Thrips orarius sp. n. and six first records of thrips (Thysanoptera) from Norway

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Thrips orarius **sp. n.** is described from the coastal part of the county Søgne in southern Norway. The new species is remarkable within the genus *Thrips* Linnaeus, 1758 for its unusual combination of character states. Furthermore, six thysanopteran species are presented as new to the Norwegian fauna, and records of two Thripidae, which in Norway are previously known from indoor cultivations only, are reported.

Key words: *Thrips orarius*, Thysanoptera, new species, thrips, rare, Norway.

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Introduction

In Norway, thrips (Thysanoptera) have long been neglected in faunistic research, and only recently more and comprehensive studies have been available. Until 1960 only 19 species were known form Norway (Herstad 1960), whereas Ahlberg (1926) noted 69 from Sweden, and Hukkinen (1935, 1936a, 1936b) and Hukkinen & Syrjänen (1937) gave the number of thrips species from Finland as 96. Therefore, the expected number from Norway ought to have been much higher, too. Later comprehensive studies by Olsen (1987), Olsen & Midtgaard (1996) and Olsen & Solem (1982) resulted in 96 species and led to an estimated number of 120 species for the Norwegian fauna (Ottesen 1993). At present, 135 species are known to have been reported from Norway, including species known from indoor cultivation (Kobro 2011). Many of these Thysanoptera are associated with the genus *Thrips* Linnaeus, 1758 (Kobro 2011). Members of this genus are mainly flower-living, only a few species occur on grasses, leaf buds or leaves. Within the family Thripidae, *Thrips* is the largest genus including almost 300 species worldwide (ThripsWiki 2020). 26 of them are reported from Norway (Kobro 2011). In the following a new species within the genus *Thrips* is described, which has been found in coastal habitats of southern Norway: *Thrips orarius* **sp. n.** Furthermore, we present six first records from Norway including an introduced species which originally has come from the Americas and seven field finds of two species of Thysanoptera at present known from greenhouses and indoor cultivations only.

Material and methods

Investigation on thrips is performed at the Norwegian Institute of Bioeconomics since 1995.

Green plant material, usually with flowers, was collected and washed. Also bark of dead trees and dead branches were collected and deposited in Berlese funnels (Kobro 2003). Since 2015 Kjell Magne Olsen has contributed substantially. He has been involved in several projects within Biofokus and has added additional aspects to our studies through his own research focus: *Tipulomorpha* (Diptera). His choice of localities and methods was often different and complementary to those described by Kobro (2003). Besides different types of traps, Olsen used active methods such as netting to collect the insects. Thysanoptera have been sorted out from a huge number of samples and were sent to us for identification. For further examination, all specimens were macerated and mounted on microscope slides in Canada balsam (Kobro 2003, Ulitzka 2020b). Terebrantia were identified with keys of zur Strassen (2003), the tubuliferan species *Tylothrips osborni* (Hinds, 1902) with a key provided by Goldarazena (2004). Photomicrography was performed with a digital camera (Canon EOS 70d) attached to a Zeiss Standard Microscope. Photos have been produced in focus stacking technique with Helicon Focus software. Nik Sharpener Pro and Adobe Photoshop were used for final colour adjustment and sharpening. Details of some thrips were drawn using a Zeiss drawing tube attached to the microscope. All photos and line drawings presented are created by the second author.

Results

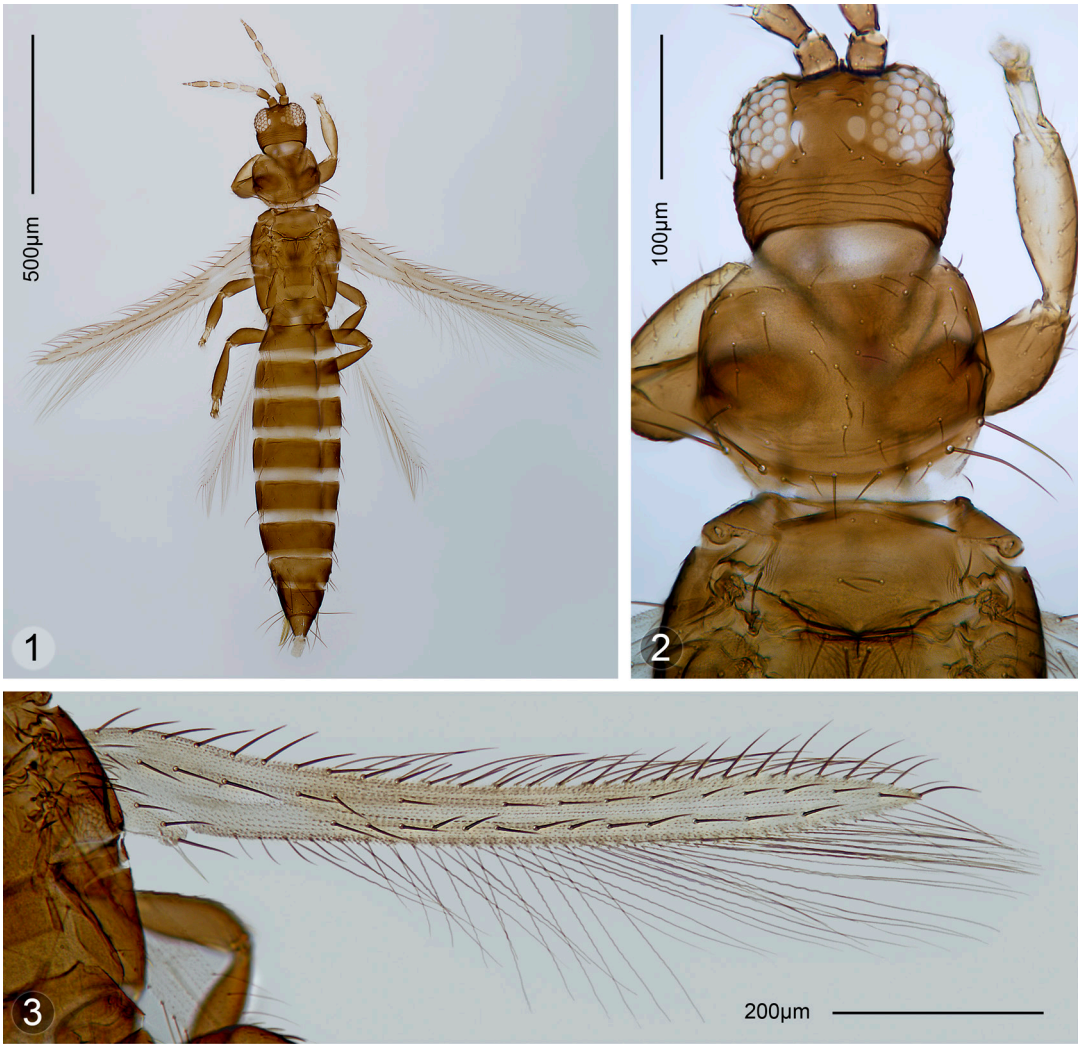
Description of a new thrips species

***Thrips orarius* sp. n.** (Figures 1–6 and 8–9)

Female macroptera. Body (Figure 1) uniformly brown, except fore tarsi and antennal segments III–IV which are yellow, and fore tibiae and antennal segments V–VIII which are pale brown; major body setae brown; wings (Figures 1 and 3) shaded pale brown, slightly darker in the middle third.

Antennae 8-segmented (Figure 4). Head (Figure 2) wider than long, slightly convex behind compound eyes towards base. Ocellar setae pair 1 lacking; 3 arising just outside anterior margins of ocellar triangle, longer than 2; postocular setae arising in a row parallel to eye margin, setae 1 longer than others. Vertex transversely sculptured behind compound eyes; ocellar area smooth, without sculpture. Mouth cone pointed; maxillary palps 3-segmented. Pronotum (Figure 2) wider than long; sculptured with faint transversal lines near fore and hind margin, smooth in the middle and laterally; with 4 pairs of short anteromarginal, 2 pairs of long posteroangular setae, 3 pairs of short posteromarginal setae and about 20 scattered discal setae. Mesonotum (Figures 2 and 9) with faint transverse striations, cephaladly ending just behind anteromedian campaniform sensilla. Metanotum (Figure 9) striate laterally, anteromedially with transverse reticulations; median setae stout, attached behind anterior margin of the plate. Forewing (Figure 3), first vein with setal row almost complete, with two gaps that give the impression of one missing seta each [arrangement of setae, left (right) wing 4 + 5 + 10 (4 + 3 + 9)]; second vein with 14 (13) setae; clavus with 5 marginal setae, apical seta longer than subapical; fringes on hind margin wavy. Abdominal tergite I transversely striate, campaniform sensilla close to posterior margin; II (Figure 5) with 4 lateral setae and 1–3 microtrichia laterally on the hind margin; II–VII with 1 or 2 faint transverse streaks along subbasal line, but almost no sculpture on median area mesad of setae pair 2; VIII (Figures 6 and 8) sublaterally with a few posteromarginal microtrichia approximately between the level of the inner campaniform sensilla and the setae s2; IX with 2 pairs of campaniform sensilla, median setae extending beyond apex of X; ctenidia (Figure 8) on tergites V–VIII well developed, on VIII located behind the spiracle and terminating at tergal setae 3 (Figure 6). Pleurotergites and sternites without discal setae (Figure 8). Sternite I with 3 tiny setae between the hind coxae; II with 2 pairs of marginal setae, III–VII with 3 pairs, VII with posteromarginal setae 1 arising in front of posterior margin (Figure 8).

Measurements (holotype female in microns). Body length 1650. Head, length 120; width across eyes 168; ocellar setae 3, length 24. Pronotum, length 146, width 216; posteroangular setae 84–



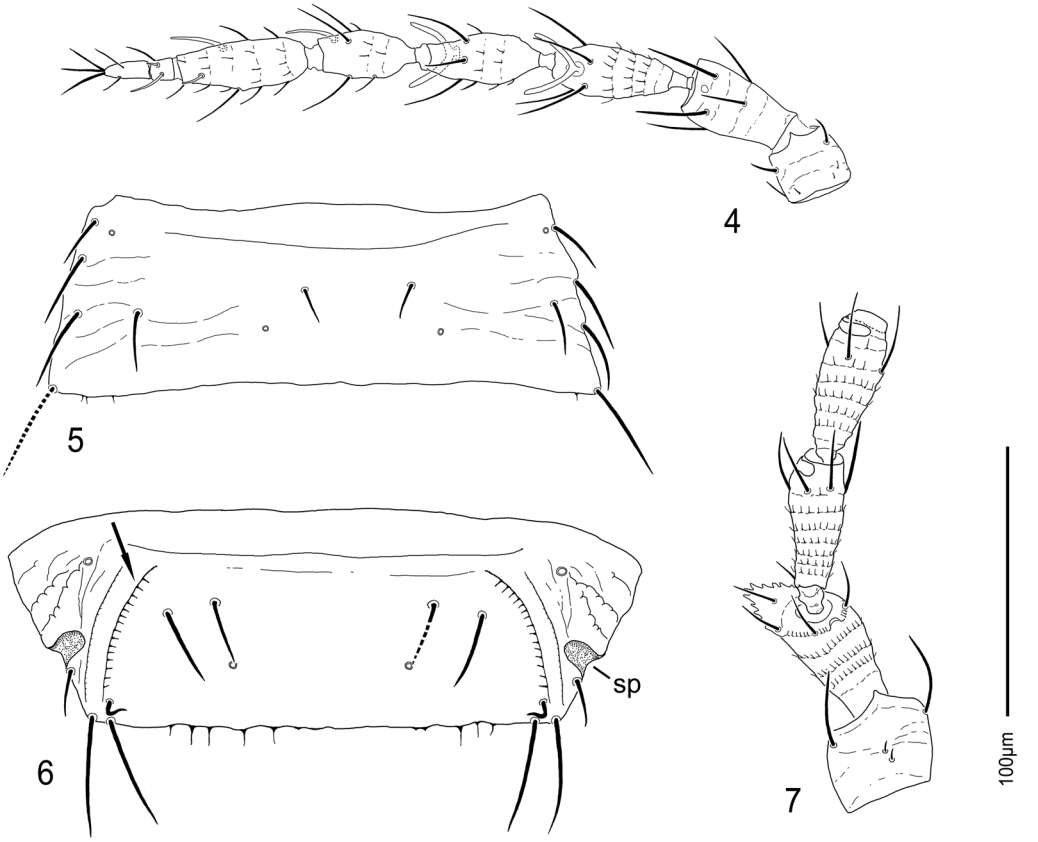
FIGURES 1–3. *Thrips orarius* **sp. n.** holotype ♀. **1.** Habitus, dorsal view. **2.** Head and thorax. **3.** Right forewing.

91; posteromarginal setae s1 38, s2 and s3 21–24. Metanotum median setae 77, distance from fore margin 5. Forewing, length 843. Antennal length 287; segments III–VIII, length 55, 50, 41, 53, 10, 17.

Material studied. Holotype ♀, VEST-AGDER [**VAY**], Søgne: Kapelløya, 58.049975°N 7.835504°E, from flowering *Linaria vulgaris* (Plataginaceae), 19.VII.2016, leg. S. Kobro, coll. M.R. Ulitzka. Paratypes: 1♀ collected with holotype, coll. ANIC, Canberra, Australia and 1♀ from *Carex* (Cyperaceae); Trollneset, 58.0796207°N 7.692397°E, 19.VII.2016, leg. S. Kobro, coll. BMNH, London, Great Britain.

Etymology. The species epithet *orarius* derives from the identical Latin adjective meaning “close to the coast”. The name referrers to the coastal locality where the specimens have been collected.

Differential diagnosis. The new species is clearly associated with the genus *Thrips*. It does not only show the seven consistent character states indicated for members of the *Thrips* genus-group (Mound 2002) but also corresponds with the diagnosis for the genus given by Mound & Masumoto (2005, p. 10). However, *T. orarius* **sp. n.** is unusual in the combination of certain



FIGURES 4–6. *Thrips orarius* **sp. n.** holotype ♀. **4.** Left antenna. **5.** Abdominal tergite II. **6.** Abdominal tergite VIII; lateral ctenidia indicated; sp: spiracle. **FIGURE 7.** *Ankothrips niezabitowskii* (Schille, 1910). Antennal segments I–IV. Reconstructed setae in figures 6 and 7 are drawn dashed. Scale bar applies to all line-drawings.

characters: it has an almost complete setal row on the first wing vein (Figure 3) but at the same time its abdominal sternites are lacking discal setae (Figure 8). Among the European species this character state is shared only with *Thrips buxi* Berzosa, 1987, *Thrips asparagi* zur Strassen, 1968 and *Thrips euphorbiicola* Bagnall, 1924. In contrast to *T. orarius* **sp. n.** the two latter have the pleurotergites with dens microtrichia, tergite II with three lateral setae and tergite IX with only one pair of campaniform sensilla. *T. buxi* can be distinguished from the new species in having the antennae seven-segmented and the marginal comb on tergite VIII irregular but complete (Berzosa 1987). *Thrips malloti* Priesner, 1934 from Asia and Australia shows similar character states as *T. orarius* **sp. n.** but has the metanotum distinctly reticulate and seven-segmented antennae (Priesner 1934, see Zhang *et al.* 2011).

At present, males of *T. orarius* **sp. n.** remain unknown. Females may be identified amongst the European *Thrips* species using the following addition to the key provided by zur Strassen (2003):

1. Abdomen with ovipositor (Figure 8) ♀ 2
2. All sternites without discal (accessory) setae (Figure 8) …….....……. 38
38. First vein of forewing with more than 6 setae in distal half (Figure 3) …….……... 39
39. Tergite II with 4 lateral setae (Figure 5), pleurotergites without microtrichia, tergite IX

with two pairs of campaniform sensilla …..... ..... 39a

39a. Antennae 7-segmented, tergite VIII with marginal comb complete .... ***T. buxi*** Berzosa, 1987

– Antennae 8-segmented (Figure 4), tergite VIII with marginal comb broadly interrupted, with a few sublateral microtrichia only (Figure 6) …..... ***T. orarius*** **sp. n.**

Thrips new to the Norwegian fauna

Melanthripidae

Ankothrips niezabitowskii **(Schille, 1910)**
(Figures 7 and 10–11)

Ankothrips niezabitowskii is recorded widely but infrequently in Central and Southern Europe. It is an anthophilous species that feeds on pollen of *Juniperus* (Cupressaceae), mainly *J. communis*. Adults and larvae therefore can be seen only during the short flowering period on the host (May–June), afterwords their development proceeds in the soil to prepupae and pupae in cocoons. It reproduces with one generation per year (Kucharczyk & Kucharczyk 2013). Within the genus, *A. niezabitowskii* is easily recognized by the following character states: abdomen brownish (Figure 11), mouth cone short (Figure 11), process of antennal segment II marginally dentate (Figure 7), and abdominal tergite IX with median setae s1 close together (distance 10–15µm) (Figure 10). *A. niezabitowskii* is endangered, mainly by the loss of xerophilic habitats and succession of juniper heaths. It is included in the Red List of threatened species of Poland and the Czech Republic (IUCN Red List category: EN; see Kucharczyk & Kucharczyk 2008). In the latest version of the Red List of Germany, the current population status of *A. niezabitowskii* is classified as rare with a constant long-term population trend, i.e. not threatened (zur Strassen 2011). The northern distribution of the species' occurrence was considered in Poland (Kucharczyk 2006), however, according to Fauna Europaea it is also present in Central Russia (Vierbergen 2020). The data provided by Fauna Europaea and the record in Norway may rather indicate an overall West Palearctic distribution.

Material studied: 1♀, AKERSHUS [**AK**], Bærum: Ostøya, 59.8728°N 10.5596°E, 26.IV.–07.VI.2018, leg. S. Olberg & K.M. Olsen (malaise trap, mowed meadow), det. S. Kobro, coll. M.R. Ulitzka.

Thripidae

Anaphothrips gracillimus **Priesner, 1923**
(Figure 12)

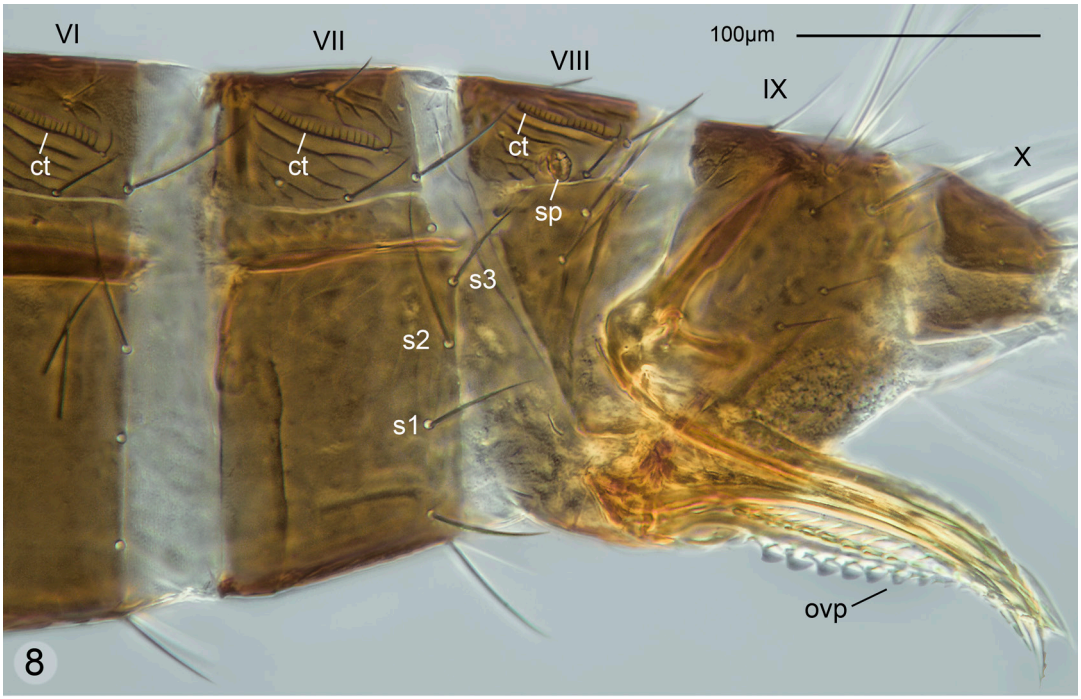
Anaphothrips gracillimus is widespread from Spain over large parts of Central Europe to Russia; in the North its distribution range extends to Finland (Sigmund *et al*. 2015). It is a hygrophilous thrips which lives in sparse forests or at forest edges on leaves of tall grass, particularly on *Calamagrostis epigejos* (Graminaceae), however, it is rarely collected (Schliephake & Klimt 1979, zur Strassen 2003). Females of *A. gracillimus* are found either with fully developed wings or in (hemi-)micropterous forms (Figure 12), males are always micropterous (zur Strassen 2003).

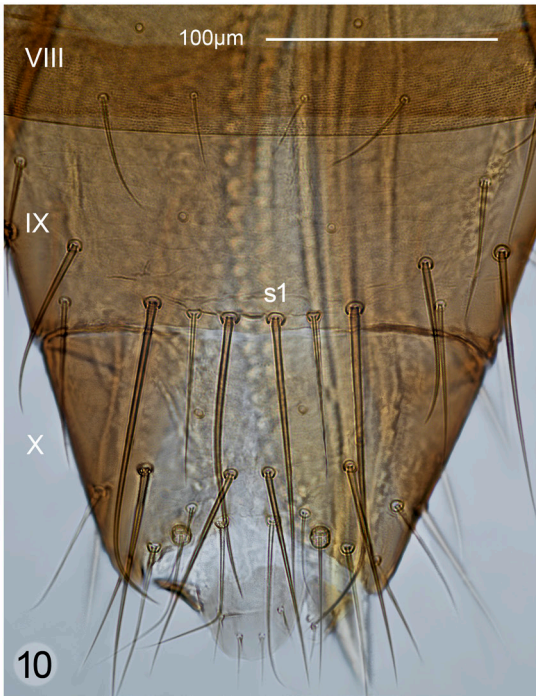
Material studied: 1♀ *hemimacroptera*, HORDALAND [**HOY**], Odda: Valldal, EIS 24, from *Ranunculus acris* (Ranunculaceae), 19.VII.1997, leg. & det. S. Kobro, ver. R. zur Strassen, coll. M.R. Ulitzka.

Chirothrips molestus **Priesner, 1926**
(Figures 13–15)

Chirothrips molestus is widespread, although not common, across the Palaearctic south east to Iran, possibly reaching into Mongolia. (Mound *et al.* 2018, Schliephake & Klimt 1967). It is found in warmer habitats on grasses, particularly *Agropyron* (Poaceae) (zur Strassen 2003). In *C. molestus*, antennal segment II is produced outwards, however, with the setae not in terminal but in a subapical position (Figure 14), in contrast to most other members of *Chirothrips*; the sense cones on segments III and IV are simple; and the craspeda on the hind margin of the anterior abdominal tergites are reduced to finely pointed triangular plates (Figure 15).

Material studied: 2♀♀, AKERSHUS [**AK**], Bærum: Ostøya, 59.8721°N 10.5591°E, 8.VIII.2018, leg. K.M. Olsen & O.J. Lønnve





FIGURES 8–9. *Thrips orarius* **sp. n.** ♀. **8.** Abdominal segments VI–X; ct: tergal ctenidia, s1–s3: setae 1–3, sp: spiracle, ovp: ovipositor. **9.** Metanotum (phase contrast). **FIGURE 10.** *Ankothrips niezabitowskii* ♀ (Schille, 1910). Distal abdominal segments; s1: dorsal setae 1.

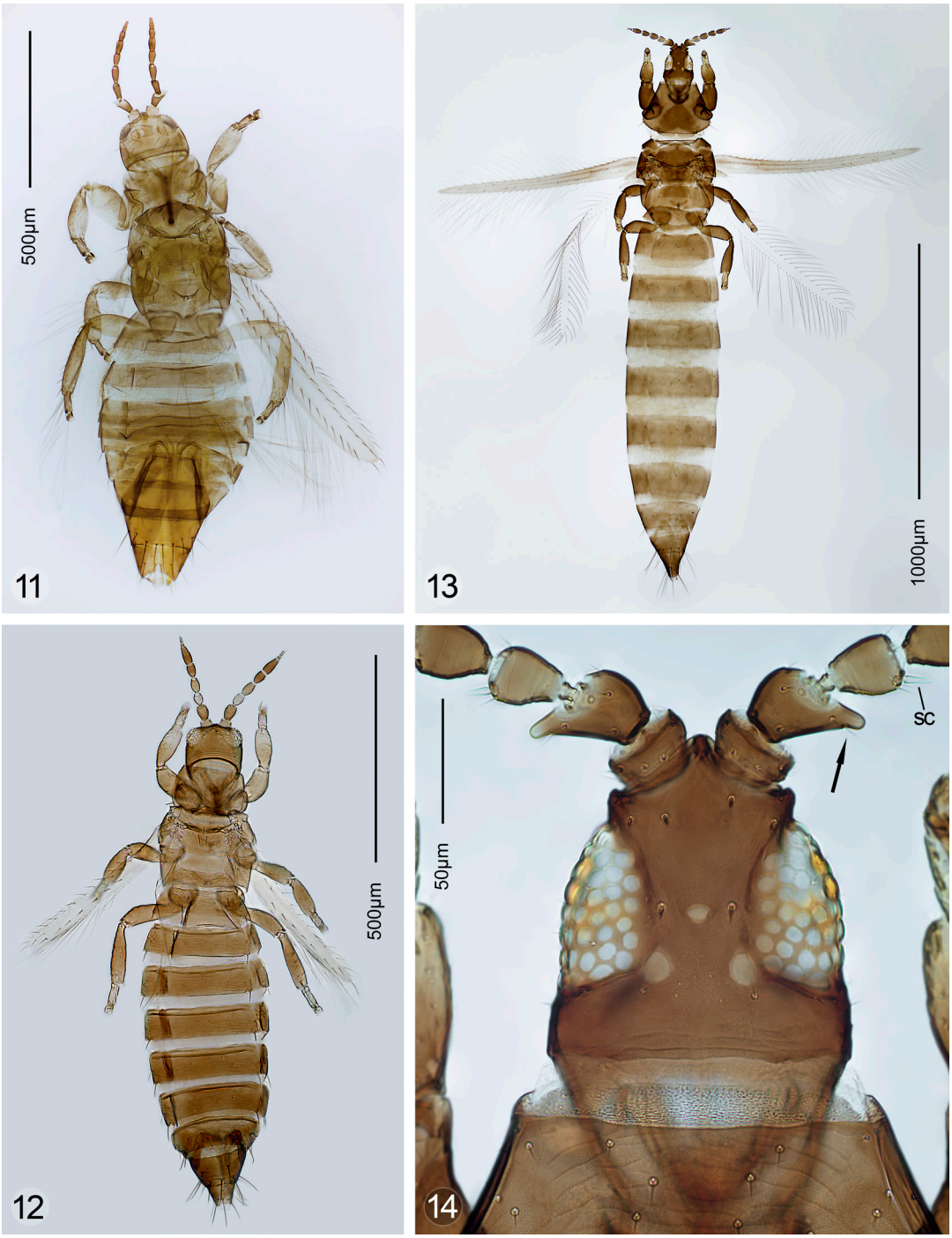


FIGURE 11. *Ankothrips niezabitowskii* (Schille, 1910) ♀. **FIGURE 12**. *Anaphothrips gracillimus* Priesner, 1923 ♀ *hemimacroptera*. **FIGURE 13–14**. *Chirothrips molestus* Priesner, 1926 ♀. **13.** Habitus. **14.** Head; subapical setae on antennal segment II indicated, sc: sense cone.

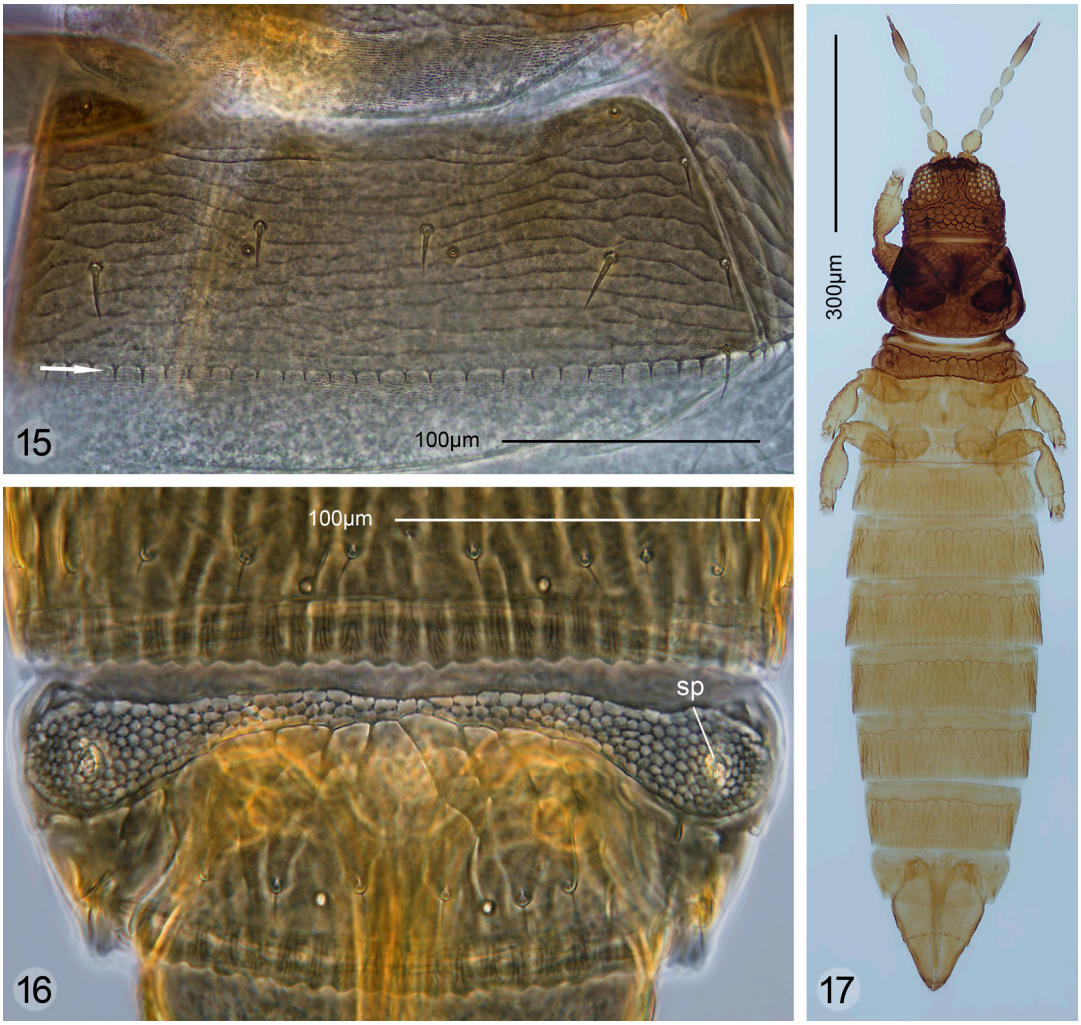


FIGURE 15. *Chirothrips molestus* Priesner, 1926 ♀. Abdominal tergite II (phase contrast); indicated: row of finely pointed craspeda. **FIGURES 16–17.** *Prosopothrips vejdovskyi* Uzel, 1895 ♀. **16.** Reticulated area on tergite VIII (phase contrast); sp: spiracle. **17.** Habitus (right foreleg lacking).

(netted, mowed meadow), det. S. Kobro, coll. M.R. Ulitzka.

***Prosopothrips vejdovskyi* Uzel, 1895**
(Figures 16–17)

Prosopothrips vejdovskyi is recorded widely but infrequently from Spain over large parts of Central Europe to West-Russia. In the North its distribution range extends to Finland (Hukkinen 1936a, zur Strassen 2003). It is found on different plants in short vegetation, often in or under leaf rosettes, particularly in mountainous and wooded areas. Larvae have been found in grasses, but also repeatedly on *Stachys* and *Salvia* (Lamiaceae), which are most likely the main hosts (Priesner 1923, Vierbergen *et al.* 2010). *P. vejdovskyi* is easily recognized by its colouration: head, pronotum and mesonotum are dark brown in contrast to the metanotum and abdomen, which are yellow (Figure 17). Furthermore, the reticulated area on tergite VIII is narrowed in the middle showing 1–3 rows of reticules only (Figure 16).

Material studied: 1♀, AKERSHUS [**AK**], Aurskog: Mikkelsrud, 59.9759°N 11.6685°E,

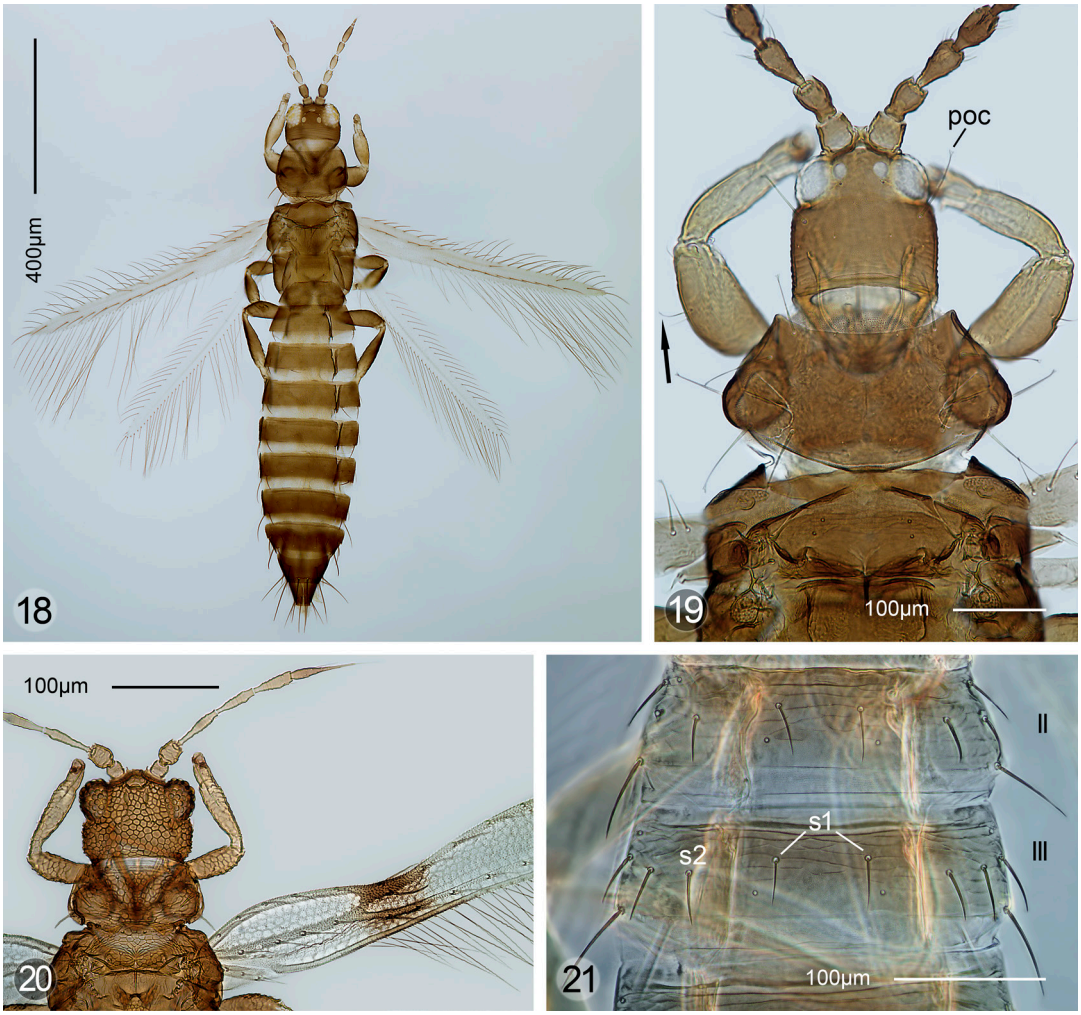


FIGURE 18. *Tenothrips frici* (Uzel, 1895) ♀. **FIGURE 19.** *Tylothrips osborni* (Hinds, 1902) ♀ *macroptera*. Head and thorax; characteristic femoral seta indicated; poc: postocular setae. **FIGURE 20.** *Parthenothrips dracaenae* (Heeger, 1854) ♀. Head, thorax and basal part of right forewing. **FIGURE 21.** *Thrips nigropilosus* Uzel, 1895 ♀ *macroptera*. Abdominal tergites II and III (phase contrast); setae s1 about as long and strong as s2.

14.VII.2017, leg. K.M. Olsen (netted, mowed meadow), det. S. Kobro, coll. M.R. Ulitzka.

***Tenothrips frici* (Uzel, 1895)** (Figure 18)

At present, the northernmost records of *Tenothrips frici* are from Great Britain (Devon, Kent, Sussex), and have been interpreted as wind-borne occasional migrants from the South. *T. frici* is widespread and common across the Western Palearctic, mainly in southern areas. It has been introduced around the world, to Western USA, Colombia, Argentina, Uruguay, Hawaii, Pakistan, South Africa, Australia and New Zealand (Mound & Walker 1982, Mound & Marullo 1996). It may be characterised as euryecious, and is living polyphagously in flowers of many different plants, with a preference for Asteraceae. Within the uniformly brown coloured *Tenothrips*-species, females of *T. frici* may be recognised by the following character states: metanotum without campaniform sensilla; abdominal tergite VIII with marginal comb interrupted, leaving 3–9

microtrichia laterally; second vein of forewing usually with 10–12 setae (Figure 18).

Material studied: 1♀, VEST-AGDER [**VAY**], Søgne: Trollneset, 58.0796207°N 7.692397°E, from flowering *Lonicera periclymenum* (Caprifoliaceae), 19.VII.2016, leg. & det. S. Kobro, ver. L.A. Mound, coll. M.R. Ulitzka.

Phlaeothripidae

***Tylothrips osborni* (Hinds, 1902)** (Figure 19)

Tylothrips osborni is a fungus-feeding thrips of the leaf-litter fauna. Originally, it is found in the eastern USA and occasionally in South America (Mound 1976). It was introduced into Europe, probably by shipping (compare Mound 1983) and has been reported from Spain (Goldarazena & Mound 1998), Italy (de Marzo & Ravazzi 2007) and Germany (Ulitzka 2013, 2021). *T. osborni* is easily distinguished from other Phlaeothripids of the Central European fauna by (1) the presence of asymmetrical setae on the femora (Figure 19) and ventrolaterally on the pterothorax, (2) long funnel-shaped postocular setae (Figure 19) and (3) an unusual arrangement of sense cones: 3 on antennal segment III, 4 on antennal segment IV (see Ulitzka 2013, p. 144, figures 3–5).

Material studied: 1♀ *macroptera*, AKERSHUS [**AK**], Oslo: Oslo, EIS 28, extracted from soil in a shipping container with *Calluna vulgaris*-plants (Ericaceae) from Germany, 14.IX.2015, leg. A. Endrestøl & A. Often, det. & coll. M.R. Ulitzka.

Thrips from new habitats in Norway

Thripidae

***Parthenothrips dracaenae* (Heeger, 1854)** (Figure 20)

Known as the Parlour palm thrips, this is the only species in the genus *Parthenothrips* Uzel, 1895 (Mound *et al*. 2018). It is widespread around the world in tropical and subtropical countries. Its country of origin, however, remains a subject for speculation, but it possibly is Australia, where it is locally common in forests along the East coast (Mound *et al.* 2019). In Central Europe, it is described as a pest found under glass only or on indoor landscape planting (zur Strassen 2003). Larvae and adults are phyllophagously feeding on a wide range of plants, most of which have hard leaves. Frequently, *P. dracaenae* is associated with palms and other monocotyledons. *P. dracaenae* is associated with Panchaetothripinae, thrips that generally show a conspicuously reticulate body sculpture. It is easily distinguished from related species by its broad forewings, which are constricted in the basal third, have the membrane reticulate and lack cilia on the costa (Figure 20). The specimens listed below represent first records from Norway collected in the field. They seem worth mentioning as three of them were found in localities far away from potentially protected indoor plantings. Moreover, one female was collected in mid-January —i.e. in winter when Norway is covered by snow— on dead wood, which raises the suspicion that *P. dracaenae* might be able to overwinter outdoors.

Material studied: 1♀, BUSKERUD [**BØ**], Lier: Eriksrud, EIS 28, from *Malus domestica* (Rosaceae), 20.VIII.1995, leg. & det. S. Kobro, coll. M.R. Ulitzka. 1♀, AKERSHUS [**AK**], Nesodden: Fagerstrand, 59.734917°N 10.618833°E, from dead *Picea abies* (Pinaceae), 17.I.1998, leg. & det. S. Kobro, coll. M.R. Ulitzka. 2♀♀, VESTFOLD [**VE**], Sandefjord: Melsomvik, 59.220972°N 10.342056°E, from *Hedera helix* (Araliaceae), 16.VI.2018, leg. & det. S. Kobro, coll. M.R. Ulitzka.

***Thrips nigropilosus* Uzel, 1895** (Figure 21)

Thrips nigropilosus, the chrysanthemum thrips, is originally distributed across the Palearctic to Japan (Mirab-balou *et al*. 2011) and has been widely introduced around the world (Mound *et al*. 2018). Locally common, especially in grassland habitats, it is living and breeding in flowers as well as on young leaves of various plants, particularly Asteraceae (*Achilea*, *Chrysanthemum*, *Pyrethrum* and *Senecio*). Within the genus *Thrips* this species is unusual in that the wings are variable in length, probably due to effects of population density and feeding conditions (Nakao 1999), and furthermore, in having the median pair of discal

setae on abdominal tergites II–III at least half as long as the median length of the tergite (Figure 21). *T. nigropilosus* occasionally occurs as a serious pest of the ornamental flower production but also on crops such as basil (Conti & Rossi 2003), mint (Kucharczyk *et al*. 2019) or cucumbers (Vappula 1965), both in outdoor and indoor cultivation. In Scandinavia, *T. nigropilosus* has been recorded for the most part from artificial conditions such as greenhouses (Kobro 2011, Gertson 2016), from the field it has been reported from Finland (Kettunen 2008) and Denmark (Maltbæk 1932) only. The specimens listed below represent first records from natural habitats from Norway.

Material studied: 1♀ *macroptera*, AKERSHUS [**AK**], Nesodden: Fagerstrand, 59.739607°N 10.588996°E, from *Menyanthes trifoliata* (Menyanthaceae), 20.VI.2003, leg. & det. S. Kobro, coll. M.R. Ulitzka. 2♀♀ *micropterae*, Asker: Solli, 59.8493°N 10.3423°E, 4.VIII–24. IX.2018, leg. K.M. Olsen & O.J. Lønnve (pitfall trap, mowed meadow), det. S. Kobro, coll. M.R. Ulitzka.

Discussion

Some of the species treated above are generally considered rare and uncommon. However, it seems worth mentioning that it is hard to assess whether a species is just rarely collected or *de facto* rare. This is particularly true for Thysanoptera due to the lack of fundamental faunistic data. The fact that a species is infrequently encountered may be influenced by various factors such as a narrow endemic range, fragmented habitat pattern, as well as strict habitat and host specialisation. Once their needs are known, some species suddenly become much easier to find. This was shown by three thysanopteran examples from Norway: *Phlaeothrips annulipes* Reuter, 1880, *Hoplothrips polysticti* (Morison, 1949) and *Hoplothrips carpathicus* Pelikán, 1961. After their description, these species had been stated as rare and threatened because only a few specimens had been collected. This first assessment, however, was affected by the cryptic behaviour of these species under bark and by lacking knowledge regarding their narrow food preferences (Kobro 2001, 2006, Kobro & Nittérus 1999, Morison in Qvick 1977, zur Strassen 1994). *P. annulipes* lives on dead birch branches on the forest floor from the first summer after the branches have died. This habitat supports only one generation. After their hibernation on the branches, adults need to move to other dead branches when they appear in the following year. The fact that *P. annulipes* produces only macropterous forms is interpreted to be associated with this behaviour (Kobro 2006). In contrast, *H. polysticti* and *H. carpahticus* live on fungus infested logs, which provide habitat for several years until the next stage of decay is reached and the fungal flora changes. As long as foraging does not force them to relocate, they remain and even reduce their wings to save energy, producing micropterous forms or macropterous ones that break their wings off. A similar behaviour is known from *Hoplothrips* [*Trichothrips*] *flumenellus* (Hood, 1931) (= *Hoplothrips unicolor* (Vuillet, 1914), synonymized by Mound *et al.* 1976) (Hood 1940, see also Bournier 1991). After the habitats of these species became more obvious, they have been recorded much more commonly. Furthermore, they are known today to be distributed over large areas of Norway (Kobro 2001, Kobro 2006, Kobro & Solheim 2002, Kobro unpublished manuscript) and Finland (Kettunen *et al.* 2005). In general, many of these specialists —regardless of whether they live in small habitats as rotting wood or in large specific ecosystems, such as steppe grassland— are likely to be more widespread. However, they often occur in low abundance only, live monophagously on specific hosts, and thus are difficult to detect and sometimes overlooked in faunistic surveys. Most thrips published in recent years as first records from North and Central European countries correspond to this pattern, e.g. *H. carpathicus* from Luxembourg (Köhler *et al.* 2013), *Thorybothrips unicolor* (Schille, 1911) from Sweden (Gertson & Fägerström 2017) as well as five first records from Germany (Ulitzka 1997, 2013, 2019, 2020a and 2021). In the present study, too, at least three of the species fit into this scheme: (1) *A. niezabitowskii* feeds monophagously on *Juniperus* pollen and therefore is found during a short period only on its host

plant, which itself grows in certain habitats only, (2) *C. molestus* is a species of dry grasslands and restricted to specific grasses, and (3) *P. vejdovskyi* is also found in short vegetation such as grasses, but most likely it breeds on *Stachys*. Estimating the abundance of the latter is exceedingly difficult due to its cryptic behaviour in ground-level niches such as in or under leaf rosettes. Moreover, it is apterous, thus sedentary and therefore hardly ever recorded with traps, but only by selectively scanning its habitats. It must remain open whether *T. orarius* **sp. n.** might also be included in the list of habitat specialist – possibly of the coastal zones. Although recorded at both sites near the sea, the number of 3 specimens is far too low to make a statement. This also applies to the host plant. Further studies, and particularly records of larvae, will be necessary to shed light on this.

It seems worth mentioning that the three species discussed above as habitat specialists —*A. niezabitowskii*, *C. molestus* and *P. vejdovskyi*— have been recorded in cut meadows. On the one hand at least low-input meadows are considered to provide valuable habitats for numerous species (BfN 2014). On the other hand, however, this biodiversity is exposed to increasingly serious threats in recent decades due to technical progress. Scythes and pitchforks have long ago been replaced and motorised mowers are part of almost every farmer's equipment. Mechanised mowing techniques, however, cause serious impacts on the field fauna, also depending on the method used. In particular rotary mowers have been found to be more harmful than cutter bars (van de Poel & Zehm 2014), but all motorised mowing has detrimental effects on arthropod populations. It directly kills a large number of individuals, and depletes resources for others, forcing them to disperse. Both effects change the composition of the local assemblages. Humpert *et al*. (2010) and Oppermann *et al.* (2000) showed that effects of mowing on arthropods also depend on their body size and mobility. Moreover, damage differs between the strata they inhabit; on the ground it is mainly caused by machine's wheels, while in the vegetation damage is largely due to the cutting gear, and conditioner if used. Comprehensive data are lacking for most arthropods, including Thysanoptera. It might be assumed that their chance to survive the direct impact of cutting seems relatively high due to their small body size. In longer term, however, thrips populations are likely to be affected by depleted food resources and loss of niches. The increased use of grass as grazing, hay and ensilage, causing removal of inflorescences at a time particularly critical for grass thrips, has been considered to cause declines in the abundance of *Anaphothrips obscurus* (Müller, 1776) in Britain (Lewis 1973, p. 196). The strategy of collecting small insects such as thrips directly after mowing seems to be quite an inventive method (*sensu* Kettunen *et al.* (2005, p. 249), as the specimens are much easier to record while they flee and seek new habitats. Even species with a cryptic behaviour like *P. vejdovskyi*, which are usually hard to find, will most likely be forced to leave their hidden habitats in the process.

It seems quite probable that the number of thrips species in Norway might continue to increase. Some species that occur in adjacent countries such as Finland and Sweden but still have not been found in Norway are very likely to be present there. Describing 'first records' from European countries, we should bear in mind that the fragmented political territories on this continent are usually much smaller than the geographical distribution of most species, which spans far across national borders. Nevertheless, faunistic studies seem important, particularly in northern countries. On the one hand because they show northern borders of the species distribution, and on the other hand, they allow conclusions to be drawn on how their distribution is shifting in the context of global warming.

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