

First record of *Formica fennica* Seifert, 2000 (Hymenoptera, Formicidae) in Norway

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During a journey from the south to the central part of Norway, some mound nests of *Formica* spp. Linnaeus, 1758 were inspected, most of them in Sør-Trøndelag County, in relatively little examined parts of Norway. The only nest of *Formica fennica* Seifert, 2000 was registered near Sætervika, in postglacial marsh landscape along a fjord, and this was the western-most record of this species and first one for Norwegian ant fauna to the date. Selected data on this species are compared with data on related *Formica exsecta* Nylander, 1846 from nearby much more common nests. Short information on other registered mound-building *Formica* spp. ants are also mentioned as a contribution to ant faunistics in Norway.

Key words: Hymenoptera, Formicidae, *Formica fennica*, *Formica exsecta*, *Formica* spp., Norway.

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Introduction

Mound-building *Formica* spp. Linnaeus, 1758 are often dominant ants in North-European ecosystems. Due to conspicuous nests and high number of workers, their presence can be easily registered. However, the data on distribution of individual species are often unsatisfactory. The main reasons are as follows: re-evaluation of previously described species and description of new species latterly (Seifert 2000), difficult species determination connected with potential misidentifications, possible hybridization between some ant species (e.g. Kulmuni *et al.* 2010), and vast area of unexplored regions and possible shift of species areas in connection with climatic changes. In Norway, it is very needful to explore new areas and, on the other hand, to compare older information (Collingwood 1979, Kvamme 1982) from previously examined areas with new data from the same sites. It is in accordance with records of ant species new for the Norwegian

fauna these years (Kvamme & Collingwood 2009, Kvamme & Olsen 2011).

Material and methods

During a short trip through Norway in April–May 2012, the author had the opportunity to check visible mound nest of *Formica* spp.. Some of the nests were found near main roads in Oppland and Akkershus counties but most of others were examined in less accessible sites along borders between Nord-Trøndelag and Sør-Trøndelag counties. The explored sites were connected with European Invertebrate Survey (EIS) grid system, commonly used in ant faunistics in Norway (Kvamme 1982). Coordinates of selected nests were registered using GPS device, photos of nests and their surroundings were taken and samples of 2–6 workers per nest were collected into marked plastic vials with paper soaked with ethyl-acetate. Samples were determined later in the laboratory

conditions according to Seifert (2000, 2007): the acquired morphometric values could be slightly influenced by used technique and my experiences. Most specimens are deposited in collections of Botanical Garden of P.J. Šafárik University in Košice, Slovakia, three workers of *Formica fennica* Seifert, 2000 are deposited in collections of Senckenberg Museum für Naturkunde in Görlitz, Germany.

Results and discussion

The samples of workers were collected from 17 mound nests of *Formica* spp. (Table 1, Figure 1), from the subgenera *Formica* s.str. Linnaeus, 1758 and *Coptoformica* Müller, 1923 (Figure 2). Each sample is defined with the code consisting of sampling date and specific nest number (e.g. 2012_04_29-872 means a sample collected on 29 April 2012 from the nest 872 and other data related to the respective sample or nest are in Figure 1, Table 1 and Table 2 under the same code). There were registered three nests of *Formica aquilonia* Yarrow, 1955, three nests of *F. lugubris* Zetterstedt, 1840, one nest of *F. polycytena* Förster, 1850, one nest of *F. fennica* and nine nests of *F. exsecta* Nylander, 1846. Morphometric data on *Coptoformica* workers from examined nests are presented in Table 2. These measurements are important for safe determination of ant samples and the registered values contribute to our knowledge on variability of these species within their areas of distribution.

The only nest of *F. fennica* was found in wet conditions very close to a small lake (Figure 3)

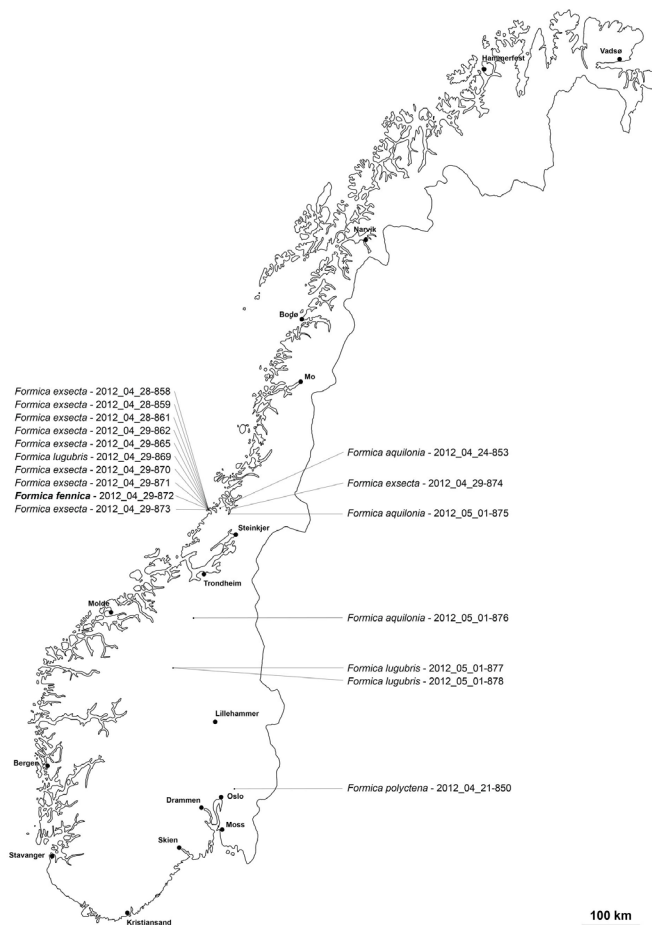


FIGURE 1. Positions of Norwegian nests of *Formica* spp. Linnaeus, 1758 with collected specimens discussed in this paper.

east of the village of Sætervika (or Seter). It was a small mound surrounded by heather (*Calluna vulgaris*): no fresh grass and herbs were seen in this early sprigtime (29 April 2012). In this area with typical post-glacial landscape character, the dominating mound-building ant species was *F. exsecta* (Figure 4), whereas *F. fennica* and *F. lugubris* seemed to occur here more rarely. All nests of *F. exsecta* (and one small initial nest of *F. lugubris* – Figure 5D) found around the above mentioned lake eastwards from Sætervika were individual small mounds lying mostly in heather (*C. vulgaris*, Figure 5A), *Arctostaphylos uva-ursi* (Figure 5B) and *Empetrum nigrum*, (Figure 5C)

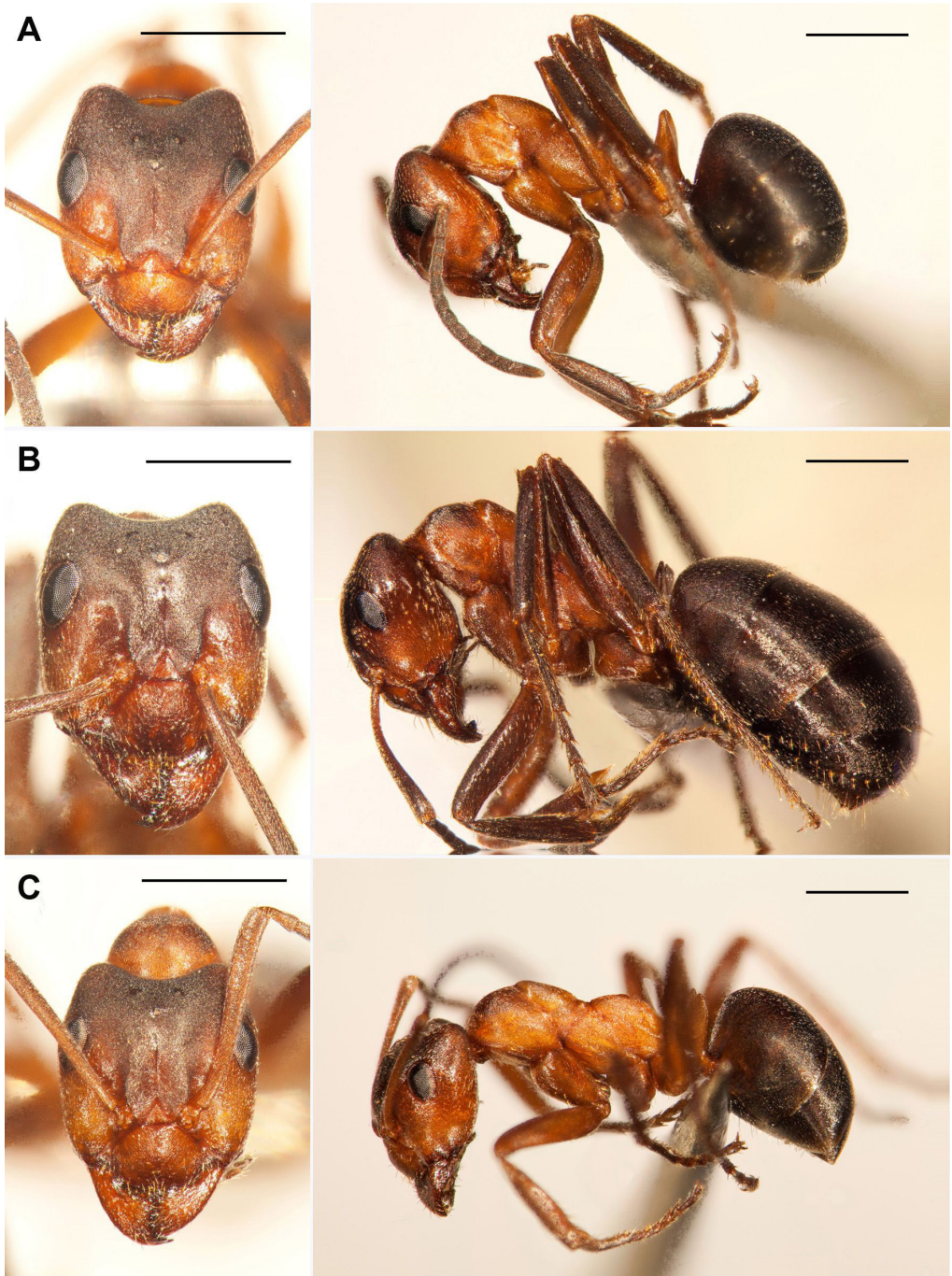


FIGURE 2. Selected specimens of *Coptoformica* Müller, 1923 workers. **A.** *Formica fennica* Seifert, 2000 from the nest 2012_04_29-872 (Tables 1, 2, Figure 3), **B.** *F. exsecta* Nylander, 1846 from the nest 2012_04_29-873 (Tables 1, 2, Figure 4C), **C.** *F. exsecta* from the nest 2012_04_29-862 (Tables 1, 2). Scale bars: 1mm.

TABLE 1. General characteristics of mound nests of *Formica* spp. Linnaeus, 1758 sampled in Norway from 21 April to 1 May 2012.

Species/Nest code	Rounded coordinates	Rounded altitude (m.a.s.l.)	EIS grid square	County	Municipality	Nearest village	Approximate nest size (cm) (base diameter x height)	Surrounding main vegetation
<i>Formica fennica</i>								
2012_04_29-872	64° 23' N, 10° 35' E	45	100	Sør-Trøndelag	Osen	Sætervika	55 x 40	heather, pine
<i>Formica exsecta</i>								
2012_04_28-858	64° 24' N, 10° 32' E	35	100	Sør-Trøndelag	Osen	Sætervika	45 x 30	birch, heather
2012_04_28-859	64° 24' N, 10° 32' E	25	100	Sør-Trøndelag	Osen	Sætervika	85 x 30	grass
2012_04_28-861	64° 24' N, 10° 32' E	20	100	Sør-Trøndelag	Osen	Sætervika	85 x 20	grass
2012_04_29-862	64° 24' N, 10° 35' E	45	100	Sør-Trøndelag	Osen	Sætervika	50 x 10	heather, kinnikinnick, black crowberry, reindeer lichen, pine
2012_04_29-865	64° 24' N, 10° 35' E	105	100	Sør-Trøndelag	Osen	Sætervika	25 x 20	heather, pine
2012_04_29-870	64° 24' N, 10° 36' E	60	100	Sør-Trøndelag	Osen	Sætervika	55 x 20	heather, kinnikinnick, black crowberry
2012_04_29-871	64° 24' N, 10° 35' E	45	100	Sør-Trøndelag	Osen	Sætervika	50 x 40	heather, common juniper
2012_04_29-873	64° 23' N, 10° 35' E	45	100	Sør-Trøndelag	Osen	Sætervika	50 x 35	heather
2012_05_01-874	64° 24' N, 11° 11' E	25	101	Nord-Trøndelag	Namdalseid	Tøttedal	130 x 50	grass, heather, cowberry, birch, spruce
<i>Formica aquilonia</i>								
2012_04_24-853	64° 26' N, 10° 57' E	110	100	Nord-Trøndelag	Flatanger	Lauvsnes	135 x 85	spruce, birch, cowberry
2012_05_01-875	64° 19' N, 11° 13' E	10	101	Nord-Trøndelag	Namdalseid	Sjøåsen	220 x 70	birch, spruce, grass
2012_05_01-876	62° 43' N, 09° 58' E	450	86	Sør-Trøndelag	Rennebu	Innset	170 x 50	birch, spruce, pine
<i>Formica lugubris</i>								
2012_04_29-869	64° 24' N, 10° 36' E	70	100	Sør-Trøndelag	Osen	Sætervika	30 x 5	heather, kinnikinnick, pine, common juniper
2012_05_01-877	61° 56' N, 09° 18' E	455	71	Oppland	Dovre	Dovre	160 x 65	pine, cowberry
2012_05_01-878	61° 56' N, 09° 18' E	450	71	Oppland	Dovre	Dovre	60 x 25	pine, birch, common privet, grass
<i>Formica polyctena</i>								
2012_04_21-850	60° 05' N, 11° 09' E	155	37	Oslo/Akershus	Ullensaker	Kløvfta	140 x 25	grass, birch

TABLE 2. Selected morphometric data on collected *Coptoformica* Müller, 1923 workers (arithmetic mean [lower extreme – upper extreme]).

Morphometric characters used according to Seifert (2007): n – number of workers collected per nest; CL – maximum cephalic length; CW – maximum cephalic width; EyeHL – length of the longest seta of compound eyes; nCOXA – number of standing setae on the frontal face of one front coxa; TERG – the frontalmost abdominal tergite with at least 1 standing seta; ClySet – distributional levels (1–5) of the presence of different setae positions on clypeus.

Species/Nest code	n	CL(µm)	CW(µm)	CL/CW	EyeHL (µm)	nCOXA	TERG	ClySet
<i>Fomrica fennica</i>								
2012_04_29-872	4	1392 [1323-1441]	1314 [1254-1357]	1.058 [1.053-1.068]	18.8 [9-25]	0.5 [0-2]	4 [4-4]	2 [2-2]
<i>Fomrica exsecta</i>								
2012_04_28-858	5	1455 [1408-1503]	1409 [1359-1446]	1.033 [1.016-1.045]	26.0 [24-30]	2.9 [1.5-5]	2.2 [1-3]	2 [1-3]
2012_04_28-859	4	1414 [1340-1489]	1333 [1270-1380]	1.061 [1.050-1.079]	20.1 [18-22]	6.5 [6-7]	1 [1-1]	3.5 [3-4]
2012_04_28-861	2	1522 [1482-1561]	1422 [1367-1477]	1.071 [1.057-1.085]	16.3 [15-18]	9 [6-12]	1 [1-1]	3.5 [3-4]
2012_04_29-862	2	1414 [1401-1428]	1343 [1332-1353]	1.053 [1.051-1.055]	12.6 [6-19]	6.5 [4-9]	1 [1-1]	3.5 [3-4]
2012_04_29-865	3	1458 [1374-1516]	1410 [1333-1481]	1.034 [1.024-1.048]	27.1 [24-31]	2.7 [2-3]	1.3 [1-2]	2.3 [2-3]
2012_04_29-870	5	1429 [1414-1442]	1395 [1357-1413]	1.025 [1.009-1.047]	25.7 [22-29]	9 [7-11]	1 [1-1]	4 [3-5]
2012_04_29-871	3	1342 [1285-1414]	1282 [1244-1353]	1.047 [1.033-1.062]	27.6 [24-34]	7.3 [6-9]	1 [1-1]	3.7 [3-4]
2012_04_29-873	3	1645 [1618-1668]	1576 [1559-1605]	1.044 [1.028-1.065]	13.5 [10-18]	9.3 [8-11]	1 [1-1]	4.7 [4-5]
2012_05_01-874	5	1509 [1401-1578]	1420 [1304-1489]	1.063 [1.047-1.083]	25.5 [21-33]	8 [6-13]	1 [1-1]	4.2 [3-5]

between sparsely growing *Pinus sylvestris* on rocks. Closer to the village, near pastures, there were also bigger *F. exsecta* nests forming small colonies in grass (Figure 4D). From each such colony, workers from only one nest were taken and is presented in Table 2 (2012_04_28-859, 2012_04_28-861).

Collected workers of *F. fennica* showed typical absence of setae on fore coxae and first four abdominal tergites, other characters were also within limits for this species according to Seifert (2000) (Figure 2A, Table 2). Near the described nest of *F. fennica*, more or less remote nests of *F. exsecta* show relatively high variability in worker's morphometric data but they were mostly clearly different from *F. fennica* values (Table 2). Only the sample no. 2012_04_28-858 (Table 2) showed atypical pilosity characters in workers, especially low values for clypeus (ClySet) which

were out of limits defined by Seifert (2000, 2007) for *F. exsecta*. Figure 2B–C is an example of this within-species variability on the same area. It compares worker specimens from two nests of *F. exsecta*: a large, dark worker with remarkable pilosity in the nest at the mentioned lake (Figure 2B, Figure 4C, and Figure 5A) with a smaller, lighter worker with reduced eye setae (Figure 2C) from the nest located higher on the rocky slope between pines.

To the date, *F. fennica* was known only from Finland and Caucasus - two restricted regions remote to each other (Schultz & Seifert 2007, Punttila & Kilpeläinen 2009). It was supposed that this West Palaearctic species is continental, south boreal inhabitant with relict occurrence in the Caucasus (Schultz & Seifert 2007). However, there was very little information on true distribution of *F. fennica*, the species described



FIGURE 3. Nest of *Formica fennica* Seifert, 2000 (2012_04_29-872) at a small post-glacial lake eastwards from Sætervika (EIS 100).

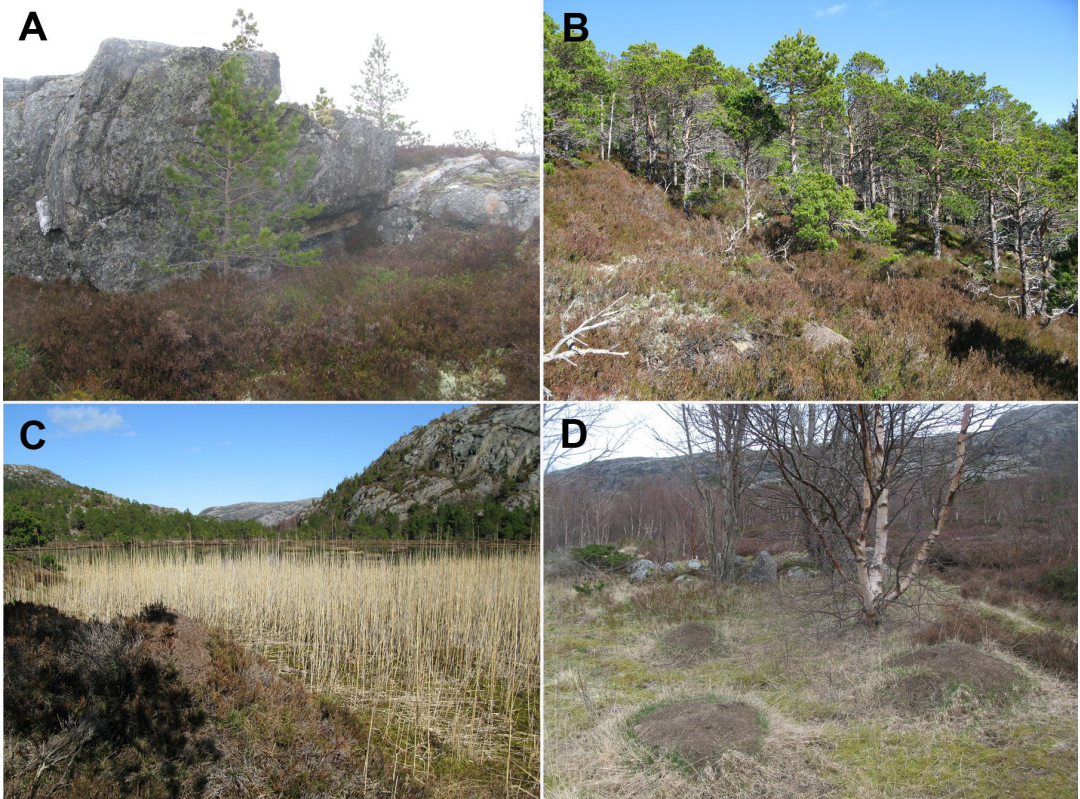


FIGURE 4. Selected nests of *Formica exsecta* Nylander, 1846 eastwards from Sætervika (EIS 100) – examples of different nest conditions. **A.** Small nest (2012_04_29-865) located in extreme conditions high on narrow rocky crest; **B.** Sunny slope, a clearing among pines (2012_04_29-870, Figure 5B–C); **C.** The nest (2012_04_29-873, Figure 5A) with in average larger and darker workers (Figure 2B) on the opposite site of the same lake where the nest of *F. fennica* Seifert, 2000 was recorded; **D.** Small colony of several nests (2012_04_28-859) at the border of pastures.



FIGURE 5. Examples of different vegetation in details at selected nests of *Formica exsecta* Nylander, 1846 (A, B, C) and *F. lugubris* Zetterstedt, 1840 (D) eastwards from Sætervika (EIS 100). **A.** Heather (*Calluna vulgaris*) at the nest 2012_04_29-873; **B.** Kinnikinnick (*Arctostaphylos uva-ursi*) and **C.** Crowberry (*Empetrum nigrum*) at the same nest of 2012_04_29-870; **D.** Nest material of the initial nest stage of *F. lugubris* (2012_04_29-869) consisting from pieces of pine (*Pinus sylvestris*), common juniper (*Juniperus communis*) and heather (*C. vulgaris*). Scale bars: 5mm.

not long ago (Seifert 2000), so it's possible older specimens could be determined as some similar *Coptoformica* species in the past. The other reason of limited information is that there are still vast areas with insufficient data on ant fauna.

As for *Formica* s. str. ants (*F. aquilonia*, *F. lugubris* and *F. polyctena*) collected in other regions of Norway (Figure 1), their nests were registered in areas with known or supposed occurrences of these species, though some of them were within EIS grid squares with no data on these ants to the date. However, there should be specially mentioned two nests of *F. aquilonia* (2012_05_01-875 near Sjøåsen and 2012_05_01-876 near Innset, Table 1) with workers with much reduced pilosity. Absence of occipital hairs,

and often of pronotal setae, in most collected workers from these nests led me to the result of very northern occurrence of *F. polyctena* at first. However, analysis that is more detailed showed the identity of *F. aquilonia*, especially based on the basis of relatively thicker scapes. This is another area for further study of intraspecific variability or interspecific hybrids in these ants (Kulmuni *et al.* 2010).

In spite of little number of collected samples, they brought new information on Norwegian *Formica* spp. ants in comparison with relevant literature. Therefore it is highly probable that more detailed investigation with regular monitoring could shed more light on actual distribution of these (and other) ants in Norway.

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