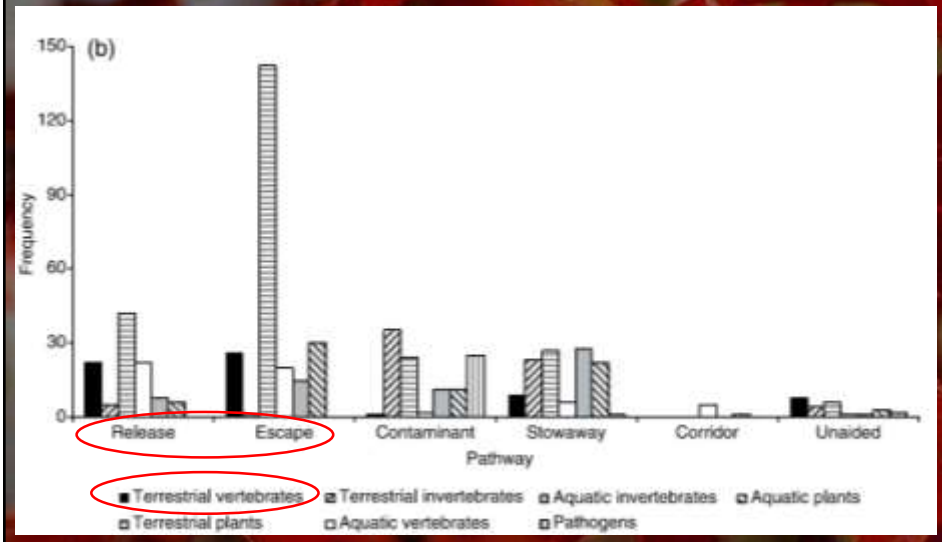


Hulme et al. 2008

How do alien terrestrial vertebrates find their way to forests?



Hulme et al. 2008

How do alien terrestrial vertebrates find their way to forests?

classification of introduction pathways according to the Global Register of Introduced and Invasive Species (GRIIS)

GRIIS www.griis.org

How do alien terrestrial vertebrates find their way to forests?

pathways relevant for terrestrial alien vertebrates (according to GRIIS):

releases	escapes
Biological control	Zoo
Hunting	Farmed animals
	Fur farms
	Pet species

GRIIS www.griis.org

How do alien terrestrial vertebrates find their way to forests?

release for hunting

Invasive Alien Species IAS

Sika deer *Cervus nippon*
White-tailed deer *Odocoileus virginianus*
Wapiti *Cervus canadensis*
Fallow deer *Dama dama*
Siberian roe deer *Capreolus pygargus*
Mouflon *Ovis mussimon*
Canadian beaver *Castor canadensis*
Raccoon dog *Nyctereutes procyonoides*
Raccoon *Procyon lotor*
American mink *Neovison vison*

How do alien terrestrial vertebrates find their way to forests?

release for biological control

Vietnamese potbellied pig *Sus scrofa bittatus*

released for protection of young forest plantations in Poland against root-damaging larvae

How do alien terrestrial vertebrates find their way to forests?

escape (zoos, farms, pets…)(…fur farms)

Invasive Alien Species IAS

American squirrel *Sciurus carolinensis*
Black squirrel *Sciurus niger*
Siberian chimpmunk *Tamias sibiricus*
Ring-tailed koati *Nasua nasua*

Sika deer
White-tailed deer
Wapiti
Fallow deer
Mouflon
Canadian beaver
Raccoon dog
Raccoon
American mink

What is the negative imapct of invasive alien vertebrates in forests?

in terms of monetary value of timber production, impact of invasive alien vertebrates is (probably by orders of magnitude) lower than that incurred by alien invertebrates, plants or fungi

the good news is that foresters do not have to be afraid that alien vertebrates will make their forest look like this:

however, their presence in forests is not completely neutral, particularly from the point of view of nature conservation

What is the negative imapct of invasive alien vertebrates in forests?

impact classification according to
the Global Register of Introduced and Invasive Species (GRIIS)

GRIIS www.griis.org

What is the negative imapct of invasive alien vertebrates in forests?

consequences of impact from terrestrial alien vertebrates
(according to GRIIS):

socio-economic	ecosystem-habitat	species-population
Damage to forestry	Modification of succesion	Native population size decline
Damage to agriculture	Primary production alteration	Native species range change
Threat to human health	Habitat degradation	Alteration of genetic resources
	Soil erosion	

GRIIS www.griis.org

What is the negative imapct of invasive alien vertebrates in forests?

mechanisms of impact from terrestrial alien vertebrates (according to GRIIS):

- Grazing/herbivory/browsing
- Predation
- Competition
- Hybridisation
- Disease/parasite transmission
- Poisoning/toxicity
- Rooting/Digging
- Trampling

GRIIS www.griis.org

Examples of invasive alien vertebrates in forests

sika deer *Cervus nippon*

Grazing/herbivory/browsing
Hybridisation
Parasite transmission
Competition
Trampling

→ Damage to forestry
Damage to agriculture

→ Modification of succesion
Primary production alteration

→ Alteration of genetic resources

Examples of invasive alien vertebrates in forests

sika deer *Cervus nippon*

Hybridisation
affected species:
Red deer *C. elaphus*

Parasite transmission
Ashworthius sidemi
(Asiatic bloodsucking nematode)
affected species:
European bison,
roe deer, red deer,
domestic cattle, sheep

Examples of invasive alien vertebrates in forests

Herbivory/browsing
Competition
Disease transmission

Damage to forestry

Native population size decline
Native species range change

Grey squirrel *Sciurus carolinensis*

Examples of invasive alien vertebrates in forests

Grey squirrel *Sciurus carolinensis*

Herbivory/browsing

Competition
Disease transmission:
squirrel pox virus
affected species:
Red squirrel *S. vulgaris*

Examples of invasive alien vertebrates in forests

Disease/parasite transmission
Predation

Threat to human health

Native population size decline

Raccoon
Procyon lotor

Raccoon dog
Nyctereutes procyonoides

American mink
Neovison vison

Examples of invasive alien vertebrates in forests

Raccoon *Procyon lotor*, Raccoon dog *Nyctereutes procyonoides*,
American mink *Neovison vison*

Disease/parasite transmission
rabies,
Baylisascaris procyonis

Predation

Examples of „non-invasive" alien vertebrates in forests

Because of negative impact, sika deer and grey squirrel are controlled

There are, however, alien species tolerated despite being invasive

Grazing/herbivory/browsing
Trampling

Damage to forestry
Damage to agriculture

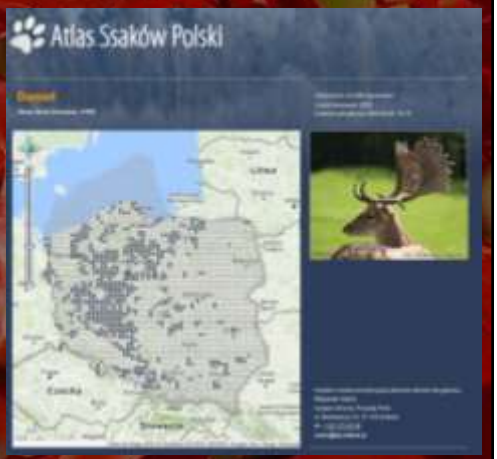
Modification of succesion
Primary production alteration

Fallow deer *Dama dama*

Examples of „non-invasive” alien vertebrates in forests

Fallow deer *Dama dama*

N of Fallow deer in Poland:
1990 – 5 400
2014 – 28 000



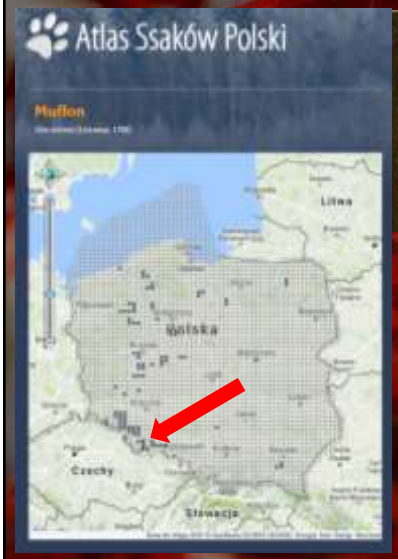
Examples of „non-invasive” alien vertebrates in forests

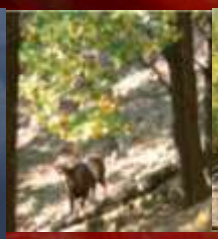
Trampling → **Modification of succesion**
Primary production alteration
Habitat degradation
Soil erosion

Mouflon *Ovis mussimon*

Examples of „non-invasive” alien vertebrates in forests

Mouflon *Ovis mussimon*





How to mitigate the problem of biological invasions in forests?

Efforts of forestry services towards mitigating the problem of biological invasions are obviuosly focused on alien species affecting timber production

These efforts are also important from nature conservation perspetive, because alien species that severely affect timber production, at the same time usually have detrimental influence also on biological diversity (forests are biodiversity hotspots)

However, it may be more challenging for forestry services, to address threats from forest alien species whose impact is only on biodiversity (and not on economy)

The challenge may be insufficient financing and manpower…

…but also insufficient awareness of the problems caused by invasive alien species

How to mitigate the problem of biological invasions in forests?

Convention on Biological Diversity (CBD), Decision VI/23 from 2002

Guiding Principles for the Prevention, Introduction and Mitigation of Impacts of Alien Species That Threaten Ecosystems, Habitats or species:

1: Precautionary approach
2: Three-stage hierarchical approach
3: Ecosystem approach
4: The role of States
5: Research and monitoring
6: Education and public awareness
7: Border control and quarantine measures
8: Exchange of information
9: Cooperation, including capacity-building
10: Intentional introduction
11: Unintentional introductions
12: Mitigation of impacts
13: Eradication
14: Containment
15: Control

How to mitigate the problem of biological invasions in forests?

Cost-effective solutions to improve implementation of the CBD's guiding principles in forests:

5: Research and monitoring
– extend the scope of monitoring schemes in forests to include a wider set of species; establish early-warning systems (sometimes just one phone call or email is enough)

6: Education and public awareness
– include biological invasions into forest education centers programmes

10: Intentional introduction
– consider biodiveristy interests while cooperating with hunters on introductions of game species (particulary that the level of awareness of the problem among hunters has improved

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Thank you!

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