

RED WOOD ANTS SETTLEMENTS AS OUTSIDE STUDY OBJECTS AND MANAGEMENT OF ANT-FRIENDLY TOURISM



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Red wood ants:

Represent the highest level of invertebrate social evolution in the same sense that human beings represent the summit of vertebrate evolution

The extinction of ants and social pollinators (my addition) in the world would be a serious catastrophe. But, on the other hand, if the mankind would die, the greatly suffered nature would start to flourish again (Hölldobler, Wilson, 1990, 1994).

Red wood ants

- Red wood ants (*Formica* s. str.) are a key species in boreal forest communities.
- The importance of ants in forest ecosystems, and their interaction between birds, mammals and other insects have significant role in the function of forest community.

The interactions between birds, mammals and other insects



Some facts about brown bear diet in Estonia

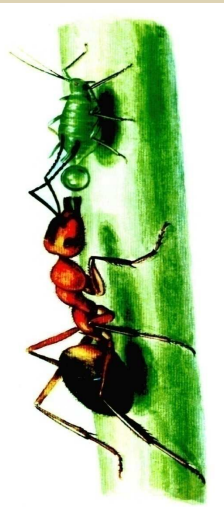
The commonest vertebrate are wild boar, domestic pig and cow, while **the most frequently eaten invertebrates are ants**, especially from groups of *Formica* and *Lasius*.

The ants are important food source in brown bear diet, they **give more than one-third of estimated dietary energy content in summer** (Vulla, *et al.*, 2009)



Vulla, E., Hobson, K. A., Korsten, M., Leht, M., Martin, A.-J., Lind, A., Männil, P., Valdmann, H. & Saarma, U. 2009: Carnivory is positively correlated with latitude among omnivorous mammals: evidence from brown bears, badgers and pine martens. — *Ann. Zool. Fennici*.

Aphid farming



The colony of red wood ants collect up to :

- 1000 kg aphid nectar per summer (Maavara, Martin, 1979; Martin et al, 1999, 2003)
- 35 (Rosengren, Sundström, 1991) - 70 kg (Martin, 1981, 2000) prey food

Red wood ant settlements as objects in:

- Nature tourism and recreation
- Outside study:
 1. Biology of ants
 2. Ants in forest protection
 3. Ant control
 4. Resettlement of red wood ant nests
 5. Artificial settlements for field and outside study

Sipelqamaailm

Te asute siipelgarigi sünni juures. Siia asustati 2007. aastal Soevarikust ümber üheksa laanekuklaste pesa, millestest peaks kujunema lähiaastatel siinsete metskude uued peremehed, kes hoiavad metsad kahjuritevabad ja pakuvad lisatõutu ning erinevaid teenuseid siinsete metskude teistele asulatele: imetajatele, lindudele ja kahepaiksetele ning väga paljudele metsaputukatele.

Sipelgad on koos mesilaste, herilaste ja kimalastega üks tähtsaim putukaterühm kiletivaliste seltsis. Sipelgate sugukonnas on metsakülalased evolutsioonilt üks arenemini ja looduslikult domineerivam liigrühm. Seda kõike on nad saavutanud tänu oma sotsiaalsel eluviisel. Sipelgare liikmete vahel on, tööjõut, järglaste hoole, info- ja toiduvahetus ning koostöö osalemine vajalike tööülesannete täitmiseks.

Nii sipelgatel kui inimestel on välja kujunenud sotsiaalsed struktuurid ja sotsiaalne eluviis – sipelgad peetakse kõige kõrgemale arengutasemele jõudnud olendite selgrootute loomade hulgas, inimest aga selgroogsete seas. Samas, kui hävksid sipelgad, oleks see suurim katastroof kõikidele elukooslustele, inimese kadumine maalt paneks aga taas õitsema kõik looduskooslused (Hölldobler, Wilson, 1990).

Sipelgaid:

Maaailmas	8 800...15 000 liiki
Aafrikas	2 500 liiki
Austraalias	1275 liiki
Venemaal	350 liiki
Euroopas	180 liiki
Eestis	50 liiki
Tähtveres	üle 20 liiki

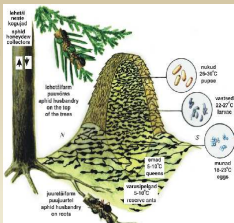
Sipelgate tähtsus:

- lai levik
 - kõrge biomass (kuni 300 kg/ha)
 - toiduks lindudele, imetajatele
 - hajurikolletele kollektiiviselt ja organiseeritud alarühjad
 - mulla aereerijad ning orgaanilise aine lagundajad
 - seemnete levitajad
 - tolmeldajad
 - metsauuendajad
 - head biotindikaatorliigid
 - elanud maal 100 000 000 aastat
- Metsaklassid** on võetud kaitsse alla enamikes Euroopa riikides asukondade elujärgisus on märgatavalt vähenenud, kukkudes lisaks 3. kategooria kaitsealuste loomade
- Punaseks Raamatusse ning nende kaitseks on rajatud looduskaitselaid. Peamisteks ohuteguriteks on ulat
- intensiivne tallamiskoorums ja keskkonasaaste.

Kallid külalised, palun:

- püüde mitte tallata sigelgradadel ja kasutage radade ületamisel kaitsesillakesi
 ärge lõhkuke sigelgasepi
 kõndige ainult mööda metsateid, jalgradasid ja tähistatud õpperadasid
 püüde hoida mets puhtana – kui leiad prugi, vii see prügikasti või peida sambla
 alla nagu ka sigelad kannavad oma toidujäätmeid ja sumud pesakaaslaste
 kalmistutele ning jäämehedilatesse.

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Gen. *Formica* – kuklane (18 liiki)

Formica s.str. – metsakuklased – red wood ants (7 species)

- F. polycytena* – palukuklane
F. aquilonia – laanekuklane
F. rufa – arukuklane
F. pratensis – liivakuklane
F. lugubris – karukuklane
F. nigricans – veerekuklane
F. truncorum – kannukuklane



Myrmica sp. – rautsikud (Eestis 10 liiki)



Lasius niger –
Mullamurelane – black
beetle ant



Lasius flavus –
Nidmusseln – gelb



Camponotus sp. – hobusipelgad – carpenter ant



ad – carpenter ant

Kingdom of Ants

Here we witness the origin of the new kingdom of the red wood ant of *Formica aquilonia*. In 2007 nine new anthills were transplanted from Soevärku to form a new ant settlement in this place. The ants will be new good hostesses of the surrounding forests, they keep forests free from pests and offer food and services for other inhabitants, e.g. mammals, birds, amphibians. Anthills are comfortable homes for several hundreds of forest insect species.

The ants together with bees and bumblebees are the most important insect group in the hymenoptera. Red wood ants are characterized by the highest level of sociality compared to other social insects. They have the dominant role in nature due to the social life style in their settlements. They are able to depress a number of pest insects and regulate positively the balance of forest community. They represent the highest level of invertebrate evolution in the same sense that human beings represent the summit of vertebrate evolution. The extinction of ants and social pollinators (bees and bumblebees) in the world would be a severe catastrophe. But, on the other hand, if the mankind would die, the greatly suffered nature would start to flourish again (Hölldobler, Wilson, 1990).

The ants:

in the world	8 800...15 000 species
in Africa	2 500 species
in Australia	1275 species
in Russia	350 species
in Europe	180 species
in Estonia	50 species
In Tähtvere	over 20 species

The importance of ants

- widely distributed
 - high biomass
 - food for birds and mammals
 - leading predators of other insects, many pest insects
 - decomposers of organic material
 - participate in soil genesis through the aeration of the soil and mixing forest detritus with soil
 - mineralize the forest floor and favour a better germination of seeds including
 - pollinate wild plants including berries and distribute their seeds increasing the biodiversity of forest communities
 - are excellent bioindicators of environmental pollution
 - have lived 100 000 000 years on Earth
- Red wood ants have been taken under protection in majority of the European countries because their populations have decreased remarkably. In Estonia the red wood ant is a protected species and to the IUCN Red Data Book it is listed in the category of threatened species and to the IUCN Red Data Book List of Threatened Species, Padaköivi and Alaste nature reserves have been formed to protect the two biggest Red Wood Ant populations in Estonia. The main factors are clear cutting, intensive tramping and environmental

Dear visitors!

- Be careful and do not step on ant trails
- Don't damage nests
- Walk only along marked nature study or hiking trails, along paths and roads
- Don't leave trash behind – everything you have brought into the protected area, you should take along when you leave

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Akste, Padakõrve and Valgesoo Nature Reserves



The communication and trophallaxis of ants and their nestmates



The behaviour of ants



In the ant nursery



Hölldobler ja Wilson, 1994

The wars between ants



F. fusca – *F. sanguinea* in Estonia

Resettlement of red wood ants

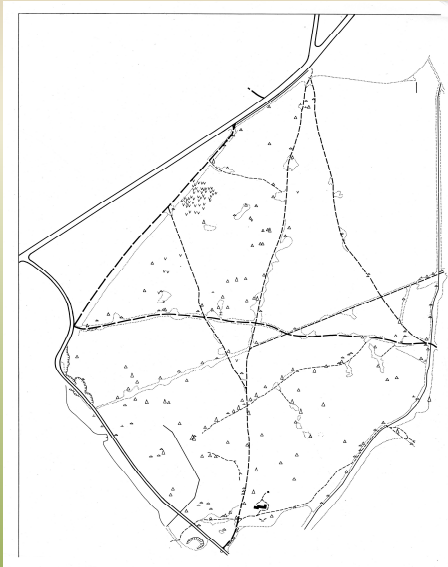
Nature (the ants) dislikes
empty places (saunas)



If red wood ants have
occupied our saunas,
cottages or apiaries -- the
deportation (=removal) of
ants is necessary



Artificial settlements and formicariums for outside study purpose



Human load

Red wood ants suffer from:

- Environmental pollution
- Forest management
- **Trampling load**

Trampling by tourists has become a serious problem in some nature reserve in Estonia because of nature tourism popularity rapid growth.

The aim of present study is:

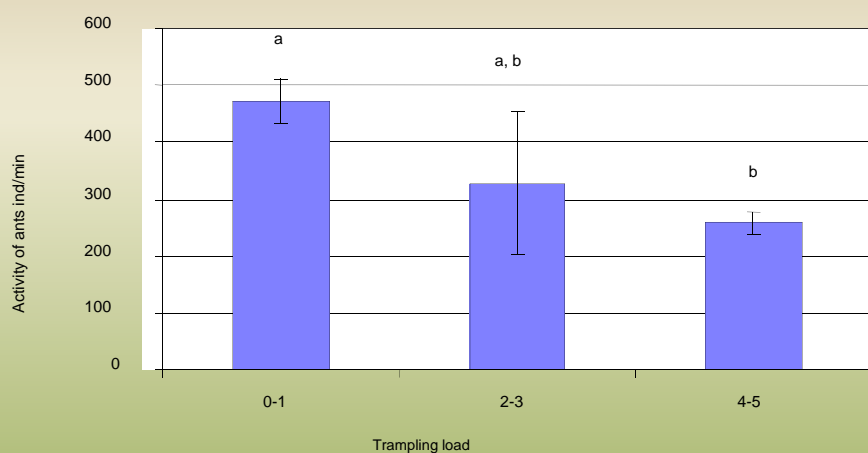
- to explain the impact of trampling load on the state of red wood ant of *Formica aquilonia* settlements
- to give recommendations for ant-friendly tourism in red wood ant nature reserves in Estonia

Material and methods

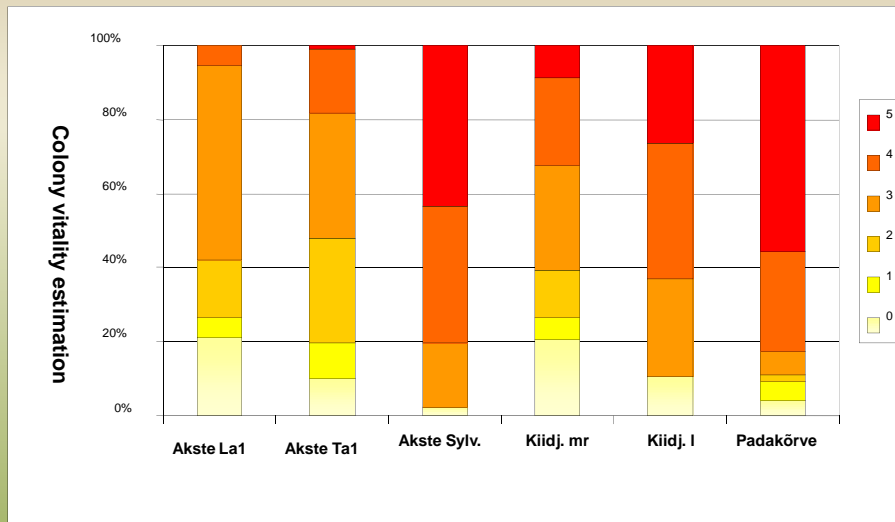
- The impact of trampling load in red wood ant settlements was studied mainly in 2002...2009.
- Data collected from **Akste and Valgesoo Nature Reserves** and in Kiidjärve settlement, **which are very intensively visited areas** and from **Padakõrve Nature Reserve where the trampling load is low** at present time.
- Trampling load was estimated by the **degradation of plant cover** and by the **state of nests in ant settlements**.
- Impact of trampling load to the red wood ant settlements was observed by:
 - **the total traffic intensity of foragers on ant paths** (individuals per minute through the crosscut of the path),
 - **number of ant paths per nest** and
 - **vitality of the colony** (in 5-point grading).

The results

Influence of trampling load (5-point grading) on the traffic activity (ind/min) in Akste Nature Reserve in 2004 –2006



Proportion of colonies with different vitality in Akste, Kiidjärve and Padakõrve Nature Reserves



The nest in the region of heavy trampling load in 2005 and ...



the same nest in 2006, 1 year after closing
the reservation for tourists



Conclusions

- The results showed that the state of Padakõrve nests is much better than those in Akste Nature Reserve
- The heavy trampling load is most dangerous in the close vicinity of the nests causing:
 - substantial fall in traffic intensity of foragers on ant paths,
 - decrease the number of ant paths and therefore
 - lose the food territory and
 - decline the vitality of the colonies take place.
- Comparison of different trampling load rates showed that the more intensive trampling is, the bigger are the nest damages
- The best way for ants would be absence of trampling load
- Intensive trampling load has a long-time effect on red wood ant of *Formica s.str.* settlements.

Conclusions 2

- Human load causes disturbances in red wood ant social homeostasis in the colony, supercolony and settlement level
- and the suffered red wood ant colonies and settlements have been become more vulnerable to their natural enemies like mammals, birds and nest parasites



Recommendations for the ant-friendly future tourism

- **Tourism** (hiking and study trails) **should be more dispersed spatially and temporal way** between different red wood ant settlements all over the Estonia
- Existing natural barriers like ditches between hiking trail and nests prevent people from stepping on ant paths and damage the mounds
- Tours in ant reservations should be only for showing the reality in nature, **more detailed information can be told in an illustrated lessons before in local field class-rooms**
- Artificial settlements and formicariums are needed
- Professional guides should **set a good pattern** for tourists and pupils to wake them up, how to behave in ant reservation.

Although nature tourism is essential to educate people and offer recreation possibilities, the areas exposed should be well planned and managed if we want to preserve the beauty of intact nature for the future generations and save threatened species.

Thank you for attention!

See you in the kingdom of red wood ants!

