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# The Arthropod Fauna of Oak (*Quercus* spp., Fagaceae) Canopies in Norway

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**Abstract:** (1) We document the invertebrate fauna collected from 24 oak canopies in east and west Norway as a contribution to the Norwegian Biodiversity Information Centre's 'The Norwegian Taxonomy Initiative'. (2) A snap-shot inventory of the canopies was recorded by means of emitting a mist of natural pyrethrum into the canopies at night using a petrol-driven fogger and collecting the specimens in butterfly nets spread on the ground under the canopy. (3) Almost the entire catch of more than 6800 specimens was identified to 722 species. Out of 92 species new to the Norwegian fauna, 21 were new to science and, additionally, 15 were new to the Nordic fauna. Diptera alone constituted nearly half of the species represented, with 61 new records (18 new species). Additionally, 24 Hymenoptera (one new species), six oribatid mites (two new species) and one Thysanoptera were new to the Norwegian fauna. (4) Our study emphasizes the importance of the oak tree as a habitat both for a specific fauna and occasional visitors, and it demonstrates that the canopy fogging technique is an efficient way to find the 'hidden fauna' of Norwegian forests. The low number of



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red listed species found reflects how poor the Norwegian insect fauna is still studied. Moreover, the implication of the IUCN red list criteria for newly described or newly observed species is discussed.

**Keywords:** *Quercus*; oak; canopy; fogging; new species; inventory; Norway

## 1. Introduction

Pedunculate oak (*Quercus robur* L.) and sessile oak (*Q. petraea* (Matt.) Liebl.) are regarded as a biodiversity hotspot in Northern Europe and have been the target of a wide variety of biodiversity studies on arthropods (e.g., [1–10]).

Relatively few studies have targeted oak canopy invertebrates sampled with canopy fogging methods in Europe but see, e.g., [11–13] and chapters in [14]. Efraín Tovar-Sánchez with colleagues, together with a few others (e.g., [15–23]), have been pioneers in the Americas on oak canopy studies.

Emitting insecticides into the forest canopy to sample invertebrates has opened up a new area of forest biodiversity research. Originally developed in the tropics, canopy fogging techniques are now being used increasingly in temperate forests to increase the knowledge of European arboreal fauna [11,14,24–38]. Stork and colleagues [34] discuss the efficiency of fogging as a method for sampling arthropods from the canopies. A larger spectrum of species is sampled compared with any other single method. This makes fogging a useful method for arthropod snapshot inventories. The major disadvantage is that external and internal feeders are underrepresented (phloem feeders, leaf miners and wood borers), non-obligate occasional by-passers (tourists) will be captured and that the method is sensitive to wind and precipitation [39,40].

This study presents empirical data and analyses of oak canopy invertebrate data from a survey of 24 oak canopies in Norway. We proposed the following hypotheses: 1) there are large geographical differences in species composition and 2) trees on cultivated lands (Berge and Mule Varde) have a different species composition than forest trees. Both hypotheses are related to climatic differences on macro- (H1) and microlevels (H2) (e.g., [41]) as well as the geography of Norway, where oaks are distributed along the coast, usually with scattered populations [42,43]. H2 is founded on the generally more uniform structure of managed lands and lack of a multi-layered canopy of such forest stands [44]. The project was granted by the Norwegian Biodiversity Information Centre as a part of the Norwegian Taxonomy Initiative to search for the hidden life and new species in Norway.

## 2. Materials and Methods

### 2.1. The Oaks

*Quercus robur* and *Q. petraea* have a sympatric distribution and often hybridize [45], though *Q. robur* is claimed to be more widespread [42,43]. Thus, we have not distinguished between the two species of oak or their hybrids in this study.

### 2.2. Site Descriptions

The study was carried out at six sites in southern Norway in June–July 2011 and 2012 (Figure 1, Table 1). All sites were continuous oak-dominated forests, except Berge (site 1) and Mule Varde (site 5), which had oak trees scattered on managed land. Four oaks were treated at each site. The sites were carefully selected to represent a gradient from the inner fjords of West Norway, via known biodiversity hotspots inland Vestfold and Telemark to the coastal areas of SE Norway [8,46–48] aligned with the hypotheses.

Site 1 (Berge) is a protected landscape area and classified as IUCN category V [49]. It contains the largest assemblage of old and pruned oak trees in the country. This and the proximity to a lake with specialized swamp vegetation and several old buildings are the main reasons for its protection status [47].

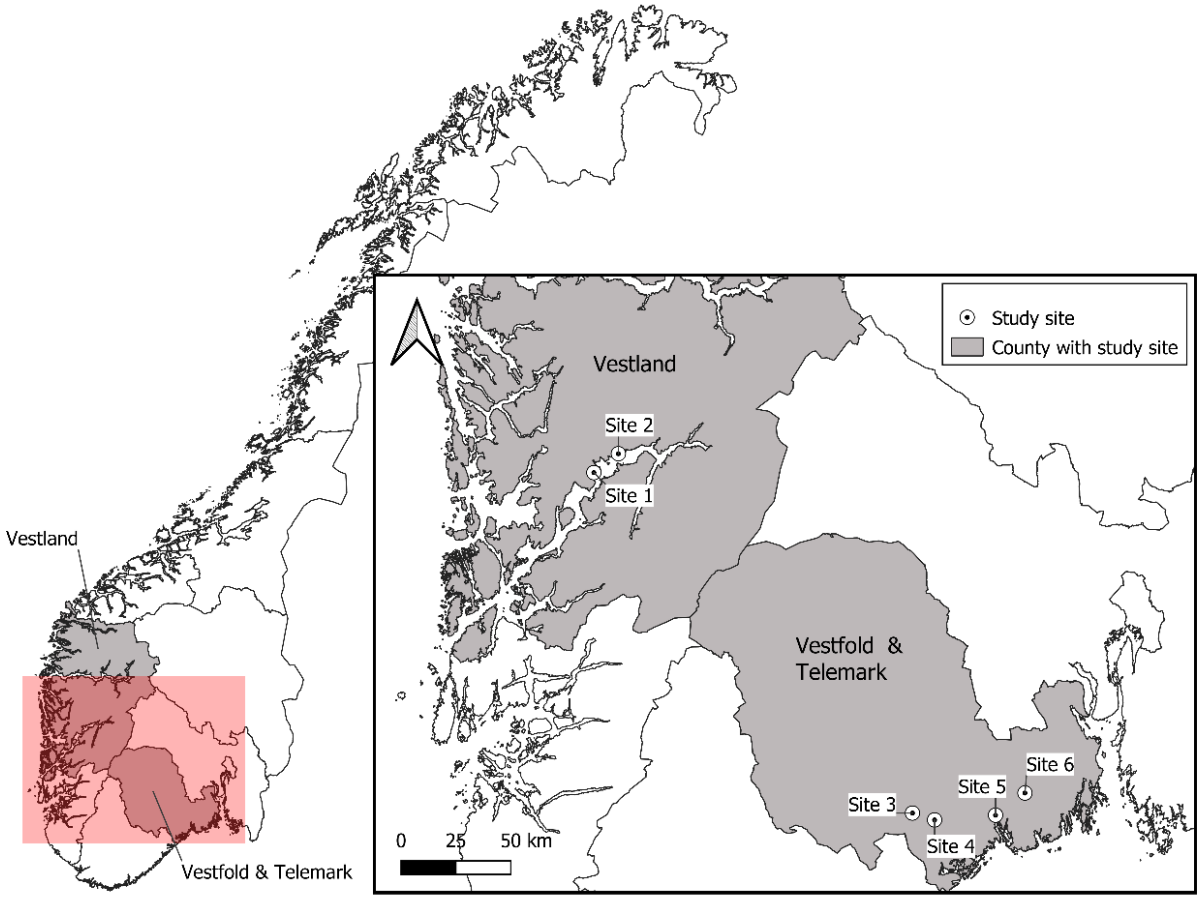


**Figure 1.** Site overview.

**Table 1.** Site details.

| Site | County | Municipality | Locality | Georeference | m asl | Sampling Period |
|---|---|---|---|---|---|---|
| 1 | Vestland | Kvam | Berge | N60.32 E6.17 | 0–50 | 21–23 June 2011 |
| 2 | Vestland | Kvam | Skeianeset | N60.41 E6.35 | 100–200 | 28 June–14 July 2012 |
| 3 | Vestfold and Telemark | Drangedal | Steinknapp | N59.08 E9.04 | 100–150 | 28–29 June 2011 |
| 4 | Vestfold and Telemark | Drangedal | Djupedal | N59.06 E9.22 | 150–200 | 2 July 2011<br>11–12 July 2012 |
| 5 | Vestfold and Telemark | Porsgrunn | Mule Varde | N59.10 E9.70 | 0–50 | 6–10 July 2012 |
| 6 | Vestfold and Telemark | Larvik | Skjærsjø | N59.20 E9.92 | 100–150 | 3–5 July 2012 |

Site 2 (Skeianeset) is a steep slope facing south and has according to one of the highest concentrations of hollow, previously pruned oaks in Norway [46]. The area is characterized by having an unusually high proportion of red-listed species of plants, bryophytes and fungi and is considered to be one of the most important deciduous forests in West Norway [46].

Site 3 (Steinknapp) is a nature reserve that is known to harbor many rare and threatened species (e.g., [48]). Its importance for biological diversity also explains its status as a nature reserve (IUCN category IA). Most likely, large parts of this area were clear-cut in the past as really old oaks are sparsely present and the more or less continuous oak forest is rather homogenous. The oaks treated in this study were just outside of the reserve.

Site 4 (Djupedal) is also a nature reserve protected according to the IUCN IA criteria. In contrast to the nearby site 3, there are several giant oaks in this area and the forest is characterized as old growth. Moreover, the forest is more closed and heterogeneous than at site 3.

Site 5 (Mule Varde) is a cultural heritage site and public park. Large oak trees are scattered throughout the property.

Site 6 (Skjærsjø) is a mixed deciduous forest with larger areas of conifer woods intermixed.

### *2.3. Data Collection*

The trees were chosen to represent 'typical' trees in the areas. This implies that after traversing the site, the chosen trees were not at the edges, not standalone trees except for at Berge and Mule Varde where most trees were standalone. Furthermore, the biggest and smallest trees were also avoided. Arthropod sampling was performed by emitting a 1% concentration of natural pyrethrum, Py-Sekt, into the canopy using a Golden Eagle 2610E fogger for approximately 10 minutes in the period between 1 AM and 3 AM on a windless and dry night. Py-sekt contains 1–5% piperonyl butoxide and 0–1% pyrethrum [50]. It breaks down quickly in direct sunlight and is, therefore, relatively safe to use in natural environments [51]. The available space for arthropods will obviously vary both according to the breadth and height of the crown, but for practical reasons we preferred to collect knocked-down invertebrates from a fixed area. Twenty large butterfly nets (18 with Ø50 cm and 2 with Ø100 cm, mesh size from 0.3–0.5 mm) were mounted on the ground or on the lower branches beneath the crown to collect the knocked-down invertebrates, i.e., 5.11 $m^2$ of the area beneath each tree was sampled. As so, the proportion of the crown projection area covered will vary slightly between individual trees but is assumed not to affect the qualitative data. The nets remained on the ground for approximately one hour after fogging before the collected material was transferred to 80% ethanol. The material was then sorted and shipped to the co-authors of this paper for identification, with the exception of Lepidoptera and cecidomyiid midges, which remain unidentified.

Most of the material is stored in the Natural History Museum at the University of Oslo and the Norwegian Institute of Bioeconomy Research's entomological collection. The phorid flies are at the Zoological Museum at Cambridge University, England, and a part of sciarid material, including the holotype of *Bradysia quercina* Menzel and Köhler, 2014, is deposited at the Senckenberg Deutsches Entomologisches Institut, Müncheberg, Germany.

### *2.4. Species Records*

Species designated as new records for Norway or the Nordic countries at the time of identification were based on the individual expert's consideration, but also on published records in Fauna Europaea [52] and records in the Norwegian Biodiversity Information Centre's species record database accessed throughout the preparation of this manuscript at www.artsdatabanken.no.

Specimens fully identified to species level were included in the analyses and counted in addition to unidentified species with only one species collected in the respective higher taxon. Uncertain species identifications, i.e., denoted with *confer* (cf.) or *near*, were included when the species were not already identified with certainty from other specimens. In cases where the identity of the species was clear, yet undefined (i.e., denoted as sp., sp. 1, etc.), the species beyond the number of identified species were counted. When more unidentified species within the same genus were found, i.e., spp., they were not included in the counts except for counting 1 when no other species in that genus was found. Abundances of common species of spiders and collembolans were sometimes indicated as 'few', 'some' and 'many', and were thence given dummy numbers 5, 10 and 20, respectively.

### *2.5. Data Analyses*

Rarefaction curves extrapolated to three times the sample size, i.e., 72 trees were carried out with EstimateS, version 9.1.0 [53]. The extrapolation relies on statistical sampling methods rather than modeling. Here, the bias corrected form of Chao1 is the asymptotic richness estimator for individual-based abundance data [54]. We chose to extrapolate because rarefaction curves of insect assemblages are usually steep and do not converge unless

a massive sampling effort is conducted. However, extrapolation beyond three times the sample size is not recommended [53] because the variance increases with the extrapolation.

Whittaker's $\beta$ was calculated as a measure of species turnover along the sampling gradient. It is insensitive to species richness and is calculated as follows:

$$\beta = \left( \frac{\left( \frac{S}{\alpha_{max}} \right) - 1}{N - 1} \right) \times 100 \quad (1)$$

where $S$ = total number of species, $\alpha_{max}$ = highest number of species in any one locality and $N$ = the number of localities [55]. It ranges from zero (no turnover) to 100 (every locality has a unique set of species). These calculations were performed to complement multivariate analysis using detrended correspondence analysis (DCA) with Canoco, version 4.56 [56] to relate species composition and site characteristics along the sampling gradient. The aim was to investigate whether the species composition within a site differed from the composition of species at the other sites and relate that to environmental characteristics. DCA assumes unimodal species responses to environmental factors in contrast to principal components analysis, or its detrended equivalent, where linear responses are assumed [57]. Therefore, over a longer geographic gradient with different climatic or other underlying environmental factors, DCA is to be preferred. The multivariate analysis was performed on untransformed species abundances with downweighing rare species.

## 3. Results

### *3.1. Faunistics*

Combined, more than 6800 specimens were identified to 722 species. Ninety-two species (12.7%) were new to the Norwegian fauna upon sampling (Table A1), 61 Diptera, 24 Hymenoptera, one Thysanoptera and six oribatid mites. Of these, the following 21 species (2.9%) were new to science: 16 phorid flies (13 described in [25]), one sciarid midge [27], one chironomid midge [58], one aphelinid wasp [59] and two oribatid mites awaiting description. Additionally, of the 92 new Norwegian records, 15 were found in the Nordic countries for the first time (Table A1). Diptera was the most species-rich order of invertebrates with 334 species (46.3%), followed by Hymenoptera with 117 (16.2%) and Coleoptera with 84 (11.6%). Additionally, Diptera was represented with the highest number of specimens with 1339 (19.5%), followed by Hemiptera with 1108 (16.1%) and Coleoptera with 821 (12.0%). Collembola and Araneae were not included in the specimen calculations as their abundances were ranked for the common species. These figures correspond well with other inventories from canopies.

Amongst the sites, the six most species-rich orders were represented in stable proportions with respect to the number of species present (Figure 2), with Diptera being the clearly most species rich at all the sites (29% in Skjærsjø to 47% in Berge). The proportion of specimens for the six most abundant orders, however, showed a varied pattern in that Isopoda constituted 23% of the specimens collected at Djupedal, Hemiptera almost 45% at Mule Varde and Coleoptera 25% at Skjærsjø (Figure 2). Moreover, the number of collected species ranged from 166 in Berge to 370 in Steinknapp, and the number of specimens collected was 4.6 times higher in Steinknapp (2440) than at Berge (536) (Table 2). Steinknapp contained 1.8 times as many species as the second most species-rich site, Djupedal (just a few kilometers away). Although species new to science were found in all the localities, 14 of the 21 new species were found in Steinknapp (25 specimens) with five species as the second highest number in any of the other localities (Skjærsjø, 37 specimens). In addition, 45 species new to Norway (134 specimens) were found in Steinknapp, followed by 20 species (60 specimens) in Djupedal.

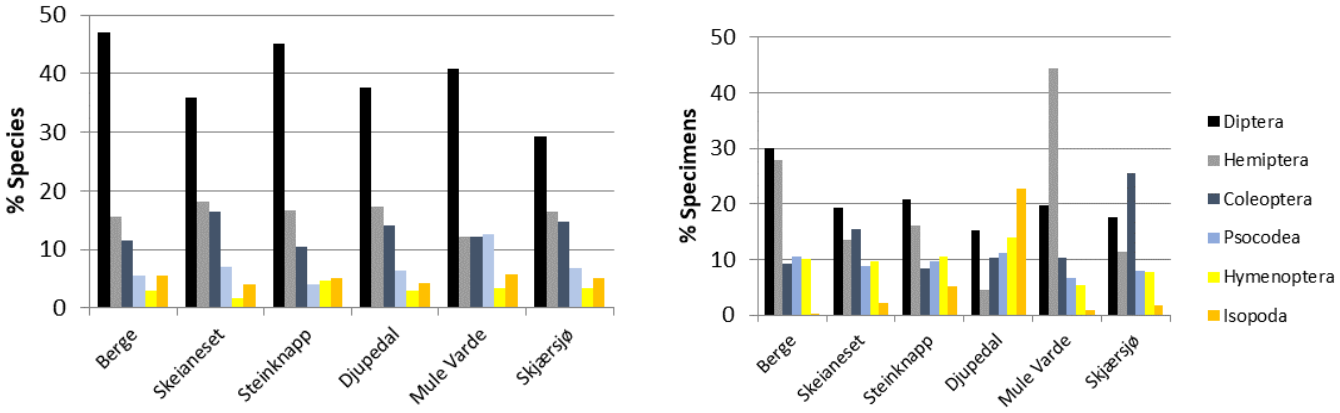


**Figure 2.** (**Left**) Percentage distribution of species (top six orders). (**Right**) Percentage distribution of specimens (top six orders).

**Table 2.** Site diversity data. $N_{Species}$ = Number of species collected from the site. $N_{Specimens}$ = Number of specimens collected from the site. $R_{\alpha}$ = Range of species numbers collected from any tree within the site. $R_{Specimens}$ = Range of specimens collected from any tree within the site. $N_{Singletons}$ = Number of species represented by one specimen only. Turnover = Whittaker's β within the site.

| | $N_{Species}$ | $N_{Specimens}$ | $R_{\alpha}$ | $R_{Specimens}$ | $N_{Singletons}$ | Turnover |
|---|---|---|---|---|---|---|
| Berge | 166 | 536 | 31–86 | 83–209 | 82 | 31.01 |
| Skeianeset | 170 | 719 | 40–88 | 76–324 | 95 | 31.06 |
| Steinknapp | 370 | 2440 | 69–192 | 278–916 | 198 | 30.90 |
| Djupedal | 207 | 1671 | 8–103 | 42–787 | 103 | 33.66 |
| Mule Varde | 174 | 669 | 38–80 | 92–336 | 111 | 39.17 |
| Skjærsjø | 177 | 830 | 52–76 | 179–230 | 108 | 44.30 |

Even though 50.6% of the species (358 species) were represented by singletons and 56.1% (397 species) were found in only one tree (uniques), the turnover along the entire sampling gradient (all 24 trees) was as low as β = 13.34. Rejecting H1, this means that the species communities along the gradient are comparably similar. Between-site turnover showed the same with β = 18.27. Within the sites, however, turnover was higher (Table 2), ranging from 31.01 (Berge) to 44.30 (Skjærsjø). Thus, despite the high turnover within each site (Table 2), the shift in species composition throughout the sampling gradient was comparably lower, indicating that a similar set of species appear in low numbers in geographically disjunct locations.

This separation of sites is also reflected in the DCA ordination diagram (Figure 3), as the two sites on cultivated land (Berge and Mule Varde) were nicely grouped separately from the other sites indicating similar within-site composition of species but different from each other (except tree 11 from Steinknapp), and thus supporting H2. At the opposite side of the gradient, the Djupedal site also indicates a similar species composition within the site, but different from the other sites. The strong explanatory powers of the DCA axes one and two (Eigenvalues = 0.51 and 0.32, respectively), as well as the long gradient (3.98 SD), corroborate this.

### *3.2. Species Records*

#### 3.2.1. Araneae

Spiders are all predators and are usually more associated with their prey than with tree species. Noteworthy though, among the 28 species collected, one threatened species was found (*Dipoena braccata* (C. L. Koch, 1841), see Table 3). *Diplocephalus picinus* (Blackwall, 1841) is a species normally found in broadleaf forests, while *Moebelia penicillata* (Westring, 1851), *Paidiscura pallens* (Blackwall, 1834), *Neriene peltata* (Wider, 1834) and *Theridion mystaceum* L. Koch, 1870 are all known to climb trees [6,60].

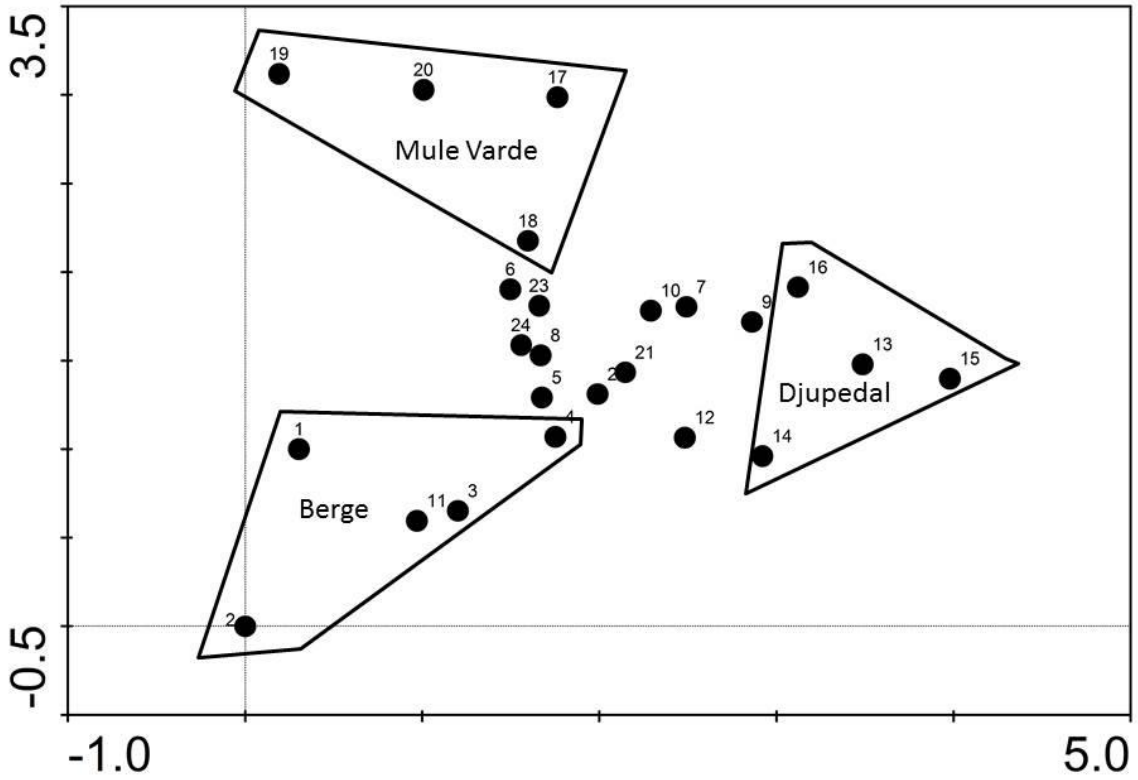


**Figure 3.** DCA ordination diagram. Eigenvalue 1 = 0.51. Eigenvalue 2 = 0.32. Dummy values 5, 10 and 20 for Araneae and Collembola included as described in the material and methods chapter.

**Table 3.** Red listed species [61]. Categories: VU = vulnerable, NT = near threatened.

| Order | Family | Species | Category | Locality | Specimens | Biology |
|---|---|---|---|---|---|---|
| Araneae | Theridiidae | *Dipoena braccata* (C. L. Koch, 1841) | VU | Steinknapp | Few | Lower branches, conifer forests |
| Isopoda | Trachelipodidae | *Trachelipus ratzeburgii* (Brandt, 1833) | NT | Djupedal<br>Skjærsjø | 16<br>3 | Broadleaf forest |
| Coleoptera | Cantharidae | *Malthinus seriepunctatus* Kiesenwetter, 1852 | NT | Skeianeset<br>Steinknapp<br>Djupedal | 1<br>3<br>32 | Thermophilus, predator, *Quercus* |
| | Scirtidae | *Prionocyphon serricornis* (Müller, 1821) | NT | Skeianeset | 2 | Eurytop, saprophagous |
| | Dasytidae | *Dasytes aeratus* Stephens, 1830 | NT | Mule Varde | 1 | Eurytop, predator |

3.2.2. Acari

Two oribatid mites new to science were found. *Damaeus* sp. n. was abundant, with 51 specimens and was present at all the sites except Djupedal, while *Phthiracarus* sp. n. was found with five geographically disjunct specimens (Table A1). In addition, the following four oribatid species were recorded from the Nordic countries for the first time: *Liacarus (Dorycranosus) splendens* (Coggi, 1898) with one specimen from Steinknapp, *Oribatella (Oribatella) quadricornuta* (Michael, 1880) with 14 specimens from Steinknapp, *Phauloppia nemoralis* (Berlese, 1916) with one specimen from Skeianeset and two from Steinknapp, and *Xenillus (Xenillus) discrepans* Grandjean, 1936 with 14 specimens from Skeianeset, three from Mule Varde and one from Skjærsjø, respectively.

Among the arboreal species of oribatid mites inhabiting the oak canopies, we can include the following species living in the growths of mosses and lichens therein: *Camisia* (*C.*) *horrida* (Hermann, 1804), *Carabodes* (*C.*) *areolatus* Berlese, 1916, *Carabodes* (*C.*) *labyrinthicus* (Michael, 1879), *Cymberemaeus cymba* (Nicolet, 1855), *Eupelps acromios* (Hermann, 1804) and *Oribatula* (*Zygoribatula*) *exilis* (Nicolet, 1855). The following specialized lichenophagous

species were also common in the treetops, feeding on the lichen thalluses: *Phauloppia lucorum* (C. L. Koch, 1841) and *Phauloppia nemoralis* (Berlese, 1916). The following oribatid species, preferring decaying wood, were also frequent in tree canopies: *Caleremaeus monilipes* (Michael, 1882), *Carabodes* (*C.*) *rugosior* Berlese, 1916 and *Euphthiracarus* (*E.*) *cribrarius* (Berlese, 1904). Arboreal species are usually bigger (length of body 600–1000 µm), dark brown or black, with a heavily sclerotized cuticle and a thick layer of waxy cerotegument on the body surface, protecting them from desiccation. Forest litter and soil species, on the other hand, are characteristically smaller, lighter in color, with a weaker sclerotized cuticle and a thinner layer of cerotegument (families Tectocepheidae, Oppiidae, Suctobelbidae, Brachychthoniidae, etc.). They were not found in the tree canopies.

#### 3.2.3. Isopoda

*Trachelipus ratzeburgii* (Brandt, 1833) is categorized as near threatened on the Norwegian red list [61]. It appeared with 16 specimens in Djupedal and three in Skjærsjø (Table 3).

#### 3.2.4. Collembola

Being scavengers for most, springtails are common in trees [62]. All of the 23 species found in the oak canopies can be considered as common species, with *Entomobrya nivalis* (Linnaeus, 1758) as the most abundant species in this study by far. This species, together with *E. albocincta* (Templeton, 1835), *E. corticalis* (Nicolet, 1842), *E. marginata* (Tullberg, 1871) and *Sminthurinus alpinus* Gisin, 1953, are known arboreal species being associated with the lichens growing on bark.

#### 3.2.5. Hemiptera

Altogether, 35 species of Hemiptera were collected–21 Heteroptera and 14 Auchenorrhyncha –most of them are oak associates [6,63,64]. *Temnostethus gracilis* Horváth, 1907 and *Phylus melanocephalus* (Linnaeus, 1767) were the two most common species of Heteroptera and were found in almost all the sites. Other oak dwellers worth mentioning are, for example, *Cyllecoris histrionicus* (Linnaeus, 1767), *Psallus varians* (Herrich-Schaeffer, 1841), *P. mollis* (Mulsant and Rey, 1852), *P. variabilis* (Fallén, 1807) and *P. wagneri* Ossiannilsson, 1953.

#### 3.2.6. Psocodea

Twenty-four species of the order Psocodea were collected from the oak canopies, all belonging to families formerly referred to as the paraphyletic «order Psocoptera» [65,66]. Most Psocodea feed on algae, microfungi and lichens, or decomposing stages of these, as well as pollen. Most of the foliage-living species are associated with either conifers or broadleaved trees, whereas bark-living species (on trunks as well as branches and twigs) are less discriminate. For most Psocodea, the character of the foodstuff itself, which may be dependent on physical factors such as moisture, light and exposure, is probably more important than the tree species. No Psocodea species was found at all the sites, but *Reuterella helvimacula* (Enderlein, 1901), *Valenzuela flavidus* (Stephens, 1836) and *Mesopsocus unipunctatus* (Müller, 1764) were the most common species (see Table A1). Almost all of the collected species are arboreal on a variety of tree species; *Lachesilla quercus* (Kolbe, 1880) has been believed to be confined to oak [6], but may also be found on other tree species, and outside the distribution of oak. Its apparent association with oak may rather be an expression of its preference [67,68] for dead leaves lingering on the tree, as commonly found on oaks, or on cut-off branches on the ground. *Valenzuela flavidus* and *Graphopsocus cruciatus* (Linnaeus, 1768) are associated with foliage of various deciduous trees [6,69].

#### 3.2.7. Thysanoptera

Five specimens of *Poecilothrips albopictus* Uzel, 1895 were found at the two sites in Drangedal and in Larvik. This species was taken for the first time in Norway and its distribution indicates that it is fairly common. The biology of Thysanoptera is generally

poorly known and it cannot be claimed that any of the 14 species in this study are associated with oaks—they are more likely to be associated with substrates offered by the tree, such as fungal spores, algae, etc.

#### 3.2.8. Diptera

This was by far the most species rich group, with 334 species collected, 18 species new to science, 7 species new to the Nordic fauna and an additional 52 species caught in Norway for the first time (Table A1). Phoridae was the family with the largest number of specimens collected (212 specimens), followed by Ceratopogonidae (203) and Chironomidae (123). Phoridae was also the most species rich family by far, with 76 species, of which 16 species were new to science (all of them in the genus *Megaselia*); in addition, four species were new to the Nordic countries and 23 were new to Norway [25]. *Borophaga agilis* (Meigen, 1830) was reported new to Norway in [25], but was later found to have been reported in [70]. Sciaridae was the second most species-rich group, with 43 species (one species new to science and eleven new records for Norway) [27,71], followed by Chironomidae with 42 species (one species new to science [58], and two new to Norway). In addition, the following families were represented by new records: Limoniidae and Lauxaniidae (one new to the Nordic countries and one new to Norway, respectively), Ceratopogonidae (one new to the Nordic countries) and Fanniidae (one new to Norway).

The ecology of Diptera is mostly poorly known, and the abundant families in this study, e.g., Phoridae, Ceratopogonidae and Chironomidae, are usually neglected in general faunistic surveys. Only adults were identified, while habitat requirements are a characteristic of the larvae of most species in these families. Nonetheless, most of the species in the sciarid genera *Bradysia*, *Corynoptera* and *Scatopsciara* in this study (see Table A1) might have a connection with oak trees beyond accidental visits, as they are mentioned as deciduous forest species in the literature [27,72]. Other species of Sciaridae are also mentioned as deciduous forest associates (see Table A1). Additionally, *Phyllodromia melanocephala* (Fabricius, 1794) (Empididae) and *Systenus bipartitus* (Loew, 1850) (Dolichopodidae) are species known to inhabit deciduous forests. The first was one of the most common species, with 77 specimens collected and from all the sites.

Many species of Diptera are known to be trunk dwelling, fungivores or associated with rotting wood, habitats that are present abundantly in old oak trees. A rather high proportion of the collected species, where ecological information is available, can be assigned to either of these categories, most of them with few specimens. One exception was *Forcipomyia titillans* (Winnertz, 1852), a rotting matter associate [73], which was found with 22 individuals.

Other individual species accounts worth mentioning are those being abundant at all the sites or aggregated at any one site. *Culicoides impunctatus* Goetghebuer, 1920 (Ceratopogonidae) is a haematophagous parasite on vertebrates and is also known to aggregate close to the breeding sites, which are humid areas, preferably peat bogs [74]. It was abundant in Steinknapp and Skjærsjø in particular, with 36 and 30 specimens collected, respectively. *Phora edentata* Schmitz, 1920 (Phoridae), a species new to Norway, was fairly abundant at most of the sites, which indicates that it is a rather common species. Two other species, *Rhagio lineola* Fabricius, 1794 (Rhagionidae) and *Lyciella platycephala* (Loew, 1847) (Lauxaniidae) were abundant in most sites. Both of these species are common and occupy many habitats. Twelve specimens of *Anapausis helvetica* Haenni, 1984 (Scatopsidae) were collected from Mule Varde and not from elsewhere. This species is rarely collected, but present knowledge may indicate an association with open areas, farmlands and parks [75]. *Platypalpus ecalceatus* (Zetterstedt, 1838) (Hybotidae) was collected with 13 individuals and only in Djupedal. This species is most likely a predator, as are nearly all Empidoidea (Terje Jonassen, pers. comm), but we cannot readily explain why it appears aggregated at only one site. We can see a similar pattern for two other Empidoidea, the dolichopodids *Chrysotimus flaviventris* (von Roser, 1840) and *Dolichopus plumipes* (Scopoli, 1763), being represented with 21 and 66 specimens in the Drangedal samples,

respectively, and almost absent from all the other sites (see Table A1). Ten specimens of *Megaselia robertsoni* Disney, 2008 (Phoridae), a species new to Norway, were found only at Steinknapp.

#### 3.2.9. Hymenoptera

A total of 117 species of Hymenoptera were collected, with one species new to science, four species new to the Nordic countries and 21 additional species new to Norway (Table A1). Many of the specimens could only be identified to genera or 'near to' designated species. Thus, we cannot rule out that there are additional undescribed species in this material. Of the two suborders, Symphyta and Apocrita were represented only by Apocrita. Of the 118 species, 12 Aculeata, i.e., nine Formicidae and three Crabronidae, were found, with the remaining 106 species all belonging to the 'Parasitica infraorder'. Ceraphronoidea with 22 species (68 specimens); Chalcidoidea, 55 species (160); Cynipoidea, nine species (31); Diaprioidea, 11 species (15); Platygastroidea, 21 species (56). The Ichneumonoidea superfamily was not processed, only one species of *Gelis* sp. (1) has been added to the list. Ants in the mound building *Formica rufa* group, namely *F. polyctena* (Förster, 1850) were, not surprisingly, the most abundant species. They were all collected in Drangedal and from all the treated trees at Djupedal. None of the remaining species were abundant in any of the sites, but 30 specimens of *Tamarixia pubescens* (Nees, 1834) (Eulophidae), a new species to the Nordic fauna, were collected and taken at all the sites. This is a parasitoid of psyllids known to parasitize *Trioza remota* Förster, 1848 [76], which, as nymph, is an oak obligate. *T. remota* was, however, not found in this study. *Seladerma tarsale* (Walker, 1833) (Pteromalidae) was also rather common with 24 specimens, whereof 14 were collected in Steinknapp. This species is a primary parasitoid of Agromyzidae flies [77]. No Agromyzidae were present in the material, however.

The representation of species shows a well-defined association with oak-galls. The oak-galls living inquilins are *Ceroptres clavicornis* Hartig, 1840, *Neuroterus* nr. *politus* Hartig, 1840, *Saphonecrus connatus* (Hartig, 1840), *Synergus apicalis* Hartig, 1841, *S. crassicornis* (Curtis, 1838), *S. gallaepomiformis* (Fonscolombe, 1832) and *S. pallipes* Hartig, 1840, all of which are in the Cynipidae family. Of the large number of oak-gall parasitoids the following are worth mentioning: *Aulogymnus gallarum* (Linnaeus, 1761) (Eulophidae), *Eupelmus annulatus* Nees, 1834 (Eupelmidae), *Ormyrus pomaceus* (Geoffroy, 1785) (Ormyridae) and the pteromalids *Cecidostiba semifascia* (Walker, 1835), *Mesopolobus dubius* (Walker, 1834), *M. fasciiventris* Westwood, 1833, *M. tarsatus* (Nees, 1834), *M. tibialis* (Westwood, 1833), *M. xanthocerus* (Thomson, 1878), *Megastigmus dorsalis* (Fabricius, 1798) and *Torymus flavipes* (Walker, 1833).

#### 3.2.10. Coleoptera

Of the 84 species of beetles found, the following three are on the Norwegian red list: *Malthinus seriepunctatus* Kiesenwetter, 1851 (Cantharidae), *Prionocyphon serricornis* (Müller, 1821) (Scirtidae) and *Dasytes aeratus* Stephens, 1830 (Dasytidae) (Table 3), all of which are categorized as near threatened in [61].

Several of the following species are associated with oak or oak habitats: the curculionid *Archarius pyrrhoceras* (Marsham, 1802), *Coeliodes rana* (Fabricius, 1787), *Orchestes quercus* (Linnaeus, 1758), the already-mentioned cantharid *M. seriepunctatus*, the ciid *Cis vestitus* (Mellié, 1848), the melandryid *Conopalpus testaceus* (Olivier, 1790), the chrysomelid *Cryptocephalus labiatus* (Linnaeus, 1761) and the cerambycid *Leiopus linnei* Wallin, Nylander and Kvamme, 2009 [10,36,78]. Furthermore, many species are known to be arboreal (see Table A1) but being rare in this material was common for most of them. A common, arboreal species was *Otiorhynchus singularis* (Linnaeus, 1767) (Curculionidae), which is a species found almost everywhere. Thirty-one specimens were found at all the sites but Skjærsjø. Another weevil, *Strophosoma capitatum* (De Geer, 1775), a common herbivore on broadleaf trees, was found with 86 specimens at all but the two sites in Western Norway. The predacious Cantharidae *Malthodes guttifer* Kiesenwetter, 1852 was collected at all the

sites, except for Berge, with a total of 61 specimens. This is a common species associated with shrubs and often found climbing trees [10]. Eleven specimens of *Orchesia micans* (Panzer, 1793) (Melandryidae) were taken in Skjærsjø, its only appearance in the study. It has a close association with polypore fungi in the genus *Inonotus* [79]. The throscid *Trixagus dermestoides* (Linnaeus, 1767) was found with 11 specimens, ten of them from Steinknapp. This species is known as a generalist pollen and mold feeder (e.g., [80]), with habitats plentiful in oaks.

#### 3.2.11. Species Accumulation

The number of invertebrate species collected was 722 and with an overall turnover of 13.34, suggesting a rather homogenous species pool along the sampling gradient, thus rejecting H1. Despite the apparent homogeneity, there is a logarithmic relationship between the number of specimens collected and the number of species found (Figure 4), suggesting that a much more profound sampling effort needs to be performed before the accumulation curve starts to converge. A steep species accumulation curve is to be expected, as the sample size was low and there was a high number of singletons and uniques.

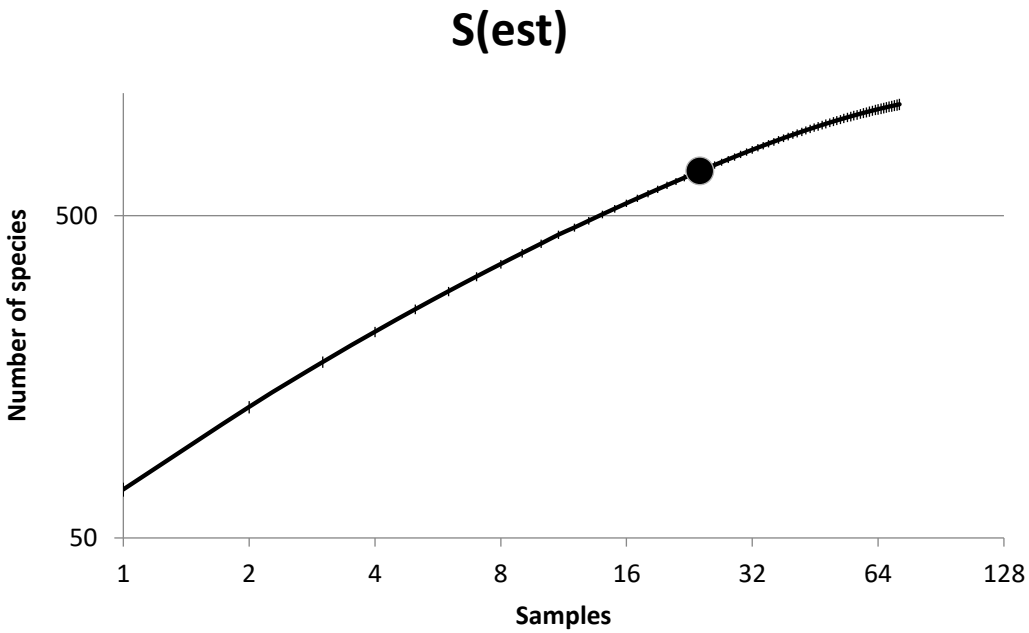


**Figure 4.** Rarefaction curves of oak diversity extrapolated beyond the dot (i.e., 24 trees) to yield 72 treatments (i.e., trees). The dot shows the number of species sampled by the number of trees treated. Note the log2 *x*-axis and the log10 *y*-axis.

## 4. Discussion

### *4.1. Invertebrate Samples*

The number of collected specimens in this study was very low compared with the material collected from a comparable study of 24 pine trees over a geographic gradient from west to east Norway, and where nearly 30,000 specimens were collected using the same methodology [38]. One explanation is fairly obvious, as the weather in both sampling periods (June/July 2011/2012) was generally cool and wet. The monthly temperature in 2011 was, on average, slightly higher than the normal temperature (ranging from −0.1 °C below (Kvam, June) to +1.7 °C above (Kvam, July)), but the precipitation ranged from 104% (Kvam, July) to 270% (Drangedal, July) of the normal [81,82]. For the year 2012, the monthly temperature was lower than the normal temperature (from −1.8 °C (Drangedal, June) to −0.2 °C (Kvam, July) below), and these months were also generally wetter than the normal (from 69% (Kvam, June) to 169% (Kvam, July)) [83,84]. Other reasons for the low catch may be related to the structure and complexity of the oak canopy compared with

the more open canopy of, for example, pine, in that a larger proportion of the invertebrates remain in the tree—either stuck in the dense foliage or on the branches [40].

### *4.2. Faunistics*

Despite the fact that the ecology is unknown for many species (see Table A1), a large proportion of the species found in this study must be assumed to be occasional visitors (i.e., the oak canopy is not their primary habitat). As oaks offer a wide selection of sites to rest, swarm and feed, an abundance of generalists is to be assumed, as well as opportunists taking advantage of the secondary habitats in the trees, for example, the ant *Camponotus ligniperda* (Latreille, 1802) living in dead parts of the tree or the numerous species associated with deposited leaf litter or soils. Yet, a few other species are likely to be accidental visitors from the surroundings, e.g., species associated with grasses and *Calluna* (see Table A1). The presence of the marine chironomid *Halocladius variablis* (Stæger, 1839) in Steinknapp is surprising, as the distance to the ocean is about 30 km. Its presence in Skeianeset and Mule Varde makes sense, however, as both sites are close to the sea.

Even though neither the psyllid *Trioza* nor agromyzid flies were found as adults, we must believe them to be present, as parasitoids of both were common—*Tamarixia pubescens* (Eulophidae) and *Seladerma tarsale* (Pteromalidae), respectively. Both host groups are known to live on oaks [85,86]. Another fact to note is that no species of the egg parasitoid family Mymaridae (Chalcidoidea) were collected. Mymaridae are among the smallest insects in the world and, regarding the number of species and specimens collected, it is inconceivable that Mymaridae species would not be present in larger numbers as well. Unfortunately, due to their size and fragility, they are likely to remain in the canopy foliage after fogging.

Correspondence in the presence of species over a broader selection of the literature shows that 80 of the species collected in this study were also present in other European studies on oak canopy or oak tree faunas [2,6,9,10,36,60,63,64,69,78,87,88].

### *4.3. Conservation and Distribution of Invertebrates*

Some paradoxes arise when comparing the number of red-listed species with the number of species new to science or new occurrences. Only five red-listed species were found, while the number of new occurrences, including new species, were 92 altogether, most of them with very few specimens. This demonstrates how poorly known the Norwegian arboreal invertebrate fauna still is. One of the criteria for inclusion on the Red List is that a species should be known to reproduce for more than 10 years in the period 1800–2015 [61]. Moreover, rarity is not a criterion for inclusion as such, but reduced population sizes, reduced habitats or reduced distributions are. Thus, the value of the red list category for a species is based on the changes in the intermediate-term development of its population and no new species or species observations will qualify for considerations into the list, but it should incentivize the monitoring of those species. Inasmuch, a new species does not necessarily have to be rare, it may just have been overlooked. Several new species or occurrences were widespread and with intermediate numbers, e.g., *Damaeus* n. sp. (50 specimens, five localities), *Xenillus (Xenillus) discrepans* (18 specimens, three localities), *Tamarixia pubescens* (30 specimens, all localities), *Megaselia ignobilis* (19 specimens, four localities) and *Phora edentata* (40 specimens, four localities) (Table A1). Canopy specialists may well have been overlooked, as some are, apparently, rarely collected using conventional techniques and the obvious inaccessibility to the canopy complicates sampling.

Oaks used to be evenly distributed within its distributional range in Norway, and fragmentation was caused by overexploitation and a colder climate in the beginning of the sub-Atlantic era [89]. The rejection of H1 can be a response to a historically continuous distribution of oaks by the remaining relic populations of invertebrates. Additionally, compared with the more diverse forest sites, the poorer community of plants, homogeneous canopy structure [44] and different microclimate [41,90] in the actively managed sites, Mule

Varde and Berge, are likely to source a different fauna to the oak trees on these sites, thus, supporting H2.

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## Appendix A

**Table A1.** Complete list of species with numbers per locality. Literature used for the table: [2,6,10,12,27,38,58–60,62–64,67–71,78,87,91–164], relevant volumes of Die Käfer Mitteleuropas, Danmarks Fauna, Svensk Insektfauna, Fauna Entomologica Scandinavica, and personal comments from the authors. The (B) and (S) in the heading under Kvam are Berge and Skeianeset, respectively, while the (S) and (D) under Drangedal are Steinknapp and Djupedal, respectively. An ¤, * or ** in front of the species name depicts a new record for either science, Norway or Nordic countries upon sampling, respectively. x, xx and xxx represent dummy numbers 5, 10 and 20, respectively.

| | | | Kvam | | Drangedal | | Porsgrunn | Larvik |
|---|---|---|---|---|---|---|---|---|
| **Higher Taxon** | **Species** | **Habitat** | **1(B)** | **2(S)** | **3(S)** | **4(D)** | **5** | **6** |
| **ARANEAE** | | | | | | | | |
| Anyphaenidae | *Anyphaena accentuata* (Walckenaer, 1802) | Varies | | | x | | | x |
| Araneidae | *Araneus sturmi* (Hahn, 1831) | Conifer forests | | x | | x | | |
| | *Araniella displicata* (Hentz, 1847) | | | | x | | | |
| Clubionidae | *Clubiona brevipes* Blackwall, 1841 | | | | | x | | x |
| Dictynidae | *Dictyna pusilla* Thorell, 1856 | | | | x | | | |
| Linyphiidae | *Agyneta conigera* (Cambridge, 1863) | | | | | | | x |
| | *Diplocephalus picinus* Blackwall, 1841 | Broadleaf forest | | | | | x | |
| | *Entelecara acuminata* (Wider, 1834) | | x | | x | | | |
| | *Erigone atra* Blackwall, 1833 | Varies | | | | | x | |
| | *Maso sundevalli* (Westring, 1851) | | | | x | | | |
| | *Moebelia penicillata* (Westring, 1851) | Crevices, forests, arboreal | | | | x | | |
| | *Neriene peltata* (Wider, 1834) | Branches, bushes | x | x | x | x | | x |
| | *N. radiata* (Walckenaer, 1842) | | | | x | | | |
| | *Pelecopsis elongata* (Wider, 1834) | Vegetation, dry | | | | | x | |
| Mimetidae | *Ero furcata* (Villers, 1789) | Varies | | | x | | | |
| Philodromidae | *Philodromus cespitum* (Walckenaer, 1802) | Conifer forests | | | | x | | x |
| Pisauridae | *Pisaura mirabilis* (Clerck, 1757) | Heath, dry | | | x | | | |
| Segestriidae | *Segestria senoculata* (Linnaeus, 1758) | Holes in wall and bark | | | x | | | |
| Tetragnathidae | *Tetragnatha montana* Simon, 1874 | | x | | | | | |
| Theridiidae | *Selimus vittatus* (C. L. Koch, 1836) | | x | | x | | | |
| | *Dipoena braccata* (C. L. Koch, 1841) | Thermoph., branches | | | x | | | |
| | *Paidiscura pallens* (Blackwall, 1834) | Varies, oak | x | x | x | x | x | x |
| | *Parasteatoda tepidariorum* (C. L. Koch, 1841) | | | | x | | | |
| | *Platnickina tincta* (Walckenaer, 1802) | Conifer forests | | | x | | | |
| | *Robertus neglectus* (Cambridge, 1871) | | | | | | x | |
| | *Theridion hemerobium* Simon, 1914 | | | | x | | | |
| | *T. mystaceum* L. Koch, 1870 | Synantrop, bark, bush | | | | | x | |
| Uloboridae | *Hyptiotes paradoxus* (C. L. Koch, 1834) | Spruce forest | | | x | | | |
| Sum species: 28 | | | 5 | 3 | 17 | 6 | 6 | 6 |

**Table A1.** *Cont.*

| | | | Kvam | | Drangedal | | Porsgrunn | Larvik |
|---|---|---|---|---|---|---|---|---|
| **Higher Taxon** | **Species** | **Habitat** | **1(B)** | **2(S)** | **3(S)** | **4(D)** | **5** | **6** |
| **OPILIONES** | | | | | | | | |
| Phalangiidae | *Lacinius ephippiatus* (C. L. Koch, 1835) | | | 12 | 1 | 3 | | |
| | *Mitopus morio* (Fabricius, 1799) | | | 1 | | | | 1 |
| Sclerosomatidae | *Leiobunum gracile* Thorell, 1876 | | | | | | 2 | 1 |
| | *Nelima gothica* Lohmander, 1945 | | | | 2 | | | |
| Sum species: 4 | | | | 2 | 2 | 1 | 1 | 2 |
| Sum specimens: 23 | | | | 13 | 3 | 3 | 2 | 2 |
| **ACARI** | | | | | | | | |
| Anystidae | *Anystis baccarum* (Linnaeus, 1758) | Predator, woody plants | 7 | 1 | 272 | 120 | 8 | |
| Ascidae | *Neojordensia sinuata* Athias-Henrlot, 1973 | Predator | | | 1 | | | |
| Bdellidae | *Bdella iconica* Berlese, 1923 | Predator | | | 1 | | | |
| | *B. muscorum* Ewing, 1909 | Predator | | | 4 | | | |
| | *Biscirus silvaticus* (Kramer, 1881) | Predator | | | 6 | 8 | | |
| Erythraeidae | cf. *Abrolophus* sp. | | | 1 | | | | |
| Eupodidae | *Eupodes voxencollinus* Thor, 1934 | | | | | 1 | | |
| Ixodidae | *Ixodes ricinus* (Linnaeus, 1758) | Mammal parasite | 4 | 4 | 2 | | | 3 |
| Parasitidae | *Holoparasitus calcaratus* (C. L. Koch, 1839) | Predator | | | 1 | 2 | | |
| | *Parasitus* sp. | Predator | | | | | 2 | |
| Phytoseiidae | *Euseius finlandicus* (Oudemans, 1915) | Predator, woody plants | 1 | | 1 | | | |
| Zerconidae | *Zercon spatulatus* (C. L. Koch, 1839) | Predator, dry habitats | | | 1 | | | 1 |
| Achipteriidae | *Achipteria (A.) coleoptrata* (Linnaeus, 1758) | Forest litter, meadows, | | | | | | 1 |
| Caleremaeidae | *Caleremaeus monilipes* (Michael, 1822) | Decaying wood, stumps | | | 1 | | | |
| Camisiidae | *Camisia (C.) horrida* (Hermann, 1804) | Mosses on trees | 2 | | 12 | 7 | 1 | 5 |
| | *Heminothrus (Platynothrus) peltifer* (C. L. Koch, 1839) | Forest litter, mosses | 1 | | | | | 2 |
| Carabodidae | *Carabodes (C.) areolatus* Berlese, 1916 | Lichens, mosses on trees | | | 1 | | | |
| | *C. (C.) labyrinthicus* (Michael, 1879) | Lichens, mosses on trees | | 3 | 1 | | | 4 |
| | *C. (C.) ornatus* Štorkán, 1925 | Coniferous forest litter | | | | | | 1 |
| | *C. (C.) rugosior* Berlese, 1916 | Forest litter, stumps, | 1 | | | | | |
| | *Odontocepheus (O.) elongates* (Michael, 1879) | Forest litter, mosses | | | 1 | | | |
| Cepheidae | *Cepheus cepheiformis* (Nicolet, 1855) | Forest leaf litter | | | | | | 1 |
| Metrioppiidae | *Ceratoppia bipilis* (Hermann, 1804) | Forest leaf litter | | | | 1 | | |
| Cymberemaeidae | *Cymbaeremaeus cymba* (Nicolet, 1855) | Lichens, mosses on trees | | 1 | | 4 | | 1 |
| Damaeidae | ¤*Damaeus* n.sp. | | 2 | 7 | 9 | | 2 | 31 |
| Ceratozetidae | *Diapterobates humeralis* (Hermann, 1804) | Forest litter, mosses | | | 47 | 2 | | 12 |
| | *Trichoribates (T.) trimaculatus* (C. L. Koch, 1836) | Forest litter | | | | | | 1 |
| Eremaeidae | *Eueremaeus oblongus silvestris* Forsslund, 1956 | Mosses, leaf litter | | | 5 | 1 | 1 | |
| Phenopelopodidae | *Eupelops acromios* (Hermann, 1804) | Mosses, lichens on trees | | | 8 | 16 | | 4 |
| Euphthiracaridae | *Euphthiracarus (E.) cribrarius* (Berlese, 1904) | Forest litter, decaying wood | 1 | | | | | |
| Galumnidae | *Galumna (G.) lanceata* (Oudemans, 1900) | Forest litter | | | | | | 1 |
| Oribatulidae | *Hemileius (H.) initialis* (Berlese, 1908) | Forest litter, meadows | 1 | | 2 | | 1 | 1 |
| | *Oribatula (Zygoribatula) exilis* (Nicolet, 1855) | Mosses, lichens on trees | | 1 | 13 | | | 1 |
| | *Phauloppia lucorum* (C. L. Koch, 1841) | Lichens on trees | 5 | 6 | 87 | 43 | 6 | 23 |
| | ***P. nemoralis* (Berlese, 1916) | Lichens on trees | | 1 | 2 | | | |
| Chamobatidae | *Chamobates (C.) borealis* (Trägårdh, 1902) | Forest litter | | | 1 | 1 | | 2 |
| | *C. (C.) pusillus* (Berlese, 1895) | Forest litter | 3 | 2 | 4 | 4 | | 1 |
| Liacaridae | ***Liacarus (Dorycranosus) splendens* (Coggi, 1898) | Decaying wood, | | | 1 | | | |
| | *L. (Liacarus) coracinus* (C. L. Koch, 1841) | Decaying wood, litter | | | | | | 1 |
| Mycobatidae | *Mycobates (M.) parmeliae* (Michael, 1884) | Forest litter | | | | 2 | | |
| Oribatellidae | ***Oribatella (Oribatella) quadricornuta* (Michael, 1880) | Forest litter | | | 14 | | | |
| Phthiracaridae | ¤*Phthiracarus* n. sp. | | | 1 | 1 | | | 3 |
| Steganacaridae | *Steganacarus (Tropacarus) carinatus* (C. L. Koch, 1841) | Leaf litter in forests | | | 1 | | | |
| Xenillidae | ***Xenillus (Xenillus) discrepans* Grandjean, 1936 | Deciduous forest litter | | 14 | | | 3 | 1 |
| Sum species: 44 | | | 11 | 12 | 28 | 14 | 8 | 22 |
| Sum specimens: 907 | | | 28 | 42 | 500 | 212 | 24 | 101 |
| **ISOPODA** | | | | | | | | |
| Armadillidiidae | *Armadillidium pictum* Brandt, 1833 | | | 14 | 127 | 366 | | 8 |
| | *A. pulchellum* (Zencker, 1799) | | | | | | | 2 |
| Oniscidae | *Oniscus asellus* Linnaeus, 1758 | | 2 | 2 | | | | 1 |
| Philosciidae | *Philoscia muscorum* (Scopoli, 1763) | | | | | | 6 | |
| Trachelipodidae | *Trachelipus ratzeburgii* (Brandt, 1833) | Broadleaf forest | | | | 16 | | 3 |
| Sum species: 5 | | | 1 | 2 | 1 | 2 | 1 | 4 |
| Sum specimens: 547 | | | 2 | 16 | 127 | 382 | 6 | 14 |
| **MYRIAPODA** | | | | | | | | |
| **Chilopoda** | | | | | | | | |
| Lithobiidae | *Lithobius borealis* Meinert, 1868 | | | | 2 | 3 | | 7 |
| **Diplopoda** | | | | | | | | |
| Julidae | *Cylindroiulus punctatus* (Leach, 1815) | | | | | 1 | | |
| Sum species: 2 | | | | | 1 | 2 | | 1 |
| Sum specimens: 13 | | | | | 3 | 6 | | 8 |

**Table A1.** *Cont.*

| | | | Kvam | | Drangedal | | Porsgrunn | Larvik |
|---|---|---|---|---|---|---|---|---|
| **Higher Taxon** | **Species** | **Habitat** | **1(B)** | **2(S)** | **3(S)** | **4(D)** | **5** | **6** |
| **COLLEMBOLA** | | | | | | | | |
| Bourletiellidae | *Bourletiella hortensis* (Fitch, 1863) | Vegetation | | 1 | | | | |
| | *Deuterosminthurus bicinctus* (Koch, 1840) | Vegetation, bushes | 8 | | | | | |
| Dicyrtomidae | *Dicyrtomina minuta* (O. Fabricius, 1783) | Forest floor | 2 | | | | 3 | |
| Entomobryidae | *Entomobrya albocincta* (Templeton, 1835) | Bark, lichens | | 3 | | | | |
| | *E. corticalis* (Nicolet, 1842) | Bark, lichens | | | xx | xx | 1 | |
| | *E. marginata* (Tullberg, 1871) | Bark, lichens | | | x | | xx | |
| | *E. nicoleti* (Lubbock, 1868) | Forest floor | | 9 | | | | |
| | *E. nivalis* (Linnaeus, 1758) | Bark, lichens | 1 | 90 | xxx | xxx | 20 | xxx |
| | *Lepidocyrtus lignorum* (Fabricius, 1793) | Litter | | 1 | xx | x | 6 | 5 |
| | *L. violaceus* (Geoffroy, 1762) | Litter | | | | | 1 | |
| | *Orchesella bifasciata* Bourlet, 1839 | Moss, rocks, trunks | | 11 | x | xx | | 3 |
| | *O. cincta* (Linnaeus, 1758) | Forest floor | | 3 | | xx | 3 | |
| | *O. flavescens* (Bourlet, 1839) | Forest floor | | | | x | 1 | 1 |
| | *Willowsia buskii* (Lubbock, 1870) | Xero- thermoph, trunks | | | | x | | |
| Hypogastruridae | *Xenylla maritima* Tullberg, 1869 | Xerophilous | 1 | | xx | x | | |
| Isotomidae | *Isotoma anglicana* Lubbock, 1862 | Litter | | | | | 1 | |
| | *Isotomurus graminis* Fjellberg, 2007 | Hygrophilous | 1 | | | | | |
| | *Pseudisotoma sensibilis* (Tullberg, 1876) | Moss, forest floor | | | | | | 2 |
| Katiannidae | *Sminthurinus aureus* (Lubbock, 1836) | Litter | | | | | 2 | |
| | *S. alpinus* Gisin, 1953 | Bark, dead trees | | | x | | | |
| Sminthuridae | *Allacma fusca* (Linnaeus, 1758) | Forest floor | 4 | 26 | | | 9 | xx |
| | *Lipothrix lubbocki* (Tullberg, 1872) | Forest floor | | | | x | | 1 |
| | Sminthuridae (juveniles) | Litter | 2 | | | | | |
| Tomoceridae | *Pogonognathellus flavescens* (Tullberg, 1871) | Forest floor | | 7 | | | | |
| Sum species: 23 | | | 6 | 9 | 7 | 9 | 10 | 8 |
| **DICTYOPTERA** | | | | | | | | |
| Blattelidae | *Ectobius lapponicus* (Linnaeus, 1758) | | | | 8 | 2 | | |
| **DERMAPTERA** | | | | | | | | |
| Forficulidae | *Chelidura guentheri* (Galvagni, 1994) | | | 7 | 4 | 2 | | 2 |
| Sum species: 2 | | | | 1 | 2 | 2 | | 1 |
| Sum specimens: 25 | | | | 7 | 12 | 4 | | 2 |
| **EPHEMEROPTERA** | | | | | | | | |
| Baetidae | *Cloeon inscriptum* Bengtsson, 1914 | | | | | | 1 | |
| **PLECOPTERA** | | | | | | | | |
| Nemouridae | *Amphinemura borealis* (Morton, 1894) | Streams | 1 | | | | | |
| | *A. sulcicollis* (Stephens, 1836) | Streams | | | 1 | | | |
| | *Nemoura cinerea* (Retzius, 1783) | Streams | | | 3 | 10 | | 2 |
| Sum species: 4 | | | 1 | | 2 | 1 | 1 | 1 |
| Sum specimens: 18 | | | 1 | | 4 | 10 | 1 | 2 |
| **HEMIPTERA** | | | | | | | | |
| **Heteroptera** | | | | | | | | |
| Anthocoridae | *Anthocoris nemoralis* (Fabricius, 1794) | Predator, arboreal, deciduous | | | | | 6 | |
| | *A. nemorum* (Linnaeus, 1761) | Predator, vegetation | | | | | 1 | 1 |
| | *Orius minutus* (Linnaeus, 1758) | Predator, varies | | | | 1 | | |
| | *Temnostethus gracilis* Horváth, 1907 | Predator, varies | | 54 | 1 | | 81 | 20 |
| | *T.* cf. *gracilis* Horváth, 1907 | | 40 | 1 | 52 | 1 | | 18 |
| Microphysidae | *Loricula elegantula* (Baerensprung, 1858) | Predator, lichens, trunk | 2 | 2 | 71 | 4 | 19 | 1 |
| | *L. pselaphiformis* Curtis, 1833 | Predator, lichens, trunk | 2 | 1 | 3 | | 1 | |
| | Indet. (Anthocoridae or Microphysidae) | | 50 | | 80 | 2 | 1 | 37 |
| Miridae | *Blepharidopterus angulatus* (Fallén, 1807) | Predator, arboreal, deciduous | | 1 | | | | |
| | *Cyllecoris histrionicus* (Linnaeus, 1767) | Predator, oak | 3 | | 6 | 3 | | |
| | *Dichrooscytus rufipennis* (Fallén, 1807) | Pine flowers and cones | | | | | 1 | |
| | *Orthotylus tenellus* (Fallén, 1807) | Predator, arboreal, deciduous | | | 2 | | 1 | |
| | *Phoenicocoris obscurellus* (Fallén, 1829) | Pine | | | | | 3 | |
| | *Phylus melanocephalus* (Linnaeus, 1767) | Predator, oak | 15 | | 16 | 10 | 36 | 7 |
| | *Phytocoris intricatus* Flor, 1861 | Conifers | | | 2 | | 1 | |
| | *Ph.* sp. | | | 1 | 9 | 1 | | 1 |
| | *Psallus confusus* Rieger, 1981 | Predator, oak | | | | | 2 | |
| | *Ps. mollis* (Mulsant and Rey, 1852) | Predator, oak | | | 17 | 4 | 5 | 1 |
| | *Ps. variabilis* (Fallén, 1807) | Predator, oak | 1 | | | | 10 | |
| | *Ps. varians* (Herrich-Schaeffer, 1841) | Predator, arboreal, deciduous | 9 | | 27 | 1 | 6 | 1 |
| | *Ps. wagneri* Ossiannilsson, 1953 | Predator, oak | | | 2 | 1 | | |
| | *Ps.* spp. | | 23 | 3 | 84 | 31 | 104 | 1 |
| | *Rhabdomiris striatellus* (Fabricius, 1794) | Oak | 1 | | 5 | | | |
| | Miridae indet. | | | 1 | | | | 1 |
| Lygaeidae | *Scolopostethus thomsoni* Reuter, 1875 | Varies | | | | | 1 | |
| Pentatomidae | *Pentatoma rufipes* (Linnaeus, 1758) | Predator, arboreal, deciduous | 3 | 7 | | | 5 | 1 |
| Sum species: 21 | | | 9 | 7 | 11 | 9 | 16 | 8 |
| Sum specimens:1030 | | | 149 | 71 | 377 | 59 | 284 | 90 |

**Table A1.** *Cont.*

| | | | Kvam | | Drangedal | | Porsgrunn | Larvik |
|---|---|---|---|---|---|---|---|---|
| **Higher Taxon** | **Species** | **Habitat** | **1(B)** | **2(S)** | **3(S)** | **4(D)** | **5** | **6** |
| **Auchenorrhyncha** | | | | | | | | |
| Cixiidae | *Cixius cunicularius* (Linnaeus, 1767) | Deciduous wood plants | | | 1 | | | |
| Delphacidae | *Javesella forcipata* (Boheman, 1847) | Grass, open habitats | | | | | | 1 |
| | *Stiroma affinis* Fieber, 1866 | Grass, forest | | 3 | | | | |
| | *Xanthodelphax flaveolus* (Flor, 1861) | Grass | | | | | | 1 |
| Issidae | *Issus muscaeformis* (Schrank, 1781) | Deciduous wood plants | | 7 | 7 | 15 | 2 | |
| Aphrophoridae | *Neophilaenus lineatus* (Linnaeus, 1758) | Grass | | 1 | | | 1 | |
| Cicadellidae | *Alebra albostriella* (Fallén, 1826) | *Quercus* | | 10 | | 2 | 7 | 1 |
| | *Edwardsiana frustrator* (Edwards, 1908) | Deciduous wood plants | | | | | 1 | 1 |
| | *E.* sp. | | | | 1 | | | 1 |
| | *Eupteryx* sp. | | | | | | 1 | |
| | *Eurhadina concinna* (Germar, 1831) | *Quercus* | | 5 | | | | |
| | *Iassus lanio* (Linnaeus, 1761) | *Quercus* | | | | 1 | | |
| | *Populicerus populi* (Linnaeus, 1761) | *Populus tremula* | | | 6 | | | |
| | *Ribautiana scalaris* (Ribaut, 1931) | *Quercus* | | | | 1 | | |
| | *Typhlocyba quercus* (Fabricius, 1777) | *Prunus* / *Quercus* | | | | | 1 | |
| Sum species: 14 | | | | 5 | 4 | 4 | 6 | 4 |
| Sum specimens: 78 | | | | 26 | 15 | 19 | 13 | 5 |
| **PSOCODEA** | | | | | | | | |
| Trogiidae | *Cerobasis guestfalica* (Kolbe, 1880) | Bark | 2 | | 3 | | 1 | 1 |
| Caeciliusidae | *Valenzuela burmeisteri* (Brauer, 1876) | Conifers, arboreal | | 1 | | | | 1 |
| | *V. despaxi* (Badonnel, 1936) | Conifers, arboreal | | 1 | 1 | | | |
| | *V. flavidus* (Stephens, 1836) | Deciduous, arboreal | 11 | 4 | 79 | 31 | | 2 |
| | *V.* sp. | | | | | 10 | | |
| Elipsocidae | *Cuneopalpus cyanops* (Rostock, 1876) | Conifers, arboreal | 1 | | | | | |
| | *Elipsocus abdominalis* Reuter, 1904 | Bark, lichens | | | | | 1 | |
| | *E. moebiusi* Tetens, 1891 | Bark | | | | 11 | 7 | |
| | *E. pumilis* (Hagen, 1861) | Bark | 14 | | 41 | | 1 | |
| | *E.* sp. (*moebiusi* or *pumilis*) | | | | 1 | | | |
| | *Reuterella helvimacula* (Enderlein, 1901) | Bark, lichens | 1 | | 15 | 88 | 18 | 11 |
| Mesopsocidae | *Mesopsocus immunis* (Stephens, 1836) | Bark | 3 | | | | 4 | |
| | *M. laticeps* (Kolbe, 1880) | Bark | | | 7 | | | |
| | *M. unipunctatus* (Müller, 1764) | Bark | 16 | 34 | 20 | 18 | | |
| Psocidae | *Amphigerontia bifasciata* (Latreille, 1799) | Bark | | | 2 | 1 | | |
| | *Blaste conspurcata* (Rambur, 1842) | Bark, xerophilous | | | 1 | | | |
| | *Loensia fasciata* (Fabricius, 1787) | Bark | | 1 | 4 | | | 1 |
| | *L.* sp. (*variegata* or *pearmani*) | | | 1 | 20 | | | 1 |
| | *Metylophorus nebulosus* (Stephens, 1836) | Bark | | | 6 | 7 | 6 | |
| | *Psococerastis gibbosa* (Sulzer, 1776) | Bark | 9 | 22 | 3 | | 1 | 47 |
| | *Trichadenotecnum sexpunctatum* (Linnaeus, 1758) | Bark | | | 3 | | 4 | |
| Lachesillidae | *Lachesilla quercus* (Kolbe, 1880) | Dead branches, leaves | | | 1 | | | |
| Stenopsocidae | *Graphopsocus cruciatus* (Linnaeus, 1768) | Deciduous, arboreal | 3 | | 19 | 12 | | 1 |
| | *Stenopsocus lachlani* Kolbe, 1880 | Conifers, arboreal | | | 1 | | 2 | |
| Philotarsidae | *Philotarsus parviceps* Roesler, 1954 | Bark | | | 2 | | | |
| Peripsocidae | *Peripsocus phaeopterus* (Stephens, 1836) | Bark | | | | 1 | | |
| | *P. subfasciatus* (Rambur, 1842) | Bark | | | 6 | 9 | | |
| | *P.* sp. (*didymus* or *phaeopterus*) | | | | | | | 2 |
| Sum species: 24 | | | 9 | 7 | 19 | 9 | 10 | 9 |
| Sum specimens: 655 | | | 57 | 64 | 235 | 187 | 45 | 67 |
| **THYSANOPTERA** | | | | | | | | |
| Aeolothripidae | *Aeolothrips melaleucus* Haliday, 1852 | Predator | | | | 1 | | |
| | *A. versicolor* Uzel, 1895 | Predator | | | | 1 | | |
| Thripidae | *Ceratothrips ericae* (Haliday, 1836) | *Calluna*, heath | | | 1 | | | 1 |
| | *Oxythrips ajugae* Uzel, 1895 | Pine cones | 6 | | | | | |
| | *Taeniothrips picipes* (Zetterstedt, 1828) | Herb flowers | | | | | 1 | |
| | *Thrips major* Uzel, 1895 | Herb flowers | | 4 | | | | |
| | *T. pini* (Uzel, 1895) | Pine | | | | | | 1 |
| Phlaeothripidae | *Acanthothrips nodicornis* (Reuter, 1880) | Dead branches, bark | | | 1 | | | |
| | *Haplothrips* sp. | | | | 1 | 1 | | |
| | *Hoplothrips pedicularius* (Haliday, 1836) | *Stereum rugosus* | | 2 | 4 | | 1 | |
| | *H. ulmi* (Fabricius, 1781) | Dead wood, fungivore | | | | 2 | | |
| | *Phlaeothrips coriaceus* Haliday, 1836 | Dead wood, fungivore | | | 10 | | | |
| | **Poecilothrips albopictus* Uzel, 1895 | ? Dead wood, fungivore | | | 2 | 2 | | 1 |
| | *Xylaplothrips fuliginosus* (Schille, 1911) | Buds, bark, predator | | | 1 | | | |
| Sum species: 14 | | | 1 | 2 | 7 | 5 | 2 | 3 |
| Sum specimens: 44 | | | 6 | 6 | 20 | 7 | 2 | 3 |
| **TRICHOPTERA** | | | | | | | | |
| Hydropsychidae | *Hydropsyche siltalai* Doehler, 1963 | | | | | | | 2 |
| Limnephilidae | *Limnephilus centralis* Curtis, 1834 | | | | 5 | | | |
| Sum species: 2 | | | | | 1 | | | 1 |
| Sum specimens: 7 | | | | | 5 | | | 2 |

**Table A1.** *Cont.*

| | | | Kvam | | Drangedal | | Porsgrunn | Larvik |
|---|---|---|---|---|---|---|---|---|
| **Higher Taxon** | **Species** | **Habitat** | **1(B)** | **2(S)** | **3(S)** | **4(D)** | **5** | **6** |
| **DIPTERA** | | | | | | | | |
| **Nematocera** | | | | | | | | |
| Tipulidae | *Tipula irrorata* Macquart, 1826 | Rotten wood, mosses | | | | 1 | | |
| | *T. lunata* Linnaeus, 1758 | Shredder, leaf litter, soil | | 1 | | | | |
| | *T. scripta* Meigen, 1830 | Shredder, leaf litter, green mosses | | 1 | | | 1 | |
| | *Nephrotoma analis* (Schummel, 1833) | Shredder, leaf litter, soil, exposed riverine sediments | | | 1 | | | |
| Limoniidae | ***Achyrolimonia neonebulosa* (Alexander, 1924) | Rotten wood, fungi, wood sap | | 1 | 1 | | | |
| | *Austrolimnophila ochracea* (Meigen, 1804) | Rotten wood, fungi | | | | 1 | | |
| | *Dicranomyia didyma* (Meigen, 1804) | Aquatic, semiaquatic, aquatic mosses, algae in waterfalls, shredder | | 1 | | | | |
| | *D. mitis* (Meigen, 1830) | Leaf litter, soil, exposed riverine sediments, shredder | | | 1 | 1 | | |
| | *D. modesta* (Meigen, 1818) | Leaf litter, soil, exposed riverine sediments, shredder | 1 | | 5 | | | |
| | *Dicranophragma separatum* (Walker, 1848) | Predator, semi-aquatic | | 1 | 1 | | | 1 |
| | *Epiphragma ocellare* (Linnaeus, 1761) | Rotten wood | | | 1 | | | |
| | *Erioptera lutea* Meigen, 1804 | Collector, semi-aquatic | 1 | | | | | |
| | *Euphylidorea phaeostigma* (Schummel, 1829) | Predator, semi-aquatic | | | | 1 | | |
| | *Limonia flavipes* (Fabricius, 1787) | Leaf litter, soil, under bark, shredder | | | 2 | | | |
| | *L. phragmitidis* (Schrank, 1781) | Leaf litter, soil, under bark, riverside mud, shredder | | | 1 | | | |
| | *Molophilus appendiculatus* (Staeger, 1840) | Collector, semi-aquatic | | 2 | 3 | 1 | | |
| | *M. bifidus* Goetghebuer, 1920 | Collector, semi-aquatic | | | | 1 | | |
| | *M. medius* de Meijere, 1918 | Collector, semi-aquatic | | | 1 | | | |
| | *M. ochraceus* (Meigen, 1818) | Collector, semi-aquatic | | | 1 | | | |
| | *Neolimonia dumetorum* (Meigen, 1804) | Rotten wood, fungi | | | | | | 1 |
| | *Ormosia lineata* (Meigen, 1804) | Collector, semi-aquatic | | | 2 | | | |
| | *O. ruficauda* (Zetterstedt, 1838) | Collector, semi-aquatic | | | 1 | 1 | | |
| | *Pilaria discicollis* (Meigen, 1818) | Predator, semi-aquatic | | | 2 | | | |
| | **Tasiocera fuscescens* (Lackschewitz, 1940) | Collector, semi-aquatic | 1 | | 3 | | | |
| Bibionidae | *Bibio nigriventris* Haliday, 1833 | Eurytop, soil | 1 | | 1 | | | |
| Psychodidae | *Pericoma* cf. *albomaculata* Wahlgren, 1904 | Likely saprophagous | | | 1 | 3 | | |
| | *Psychoda gemina* (Eaton, 1904) | Saprophag, semiaquatic | | | | | 4 | |
| | *P. phalaenoides* (Linnaeus, 1758) | Coprophagous | 4 | | 14 | | 1 | |
| | *P.* sp. | | 2 | | 1 | 1 | | |
| | *Trichopsychoda hirtella* (Tonnoir, 1919) | Saprophagous | | | 2 | | | |
| Anisopodidae | *Sylvicola cinctus* (Fabricius, 1787) | Rotten wood, fungi | | | 1 | | 6 | 1 |
| Keroplatidae | *Neoplatyura nigricauda* (Strobl, 1893) | | | | | 2 | | |
| | *Orfelia unicolor* (Staeger, 1840) | | | | 1 | | | |
| Mycetophilidae | *Boletina nigricans* Dziedzicki, 1885 | Mycetophagous | | | 1 | | | |
| | *B.* sp. | Mycetophagous | | | 1 | | | |
| | *Coelosia flava* (Staeger, 1840) | Mycetophagous | | | 1 | | | |
| | *Ectrepesthoneura* sp. | Mycetophagous | 1 | | | | | |
| | *Mycetophila* sp. | Mycetophagous | | | 1 | | 1 | |
| | *Mycoma* sp. | Mycetophagous | | | 1 | | | |
| | *Neuratelia nemoralis* (Meigen, 1818) | Mycetophagous | | | 1 | | | |
| | *Sceptonia* sp. | Mycetophagous | | | 1 | | | |
| | *Zygomyia semifusca* (Meigen, 1818) | Mycetophagous | | | 1 | | | |
| Sciaridae | *Bradysia affinis* (Zetterstedt, 1838) | Woodland, wetlands, meadows, gardens, saprophagous | | | 2 | 2 | | |
| | *B. alpicola* (Winnertz, 1867) | Woodland, bogs, grasslands, dunes, saprophagous | | | 1 | | | |
| | **B. fenestralis* (Zetterstedt, 1838) | Woodland (oak, hazel, pine), heathland, grassland, water meadows, gardens, saprophagous | | | | 1 | | |
| | *B. hilariformis* Tuomikoski, 1960 | Woodland, wetlands (mires, bogs), saprophagous | | | 1 | | | |

**Table A1.** *Cont*.

| | | | Kvam | | Drangedal | | Porsgrunn | Larvik |
|---|---|---|---|---|---|---|---|---|
| **Higher Taxon** | **Species** | **Habitat** | **1(B)** | **2(S)** | **3(S)** | **4(D)** | **5** | **6** |
| | *B. nitidicollis* (Meigen, 1818) | Woodland, heathland, wetlands (water meadows, fens, mires, bogs), grassland, dunes, saltmarsh, gardens, saprophagous | 1 | | | | | |
| | ¤*B. quercina* Menzel and Köhler, 2014 | Woodland (oak, ash, aspen, spruce), saprophagous | | | | 2 | | |
| | *B.* sp. 1 | saprophagous | | 1 | | | | |
| | *B.* sp. 2 | saprophagous | | | | | 1 | |
| | *B.* sp. 3 | saprophagous | | | | | | 1 |
| | *B.* sp. 4 | saprophagous | 1 | | 1 | 1 | | |
| | **Corynoptera forcipata* (Winnertz, 1867) | Woodland, heathland, wetlands (incl. water meadows, fens, bogs, basin mires), grassland, coastal landslips, saprophagous | | 2 | 1 | 8 | | |
| | *C. hypopygialis* (Lengersdorf, 1926) | Woodland (oak, beech, hazel), calcareous grassland, heathland, wetlands (incl. fens, bogs), open montane habitats, saprophagous | | | 2 | 3 | | |
| | **C. irmgardis* (Lengersdorf, 1930) | Woodland, heathland, wetlands (incl. water meadows, fens, bogs, reed beds, mires, bogs), grazed grassland, saprophagous | | | | | 1 | |
| | **C. membranigera* (Kieffer, 1903) | Woodland (oak, beech, poplar, pine, spruce, conifers), grassland, saprophagous | | 2 | 2 | 2 | | 2 |
| | *C.* sp. 1 | saprophagous | | | | 2 | | |
| | *C.* sp. 2 | saprophagous | | | | 1 | | |
| | *C.* sp. 3 | saprophagous | | | 1 | | | |
| | *C.* sp. 4 | saprophagous | | 1 | | | | |
| | *C.* sp. 5 | saprophagous | | | | 1 | | |
| | *C.* sp. 6 | saprophagous | | 1 | | | | |
| | *C.* sp. 7 | saprophagous | | | 1 | | | |
| | *C.* sp. 8 | saprophagous | | | | 1 | | |
| | *C.* sp. 9 | saprophagous | | | 1 | | | |
| | *C.* sp. 10 | saprophagous | | | 1 | | | |
| | **Cratyna (C.) ambigua* (Lengersdorf, 1934) | Woodland (oak, beech, poplar, pine, spruce), calcareous grassland, water meadows, saprophagous | 1 | | | | | |
| | *C.* sp. 1 | saprophagous | | | | 1 | | |
| | *Epidapus gracilis* (Walker, 1848) | Woodland (oak, beech, maple, larch, pine, spruce, conifers), heathland, bogs, saprophagous | | | | | | 1 |
| | *Leptosciarella* sp. 1 | Xylobiont | | | | 1 | | |
| | *Lycoriella ingenua* (Dufour, 1839) | Woodland (oak, hazel, poplar), heathland, wetlands (fens, sedge beds, water meadows), parkland, gardens, greenhouses, mycetophagous | | | | 1 | | |
| | **Pseudolycoriella paludum* (Frey, 1948) | Woodland (oak, beech, elm), bogs, saprophagous | | | | 4 | | |
| | *Scatopsciara atomaria* (Zetterstedt, 1851) | Woodland, heathland, wetlands (fens, bogs, mires, water meadows), marshland, grassland, parkland, gardens, saprophagous | 4 | | 12 | | 1 | |
| | **S. calamophila* Frey, 1948 | Woodland, grassland, heathland, marshland, gardens, saprophagous | | | 6 | 2 | 1 | |

**Table A1.** *Cont.*

| | | | Kvam | | Drangedal | | Porsgrunn | Larvik |
|---|---|---|---|---|---|---|---|---|
| **Higher Taxon** | **Species** | **Habitat** | **1(B)** | **2(S)** | **3(S)** | **4(D)** | **5** | **6** |
| | **S. multispina* (Bukowski and Lengersdorf, 1936) | Woodland, grassland, heathland, wetlands (dump meadows, sedge beds), parkland, gardens, saprophagous | 3 | | 6 | | | |
| | **S. neglecta* Menzel and Mohrig, 1998 | Woodland, grassland, heathland, wetlands (water meadows, sedge beds), parkland, gardens, saprophagous | | | | 1 | | |
| | *S. pusilla* (Meigen, 1818) | Woodland, grassland, heathland, wetlands (bogs, dump meadows), saprophagous | | | 1 | | | |
| | *S. vitripennis* (Meigen, 1818) | Woodland, grassland, heathland, wetlands (water meadows, fens), parkland, sand dunes, saprophagous | 3 | | 8 | | | |
| | *S.* sp. 1 | saprophagous | | | 1 | | | |
| | *S.* sp. 2 | saprophagous | | | | 1 | | |
| | **Trichosia (T.) flavicoxa* Tuomikoski, 1960 | Woodland, parkland (oak, alder, beech), Xylobiont | | | 1 | | | |
| | *T.* sp. 1 | Xylobiont | | | 1 | | | 1 |
| | *T.* sp. 2 | Xylobiont | | 1 | | | | |
| | **Xylosciara trimera* Tuomikoski, 1960 | Woodland, parkland (oak, beech), xylobiont | | | | | | 1 |
| | *X.* sp. 1 | Xylobiont | | 1 | | | | |
| Ceratopogonidae | *Atrichopogon griseolus* (Zetterstedt, 1855) | | | | 1 | | | |
| | *A. minutus* (Meigen, 1830) | Rotting material | 1 | | | | | |
| | *A. muelleri* (Müller, 1905) | Aquatic larvae | | | | 1 | | |
| | *A.* sp. | | | | | | 1 | |
| | *Bezzia flavicornis* (Staeger, 1839) | | | | 1 | | | |
| | *Be. ornata* (Meigen, 1830) | | | | | | 1 | |
| | *Brachypogon perpusillus* (Edwards, 1921) | | | 1 | | | | |
| | *Br. sociabilis* (Goetghebuer, 1920) | | 1 | | | | | |
| | *Culicoides chiopterus* (Meigen, 1830) | Dung / saprophagous | | | | | | 1 |
| | *C. clintoni* Boorman, 1984 | Peat bogs | | | | | | 2 |
| | *C. impunctatus* Goetghebuer, 1920 | Peat bogs | 4 | 16 | 36 | 1 | 1 | 30 |
| | *C. kibunensis* Tokunaga, 1937 | | 1 | 1 | 2 | | 1 | |
| | *C. obsoletus* (Meigen, 1818) | | 1 | 9 | | 11 | 2 | 4 |
| | *C. pallidicornis* Kieffer, 1919 | | 1 | | 1 | | | |
| | *C. pictipennis* (Staeger, 1839) | | | | | | 1 | |
| | *C. scoticus* Downes and Kettle, 1952 | Dung / saprophagous | | | 2 | | | |
| | *C. segnis* Campbell and Pelham-Clinton, 1960 | | 3 | 3 | 3 | | 1 | 1 |
| | *Dasyhelea* spp. | | | 1 | | | | 1 |
| | ***Forcipomyia dichromata* Remm, 1968 | | | | 1 | | | |
| | *F. tibialis* Remm, 1961 | | | 1 | | | | |
| | *F. titillans* (Winnertz, 1852) | Rotting material | 6 | 8 | 3 | | 1 | 4 |
| | *F.* spp. | | 2 | | 1 | 1 | 1 | 1 |
| | *Kolenohelea calcarata* (Goetghebuer, 1920) | | | 4 | | | | |
| | *Palpomyia pubescens* Kieffer, 1919 | | | 10 | 1 | 4 | 1 | |
| | *Serromyia femorata* (Meigen, 1804) | | | 1 | | | 1 | 1 |
| | *Stilobezzia ochracea* (Winnertz, 1852) | | | | 1 | | | |
| Scatopsidae | *Anapausis helvetica* Haenni, 1984 | | | | | | 12 | |
| | *A. rectinervis* Duda, 1928 | Eurytop | 1 | | | | | |
| | *Efcookella albitarsis* (Zetterstedt, 1850) | Saprophagous | 1 | | | | | |
| | *Holoplagia bullata* (Edwards, 1925) | Rotting wood, ants (?) | | | | 1 | | |
| | *Swammerdamella acuta* Cook, 1956 | | 4 | | 1 | | | |
| Chironomidae | | | | | | | | |
| *Chironominae* | *Chironomus* (*Chaetolabis*) *macani* Freeman, 1948 | | 1 | | | | | |
| | **Chironomus (Lobochironomus) pseudomendax* Wülker, 1998 | | 1 | | | | | |
| | *Glyptotendipes (G.) cauliginellus* (Kieffer, 1913) | | 5 | | | | | |
| | *Microspectra nana* (Meigen, 1818) | | 1 | | 2 | | | |
| | *M. pallidula* (Meigen, 1830) | | 1 | | | | | |
| | *Parachironomus tenuicaudatus* (Malloch, 1915) | | 1 | | | | | |
| | *Paratendipes albimanus* (Meigen, 1818) | | 2 | | | | | |
| | *Stempellinella brevis* (Edwards, 1929) | | | | 3 | | | |
| | *Tanytarsus medius* Reiss and Fittkau, 1971 | | 1 | | | | | |
| | *T. signatus* (van der Wulp, 1859) | | | | 1 | | | |

**Table A1.** *Cont.*

| | | | Kvam | | Drangedal | | Porsgrunn | Larvik |
|---|---|---|---|---|---|---|---|---|
| **Higher Taxon** | **Species** | **Habitat** | **1(B)** | **2(S)** | **3(S)** | **4(D)** | **5** | **6** |
| *Orthocladiinae* | *Bryophaenocladius ictericus* (Meigen, 1830) | | | 1 | | | | |
| | *B.* cf. *vernalis* (Goetghebuer, 1921) | | | | 2 | 2 | | 1 |
| | *B.* sp. 4ES | | | | | 4 | 1 | |
| | **B.* sp. 10ES | | | | | 1 | | |
| | *Corynoneura lacustris* Edwards, 1924 | | | | 2 | | | |
| | *Co.* sp. 16ES | | | | | | 1 | |
| | *Cricotopus glacialis* Edwards, 1922 | | | | 1 | | | |
| | *Cr. tibialis* (Meigen, 1804) | | 1 | | | | | |
| | *Eukiefferiella brevicalcar* (Kieffer, 1911) | | | | 1 | | | |
| | ¤*Gymnometriocnemus (Gymnometriocnemus) pallidus* Stur and Ekrem, 2015 | | 3 | | | | | 1 |
| | *Halocladius variabilis* (Staeger, 1839) | Marine, intertidal | | 1 | 1 | | 4 | |
| | *Limnophyes asquamatus* Søgaard Andersen, 1937 | | | | 1 | | | 1 |
| | *L. habilis* (Walker, 1856) | | | | | 1 | | |
| | *L. minimus* (Meigen, 1818) | | 5 | 1 | 7 | 5 | 2 | |
| | *L. natalensis* (Kieffer, 1914) | | 2 | | | | | |
| | *L.* sp. 3ES | | | | | | 1 | |
| | *L.* sp. 14ES | Parthenogenetic? | 2 | | | | | |
| | *Metriocnemus albolineatus* (Meigen, 1818) | | 5 | | 2 | | | |
| | *M. fuscipes* (Meigen, 1818) | | 1 | | | | | |
| | *M. picipes* (Meigen, 1818) | | 2 | | 1 | | 1 | |
| | *M.* sp. 3ES | | | | | | 1 | |
| | *Parametriocnemus stylatus adzharicus* Kownacki and Zosidze, 1973 | | 1 | | | | | |
| | *Paraphaenocladius impensus* (Walker, 1856) | | 1 | | | | 1 | |
| | *Pseudorthocladius* sp. (*curtistylus* or *uniserratus*) | | 2 | | 1 | | 1 | |
| | *Pseudosmittia albipennis* (Goetghebuer, 1921) | | 2 | | 5 | 1 | | 3 |
| | *P. forcipata* (Goetghebuer, 1921) | | 3 | | 2 | | | |
| | *Smittia* sp. 8ES | | 2 | | | | 1 | |
| | *S.* sp. 16ES | | 1 | | | | | |
| | *S.* sp. 19ES | | | | 1 | | | |
| | *Tvetenia calvescens* (Edwards, 1929) | | | | 1 | | | |
| *Tanypodinae* | *Krenopelopia* spp. | | 2 | 1 | 1 | 1 | | |
| | *Zavrelimyia divisa* (Walker, 1856) | | | | 1 | | | |
| Sum species: 153 | | | 47 | 28 | 76 | 41 | 30 | 20 |
| Sum specimens: 564 | | | 98 | 75 | 195 | 81 | 55 | 60 |
| **Brachycera** | | | | | | | | |
| Hybotidae | *Bicellaria nigra* (Meigen, 1824) | Several habitats | 1 | 1 | | 1 | | |
| | *Drapetis pusilla* Loew, 1859 | | | | 1 | | | |
| | *Euthyneura gyllenhali* (Zetterstedt, 1838) | | | | | 1 | | 1 |
| | *E. myrtilli* Macquart, 1836 | Several habitats | | | 5 | | | |
| | *Hybos grossipes* (Linnaeus, 1767) | Vegetation, predator | | | 2 | 1 | | 2 |
| | *Oedalea stigmatella* Zetterstedt, 1842 | | | | | | | 1 |
| | *O. zetterstedti* Collin, 1926 | | | | | | 1 | |
| | *Platypalpus calceatus* (Meigen, 1822) | | | | | | 1 | |
| | *P. candicans* (Fallén, 1815) | | 1 | | 3 | | | |
| | *P. ciliaris* (Fallén, 1816) | | | | 1 | | | |
| | *P. cothurnatus* Macquart, 1827 | | | | | | 1 | |
| | *P. cursitans* (Fabricius, 1775) | | 3 | | 6 | | | |
| | *P. ecalceatus* (Zetterstedt, 1838) | | | | | 13 | | |
| | *P. exilis* (Meigen, 1822) | | | | | 2 | | 1 |
| | *P. longiseta* (Zetterstedt, 1842) | | | | 1 | | 4 | |
| | *P. luteus* (Meigen, 1804) | | 1 | | 1 | | | 2 |
| | *P. major* (Zetterstedt, 1842) | | | 1 | | 2 | | |
| | *P. nigritarsis* (Fallén, 1816) | Ground vegetation | 1 | | | | 1 | 1 |
| | *P. pectoralis* (Fallén, 1815) | | | 1 | 1 | | | 1 |
| | *P. pseudofulvipes* (Frey, 1909) | | | | | | 1 | |
| | *P. verralli* (Collin, 1926) | | | | 1 | | | |
| | *Tachydromia umbrarum* Haliday, 1833 | Tree trunks, predator | 1 | | 2 | | | |
| | *Tachypeza fuscipennis* (Fallén, 1815) | Tree trunks, predator | | 1 | 3 | 1 | | |
| | *T. nubila* (Meigen, 1804) | Tree trunks | 1 | | 1 | | | 1 |
| | *Trichina clavipes* Meigen, 1830 | Vegetation, predator | | 3 | | 11 | 2 | 3 |
| Empididae | *Chelifera trapezina* (Zetterstedt, 1838) | Aquatic larvae | | 1 | | | | 1 |
| | *Empis stercorea* Linnaeus, 1761 | | 2 | | 6 | | | |
| | *Gloma fuscipennis* Meigen, 1822 | | | | 1 | | | |
| | *Hilara canescens* Zetterstedt, 1849 | | | 1 | | | | |
| | *H. intermedia* (Fallén, 1816) | | 1 | | | | | |
| | *H. platyura* Loew, 1873 | | | | | | 1 | |
| | *Phyllodromia melanocephala* (Fabricius, 1794) | Deciduous trees, predator | 15 | 12 | 9 | 23 | 1 | 17 |
| | *Rhamphomyia crassirostris* (Fallén, 1816) | | | | 1 | | | |
| | *R. flava* (Fallén, 1816) | | | 1 | | | | |
| | *Trichopeza longicornis* (Meigen, 1822) | | 1 | | | | | |

**Table A1.** *Cont.*

| | | | Kvam | | Drangedal | | Porsgrunn | Larvik |
|---|---|---|---|---|---|---|---|---|
| **Higher Taxon** | **Species** | **Habitat** | **1(B)** | **2(S)** | **3(S)** | **4(D)** | **5** | **6** |
| Atelestidae | *Atelestus pulicarius* (Fallén, 1816) | | | | 2 | | | |
| Dolichopodidae | *Chrysotimus flaviventris* (von Roser, 1840) | | | 1 | | 21 | | 6 |
| | *C. molliculus* (Fallén, 1823) | | | | | | 4 | |
| | *Chrysotus cilipes* Meigen, 1824 | | | | | | 1 | |
| | *Dolichopus nigricornis* Meigen, 1824 | | | | | 1 | 1 | 1 |
| | *D. plumipes* (Scopoli, 1763) | | 2 | | 66 | | | |
| | *D. popularis* Wiedemann, 1817 | | 2 | | 3 | | | |
| | *D. simplex* Meigen, 1824 | | 3 | | 13 | | | |
| | *Gymnopternus aerosus* (Fallén, 1823) | | | | 1 | | | |
| | *G. celer* (Meigen, 1824) | | | | | | 1 | |
| | *Medetera abstrusa* Thunberg, 1955 | Tree trunks, predator | 1 | | | | | |
| | *M. belgica* Parent, 1936 | Tree trunks, predator | 1 | | 1 | | | |
| | *Neurigona pallida* (Fallén, 1823) | | | | 1 | 1 | | |
| | *N. suturalis* (Fallén, 1823) | | | | | | 1 | |
| | *Sciapus platypterus* (Fabricius, 1805) | | | | | | 1 | |
| | cf. *Sympycnus pulicarius* (Fallén, 1823) | | | | | | 3 | |
| | *Systenus bipartitus* (Loew, 1850) | Sap, deciduous trees | | | | 1 | | 1 |
| | *Xanthochlorus ornatus* (Haliday, 1832) | | | | | | 1 | |
| | *X. tenellus* (Wiedemann, 1817) | | | | | 4 | | |
| Phoridae | | | | | | | | |
| | *Borophaga agilis* (Meigen, 1830) | | | | | 1 | | |
| | **Megaselia albiclava* (Schmitz, 1926) | | | | 2 | | | |
| | ¤*M. aliusmyia* Disney, 2015 | | | | 1 | | | |
| | ¤*M. alphamyia* Disney, 2015 | | | | 2 | 3 | | |
| | **M. basispinata* (Lundbeck, 1920) | | 1 | | 1 | | | |
| | ¤*M. chimyia* Disney, 2015 | | | | | 1 | | |
| | *M. ciliata* (Zetterstedt, 1848) | Predacious larvae | | 2 | | 1 | | |
| | *M. conformis* (Wood, 1909) | | | | | | 1 | |
| | *M. cothurnata* (Schmitz, 1919) | | | 2 | 3 | | | |
| | **M. crassipes* (Wood, 1909) | | | | 1 | | | |
| | ¤*M. deltamyia* Disney, 2015 | | | | | | 1 | |
| | **M. differens* Schmitz, 1948 | | | 2 | 4 | | 1 | 1 |
| | *M. discreta* (Wood, 1909) | Fungi | | 2 | 2 | | | |
| | *M. diversa* (Wood, 1909) | | | | | 1 | | |
| | ¤*M. etamyia* Disney, 2015 | | | 1 | | | | |
| | *M. fuscovariana* Schmitz, 1933 | | | | 4 | | | |
| | ¤*M. geiri* Disney, 2015 | | | | 1 | | | |
| | *M. giraudii* (Egger, 1862) | Decaying material | | | 2 | | 3 | |
| | **M. gregaria* (Wood, 1910) | | | | 2 | | | |
| | **M. hirticrus* (Schmitz, 1918) | | | | 1 | | 3 | 1 |
| | **M. hortensis* (Wood, 1909) | | | | | | 1 | |
| | **M. ignobilis* (Schmitz, 1919) | | | 2 | 14 | 2 | 1 | |
| | **M. immodensior* Disney, 2001 | | 1 | | | | | |
| | *M. insons* (Lundbeck, 1920) | | | 1 | 2 | | | 1 |
| | **M. intercostata* (Lundbeck, 1921) | | | | 3 | | | 1 |
| | ¤*M. karli* Disney, 2015 | | | | 1 | | | |
| | ***M. kozlovi* Disney, 2013 | | | | | 1 | 1 | |
| | ¤*M. lambdamyia* Disney, 2015 | | | | 2 | | | |
| | *M. lata* (Wood, 1910) | Fungi | | 1 | | | | |
| | *M. longicostalis* (Wood, 1912) | Decaying material | | | | | | 1 |
| | **M. longifurca* (Lundbeck, 1921) | Predacious larvae | | 1 | | | | |
| | *M. lutea* (Meigen, 1830) | Fungi | | | 1 | | | |
| | ***M. malhamensis* Disney, 1986 | | | 1 | 6 | 1 | | |
| | **M. mixta* (Schmitz, 1918) | Fungi | | | 1 | | | |
| | ***M. nigrescens* (Wood, 1910) | Fungi | | | | | 1 | |
| | *M. nigriceps* (Loew, 1866) | Necrophagous | | 1 | 1 | | | 2 |
| | ¤*M. numyia* Disney, 2015 | | | | 2 | | | |
| | ¤*M. omicronmyia* Disney, 2015 | | | | 1 | | | |
| | *M. pectorella* Schmitz, 1929 | | | | 2 | 1 | | |
| | **M. protarsalis* Schmitz, 1927 | | 1 | | | | | |
| | *M. pusilla* (Meigen, 1830) | Polysaprophagous | | | 2 | | | |
| | **M. quadriseta* Schmitz, 1918 | | | | 2 | | | |
| | ¤*M. rhomyia* Disney, 2015 | | | | 1 | | | |
| | **M. robertsoni* Disney, 2008 | | | | 10 | | | |
| | *M. ruficornis* (Meigen, 1830) | Decaying materials | 1 | 1 | 1 | | | |
| | ¤*M. solii* Disney, 2015 | | | | | | 1 | |
| | **M. speiseri* Schmitz, 1929 | | | | 1 | | | |
| | **M. spinicincta* (Wood, 1910) | Fungi | | | 1 | | | |
| | **M. surdifrons* (Wood, 1909) | | | 1 | | | | |
| | ¤*M. thunesi* Disney, 2015 | | | | | | | 1 |
| | **M. wickenensis* Disney, 2000 | | | | 1 | | | |
| | ¤*M.* sp. n. H | | | | 1 | | | |
| | ¤*M.* sp. n. I | | | | 1 | | | |
| | ¤*M.* sp. n. T(5) | | | 1 | 4 | | 1 | 1 |
| | *M.* sp. U | | | | | | | 1 |
| | *M.* sp. 2 | | | 1 | | | | |
| | *M.* sp. 3 | | | | 1 | | 2 | |
| | *M.* sp. 4 | | | | | | 1 | |
| | *M.* sp. 6 | | | | 1 | 1 | | |

**Table A1.** *Cont.*

| | | | Kvam | | Drangedal | | Porsgrunn | Larvik |
|---|---|---|---|---|---|---|---|---|
| **Higher Taxon** | **Species** | **Habitat** | **1(B)** | **2(S)** | **3(S)** | **4(D)** | **5** | **6** |
| | *M.* sp. 7 | | | | 1 | | | |
| | *M.* sp. 8 | | | | 1 | | | |
| | *M.* sp. 9 | | | | 1 | | | |
| | *M.* sp. 11 | | | | 1 | | | |
| | *M.* sp. 12 | | | | 1 | | | |
| | *M.* sp. 14 | | | | 1 | | | |
| | *M.* sp. 15 | | | | 1 | | | |
| | *M.* sp. 17 | | | 1 | 1 | 1 | | |
| | *M.* sp. 18 | | | 1 | | | | |
| | *M.* sp. 20 | | | 1 | | | | |
| | *M.* sp. 21 | | | 1 | | | | |
| | *Menozziola obscuripes* (Schmitz, 1927) | Ant parasitoid | | | 1 | | | |
| | **Phalactrophora fasciata* (Fallén, 1823) | Coccinellidae parasitoid | | 1 | | | | |
| | *Phora edentata* Schmitz, 1920 | | | 2 | 5 | 21 | 12 | |
| | *P. holosericea* Schmitz, 1920 | Root aphid predator | | | | | 1 | |
| | *P. tincta* Schmitz, 1920 | | | | 1 | | | |
| | ***Pseudacteon formicarum* (Verrall, 1827) | Ant parasitoid | 1 | | | | | |
| Rhagionidae | *Ptiolina obscura* (Fallén, 1814) | | 1 | | | | 1 | |
| | *Rhagio lineola* Fabricius, 1794 | | | 4 | 4 | 12 | 5 | 19 |
| | *R. maculatus* (DeGeer, 1776) | | | | 1 | | | |
| | *R. scolopaceus* (Linnaeus, 1758) | | | | 1 | | | |
| | *Symphoromyia crassicornis* (Panzer, 1806) | | | | 1 | | | |
| Tanypezidae | *Tanypeza longimana* Fallén, 1820 | | | | 1 | | | |
| Stratiomyidae | *Beris chalybata* (Forster, 1771) | | | | 1 | | | |
| | *B. clavipes* (Linnaeus, 1767) | | 2 | | 14 | | | |
| Tabanidae | *Hematopogon* sp. | | | | 1 | | | |
| Opomyzidae | *Opomyza germinationis* (Linnaeus, 1758) | | | | 1 | | | |
| SciomyzidaE | *Pherbellia annulipes* (Zetterstedt, 1846) | | | | 1 | | | |
| | *P. dubia* (Fallén, 1820) | | | | 3 | | | |
| | *P.* sp. (*rozkosnyi* or *scutellaris*) | | | | | 1 | | |
| Lonchopteridae | *Lonchoptera* sp. | | | | | | | 2 |
| Clusiidae | *Clusiodes verticalis* (Collin, 1912) | | | 1 | | | | |
| Lonchaeidae | *Lonchaea* sp. | | | | | | | 1 |
| Milichidae | *Phyllomyza* sp. | | | | | | 1 | |
| Lauxaniidae | **Homoneura lamellata* (Becker, 1895) | | | | 1 | | | |
| | ***H. thalhammeri* Papp, 1978 | | | | | | 1 | |
| | *Lyciella decempunctata* (Fallén, 1820) | | | 2 | 7 | 5 | | 1 |
| | *L. platycephala* (Loew, 1847) | | 6 | 4 | 17 | 24 | | 7 |
| | *L. rorida* (Fallén, 1820) | | 1 | | 3 | 1 | | |
| | *L. vittata* (Walker, 1849) | | 1 | | | | | |
| | *Pseudolyciella pallidiventris* (Fallén, 1820) | | | 1 | | | 1 | |
| | *P. stylata* (Papp, 1978) | | | | 2 | | | |
| | *P.* spp. | | | | | 2 | 5 | |
| | *Sapromyza basalis* Zetterstedt, 1847 | | | | 2 | | | |
| | *S. hyalinata* (Meigen, 1826) | | 1 | | 3 | 1 | | |
| | *Sapromyzosoma quadricincta* (Becker, 1895) | | | | 1 | 1 | | |
| | *Tricholauxania praeusta* (Fallén, 1820) | | | | | | | 2 |
| Drosophilidae | *Drosophila* sp. (*melanogaster* or *simulans*) | | | | | | | 1 |
| | *Scaptomyza pallida* Zetterstedt, 1847 | | | | 1 | | | |
| Ephydridae | *Athyroglossa glabra* (Meigen, 1830) | | | | 1 | | | |
| Fanniidae | **Fannia pauli* Pont, 1997 | | | | | | 1 | |
| | *F. polychaeta* (Stein, 1895) | | | | | 2 | 1 | |
| | *F.* cf. *polychaeta* (Stein, 1895) | | | | | 1 | | |
| | *F. tuberculata* (Zetterstedt, 1849) | | 1 | | | | | |
| | *F.* spp. | | 2 | | 2 | 1 | | |
| | *Piezura pardalina* Rondani, 1866 | | | | 1 | | | |
| Heleomyzidae | *Suillia bicolor* (Zetterstedt, 1838) | | | | 1 | | | |
| Anthomyiidae | *Mycophaga testacea* (Gimmerthal, 1834) | | | | 1 | | | |
| Muscidae | *Coenosia pudorosa* Collin, 1953 | | 3 | | | | | |
| | *Helina depuncta* (Fallén, 1825) | | 2 | 1 | | 1 | 1 | 1 |
| | *H. impuncta* (Fallén, 1825) | | | | | | 1 | |
| | *Hydrotaea irritans* (Fallén, 1823) | | | | 1 | | | |
| | cf. *Hydrotaea* sp. | | | | | | | 2 |
| | *Muscina levida* (Harris, 1780) | | | | 1 | | | |
| | *Phaonia laeta* (Fallén, 1823) | | | | | 1 | | |
| | *Thricops semicinereus* (Wiedemann, 1817) | | | | | | | 1 |
| Rhinophoridae | *Paykullia brevicornis* (Zetterstedt, 1844) | | | 1 | | | | |
| | *Stevenia atramentaria* (Meigen, 1824) | | | | | 2 | | |
| Sarcophagidae | *Sarcophaga depressifrons* Zetterstedt, 1845 | | | | | 1 | | |
| | *S. variegata* (Scopoli, 1763) | | | | | | 1 | |
| Sepsidae | *Sepsis cynipsea* (Linnaeus, 1758) | | 1 | | | | | |
| Tachinidae | *Cinochira atra* Zetterstedt, 1845 | | | | 1 | | | |
| Sum species: 181 | | | 31 | 33 | 91 | 37 | 32 | 41 |
| Sum specimens: 775 | | | 63 | 64 | 311 | 174 | 86 | 77 |

**Table A1.** *Cont.*

| | | | Kvam | | Drangedal | | Porsgrunn | Larvik |
|---|---|---|---|---|---|---|---|---|
| **Higher Taxon** | **Species** | **Habitat** | **1(B)** | **2(S)** | **3(S)** | **4(D)** | **5** | **6** |
| **HYMENOPTERA** | | | | | | | | |
| Formicidae | *Camponotus ligniperda* (Latreille, 1802) | Woodlands, dead wood | | 11 | 35 | 2 | 2 | 6 |
| | *Formica fusca* Linnaeus, 1758 | Xerophilous | | 2 | 15 | 1 | | 2 |
| | *F. polyctena* Förster, 1850 | | | | 10 | 172 | | |
| | *F. rufa* Linnaeus, 1761 | | | | 56 | | | |
| | *Lasius brunneus* (Latreille, 1798) | Decidous | | | | 1 | 1 | 1 |
| | *L. platythorax* Seifert, 1991 | Forests | 2 | | 25 | 1 | | |
| | *Myrmica rubra* (Linnaeus, 1758) | Forests | | | | | 7 | |
| | *M. ruginodis* Nylander, 1846 | Forests | 2 | 2 | | 2 | | 11 |
| | *Temnothorax* cf. *tuberum* (Fabricius, 1775) | | | | 3 | | | |
| Crabronidae | *Crossocerus tarsatus* (Shuckard, 1837) | | | | 1 | | | |
| | *Passaloecus* sp. | | | | 1 | | | |
| | *Stigmus solskyi* Morawitz, 1864 | | | | 1 | 1 | | |
| Ichneumonidae | *Gelis* sp. | Parasitoid | | 1 | | | | |
| Ceraphronidae | *Aphanogmus apicalis* Szelenyi, 1938 | Parasitoid | | | | | 1 | |
| | *A. clavicornis* Thomson, 1859 | Parasitoid | | | 2 | | | |
| | *A.* cf. *clavicornis* sp. 1 | Parasitoid | | 3 | | | 3 | 1 |
| | *A.* cf. *clavicornis* sp. 2 | Parasitoid | | | | | | 1 |
| | *A.* cf. *clavicornis* sp. 3 | Parasitoid | | 1 | | | | |
| | *A. compressus* (Ratzeburg, 1852) | Parasitoid | | 1 | 2 | 4 | 3 | 1 |
| | *A.* nr. *compressus* (Ratzeburg, 1852) | Parasitoid | 1 | | 2 | | 1 | |
| | *A.* nr. *dessarti* Hellen, 1966 | Parasitoid | | | 1 | | | |
| | *A. nigrifornicatus* Pschom-Walker, 1956 | Parasitoid | | | 1 | | | |
| | *A. steinitzi* Priesner, 1936 | Parasitoid | | | | 3 | | 1 |
| | *A. tenuicornis* Thomson, 1859 | Parasitoid | 1 | | 1 | 2 | | |
| | *A.* nr. *tenuicornis* Thomson, 1859 | Parasitoid | 2 | | | | | |
| | *A.* spp. | Parasitoid | | 5 | | 2 | 3 | |
| | **Ceraphron pedes* Förster, 1861 | Parasitoid | | | | 2 | | |
| | **C. trissacantha* Kieffer, 1907 | Parasitoid | | | | 1 | | |
| Megaspilidae | *Conostigmus* sp. 1 | Parasitoid | | 2 | | 3 | | |
| | *C.* sp. 2 | Parasitoid | | 1 | | | | |
| | *Dendrocerus laevis* (Ratzeburg, 1852) | Parasitoid | | | 1 | | | |
| | *D.* sp. 1 | Parasitoid | 1 | | | | 1 | |
| | *D.* sp. 2 | Parasitoid | | 1 | 1 | | | |
| | *D.* sp. 3 | Parasitoid | | | | 1 | | |
| | *D.* spp. | Parasitoid | | | 1 | 3 | | |
| Aphelinidae | **Aphelinus mali* (Haldeman, 1851) | Parasitoid, *Hemiptera* | | | | 1 | | |
| | ¤*A. quercus* Japoshvili and Hansen, 2015 | Parasitoid, *Quercus* | | | 1 | | | |
| | ***A. subflavescens* (Westwood, 1837) | Parasitoid, *Aphidiidae* | | | 1 | | | |
| Eulophidae | **Achrysocharoides butus* (Walker, 1839) | Parasitoid, *Gracillariidae* | | | 1 | | | |
| | **A. latreillii* (Curtis, 1826) | Parasitoid, *Gracillariidae* | 2 | | 2 | | | |
| | *Aprostocetus* spp. | Parasitoid | | 3 | 1 | | | 1 |
| | **Asecodes erxias* (Walker, 1848) | Parasitoid, polyphagous | 1 | | 1 | | | |
| | *Aulogymnus gallarum* (Linnaeus, 1761) | Parasitoid, oak-galls | | 3 | 1 | | | |
| | *Chrysocharis* cf. *prodice* (Walker, 1839) | Parasitoid | | | 1 | | | |
| | *C.* sp. | Parasitoid, | | | 1 | | | |
| | *Cirrospilus diallus* Walker, 1838 | Parasitoid, | 1 | | 2 | | | |
| | *Closterocerus trifasciatus* Westwood, 1833 | Parasitoid, polyphagous | | | 1 | | | |
| | *Elachertus* sp. | Parasitoid, | | | | | | 1 |
| | *Entedon ergias* Walker, 1839 | Parasitoid, polyphagous | | 1 | | | | |
| | *E.* sp. | Parasitoid | | | | | 1 | |
| | *Eulophus larvarum* (Linnaeus, 1758) | Parasitoid, polyphagous | | 2 | | | | |
| | *Omphale acamas* (Walker, 1839) | Parasitoid | | 3 | | | | |
| | *Pediobius eubius* (Walker, 1839) | Parasitoid, polyphagous | | | | | 1 | |
| | *P. saulius* (Walker, 1839) | Parasitoid, polyphagous | | | | 1 | | |
| | *P.* spp. | Parasitoid | | | 2 | | | |
| | *Sympiesis gordius* (Walker, 1839) | Parasitoid, polyphagous | | | 2 | | | |
| | *S. sericeicornis* (Nees, 1834) | Parasitoid, polyphagous | | 1 | 1 | | | |
| | ***Tamarixia pubescens* (Nees, 1834) | Parasitoid, *Trioza* | 4 | 3 | 16 | 4 | 2 | 1 |
| | *Tetrstichus paululus* Graham, 1991 | Parasitoid | | | 1 | | | |
| Eupelmidae | *Eupelmus annulatus* Nees, 1834 | Parasitoid, polyphagous | | 1 | | | | |
| Mymaridae | *Anagrus* sp. | Parasitoid | | | 1 | | | |
| Ormyridae | *Ormyrus pomaceus* (Geoffroy, 1785) | Parasitoid, oak-galls | | | | 1 | | 1 |
| Pteromalidae | *Ablaxia parviclava* (Thomson, 1878) | Parasitoid, polyphagous | | | 1 | | | |
| | *A.* sp. | Parasitoid, | | | | | | 1 |
| | *Cecidostiba semifascia* (Walker, 1835) | Parasitoid, oak-galls | | | | | | 1 |
| | *Cyrtogaster vulgaris* Walker, 1833 | Parasitoid, polyphagous | 1 | 1 | | | 1 | |
| | *Holcaeus stenogaster* (Walker, 1836) | Parasitoid | | | 2 | | | |
| | **Hyperimerus pusillus* (Walker, 1833) | Parasitoid, Hemiptera | 1 | | 1 | | | |
| | *Merismus megapterus* Walker, 1833 | Parasitoid, polyhgagous | | | 1 | | | |
| | *Mesopolobus dubius* (Walker, 1834) | Parasitoid, oak-galls | | | 1 | | | |
| | *M. fasciiventris* Westwood, 1833 | Parasitoid, oak-galls | | | | 1 | | 1 |
| | *M. tarsatus* (Nees, 1834) | Parasitoid, oak-galls | 1 | | 1 | | | |
| | *M. tibialis* (Westwood, 1833) | Parasitoid, oak-galls | 1 | | | | | |
| | **M. xanthocerus* (Thomson, 1878) | Parasitoid, oak-galls | | 1 | 1 | | | 1 |
| | *Miscogaster maculata* Walker, 1833 | Parasitoid, Agromyzidae | | | | 1 | | |
| | *Plutothrix bicolorata* (Spinola, 1808) | Parasitoid, Anobiidae | 1 | 1 | 1 | | | |

**Table A1.** *Cont.*

| | | | Kvam | | Drangedal | | Porsgrunn | Larvik |
|---|---|---|---|---|---|---|---|---|
| **Higher Taxon** | **Species** | **Habitat** | **1(B)** | **2(S)** | **3(S)** | **4(D)** | **5** | **6** |
| | Pteromalinae sp. | Parasitoid | | | 1 | | | |
| | *Seladerma tarsale* (Walker, 1833) | Parasitoid, Agromyzidae | 6 | | 14 | 3 | 1 | |
| | *Spalangiopelta* sp. | Parasitoid | | 1 | | | | |
| | *Stenomalina epistena* (Walker, 1835) | Parasitoid | | | 1 | | | |
| | *S. gracilis* (Walker, 1834) | Parasitoid, polyphagous | | | 1 | | | |
| | **Syntomopus thoracicus* Walker, 1833 | Parasitoid, Agromyzidae | | | 1 | | | |
| | *Trigonoderus princeps* Westwood, 1832 | Parasitoid, Coleoptera | | | 1 | | | |
| Torymidae | *Megastigmus dorsalis* (Fabricius, 1798) | Parasitoid, oak-galls | 9 | 2 | 3 | | 1 | 5 |
| | *Torymus flavipes* (Walker, 1833) | Parasitoid, oak-galls | | 5 | 1 | | | |
| | *T.* nr. *microcerus* (Walker, 1833) | Parasitoid | | 2 | | | | |
| Trichogrammatidae | *Trichogramma* spp. | Parasitoid | | | 1 | 1 | | |
| Cynipidae | *Ceroptres clavicornis* Hartig, 1840 | Inquilin in oak-gall | 2 | | 5 | 2 | | |
| | *Neuroterus* nr. *politus* Hartig, 1840 | Gall-maker on oak | 1 | | | | | |
| | *Saphonecrus connatus* (Hartig, 1840) | Inquilin in oak-gall | 2 | | 4 | | | |
| | *Synergus apicalis* Hartig, 1841 | Inquilin in oak-gall | 6 | | | 1 | | 1 |
| | *S. crassicornis* (Curtis, 1838) | Inquilin in oak-gall | | | | 1 | | |
| | *S. gallaepomiformis* (Fonscolombe, 1832) | Inquilin in oak-gall | | | 2 | | | |
| | *S. pallipes* Hartig, 1840 | Inquilin in oak-gall | | | | | 1 | |
| Figitidae | **Alloxysta brachyptera* (Hartig, 1840) | Parasitoid | | | | | | 1 |
| | *A.* spp. | Parasitoid | | | 2 | | | |
| Platygastridae | **Amblyaspis angustula* Thomson, 1859 | Parasitoid | | | | | 1 | |
| | *A. tritici* (Walker, 1835) | Parasitoid | | | | 1 | | |
| | *Euxestonotus* spp. | Parasitoid | 2 | 1 | 3 | 1 | | 3 |
| | *Inostemma hispo* Walker, 1838 | Parasitoid | | | 2 | | | 1 |
| | *Platygaster* cf. sp. 1 | Parasitoid | | 2 | | | | |
| | *P.* sp. 1 | Parasitoid | 1 | | | 1 | | 1 |
| | *P.* sp. 2 | Parasitoid | | | 1 | | | |
| | *P.* sp. 3 | Parasitoid | | | | | | 1 |
| | *P.* sp. 4 | Parasitoid | | | | 1 | | |
| | *P.* sp. 5 | Parasitoid | | 1 | | | | 1 |
| | *P.* spp. | Parasitoid | | | 1 | 2 | 1 | |
| | *Prosactogaster* sp. | Parasitoid | | | | | 1 | |
| | *Synopeas* sp. 1 | Parasitoid | | | 1 | | | |
| | *S.* sp. 2 | Parasitoid | 1 | | | | | |
| Scelionidae | **Telenomus angustatus* (Thomson, 1861) | Parasitoid | 1 | | 3 | 1 | | 7 |
| | **T. kolbei* Mayr, 1879 | Parasitoid | | | 1 | | | |
| | **T. lineolatus* Kozlov, 1967 | Parasitoid | | | | 1 | | |
| | ***T. punctatissimus* (Ratzeburg, 1844) | Parasitoid | | | 3 | | | |
| | *T.* sp. 1 | Parasitoid | | | | | | 2 |
| | *T.* spp. | Parasitoid | | 3 | | | | 1 |
| | *Trimorus* sp. | Parasitoid | | 1 | | | | |
| Diapriidae | *Aclista* sp. 1 | Parasitoid | 1 | | | 1 | | 1 |
| | *A.* sp. 2 | Parasitoid | | | | | | 1 |
| | **Cinetus piceus* Thomson, 1859 | Parasitoid | | | | | 1 | |
| | Diapriidae spp. | Parasitoid | | | | 1 | | 1 |
| | *Diphora* sp. | Parasitoid | | | 1 | | | |
| | *Entomacis perplexa* (Haliday, 1857) | Parasitoid | | | | 1 | | |
| | **Ismarus halidayi* Förster, 1850 | Parasitoid | | | | | 1 | |
| | **Trichopria aptera* (Rhute, 1859) | Parasitoid | | | | 1 | | |
| | **Zygota ruficornis* (Curtis, 1831) | Parasitoid | | | | 1 | | |
| | *Z.* sp. 1 | Parasitoid | | | | | | 1 |
| | cf. *Zygota* sp. | Parasitoid | | 1 | | | 1 | |
| Encyrtidae | **Copidosoma floridanum* (Ashmead, 1900) | Parasitoid, polyphag | | | | 1 | | |
| | ***Habrolepis italicus* Delucchi, 1965 | Parasitoid, Hemiptera | | | 1 | | | |
| Sum species: 117 | | | 26 | 31 | 62 | 36 | 21 | 29 |
| Sum specimens: 713 | | | 54 | 69 | 258 | 232 | 36 | 64 |
| **COLEOPTERA** | | | | | | | | |
| Ptiliidae | *Acrotrichis intermedia* (Gillmeister, 1845) | Humus, mycetophagous | | | | | | 2 |
| Coccinellidae | *Adalia decempunctata* (Linnaeus, 1758) | Eurytop, carnivore | | | 1 | | | |
| | *Halyzia sedecimguttata* (Linnaeus, 1758) | Arboreal, mycetoph | | 1 | | | | |
| Staphylinidae | *Atheta vaga* (Heer, 1839) | Eurytop, carnivorous | | | | | 1 | |
| | *Dexiogyia forticornis* (Strand, 1939) | Carnivorous | | | | | 4 | |
| | *Eusphalerum luteum* (Marsham, 1802) | Eurytop, phytophagous | | | 1 | | | |
| | *Haploglossa villosula* (Stephens, 1832) | Humus, carnivorous | 1 | | | | | |
| | *Holobus flavicornis* (Lacordaire, 1835) | Humus, detritivorous | | | 2 | | | |
| | *Leptusa fumida* (Erichson, 1839) | Bark, carnivorous | | 4 | | 1 | | |
| | *L. ruficollis* (Erichson, 1839) | Bark, carnivorous | 7 | 47 | 57 | 30 | 12 | 144 |
| | *Oxypoda arborea* Zerche, 1994 | Carnivorous | | | | | | 1 |
| | *Phloeocharis subtilissima* Mannerheim, 1830 | Bark, dead trees | 1 | 1 | | | | |
| Scraptiidae | *Anaspis marginicollis* Lindberg, 1925 | Eurytop, phytoph, carniv | 4 | | 1 | | | 1 |
| | *A. rufilabris* (Gyllenhal, 1827) | Lignicolous, carnivorous | | | 2 | 2 | | |
| | *A. thoracica* (Linnaeus, 1758) | Eurytop, phytoph, carniv | | | | | | 1 |
| Aderidae | *Anidorus nigrinus* (Germar, 1842) | Xylophagous, mycetoph | | 1 | | | | |
| Curculionidae | *Archarius pyrrhoceras* (Marsham, 1802) | Arboreal, *Quercus* | | | | 1 | | |
| | *Brachysomus echinatus* (Bonsdorff, 1785) | Humicolous, polyph | | 1 | | 1 | | |
| | *Coeliodes rana* (Fabricius, 1787) | Arboreal, *Quercus* | | 1 | | | 1 | |

**Table A1.** *Cont.*

| | | | Kvam | | Drangedal | | Porsgrunn | Larvik |
|---|---|---|---|---|---|---|---|---|
| **Higher Taxon** | **Species** | **Habitat** | **1(B)** | **2(S)** | **3(S)** | **4(D)** | **5** | **6** |
| | *Hylobius abietis* (Linnaeus, 1758) | Conifers | | 1 | | | | |
| | *Micrelus ericae* (Gyllenhal, 1813) | *Calluna*, *Erica* | | | | 1 | | |
| | *Orchestes quercus* (Linnaeus, 1758) | Arboreal, *Quercus* | 6 | 1 | 1 | 2 | 1 | 1 |
| | *Otiorhynchus scaber* (Linnaeus, 1758) | Arboreal, polyphagous | | 2 | 2 | 1 | | |
| | *O. singularis* (Linnaeus, 1767) | Arboreal, polyphagous | 2 | 13 | 4 | 11 | 1 | |
| | *Polydrusus cervinus* (Linnaeus, 1758) | Arboreal, polyphagous | | | | | | 1 |
| | *P. tereticollis* (De Geer, 1775) | Arboreal, polyphagous | 2 | | | | | |
| | *Strophosoma capitatum* (De Geer, 1775) | Arboreal, polyphagous | | | 39 | 34 | 2 | 11 |
| | *S. melanogrammum* (Forster, 1771) | Arboreal, polyphagous | | 1 | | | | |
| Elateridae | *Athous haemorrhoidalis* (Fabricius, 1801) | Herbs, phytophagous | | | 2 | | | |
| | *A. subfuscus* (Müller, 1764) | Herbs, carnivorous | 3 | 2 | 2 | 1 | | 4 |
| | *Dalopius marginatus* (Linnaeus, 1758) | Arboreal, polyphagous | | 1 | 2 | | | 1 |
| | *Paraphotistus impressus* (Fabricius, 1792) | Arboreal, phytophagous | | 1 | | | | |
| Cryptophagidae | *Atomaria fuscata* (Schönherr, 1808) | Eurytop, saproph, mycetoph | | | | | 2 | |
| | *A. turgida* Erichson, 1846 | Eurytop, saproph, mycetoph | | | | | | 1 |
| | *Cryptophagus setulosus* Sturm, 1845 | Xerophil, saproph, mycetoph | | 1 | | | | 1 |
| Byturidae | *Byturus tomentosus* (De Geer, 1774) | Arboreal, Rosaceae | | | | | 1 | |
| Cantharidae | *Cantharis figurata* Mannerheim, 1843 | Eurytop, carnivorous | 2 | | | | | |
| | *Malthinus flaveolus* (Herbst, 1786) | Eurytop, carnivorous | | 6 | 6 | 1 | | 5 |
| | *M. seriepunctatus* Kiesenwetter, 1851 | Thermoph, carnivorous, *Quercus* | | 1 | 3 | 32 | | |
| | *Malthodes brevicollis* (Paykull, 1798) | Carnivorous | 2 | | 2 | 1 | | 3 |
| | *M. crassicornis* (Mäklin, 1846) | Xerophilous, carniv | | | | 1 | | |
| | *M. fuscus* (Waltl, 1838) | Eurytop, carnivorous | 1 | 1 | 2 | 2 | | 6 |
| | *M. guttifer* Kiesenwetter, 1852 | Arboreal, *Salix*, carniv | | 12 | 1 | 27 | 19 | 2 |
| | *M. marginatus* (Latreille, 1806) | Arboreal, carnivorous | 1 | | 1 | 3 | | |
| | *M. pumilus* (Brebisson, 1835) | Xerophilous, carniv | | 1 | 1 | 1 | | 1 |
| | *M. spathifer* Kiesenwetter, 1852 | Eurytop, carnivorous | 5 | 4 | 13 | 5 | | 3 |
| | *Podistra rufotestacea* (Letzner, 1845) | Eurytop, carnivorous | | | 1 | | | |
| | *Rhagonycha lignosa* (Müller, 1764) | Eurytop, carnivorous | 2 | | 9 | | | |
| | *R. lutea* (Müller, 1764) | Eurytop, carnivorous | | 1 | | | | |
| | *R. nigriventris* Motschulsky, 1860 | Eurytop, carnivorous | 2 | | 4 | | 1 | |
| Ciidae | *Cis festivus* (Panzer, 1793) | Eurytop, mycetoph | | | 1 | | | |
| | *C. glabratus* Mellié, 1848 | Polypor, mycetoph | | | | | 1 | |
| | *C. vestitus* (Mellié, 1848) | Polypor, mycetoph, *Quercus* | | | 2 | | | 2 |
| | *Orthocis alni* (Gyllenhal, 1813) | Polypor, mycetoph | 1 | | | 1 | | |
| Melandryidae | *Conopalpus testaceus* (Olivier, 1790) | Xylophagous, mycetoph, *Quercus* | | 1 | 1 | | | |
| | *Orchesia micans* (Panzer, 1793) | Polypor, mycetoph | | | | | | 11 |
| Latridiidae | *Corticarina minuta* (Fabricius, 1792) | Eurytop, mycetoph | | | | 1 | | |
| | *C. similata* (Gyllenhal, 1827) | Eurytop, mycetoph | | | 3 | 5 | 2 | 1 |
| | *Cortinicara gibbosa* (Herbst, 1793) | Eurytop, mycetoph | | | | 2 | 1 | |
| Chrysomelidae | *Cryptocephalus labiatus* (Linnaeus, 1761) | Arboreal, *Quercus* | | | | | | 1 |
| | *Phratora laticollis* (Suffrian, 1851) | Arboreal, *Populus* | | 1 | | | | |
| Nitidulidae | *Cychramus variegatus* (Herbst, 1792) | Eurytop, mycetoph | | | | 2 | | |
| | *Epuraea unicolor* (Olivier, 1790) | Eurytop, saproph | | | | | 6 | |
| Scirtidae | *Cyphon coarctatus* Paykull, 1799 | Hygroph, phytoph | 2 | | 6 | | | |
| | *C. padi* (Linnaeus, 1758) | Hygroph, phytoph, *Sphagnum* | 2 | | | | | |
| | *Prionocyphon serricornis* (Müller, 1821) | Eurytop, saproph | | 2 | | | | |
| Dasytidae | *Dasytes aeratus* Stephens, 1829 | Eurytop, carnivorous | | | | | 1 | |
| | *D. plumbeus* (Müller, 1776) | Eurytop, carnivorous | | 1 | | | | |
| Carabidae | *Dromius agilis* (Fabricius, 1787) | Arboreal, carnivorous | | | 1 | | | 5 |
| | *D. angustus* Brullé, 1834 | Arboreal, carniv, *Pinus* | | | 2 | | | |
| | *D. quadrimaculatus* (Linnaeus, 1758) | Arboreal, carnivorous | | | 1 | | 7 | |
| | *Philorhizus notatus* (Stephens, 1827) | Humus, xeroph, carniv | | | | | 1 | |
| Ptinidae | *Dryophilus pusillus* (Gyllenhal, 1808) | Xylophagous, *Pinus* | | | | | | 1 |
| | *Grynobius planus* (Fabricius, 1787) | Xylophagous | | 1 | | | | |
| | *Ptinus subpillosus* Sturm, 1837 | Phytop, saprophagous | | | 1 | | 3 | 1 |
| | *P. villiger* (Reitter, 1884) | Humus, xylophagous | | | | 1 | | |
| Histeridae | *Gnathoncus buyssoni* Auzat, 1917 | Eurytop, carnivorous | | | | | 1 | |
| Cerambycidae | *Leiopus linnei* Wallin, Nylander and Kvamme, 2009 | Xylophagous, *Quercus* | | | 3 | | | 1 |
| | *Pogonocherus hispidulus* (Piller and Mitterpacher, 1783) | Xylophagous, Fagaceae | | | | 1 | | |
| Salpingidae | *Salpingus planirostris* (Fabricius, 1787) | Bark, carnivorous | 4 | | 2 | 2 | | |
| Silvanidae | *Silvanoprus fagi* (Guérin-Ménéville, 1844) | Eurytop, omnivorous | | | 1 | | | |
| Throscidae | *Trixagus carinifrons* (Bonvouloir, 1859) | Eurytop, arboreal | | | 5 | | | |
| | *T. dermestoides* (Linnaeus, 1766) | Eurytop, arboreal | | | 10 | | 1 | |
| | *T. leseigneuri* Muona, 2002 | Eurytop, arboreal | | | 8 | | | |
| Sum species: 84 | | | 19 | 28 | 39 | 29 | 21 | 26 |
| Sum specimens 821 | | | 50 | 111 | 206 | 173 | 69 | 212 |

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