Stowaways in horticultural plants imported from the Netherlands, Germany and Denmark

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A steadily increasing import of horticultural plants to Norway for outdoor use facilitates the entry of organisms as stowaways on these plant commodities. Samples were taken from consignments of newly imported horticultural plants, mainly *Thuja* sp. and *Taxus* sp., from the Netherlands, Germany and Denmark. Three sampling methods were used: shaking the plants, sampling soil and debris from the bottom of the container, and visual inspections of the plants. Insects and spiders were prioritized in the collection process, but also species of Diplopoda, Isopoda, Gastropoda and Oligochaeta were represented in the material collected. The sampling resulted in 157 identified species and 1194 specimens. The three methods used resulted in 85, 93 and 5 species, respectively. 16 of the species found (14 insects, one spider and one diplopode) were at the time of discovery new to the Norwegian fauna, including the invasive alien ladybird *Harmonia axyridis* Pallas, 1773. Their biology, more recent observations and potential for establishment in Norway are discussed. At least 10 of the species are likely to establish in the country. The result of our investigations reveals that the WTO-SPS-Agreement and subsequent control measures are neither sufficient to protect an area against non-quarantine species nor to protect biodiversity.

Key words: Stowaways, species new to Norway, alien species, invasive species, biodiversity, Convention on biological diversity (CBD), WTO-SPS-Agreement

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Introduction

The adverse effects of increasing global trade may cause a decline in biodiversity and a homogenization of the Earth's biota (Wittenberg & Cock 2001, Mooney 2005, Kenis et al. 2009). In Norway, the import of horticultural plants for further cultivation in plant nurseries or for direct sale to consumers for outdoor and private use has doubled between 1997 and 2006 (NGF 2006). One of the driving forces for this steadily growing industry is probably the fact that plants produced in other countries are more competitive on price compared to the domestic production.

Many of the plants imported for outdoor use have been grown in the field for one or several years in other parts of Europe (or elsewhere), where they serve as host plants or refugee sites for the local fauna. Plants grown directly in the field are in addition imported with a lump of the soil around their roots originating from the production site. Probably soil-living organisms and organisms with stage(s) of its lifecycle in soil

will be present in the soil at the time of export, and are still alive when the plants are sold and transplanted in Norway. Thus, it is likely that the steadily increasing import to Norway results in importation of unwanted stowaways following these plant commodities.

A master thesis (Staverløkk 2006) was carried out in 2006, where one of the aims was to document the occurrence of stowaways imported to Norway. Importantly, the study had a wider focus than the Norwegian quarantine pest list, since organisms that are not on this list receive almost no attention from the national control system (Norwegian Food Safety Authority (Norway's National Plant Protection Organization, NPPO)). Samples were taken from consignments with horticultural plants newly imported from different countries in Europe, mainly Germany, Denmark and the Netherlands. Three collecting methods in a limited time period were used and resulted in 157 species (mainly insects). The results reported in this study focus on the 16 species of mainly insects and spiders recorded in the master study, which by the time of record had not previously been documented from Norway. Some of these species have later been observed in Norway, and our results from 2006 show that importation with horticultural plants is a major immigration route. Some information on distributions and biology of the 16 species is included in Staverløkk & Sæthre (2007). The present study stresses today's knowledge on these species and their chances of establishment in Norway.

Material & Methods

The sampling was conducted in collaboration with the Norwegian Food Safety Authority and one of the importing plant nurseries (Rustad Planteskole). Sampling was carried out at the time of, or very shortly after, arrival of the individual consignments. The geographic areas for the study were Akershus and Oslo counties, which are located in South-Eastern Norway and are the biggest import areas for such goods into the country. Most samplings were carried out during April and May 2006 (peak import season), while a few were conducted in August 2006. Most of the plants sampled were *Thuja* sp. and *Taxus* sp. imported from Aalsmeer in the Netherlands, Rellingen in Germany or from Denmark, but also a few other horticultural plants were included (for full list, see Attachment 5 in Staverløkk 2006). However, some of these plants may originate from other countries before transported to the shipping country.

A total of 27 consignments were investigated and three sampling methods were used:

Method 1: Shaking method (on the spot).
Plants were shaken by carefully hitting the branches above a white paper. The organisms that fell off the plants were quickly collected by an "exhauster". Each sample size was between 5–10 plants of the same plant species/variety from the same consignment. Organisms from one sample were put in the same vial. A total of 17 samples were taken.

Method 2: Sampling organic material and compost (further investigations in the laboratory).
Compost, soil and whatever organic material that had fallen off during the transport or when unloading the containers were collected from the bottom of the containers, using a big brush. This material was put in plastic bags and brought to the laboratory for further investigation under a stereomicroscope. A total of 6 samples were taken.

Method 3: Visual observation (on the spot).
Inspections of plants were performed using the naked eye. This method was used on larger plants when shaking was impossible due to the size and weight of the plants or for other practical reasons. A total of 4 samples were taken.

Further handling of the material
Insects and spiders were prioritized in the sampling process, but also species of Diplopoda, Isopoda, Gastropoda and Oligochaeta were represented. The material collected was brought to the laboratory; specimens were separated individually or in groups, put in tubes, preserved in 70% alcohol, and properly labelled, all at the

day of collection. The material was identified by different experts in Norway, Sweden and the UK. A database containing all information about each sample, including information from the plant health certificate such as certificate number, place of origin, exporting/importing entity, and so on, were made (Staverløkk 2006).

Results

Interceptions and species recorded in Norway for the first time

The three sampling methods used resulted in 1194 specimens, and from this material 157 different species were identified. Method 2 appeared as the most efficient of the three methods used: 93 species from a total of 6 samples, compared to 85 species from 17 samples by shaking and only five species from four samples by visual inspections. Figure 1 illustrates that the methods influenced the composition of the sampled fauna.

Among the 157 species identified during the investigation 18 species were not recorded in Norway at the time of discovery. Below is a description of 16 of them (Table 1). Of these, at least 10 species are likely to establish in Norway. Three of the species has later been recorded outdoors.

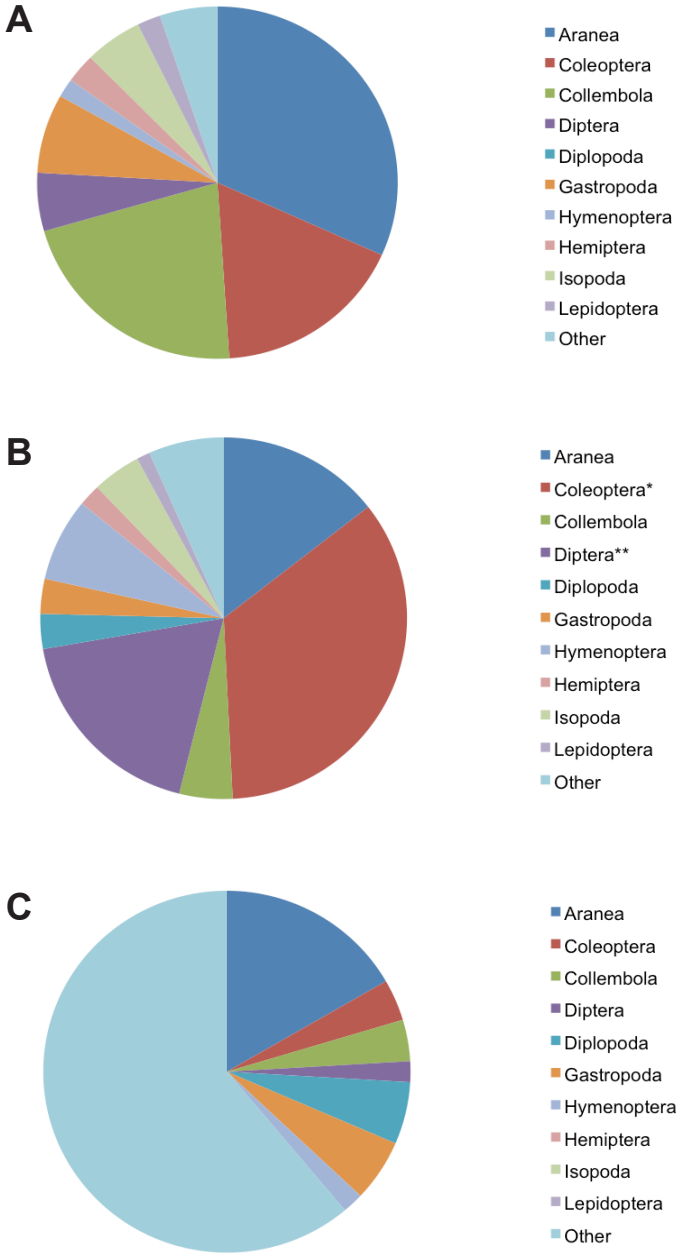

Figure 1. Relative frequencies of different organisms collected by three sampling methods. **A**. Shaking method; **B**. Compost; **C**. Visual observation. "Other" includes Psocoptera, Dermaptera, Thysanoptera, Neuroptera, Arachnida (not included spiders) and Oligochaeta. * Of a total of six samples and 332 specimens, 244 specimens of one single species were found in one single sample. ** Of a total of six samples and 175 specimens, 129 specimens of one single species were found in one sample.

Table 1. The 16 species listed below were at the time of discovery new to the Norwegian fauna. They were found as stowaways in imported horticultural plants in 2006. Host plant/habitat refers to the plant(s) the species was connected to when discovered and is not necessarily a true host plant or a preferred habitat of the species. Sampling method refers to 1) Shaking method, 2) Compost, and 3) Visual observation

Date	No. ind.	Family	Species	Host plant/-habitat	Samp. method	Exporting country
19.04	1	Entomobryidae	*Orchesella quinquefasciata* (Bourlet 1843)	*Thuja occidentalis*	1	The Netherlands
26.04	12	Entomobryidae	*Orchesella quinquefasciata* (Bourlet 1843)	*Thuja occidentalis*	1	The Netherlands
19.04	1	Lygaeidae	*Heterogaster urticae* (Fabricius 1775)	*Thuja occidentalis*	1	The Netherlands
03.05	2	Pentatomidae	*Piezodorus lituratus* (Fabricius 1794)	*Thuja* sp.	2	The Netherlands
18.04	1	Ectopsocidae	*Ectopsocus petersi* Smithers 1978	*Thuja occidentalis*	1	The Netherlands
19.04	2	Ectopsocidae	*Ectopsocus petersi* Smithers 1978	*Thuja occidentalis*	1	The Netherlands
24.04	7	Ectopsocidae	*Ectopsocus petersi* Smithers 1978	*Taxus media*	1	The Netherlands
26.04	1	Carabidae	*Harpalus signaticornis* (Duftschmid 1812)	*Thuja occidentalis*	1	The Netherlands
19.04	1	Coccinellidae	*Harmonia axyridis* (Pallas 1773)	*Thuja occidentalis*	1	The Netherlands
11.05	1	Coccinellidae	*Rhyzobius chrysomeloides* (Herbst 1792)	Mix of plants	2	Germany
02.05	1	Staphylinidae	*Quedius scintillans* (Gravenhorst 1806)	Mix of plants	2	Denmark
11.05	1	Chrysomelidae	*Epitrix pubescens* (Koch 1803)	Mix of plants	2	The Netherlands
19.04	1	Curculionidae	*Otiorhynchus dieckmanni* Magnano 1979	*Thuja* sp.	1	The Netherlands
03.05	244	Curculionidae	*Otiorhynchus dieckmanni* Magnano 1979	*Thuja* sp.	2	The Netherlands
04.04	1	Latridiidae	*Cartodere bifasciata* (Reitter 1877)	*Hydrangea*	3	The Netherlands and Germany
11.05	3	Latridiidae	*Cartodere bifasciata* (Reitter 1877)	Mix of plants	2	The Netherlands
24.04	2	Sciaridae	*Chaetosciara estlandica* (Lengersdorf 1929)	*Taxus media*	1	The Netherlands
02.05	1	Formicidae	*Temnothorax crassispinus* (Karavaiev 1926)	Mix of plants	2	The Netherlands
03.05	1	Formicidae	*Temnothorax unifasciatus* (Latreille 1798)	*Thuja* sp.	2	The Netherlands
02.05	1	Julidae	*Brachyiulus pusillus* (Leach 1814)	Mix of plants	2	The Netherlands
11.05	2	Dictynidae	*Lathys humilis* (Blackwall 1855)	Mix of plants	2	The Netherlands

COLLEMBOLA

Orchesella quinquefasciata (Bourlet, 1841) (Entomobryidae)

The species is widely distributed in Europe except Fennoscandia and Denmark (Fjellberg 2007) and countries east of Germany. The species distribution is not quite clear, but *O. quinquefasciata* seem to be more abundant in the south and west of Europe (Deharveng et al. 2007). In England the species is recorded from chalk grasslands (Shaw et al. 2003) and in the Netherlands from damp meadows (Berg 2007). It seems to prefer wet clay containing soil with a rough cover but not too thick layer of mulch. It is likely that the species can establish local populations in South and Southwest Norway through repeated import (pers. com. Arne Fjellberg).

HEMIPTERA

Heterogaster urticae (Fabricius, 1775) (Lygaeidae)

The species is distributed all over Europe included Sweden, Denmark and Finland (Aukema 2007). Eggs are laid in the soil, on the leaves of or close to nettle plants (*Urtica* spp.). In Europe known host plants are *Urtica dioica* L. and the roots of European beach grass, *Ammophila arenaria* L. (Stichel, 1958). *H. urticae* overwinters as imago

under bark or holes in trees close to its host plants (Southwood & Leston 1959). It inhabits warm, sunny fields and non-acid waste lands. Passive dispersal seems to be the known ways of movement to new areas for this species, like import of fruits and grass (Scudder & Eyles 2003). About a year after the present study was completed an outdoor population was found in Østfold county, in South East Norway (Ødegaard & Endrestøl 2007).

***Piezodorus lituratus* (Fabricius, 1794) (Pentatomidae)**

The species is widely spread all over Europe and established populations are found both in Denmark and southern parts of Sweden (Tolsgaard 2001, Sandström 2007). *P. lituratus* hibernates as imago, and the nymphs are found in June–September (Tolsgaard 2001). Its main host plant is broom, *Cytisus scoparius* L., while other host plants include gorse (*Ulex europaeus* L.), legumes (*Lupinus* sp., *Trifolium* sp., *Melilotus* sp. and *Medicago* sp.), and the woody Papilionaceae of the tribe Genisteae (Panizzi et al. 2000). *P. lituratus* completes one generation per year in its northern area of distribution with an obligatory diapause (Schaefer & Panizzi 2000). In Norway this species might find good habitats in the most southern parts of Norway where its main host plant (*C. scoparius*) can be found (pers. com. Frode Ødegaard).

PSOCOPTERA

***Ectopsocus petersi* Smithers, 1978 (Ectopsocidae)**

In Europe this species is only recorded in Great-Britain, France, Belgium, Ireland, and Northern-Ireland (Copenhagen & Lienhard 2007). According to Lienhard (1998) *E. petersi* seems to have its natural occurrence in Europe and is more connected to the Atlantic cost on the European side than the North American side, where the species also can be found. Its preferred habitat is sunny branches and leaves. *E. petersi* could be a more abundant species than the distribution map shows because of poor registrations of this order (pers. com. Johannes Anonby). It is not recorded in Sweden or Denmark. Since Psocoptera species are mainly distributed by wind, it is likely to assume that *E. petersi* would have been present in Norway if the climatic conditions were suitable for the species. *E. briggsi*, a cosmopolite that occurs in Norway, could be a competitor of *E. petersi*, though it is not many records of this species either. It is therefore reasonable to conclude that low summer temperatures could be a minimum factor for both of these species (pers. com. Johannes Anonby).

COLEOPTERA

***Harpalus (Semiophonus) signaticornis* (Duftschmid, 1812) (Carabidae)**

The beetles are found on open, sandy or chalky ground. They prefer dry habitats at both low and high altitudes. Many species in the genera are nocturnal and stay buried in the soil during daytime. Unlike many other ground beetles, *Semiophonus* species are not entirely carnivorous, but also eat seeds, pollen, fruits, etc. (Harde 1984, Lindroth 1986). Except from the countries on the British Isles and Norway, this species is widely distributed in Europe. Established populations are recorded in southern Sweden, Denmark, Estonia and Lithuania (pers. com. Frode Ødegaard).

***Rhyzobius chrysomeloides* (Herbst, 1792) (Coccinellidae)**

It is one of two species of its genus found in Central Europe. The ladybird is found chiefly on pine-trees and shrubs (Harde 1984). Eggs are laid in the cortex of pine and the species is an effective predator on aphids and scale insects, especially *Matsucoccus feytaudi* Ducasse, 1941. *R. chrysomeloides* has a one year life cycle and the adults become reproductive after hibernating in various sheltered places, i.e. in bark scales and crevices. The beetles can be caught in the summer on vegetation, and in the winter they can be found in moss, at plant roots, and under bark. *R. chrysomeloides* is generally abundant near water. The species is widely distributed in the countries around the Mediterranean, and it occurs up to The Netherlands and Germany. It is recorded in Denmark but not in Sweden (pers. com. Frode Ødegaard), and its potential for establishment in

Norway is uncertain.

***Quedius scintillans* (Gravenhorst, 1806) (Staphylinidae)**
It is a widely distributed species in Europe. It is recorded from Denmark and larger parts of Sweden, and is likely to become established in Norway if introduced (pers. com. Frode Ødegaard).

***Epitrix pubescens* (Koch, 1803) (Chrysomelidae)**
This flea beetle is associated with swamps and bogs in weedy places, field margins, and on arable land (Koch 1992). The tiny beetles hibernate as adults and may appear in the fields very early in the season and cause serious damage to young plants. Flea beetles cause small shot-hole damage to leaves, and several species are known as agricultural pests. Host plants of *E. pubescens* belongs to the Solanaceae family and the *Solanum* genus, which contains a number of species beneficial to humans. The beetle seems to live equally well on both species of nightshade, *S. nigra* L. and *S. dulcamara* L. (Allen 1984, 1988). Halstead (1998) report an observation on *E. pubescens* infesting *S. crispum* Ruiz & Pav., and this species may have several host plants. In winter it can be found in litter, grass tussocks, leaves and moss on trunks. The species is distributed in all the European countries except Denmark, Iceland, Ireland, Northern-Ireland and Norway according to Audisio (2007). It has been recorded in many counties in Sweden, and is likely to become established in Norway as well if introduced (pers. com. Frode Ødegaard).

***Harmonia axyridis* Pallas, 1773 (Coccinellidae)**
One specimen (female with eggs) was collected on *Thuja occidentalis* L. from the Netherlands. The harlequin ladybird is regarded the most invasive ladybird in the world. The species was first imported as a biological control agent from East-Asia to USA in 1916, and was brought to Europe in the 1980`s. During the last ten years it has spread to most European countries (Brown et al. 2007). The ladybirds aggregate on houses and seek to a "cold-free space" during fall, which could partly explain its invasive success in the northern region. Threat to the biodiversity through both competition and predation on other Coccinellidae species seems to be one of the negative attributes of this species (Adriaens et al. 2003). Based on the species' appetite for aphids it is considered a beneficial insect in agriculture and gardening, but there are also reports about the harlequin ladybird becoming a pest when they aggregate in numbers of hundreds. A review of the biology and invasive skills of the ladybird along with the first record in Norway is given by Staverløkk et al. (2007). Since the first record in 2006, the species has been found outdoors at several locations in southern Norway (Staverløkk & Sæthre 2008). It is now considered established in Norway, probably as a consequence of the increased import of plants for outdoor use.

***Otiorhynchus dieckmanni* Magnano, 1979 (Curculionidae)**
In one consignment a number of 244 specimens were found on *Thuja* sp. imported from the Netherlands. Root weevils have been a big problem for plant nurseries in many years. About 15 years ago, plant commodities were denied entry to Norway if root weevils were found. Later, it became evident that weevils appeared in so many consignments, that the NPPOs in most European countries found it impossible to carry out controls. As a result the weevils were simply removed from the quarantine list. After the acceptance of root weevils in imported plants, the spread of these species has increased all over Europe. Like many of the *Otiorhynchus* species, *O. dieckmanni* are parthenogenetic, and one single individual can be enough to start a new population. Most of the conifers are imported with a lump of soil from the production site. In this soil the larvae of many *Otiorhynchus* species may be present. *O. dieckmanni* was first registered in Germany in 1978, but the country of origin is still unclear, despite the fact that *O. dieckmanni* belongs to the subgenus *Arammichnus* Gozis which has several species in Italy (Magnano 1979). *O. dieckmanni* is a polyphagous species with a wide range of host plants (Dieckmann 1980). In Europe the beetle is becoming more abundant, and it is found at several locations in the Netherlands (Heijerman & Raemakers 2001). In Scandinavia *O. dieckmanni*

is found in Denmark and Sweden. The record in Sweden is based on one single specimen found on Öland in 1981. One specimen was recorded in Denmark in 2007 (Runge 2008).

***Cartodere (Aridius) bifasciata* (Reitter, 1877) (Latridiidae)**

Three species of *Cartodere* Thompson, 1859 are found in central Europe. They are notable for the thick ribs on their elytra, and waxy secretion on the sides of the protothorax which appears like translucent margin in dorsal view. The elytra of *C. bifasciata* have dark markings on a lighter background but can be somewhat variable in colour (Hodge & Jones 1995). As mould-feeders they are found on bark, wood and leaves, in hay and straw debris and occasionally on mildewed wallpaper in damp houses (Harde 1984). Not much is known about the biology of the species as most of the literature is reports of new records. *C. bifasciata* originates from Australia and has been spread around the world through import of exotic crops, grass and rushes. It is rarely recorded in native habitats, but has been found on flowering shrubs, in moss and in leaf litter (Watt 1969). The first record of *C. bifasciata* in the UK was in 1949 and it had previously been accidentally introduced to Germany through Australian tobacco. The species is distributed in larger parts of Europe (France, Germany, The Netherlands, Belgium, Switzerland, Austria, Czech Republic, Great Britain, Denmark and Sweden). It is also found on the island of Madeira (Audisio & Rücker 2007). *C. bifasciata* is established in compost heaps in both Denmark and Sweden and introduced to several locations in Sweden (pers. com. Frode Ødegaard). It is therefore likely that the species is able to establish also in Norway.

DIPTERA

***Chaetosciara estlandica* (Lengersdorf, 1929) (Sciaridae)**

This species has an eastern distribution in Europe with records from Germany, Sweden, Finland, Estonia, Czech Republic, Latvia, Kaliningrad Region and central parts of Russia (de Jong & Heller 2007). The species might occur in the Norwegian fauna as well (pers. com. Øivind Gammelmo), but there is a lack of knowledge about Sciaridae species in Norway and no records of the species so far.

HYMENOPTERA

***Temnothorax (Leptothorax) crassispinus* Karavaiev, 1926 (Formicidae)**

The specimen found was a queen. The genus *Temnothorax* Mayr 1861 was until recently referred to as *Leptothorax* Mayr 1855 (Bolton 2003). *T. crasssispinus* is widely distributed in Eastern Europe and larger parts of Russia with Germany as the limit to the west and Albania as the southern border (Noyes & Radchenko 2007). *T. crassispinus* is a parapatric species to *T. nylanderii* and occasionally they hybridize in the contact zone in the North-Eastern Germany (Seifert 1996).

***Temnothorax (Leptothorax) unifasciatus* (Latreille, 1798) (Formicidae)**

The specimen found was a queen. The species is monogynous and monoandrous, meaning they have a single, singly mated queen. It is a xerothermic (dry and hot) species with a broad distribution in Europe but more common around the Mediterranean. In central Europe it only occurs in open, sunny sites (Seifert 1996). Established populations are not recorded in Scandinavia (only coincidental records in Sweden) and it is unlikely that the two species found in this study will establish in Norway on short term (pers. com. Per Douwes).

DIPLOPODA

***Brachyiulus pusillus* (Leach, 1814) (Julidae)**

B. pusillus can be found in seminatural biotopes such as churchyards, gardens, greenhouses and plant nurseries. The species is found under stones and woody debris and in litter, often by old walls (Andersson et al. 2005). The capacity of *B. pusillus* to disperse by own means is limited, and movement is expected to take place via plant commodities, soil and similar. It is known to occur in alder stands among bushes along streams

and field fringes in southern Scandinavia. *B. pusillus* has been introduced to USA where it is widely distributed, and also to the Canary Islands, Madeira, Azores, Africa and Australia (Andersson et al. 2005). The species is found in larger parts of Western Europe, and is recorded in Denmark and Southern Sweden. In 2008 a second record of the species in Norway was done at Ormøya, Oslo (Olsen 2008), however, further investigations needs to be done to consider it established (pers. com. Per Djursvoll).

ARANEA

***Lathys humilis* (Blackwall, 1855) (Dictynidae)**
L. humilis spins its small web among leaves and branches of trees and bushes. The spider has a size of about 2mm long and can be found in small webs on vegetation or ground level. It can be found in a variety of habitats, and is common on bark of trees such as pines and various broadleaved trees. It is widely distributed in Europe from east to west, included Denmark and Sweden (van Helsdingen 2007). It seems to prefer habitats with bark of pine and broadleaved trees, where it can hide and hunt (Lissner 2009). The species is likely to be able to establish in South and South-East Norway (pers. com. Erling Hauge).

Discussion

The investigation reported here shows that per today the import of trees and bushes for outdoor use in Norway provides a highway for stowaways. While the import has doubled the last decade (NGF 2006), the number of phytosanitary inspectors has declined. The latter being a result of internal prioritization at the Norwegian Food Safety Authority, with the consequence that the percentage of consignments controlled is very low. The control of imported plants carried out by the Norwegian NPPO is limited. They use random sampling with visual inspection to detect species listed as quarantine pests only. Other organisms that might have negative impacts on ecosystems and the environment, but are not defined as plant pests or vectors of such, are ignored.

The plants surveyed in this study were exported with a phytosanitary certificate ensuring that the plants are healthy, they carry no quarantine pests, and they carry no significant number of other organisms. It is not defined what "a significant number" of other organisms actually means, but in one of the consignments sampled in this study 244 specimens of the weevil *O. dieckmanni* (Table 1) were recorded. One does question why this consignment was not denied entry. Unfortunately the opposite happened in spite of the presence of an inspector who saw the weevils.

The majority of the 157 species reported in Staverløkk (2006) are species already present in the Norwegian fauna, but more than 10% of the species recorded were alien species. It is well known that many of the species entering new territories by man-made transport fail to establish in the new area (Mooney 2005). However, the steadily increasing import of horticultural plants, particularly those exported with a lump of soil, along with repeated introductions increase a species chance to establish.

The loss of biodiversity caused by alien species is due to competition, hybridization as well as predation (Pimentel 2002), but other ecological effects are also suggested (Kenis et al. 2009). The Convention on Biological Diversity (CBD) urges nations to have a precautionary policy: all alien species needs to be considered as troublemakers until the opposite is proven ("better-safe-than-sorry" principle). On the other hand the World Trade Organization's Sanitary and Phytosanitary-Agreement (WTO-SPS-Agreement) states that if a consignment is prohibited from entering a country based on phytosanitary measures, this must be based on "sufficient scientific evidence" (WTO 1994).

There are numerous examples from Norway and the rest of the world that after establishment of a new species, the resources needed to eradicate it are often too high for the society to pay.

How can we then limit this increasing invasion of alien species and alien populations? The

Norwegian national strategy is based on three main pillars: *1*. Prevent introduction. *2*. Eradicate established harmful species. *3*. Limit further spread and damage.

Based on our experiences with the import of horticultural plants, we suggest some practical efforts: *1*. Plants with a lump of soil should not be allowed imported since the soil brings along more organisms and such plants are far more unpredictable than plants without soil or plants grown in artificial medium. *2*. Conifers and larger plants should be thoroughly inspected before they are released as they offer excellent hiding places for many organisms. *3*. Establish secure routines for treatment of waste material from the bottom of the containers. This material is hazardous waste and needs to be treated as such. Today it ends up in composts etc. *4*. Phytosanitary inspections should be carried out at the export site rather than at the import site. *5*. The Norwegian Food Safety Authority needs to strengthen the phytosanitary part of the organization. Today only a very small fraction of the numerous tons of plants imported every year are controlled. *6*. Inspectors must be given authority (and the confidence) allowing them to consider biodiversity just as important as plant quarantine issues when carrying out their duties. *7*. The ecological risk must be taken seriously by our authorities, and necessary resources need to be allocated to develop better routines for this trade.

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