The bark and ambrosia beetle (Coleoptera, Scolytinae) collection at the University Museum of Bergen – with notes on extended distributions in Norway

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The bark and ambrosia beetle collection at the University Museum in Bergen has been curated and digitized, and is available in public databases. Several species were recorded from Western Norway for the first or second time. The pine inhabiting species *Hylastes opacus* Erichson, 1836 is reported from Western Norway for the first time, and the rare species *Pityogenes trepanatus* (Nordlinger, 1848) for the second time. The spruce inhabiting species *Pityogenes chalcographus* (Linnaeus, 1761) and *Cryphalus asperatus* (Gyllenhal, 1813), which are common in eastern Norway, were recorded in several Western Norway localities. Broadleaf inhabiting species such as *Anisandrus dispar* (Fabricius, 1792), *Taphrorychus bicolor* (Herbst, 1793), *Dryocoetes villosus* (Fabricius, 1792), *Scolytus laevis* Chapuis, 1869 and *Scolytus ratzeburgi* Janson, 1856 were collected for the second or third time in Western Norway. Several common species – likely neglected in previous sampling efforts – are well established in Western and Northern Norway.

Key words: Curculionidae, Scolytinae, Norway spruce, Western Norway, geographical distribution.

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Introduction

Bark and ambrosia beetles are snoutless weevils in the subfamily Scolytinae. These beetles are known for their engravings under bark of branches and stems of trees (bark beetles), or tunnels excavated into the heartwood where species cultivate fungi for food for their larvae (ambrosia beetles) (Kirkendall *et al.* 2014). Although some species occasionally occur in large numbers in insect traps, the large majority of species are better collected by dissecting bark and wood. Their cryptic life style is therefore one of the reasons why long-term accumulation of museum collections are particularly valuable in gathering information on the distribution and host plants of such elusive species.

A large proportion of bark and ambrosia beetles in Norway are breeding in conifer host plants. Among the 72 species currently known from Norway (Kvamme & Lindelöv 2014, Kvamme *et al.* 2015, Kvamme & Lindelöw 2014), only 27 use broadleaf trees as their host. The distribution of diversity also changes across the country, with fewer species in the north and west. In Western Norway only 27 species are registered to date, and 13 of these have less than three published records. However, recent collecting efforts in Western Norway by the author and others (Aarrestad *et al.* 2006, Kambestad & Spikkeland 2015, Ødegaard & Ligaard 2000) indicate that the number of species is increasing and that rare species are now more broadly established.

The beetle collection at the University Museum

of Bergen includes Andreas Strand's collection which contains a nearly complete representation of Scandinavian Scolytinae. Additional but less complete material is stored in the main collection. This collection has been less carefully curated, but on the other hand include more recent and partly unidentified samples, particularly from Western Norway. It appears that databases in GBIF and Norwegian Biodiversity Information Centre (NBIC) are generally lacking distributional data for this part of Norway, largely restricted to the data given by Lekander *et al.* (1977). Norwegian records in the entomological collections at the University Museum are now georeferenced and submitted to GBIF and NBIC via MUSIT. This paper summarizes this data set and discusses new Norwegian records in light of potential extension of currently known distributions.

Materials and methods

All pinned specimens of Scolytinae were digitized, georeferenced and stored in the national museum database MUSIT (data set identifier: GBIF-NO-2017-UiB-Scolytinae) and found in GBIF data set: https://doi.org/10.15468/irppio. Additional specimens which was previously barcoded and digitized in BOLD was included in the data set. Identifications were confirmed or corrected by direct comparison to verified specimens. The most trustworthy identification key to Scandinavian species is Hansen and Bejer-Petersen (1956). For seven additional northern species one may use Spessivtseff (1925). For some rare species one may use Pfeffer (1995), but the identification in such cases should be confirmed by a taxonomic expert. Previous records without citations are from the NBIC and GBIF species map databases.

Results and discussion

The collection of digitized bark and ambrosia beetles currently contain 2834 pinned specimens (Table 1). Data are present for 138 species, with 58 species collected in Norway (Figure 1). Altogether 2171 Norwegian specimens were georeferenced, with an additional 310 records, mainly from Swedish localities, totalling 2481 (Table 2). Among the georeferenced objects, 1003 were from the Strand beetle collection, and 1478 from the main insect collection which includes 308 BOLD voucher numbers (Jordal & Kambestad 2014).

Examination of specimens revealed several misidentifications. These were largely due to the wrong name *Hylastes ater* (Paykull, 1800) for specimens of *Hylastes brunneus* Erichson, 1836 and *Hylesinus wachtli* Reitter, 1887 for *Hylesinus varius* (Fabricius, 1775). Additional errors were made in the identification of *Crypturgus* Erichson, 1836 (see e.g. Jordal & Knizek 2007), and occasional mistakes in other species of *Hylastes* Erichson, 1836, and in the genera *Scolytus* Geoffroy, 1762 and *Trypophloeus* Fairmaine, 1868. Identifications made by Andreas Strand were largely correct.

The collection holds a series of records not previously published in atlas treatments (see Lekander *et al.* 1977), or reported in public databases, and therefore will significantly extend the known distribution in Norway for several species (Table 3). Species found in new locations are generally of two types: i) species with very few previous records in a particular region of the country; and ii) fairly common species with some previous records, but are clearly undersampled, and perhaps have increased their western populations in recent time. While most species in the first category are associated with broadleaved trees, those in the second category are typically spruce associated – a host plant that was almost non-existent in Western Norway until planted for forestry purposes.

Rare beetles in broadleaf trees

Anisandrus dispar (Fabricius, 1792) was recorded for the first time in Western Norway from Hardanger, breeding in fruit trees (Hesjedal 1981). The new collections reported here from Omastrand (2005) and Sveio (2013) are the second and third record in Hordaland. With one additional record from Finnøy in Rogaland in 2015, this species seems to gradually establish in the warmest parts of Western Norway. All

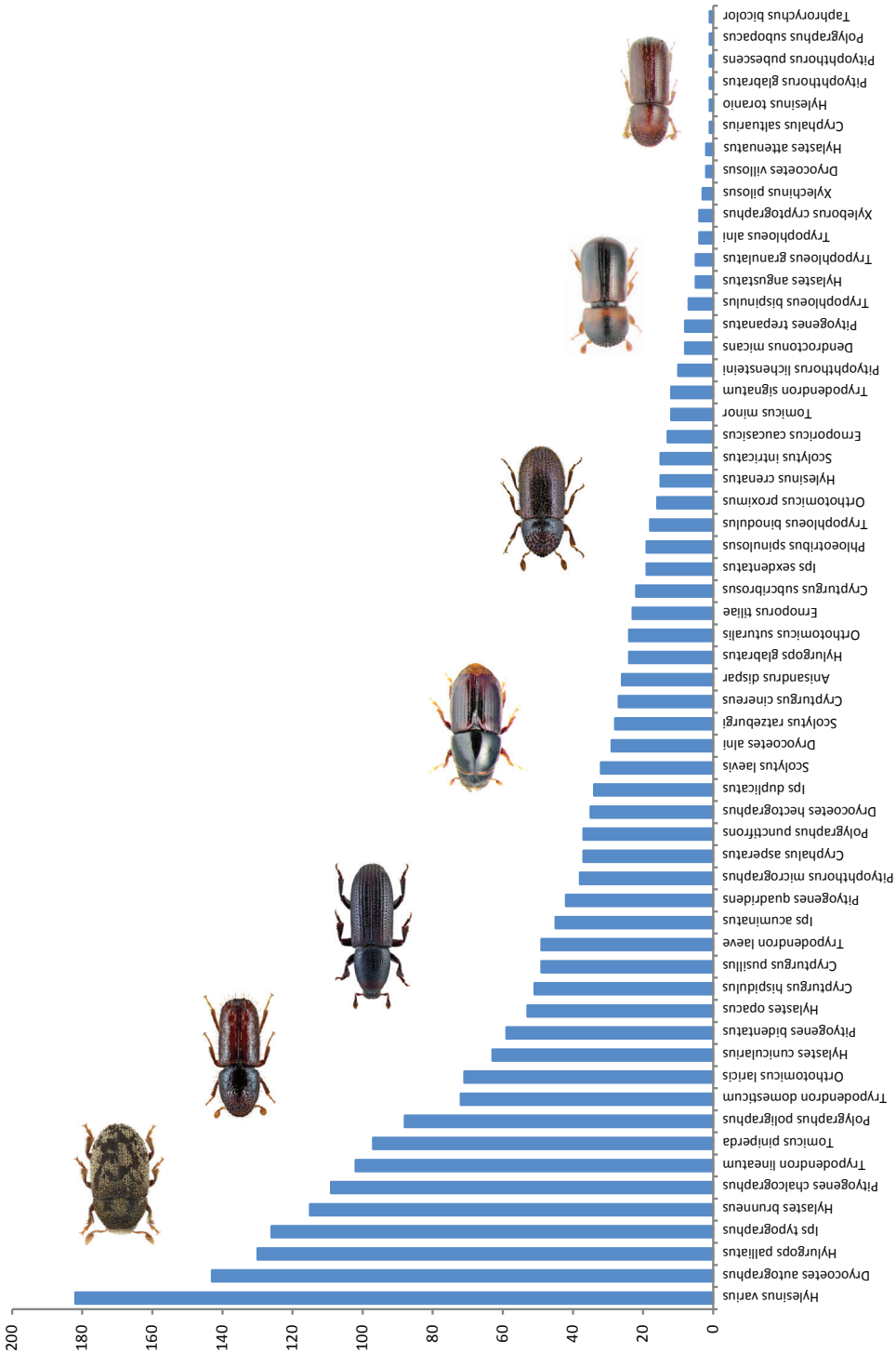

FIGURE 1. Norwegian species in the collection at the University Museum of Bergen, in ranked order by number of objects. Photos by K.V. Makarov (www.zin.ru) and Udo Schmidt (flickr) – CC BY-SA 2.0.

TABLE 1. Species of bark and ambrosia beetles (Scolytinae) present in the Coleoptera collection at the University Museum of Bergen. The right column marked 'Norway' indicates the number of spcimens from Norwegian localities.

Species ID	Specimens	Norway
Allernoporus euonymi Kurenzov, 1941	1	-
Anisandrus dispar (Fabricius, 1792)	29	26
Anisandrus maiche Stark, 1936	1	-
Carphoborus cholodkovskyi Spessivtsev, 1916	1	-
Carphoborus minimus (Fabricius, 1798)	1	-
Carphoborus rossicus Semenov, 1902	11	-
Carphoborus teplouchovi Spessivtsev, 1916	1	-
Coccotrypes dactyliperda (Fabricius, 1801)	1	-
Cryphalus asperatus (Gyllenhal, 1813)	42	37
Cryphalus kurenzovi Stark, 1936	1	-
Cryphalus longus Eggers, 1926	1	-
Cryphalus piceae (Ratzeburg, 1837)	1	-
Cryphalus pruni Eggers, 1929	1	-
Cryphalus saltuarius Weise, 1891	10	1
Crypturgus cinereus (Herbst, 1793)	32	27
Crypturgus hispidulus Thomson, 1870	54	51
Crypturgus pusillus (Gyllenhal, 1813)	56	49
Crypturgus subcribrosus Eggers, 1933	27	22
Crypturgus tuberosus Niisima, 1909	2	-
Dendroctonus micans (Kugelann, 1794)	10	8
Dendrotrupes costiceps Broun, 1881	1	-
Dryocoetes alni (Georg, 1856)	36	29
Dryocoetes autographus (Ratzeburg, 1837)	169	143
Dryocoetes baikalicus Reitter, 1899	2	-
Dryocoetes hectographus Reitter, 1913	45	35
Dryocoetes pini Niisima 1909	1	-
Dryocoetes rugicollis Eggers, 1926	1	-
Dryocoetes striatus Eggers, 1933	1	-
Dryocoetes villosus (Fabricius, 1792)	5	2
Ernoporicus caucasicus (Lindemann, 1875)	15	13
Ernoporicus fagi (Fabricius, 1798)	6	-
Ernoporicus spessivtzevi Berger, 1916	1	-
Ernoporus tiliae (Panzer, 1793)	27	23
Gnathotrichus materiarius (Fitch, 1858)	1	-
Hylastes angustatus (Herbst, 1793)	8	5

TABLE 1. *continued*

Species ID	Specimens	Norway
Hylastes ater (Paykull, 1800)	1	-
Hylastes attenuatus Erichson, 1836	7	2
Hylastes brunneus Erichson, 1836	138	115
Hylastes cunicularius Erichson, 1836	73	63
Hylastes opacus Erichson, 1836	63	53
Hylastinus obscurus (Marsham, 1803)	5	-
Hylesinus aculeatus Say, 1826	1	-
Hylesinus crenatus (Fabricius, 1787)	18	15
Hylesinus criddlei (Swaine, 1918)	1	-
Hylesinus eos Spessivtsev, 1919	1	-
Hylesinus laticollis Blandford, 1894	1	-
Hylesinus toranio (Danthione, 1788)	4	1
Hylesinus varius (Fabricius, 1775)	193	182
Hylurgops glabratus (Zetterstedt, 1828)	30	24
Hylurgops interstitialis (Chapuis, 1875)	3	-
Hylurgops longipilus (Reitter, 1894)	7	-
Hylurgops palliatus (Gyllenhal, 1813)	145	130
Hylurgus ligniperda (Fabricius, 1787)	2	-
Hypoborus ficus Erichson, 1836	1	-
Ips acuminatus (Gyllenhal, 1827)	52	45
Ips amitinus (Eichhoff, 1872)	3	-
Ips duplicatus (Sahlberg, 1836)	35	34
Ips sexdentatus (Boerner, 1767)	28	19
Ips subelongatus (Motschulsky, 1860)	3	-
Ips typographus (Linnaeus, 1758)	137	126
Kissophagus hederae (Schmidt, 1843)	1	-
Kissophagus novaki Reitter, 1894	1	-
Lymantor aceris (Lindemann, 1875)	1	-
Lymantor coryli (Perris, 1855)	2	-
Orthotomicus caelatus (Eichhoff, 1868)	3	-
Orthotomicus erosus (Wollaston, 1857)	2	-
Orthotomicus golovjankoi Pjatnistskii, 1930	2	-
Orthotomicus laricis (Fabricius, 1792)	84	71
Orthotomicus longicollis (Gyllenhal, 1827)	2	-
Orthotomicus nobilis (Wollaston, 1862)	1	-
Orthotomicus proximus (Eichhoff, 1868)	22	16

TABLE 1. *continued*

Species ID	Specimens	Norway
Orthotomicus robustus (Knotek, 1899)	1	-
Orthotomicus starki Spessivtsev, 1926	1	-
Orthotomicus suturalis (Gyllenhal, 1827)	33	24
Phloeosinus bicolor (Brulle, 1832)	1	-
Phloeosinus thujae (Perris, 1855)	1	-
Phloeotribus lecontei Schedl 1862	1	-
Phloeotribus piceae Swaine, 1911	1	-
Phloeotribus rhododactylus (Marsham, 1802)	5	-
Phloeotribus scarabaeoides (Bernard, 1788)	1	-
Phloeotribus spinulosus (Rey, 1885)	30	19
Pityogenes bidentatus (Herbst, 1784)	61	59
Pityogenes bistridentatus (Eichhoff, 1878)	2	-
Pityogenes chalcographus (Linnaeus, 1761)	123	109
Pityogenes hopkinsi Swaine, 1915	1	-
Pityogenes irkutensis Eggers, 1910	1	-
Pityogenes knechteli Swaine, 1918	1	-
Pityogenes quadridens (Hartig, 1834)	47	42
Pityogenes saalasi Eggers, 1914	5	-
Pityogenes trepanatus (Nordlinger, 1848)	13	8
Pityophthorus glabratus Eichhoff, 1878	3	1
Pityophthorus lapponicus Stark, 1952	1	-
Pityophthorus lichensteini (Ratzeburg, 1837)	11	10
Pityophthorus micrographus (Linnaeus, 1758)	51	38
Pityophthorus morosovi Spessivtsev, 1926	1	-
Pityophthorus pityographus (Ratzeburg, 1837)	7	-
Pityophthorus pubescens (Marsham, 1802)	2	1
Pityophthorus tragardhi Spessivtsev, 1921	3	-
Polygraphus poligraphus (Linnaeus, 1758)	96	88
Polygraphus proximus Blandford, 1894	4	-
Polygraphus punctifrons Thomson, 1886	41	37
Polygraphus rufipennis (Kirby, 1837)	2	-
Polygraphus subopacus Thomson, 1871	21	1
Procryphalus fraxini (Berger, 1916)	1	-
Pteleobius kraatzi (Eichhoff, 1864)	1	-
Pteleobius vittatus (Fabricius, 1792)	1	-
Scolytus carpini (Ratzeburg, 1837)	2	-

TABLE 1. *continued*

Species ID	Specimens	Norway
Scolytus intricatus (Ratzeburg, 1837)	23	15
Scolytus laevis Chapuis, 1869	34	32
Scolytus mali (Bechstein, 1805)	1	-
Scolytus multistriatus (Marsham, 1802)	4	-
Scolytus pygmaeus (Fabricius, 1787)	3	-
Scolytus ratzeburgi Janson, 1856	32	28
Scolytus rugulosus (Muller, 1818)	3	-
Scolytus scolytus (Fabricius, 1775)	11	-
Taphrorychus bicolor (Herbst, 1793)	3	1
Taphrorychus villifrons (Dufour, 1843)	1	-
Tomicus minor (Hartig, 1834)	15	12
Tomicus pilifer (Spessivtsev, 1919)	2	-
Tomicus piniperda (Linnaeus, 1758)	105	97
Trypodendron domesticum (Linnaeus, 1758)	74	72
Trypodendron laeve Eggers, 1939	49	49
Trypodendron lineatum (Olivier, 1795)	111	102
Trypodendron retusum (LeConte, 1868)	1	-
Trypodendron scabricollis (LeConte, 1868)	1	-
Trypodendron signatum (Fabricius, 1792)	14	12
Trypophloeus attenuatus (Lindemann, 1875)	4	4
Trypophloeus binodulus (Ratzeburg, 1837)	24	18
Trypophloeus bispinulus Eggers, 1927	17	7
Trypophloeus dejevi Stark, 1936	2	-
Trypophloeus granulatus (Ratzeburg, 1837)	7	5
Trypophloeus palmi Hansen, 1956	2	-
Trypophloeus tremulae Stark, 1952	1	-
Xyleborinus attenuatus (Blandford, 1894)	1	-
Xyleborinus saxeseni (Ratzeburg, 1837)	7	-
Xyleborus cryptographus (Ratzeburg, 1837)	9	4
Xyleborus monographus (Fabricius, 1792)	4	-
Xylechinus pilosus (Ratzeburg, 1837)	15	3
Xylocleptes bispinus (Duftschmidt, 1825)	2	-
TOTAL	**2834**	**2265**

TABLE 2. The number of georeferenced specimens in the various subcollections of bark and ambrosia beetles at the university Museum of Bergen.

Subcollection	Total specimens	Georeferenced	Norwegian
Col-Strand	1285	1003	1003
Col	1167	1096	996
Scol	74	74	72
Bold	308	308	100
	2834	2481	2171

members of the tribe Xyleborini are ambrosia beetles, and nearly all are tropical; xyleborine beetles are therefore not as well adapted to colder climates as the boreal ambrosia beetles in the genus *Trypodendron*, perhaps indicating why Hordaland makes the northern limit of the species distribution in Europe.

Dryocoetes villosus (Fabricius, 1792) was collected from a hollow oak at Berge in Tørvikbygd (Kvam), and young broods were found just at the boundary between dead and live bark. This record confirms a previous intercept trap sample from the same locality (Aarrestad *et al.* 2006). This is the only record in Norway beyond the south-eastern coast. This species is likely quite rare, given its peculiar habit of breeding in live old oak trees.

Taphrorychus bicolor (Herbst, 1793) was collected near Vanvik in Sauda (Rogaland). It was taken from a dead branch on a living hazel tree. Males formed harems with 3–5 females (n=3). This species was first reported from the neighbouring county Suldal (Ødegaard & Ligaard 2000) and later reported from insect trap sampling in Kvam, Hordaland (Aarrestad *et al.* 2006).

Scolytus laevis Chapuis, 1869 was found in firewood of uncertain origin, in Voss. It may therefore be transported from eastern parts of Norway, but one may note that the species is present in nearby locations in Sogndal (Sogn og Fjordane). This species is typically breeding in logs of elm, a host plant scattered across most of the lowlands in southern Norway.

Scolytus ratzeburgi Janson, 1856 was taken from firewood in Hardanger. It is previously only known in Western Norway from Luster in Sogn og Fjordane. This species breeds in birch – the most common host tree in the west. *S. ratzeburgi* is not very common but is distributed in most other parts of the country. The scarce western records are therefore noteworthy.

Dryocoetes alni (Georg, 1856) is possibly a fairly common species breeding in alder trees, but the host plant may be neglected during field collecting because new occurrences are rarely reported. It is, in Western Norway, only known from three localities along the Sognefjord and four Hordaland localities (Lekander *et al.* 1977). The three new records reported here are the first from Osterøy and Kvam counties in Hordaland.

Hylesinus varius (Fabricius, 1775) is the most abundant of the species mentioned above. However, it has a distinct northern boundary in mid-Hordaland in the west and the Mjøsa lake in the east. The first specimens are here reported from Sogn og Fjordane, in Balestrand, and many new records are from Bergen and Os counties and confirm the high abundance but yet the northern boundary is restricted to the Sognefjord. Because ash trees are common north to Troms, it seems likely that *H. varius* is highly restricted by winter temperature.

Rare pine associated species

Hylastes opacus Erichson, 1836 is recorded from Western Norway for the first time. Specimens were dissected from felled pines at Milde, south of Bergen. Male and female pairs were establishing egg galleries and a healthy population is therefore suspected for this area. This species prefers moist bark which is facing the ground, or roots, as in all other *Hylastes* species. It is mainly associated with thin-barked pine (Lekander *et al.* 1977).

Pityogenes trepanatus (Nordlinger, 1848) is known only from a recent intercept trap collection

TABLE 3. Noteworthy new records, which extend the distribution in Norway for selected bark and ambrosia beetles, based on specimens stored in the entomological collections at the University Museum of Bergen.

Species	Locality	County, Region	Coordinates	Host plant	Date	Collector
Anisandrus dispar	Omastranda	Kvam, Hordaland	60.217°N 5.969°E	ex fire wood	04.04.2005	Orukjell, E.
Anisandrus dispar	Sveio	Sveio, Hordaland	59.544°N 5.356°E	Flight intercept	20.08.2013	Kambestad, M.
Cryphalus asperatus	Ænesdalen	Kvinnherad, Hordaland	60.10°N 6.11°E	*Abies alba*		Kambestad, M.
Cryphalus asperatus	Rosendal	Kvinnherad, Hordaland	59.9871N 6.0263E	*Abies alba*	25.05.2008	Jordal, B.H.
Crypturgus pusillus	Eidet	Lierne, Nord-Trøndelag	64.44N 13.64E	*Picea abies*	09.07.2004	Jordal, B.H.
Dryocoetes alni	Gravdal	Kvam, Hordaland	60.134°N 5.895°E		06.05.1997	Pommeresche, R.
Dryocoetes alni	Kvam	Kvam, Hordaland	60.369°N 6.144°E		23.06.1998	Skartveit, J.
Dryocoetes alni	Skaftå	Osterøy, Hordaland	60.457°N 5.621°E		06.06.1974	
Dryocoetes autographus	Skei	Jølster, Sogn og Fjordane	61.561N 6.477E	*Picea abies*	05/08/1996	Jordal, B.H.
Dryocoetes autographus	Naustdal	Naustdal, Sogn og Fjordane	61.506N 5.703E	*Pinus sylvestris*	05/08/1996	Jordal, B.H.
Dryocoetes autographus	Strøno	Os, Hordaland	60.15N 5.34E	*Picea abies*	17.06.2004	Jordal, B.H.
Dryocoetes autographus	Selseng	Sogndal, Sogn og Fjordane	61.348N 6.908E	*Picea abies*	05.08.1996	Jordal, B.H.
Dryocoetes autographus	Aurenakken	Sykkylven, Møre og Romsdal	6.595°N 62.384°E		01.05.2001	Skartveit, J.
Dryocoetes autographus	Vikedalen	Sykkylven, Møre og Romsdal	62.372°N 6.607°E		16.06.2001	Skartveit, J.
Dryocoetes autographus	Vangsnes	Vik, Sogn og Fjordane	61.157N 6.633E	*Picea abies*	05.08.1996	Jordal, B.H.
Dryocoetes hectographus	Ulven	Os, Hordaland	60.2N 5.42E	*Picea abies*	17.06.2004	Jordal, B.H.
Dryocoetes hectographus	Osterøy	Osterøy, Hordaland	60.52°N 5.49°E		20.10.1991	Fjeldså, A.
Dryocoetes hectographus	Draugen bru	Selbu, Sør-Trøndelag	63.29N 10.90E	*Pinus sylvestris*	06.07.2004	Jordal, B.H.
Dryocoetes hectographus	Trondheim, Granåsen	Trondheim, Sør-Trøndelag	63.40°N 10.30°E	*Picea abies*	05.07.2004	Jordal, B.H.
Dryocoetes hectographus	Evanger	Voss, Hordaland	60.639N 6.189E	*Picea abies*	05.08.1996	Jordal, B.H.
Dryocoetes villosus	Berge, Tørvikbygd	Kvam, Hordaland	60.311N 6.165E	*Quercus robur*	19.07.2006	Jordal, B.H.
Ernoporicus caucasicus	Førre	Hjelmeland, Rogaland	59.327°N 6.583°E		25.07.1970	Fjellberg, A.
Hylastes cunicularius	Bontveit	Bergen, Hordaland	60.34N 5.49E	*Picea abies*	17.06.2004	Jordal, B.H.
Hylastes cunicularius	Haukåsvassdraget	Bergen, Hordaland	60.488°N 5.365°E		24.04.2003	Greve, L.
Hylastes cunicularius	Sandviksfjellet	Bergen, Hordaland	60.409°N 5.351°E		28.04.1989	Fjeldså, A.

TABLE 3. *continued*

Species	Locality	County, Region	Coordinates	Host plant	Date	Collector
Hylastes cunicularius	Ulven	Os, Hordaland	60.2N 5.42E	*Picea abies*	17.06.2004	Jordal, B.H.
Hylastes opacus	Arboretet, Milde	Bergen, Hordaland	60.26°N 5.28°E	*Pinus sylvestris*	25.05.2011	Jordal, B.H.
Hylesinus varius	Seberg	Balestrand, Sogn og Fjordane	61.137°N 6.270°E		10.06.2006	Gravem, R.
Hylesinus varius	Bjørndalen	Bergen, Hordaland	60.38°N 5.36°E		19.09.2004	Broch, O.J.
Hylesinus varius	Minde	Bergen, Hordaland	60.359°N 5.346°E	ex fire wood	08.09.2006	Baklund, C.H.
Hylesinus varius	Myrdalskogen	Bergen, Hordaland	60.466°N 5.314°E	ex fire wood	19.09.2004	Dahlstrøm, J.
Hylesinus varius	Søreidgrenda	Bergen, Hordaland	60.313°N 5.269°E		07.06.2006	Kvalheim, K.
Hylesinus varius	Hagavik	Os, Hordaland	60.179°N 5.408°E		10.06.2009	Stang, F.A.
Hylesinus varius	Os	Os, Hordaland	60.187°N 5.468°E	On ash	07.05.1972	Fjellberg, A.
Hylesinus varius	Bulko	Voss, Hordaland	60.575°N 6.606°E		10.11.1999	Högh, B.
Ips duplicatus	Trofors	Grane, Nordland	65.533N 13.406°E	gran	1926	Trägårdh, I.
Orthotomicus laricis	Arboretet, Milde	Bergen, Hordaland	60.25N 5.27E	*Pinus sylvestris*	25.05.2009	Jordal, B.H.
Orthotomicus laricis	Barkeland	Suldal, Rogaland	59.339N 6.068E	*Pinus sylvestris*	02.05.1993	Kirkendall, L
Orthotomicus laricis	Gimsdalen	Sykkylven, Møre og Romsdal	62.351°N 6.666°E		28.04.2001	Skartveit, J.
Orthotomicus laricis	Straumsdalen	Sykkylven, Møre og Romsdal	62.347°N 6.640°E		21.05.2001	Skartveit, J.
Orthotomicus laricis	Sørtveit	Tysvær, Hordaland	59.326N 5.728E	*Pinus sylvestris*	17.08.1995	Djursvoll, P.
Orthotomicus laricis	Rogdo	Ullensvang, Hordaland	60.272N 6.567E	*Picea abies*	02.05.1993	Breistøl, A.
Pityogenes chalcographus	Vik	Vik, Sogn og Fjordane	61.096N 6.593E	*Picea abies*	05.08.1996	Jordal, B.H.
Pityogenes chalcographus	Evanger	Voss, Hordaland	60.639N 6.189E	*Picea abies*	05.08.1996	Jordal, B.H.
Pityogenes trepanatus	Litlebø	Fjell, Hordaland	60.35N 4.97E	*Pinus sylvestris*	10.07.2013	Cognato, A.I.
Pityogenes trepanatus	Sveio	Sveio, Hordaland	59.544°N 5.356°E	Flight intercept	20.08.2013	Kambestad, M.
Scolytus laevis	Voss	Voss, Hordaland	60.629°N 6.416°E	ex fire wood	08.08.1997	Anticimex
Scolytus ratzeburgi	Hardanger	Hordaland		Birch fire wood	04.01.2006	Fagertun, K.
Taphrorychus bicolor	Vanvik	Suldal, Rogaland	59.542N 6.327E	*Corylus avellana*	19.07.2006	Jordal, B.H.
Trypodendron domesticum	Gravdal	Kvam, Hordaland	60.134°N 5.895°E		12.05.1997	Pommeresche, R.
Trypodendron domesticum	Kvinnherad	Kvinnherad, Hordaland	59.92°N 6.03°E		26.03.1969	Solhøy, T.

TABLE 3. *continued*

Species	**Locality**	**County, Region**	**Coordinates**	**Host plant**	**Date**	**Collector**
Trypodendron domesticum	Osterøy	Osterøy, Hordaland	60.52°N 5.49°E		21.04.1990	Fjellberg, A.
Trypodendron lineatum	Skei	Jølster, Sogn og Fjordane	61.561N 6.477E	*Picea abies*	05.08.1996	Jordal, B.H.
Trypodendron lineatum	Ulven	Os, Hordaland	60.20N 5.42E	*Picea abies*	17.06.2004	Jordal, B.H.
Trypodendron lineatum	Selseng	Sogndal, Sogn og Fjordane	61.348N 6.908E	*Picea abies*	05.08.1996	Jordal, B.H.
Trypodendron lineatum	Gimsdalen	Sykkylven, Møre og Romsdal	62.351°N 6.666°E	*Pinus sylvestris*	07.05.2001	Skartveit, J.
Trypodendron lineatum	Straumsdalen	Sykkylven, Møre og Romsdal	62.347°N 6.640°E		22.06.2001	Skartveit, J.
Trypodendron lineatum	Vikedalen	Sykkylven, Møre og Romsdal	62.372°N 6.607°E	*Pinus sylvestris*	06.05.2001	Skartveit, J.

in Kvam, Hordaland (Aarrestad *et al.* 2006). The species was later collected in Sveio by intercept traps (Kambestad, pers. comm.), and west of Bergen in Fjell county in 2013 where it was found breeding in twigs on young pines (A.I. Cognato and S. Smith-Cognato, pers. comm). This species is not very common in any part of Norway, but is more frequently encountered in southern Sweden (Lekander *et al.* 1977).

Orthotomicus laricis (Fabricius, 1792) is infrequently collected, especially in Western Norway where it was previously recorded only from two inner Sognefjord localities, and from Bergen (Lekander *et al.* 1977). Six more localities are reported here – from Rogaland to Møre og Romsdal, suggesting a fairly stable occurrence over most of the country.

Spruce associated species in Western Norway

Cryphalus asperatus (Gyllenhal, 1813) was previously – in Western Norway – only recorded from Rogaland (twice), and just recently from Lindås in Hordaland. Two more records are added from Hordaland, both from localities in Kvinnherad, 16 km apart. Breeding specimens were taken from dead branches on standing silver fir (*Abies alba*). This species is otherwise found in spruce, but only rarely in pine.

Pityogenes chalcographus (Linnaeus, 1761) was recently reported from Western Norway, in Voss and Ullensvang counties (A. Nilsen, pers. comm). Adding here one additional record from Voss, and from Vik county, which is the first record from Sogn og Fjordane. Although all records are from late 1980 to mid-1990, it is quite likely that this spruce associated species is now established in Western Norway.

Dryocoetes hectographus Reitter, 1913 is frequently confused with the similar species *D. autographus* (Ratzeburg, 1837) which may co-occur in the same spruce log (Nilsen 1979). Despite its common occurrence in eastern and northern parts of the country, only one previous collection was made in Western Norway, from Voss county. With the addition of three new records the species seems established over a larger area, also in the west.

Dryocoetes autographus (Ratzeburg, 1837) is

one of the three most commonly collected species of bark beetles in Norway. Records for western parts of Norway thus seems undercommunicated, or else, this species has a rapidly growing population across most of Western Norway. It can now be found in nearly any pile of spruce logs in this part of the country.

Hylastes cunicularius Erichson, 1836 is similarly very common, but only two previous collections were recorded from Hordaland. Six additional localities from Suldal in the south to Sykkylven in the north confirm a broadly distributed species in Western Norway and most other boreal forests in the Palearctic.

Trypodendron lineatum (Olivier, 1795) is one of very few species of ambrosia beetles which is restricted to conifers, mainly spruce. It is similar in distribution to *D. autographus* and *H. cunicularius* and the seven new records from Hordaland and Sogn og Fjordane confirm a broad and stable presence in Western Norway.

Depauperate spruce associated bark beetle fauna in Western Norway

Because spruce was largely absent from Western Norway since the last glacial period until planting of spruce begun less than a century ago, one may expect a slightly depauperate fauna on spruce compared to pine. A complete guild of eastern spruce associated bark beetles is therefore entirely absent from western parts of Norway. The species *Ips typographus* (Linnaeus, 1758), *Polygraphus poligraphus* (Linnaeus, 1758), *Pityophthorus micrographus* (Linnaeus, 1758) and *Crypturgus subcribrosus* Eggers, 1933 are often found together on standing dead spruces of large diameter in eastern and northern Norway and neighbouring countries. The same apply to *Hylurgops glabratus* (Zetterstedt, 1828) and *Polygraphus punctifrons* Thomson, 1886 which prefer fallen moist stems of spruce. Neither is there any record in the west of *Cryphalus saltuarius* Weise, 1891 and *Phloeotribus spinulosus* (Rey, 1885) which both prefer dead branches on standing spruce. Because many of these species are very common in the east and northwards, it is clear that factors other than host plant must be important for colonizing the west. Precipitation and summer temperature deviate markedly between east and west and make the sharpest transition between bioclimatic sections (Bakkestuen *et al.* 2008).

Another important factor in the colonisation of Western Norway is the ability to breed in pine, especially during the earlier times of patchy establishment of mature spruce stands. Species that occasionally breed in pines are indeed more common on spruce in Western Norway, in particular *H. palliatus*, *H. cunicularius* and *D. autographus*. These species were the first to establish populations on spruce in Western Norway (Lekander *et al.* 1977), and on plantations in Northern coastal areas (Nilsen 1987). However, broader host plant tolerance alone cannot explain the different timing of establishment among different species in Western Norway because several Norwegian pine specialists are also entirely absent in Western Norway, or they just recently reached the region. For species such as the south-eastern *Pityogenes trepanatus,* climate change may have been crucial to its recent spread in Western Norway and demonstrate a pattern closely similar to the small elephant hawk-moth (Jordal *et al.* 2015). Perhaps we can expect other pine-twig feeding species such as *Pityophthorus pubescens* and *Pityophthorus glabratus* – which has a similar southern distribution – to follow the pattern of *P. trepanatus*.

We are currently observing many insects species new to Western Norway, and previously rare species are now found more frequently in the region. Frequent monitoring of the fauna through systematic inventories is therefore needed to enable a better understanding of insect distributions.

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