

# Norwegian Symphyla

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A collection of Norwegian Symphyla has been reviewed. Distributional maps are presented, including older literature records and a previously unpublished material collected by the third author. Seven species have now been recorded from Norway: *Hanseniella caldaria* (Hansen, 1903), *Scolopendrellopsis subnuda* (Hansen, 1903), *Scutigereella causeyae* Michelbacher, 1942, *Scutigereella palmonii* Michelbacher, 1942, *Symphylella elongata* Scheller, 1952, *Symphylella isabellae* (Grassi, 1886) and *Symphylella vulgaris* (Hansen, 1903), of which *S. elongata* is here presented for the first time.

Key words: Symphyla, Myriapoda, Norway, faunistics, checklist.

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## Introduction

The Symphyla is a poorly studied group of invertebrates in the Norwegian fauna. Together with Pauropoda, Chilopoda and Diplopoda, they are referred to as myriapods. They all have at least eight pairs of legs as adults, with Pauropoda representing the class with the lowest number (8–11). Symphyla possess 12 pairs of legs. The largest of the Norwegian species reach about 9 mm, while the small ones reach only 1–2 mm. Symphyla are soil- or litter-dwellers, they are unpigmented and they lack eyes. They are not capable of digging tunnels and must therefore rely on either loose soil, old root canals or runways and fissures created by other invertebrates.

The paper of Lock (2010) sparked the present study. The "discovery" that *Scutigereella immaculata* (Newport, 1845) could not be confirmed as belonging to the Belgian fauna, led to the hypothesis that also some or all Norwegian records of this taxon were false.

## History of the study of Symphyla in Norway

Porat (1887) was the first to mention Symphyla from Norway, reporting '*Scutigereella immaculata*' from Bygdøy, Oslo. Subsequently, the same species has been mentioned by many authors (although not always by name). The following list present these authors chronologically and only *new* localities for Norway are mentioned: von Porat (1889), Ellingsen (1892: Kragerø, Telemark), Ellingsen (1897), Storm (1898: Trondheim, Sør-Trøndelag), Lie-Pettersen (1898: Stryn, Sogn og Fjordane and/or Bergen, Hordaland), Hansen (1903), Ellingsen (1903: Fredrikstad, Østfold; Holmestrand, Vestfold; Triset, Telemark), Attems (1904: Aust-Agder), Lohmander (1923), Børset (1969: Ås, Vollebekk, Årungenbukta and Syverud in Akershus; Linderud and Huk in Oslo), Andersen (1969), Meidell (1972: Mosterhamn, Stord, Samnanger, Tysnes, Åsane, Laksevåg, Fana, Kvinnherad and Varaldsøy in Hordaland; Haugesund, Rogaland; Arendal, Aust-Agder),

Meidell (1977: Øvre Eidfjord, Hordaland), Meidell (1978) and Meidell (1979). In addition to the records found in literature, ten records of *S. immaculata* are published on Global Biodiversity Information Facility (GBIF) (2013) by the Zoological Museum of Bergen, Norway. These are mainly specimens collected in the 1960s by Arne Fjellberg, Bjørn Berland, Hans Kauri and others, but also one older specimen, collected by Hans Tambs-Lyche in 1938. All specimens are identified by Meidell and are as disputable as the older literature records (see below). These records are, for unknown reasons, not available in Artskart (Artsdatabanken 2013), where material from the museum is otherwise usually published.

No other species were mentioned from Norway until Børset (1969) reported *Symphylella vulgaris* from four localities, namely Ås and Årungbukta in Akershus, and Linderud and Huk in Oslo. This species has later been mentioned by Meidell (1972), Leinaas (1974: Nordmoen, Akershus), Meidell (1978), Scheller (1978), Andersson et al. (2005) and Andersson et al. (2008: counties Østfold, Hedmark, Vestfold, Telemark, Aust-Agder, Vest-Agder, Rogaland, Hordaland, Sogn og Fjordane and Møre og Romsdal, all with records post 1950).

*Scolopendrellopsis subnuda* was reported by Leinaas (1974) from Nordmoen and Slørstad in Akershus (but Scheller actually collected the same species at both localities already in 1954 (unpublished data)). The species has also been mentioned by Meidell (1978), Scheller (1978), Andersson et al. (2005) and Andersson et al. (2008: counties Østfold, Oppland, Buskerud, Vestfold, Telemark, Aust-Agder, Vest-Agder, Rogaland, Hordaland, Sogn og Fjordane, Møre og Romsdal and Sør-Trøndelag, all with records post 1950).

*Symphylella isabellae* was mentioned for the first time in Scheller (1978), but without any specific locality information. Andersson et al. (2005) present a map where its distribution is along the coast from Oslofjorden to Jæren. This is also quite consistent with Andersson et al. (2008: counties Akershus/Oslo, Telemark, Aust-Agder, Vest-Agder and Rogaland, all with records post 1950). This species is listed on the Norwegian Red

List (Kålås et al. 2010) as DD (Data deficient).

*Hanseniella caldaria* was mentioned for the first time in Andersson et al. (2005), from Tøyen in Oslo. Andersson et al. (2008) merely repeat this information, albeit stating that the record was post 1950.

In the comprehensive work of Andersson et al. (2005), three species in the genus *Scutigerebella* are treated collectively and the 'combined' map almost equals the information mentioned under *S. immaculata* above. They suppose *S. immaculata*, *S. causeyae* and *S. palmonii* might be present in the area covered, but without stating the presence of either of the species in any specific country (see further discussions below). Likewise, Andersson et al. (2008) present this group as '*Scutigerebella spp.*', covering the counties Østfold, Akershus/Oslo, Hedmark, Oppland, Buskerud, Vestfold, Telemark, Aust-Agder, Vest-Agder, Rogaland, Hordaland and Sør-Trøndelag. All counties, except Østfold and Hordaland, have records dating post 1950.

Already in 1974, "about five" species were known to occur in Norway (Leinaas 1974), based on investigations by Ulf Scheller (135 samples), but no specific names were published until 1978/2005 (Scheller 1978, Andersson et al. 2005). It is therefore reasonable to assume that the five species/species groups mentioned above have been known to occur in Norway for about 40 years, and that no additional species have been discovered during the same period.

## Materials and methods

The main source of material for the present publication is a total of 171 samples collected in Norway by the first author during the years 1991–2012. All specimens were first tentatively identified by the first author, by way of a dissecting microscope (to 56x) and a primitive microscope, but without the use of clearing techniques. The identification keys in Andersson et al. (2005) were used, supplemented with those in Edwards (1959). Subsequently, the second author, in many cases including clearing techniques involving lactic acid, checked all samples. The substantial

investigations by the third author has been included to improve the distribution maps. This material has been identified by the third author.

The Olsen-material is kept partly in the first author's reference collection (29 samples) and partly in the collection of Natural History Museum in Oslo, Norway. All samples are stored in alcohol, except five *Scutigereella causeyae* samples that have unintentionally dried out and are kept dry in tubes. The Scheller-material either is in the third author's collection, in the Natural History Museum in Lund, Sweden or incorporated with the material cared for by Clive Edwards.

All data concerning both the Olsen-material and the Scheller-material are published through BioFokus' database (BAB), which is a GBIF-node, and the records should therefore also be available at Artskart (Artsdatabanken 2013).

### Results concerning the Olsen-material

*Scutigereella* spp. Altogether, 140 of the samples contained specimens belonging to *Scutigereella*.

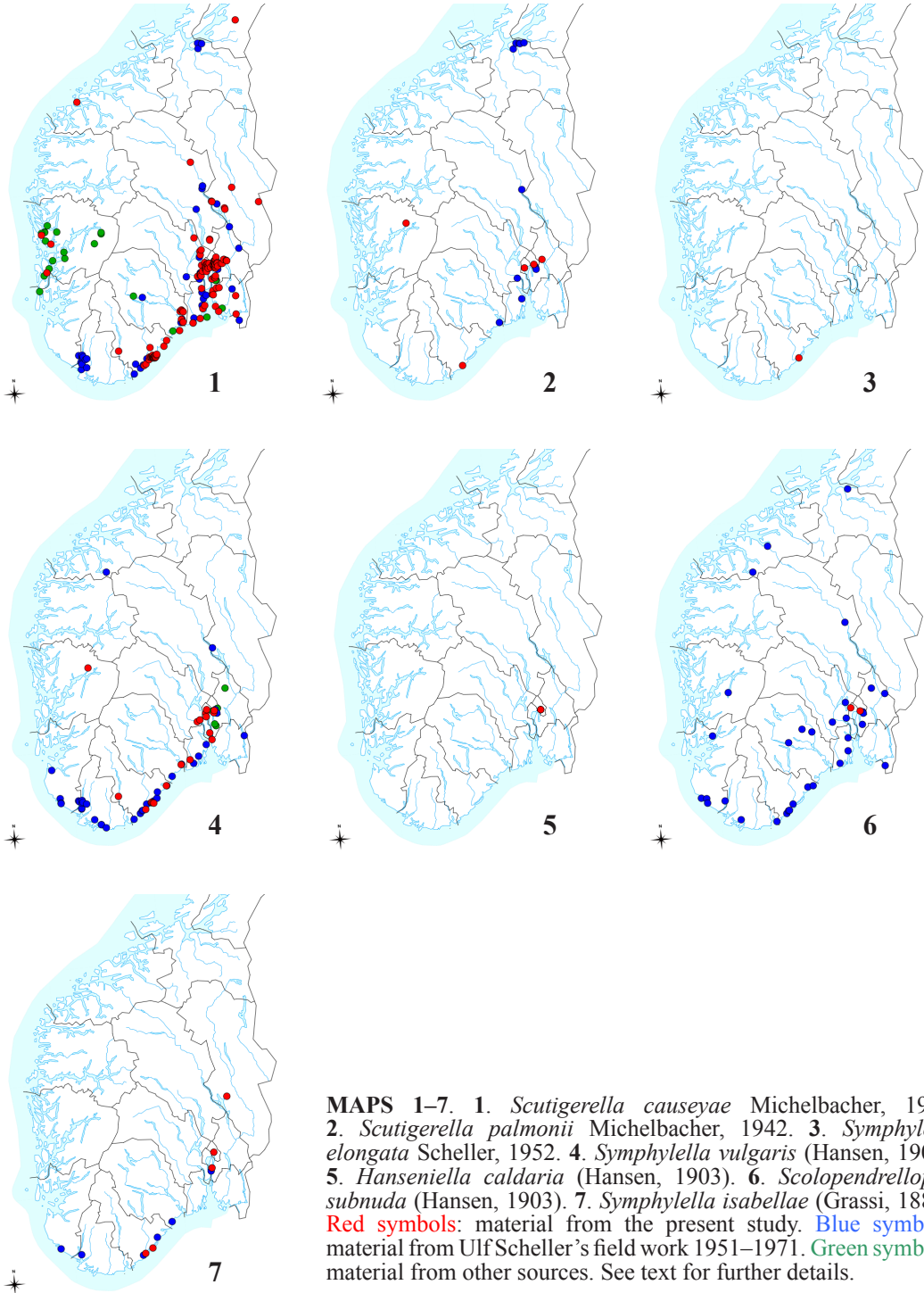
Of these, 135 are assumed to be *Scutigereella causeyae* (Figure 1), five are assumed to be *Scutigereella palmonii* and probably none are *Scutigereella immaculata* (see discussion below). This ratio seriously questions the credibility of the earlier identifications of specimens belonging to this genus. It does, however, not completely rule out the possibility that *S. immaculata* occurs in Norway, if the identity of this species at all can be settled (see below). It is very probable that most or all of these older reports actually concern *S. causeyae*.

Among the present material, *Scutigereella causeyae* was first collected at Semsvann in Asker on 4 May 1991. Specimens are present from the counties Østfold, Akershus, Oslo, Hedmark, Oppland, Vestfold, Telemark, Aust-Agder, Buskerud, Møre og Romsdal and Nord-Trøndelag (Map 1). A total of 560 specimens were collected.

The five localities with *Scutigereella palmonii* are located in the four counties Akershus, Oslo, Aust-Agder and Hordaland (Map 2). The species was first collected from Brånås in Skedsmo, on 4 September 1994. In total, 28 specimens of *S.*



FIGURE 1. *Scutigereella causeyae* Michelbacher, 1942. Photo: Koen Lock.



*palmonii* have been collected.

**A species new to Norway.** With the *S. immaculata*-complex proven to contain (at least) two species in Norway, *Symphylella elongata* is here reported as species number seven in the Norwegian fauna. Three specimens were collected near a small lake, Skogstjern, at Tromøy, Arendal in Aust-Agder County on 15 May 1999 (Map 3).

**New records of *H. caldaria*, *S. isabellae*, *S. subnuda* and *S. vulgaris*.** *Symphylella vulgaris* is seemingly more common than *Hanseniella caldaria*, *Symphylella isabellae* and *Symphylella subnuda*, with 64 specimens from 20 localities, collected between 6 March 1994 and 16 September 2000. The counties Østfold, Akershus,

Oslo, Buskerud, Vestfold, Telemark, Aust-Agder and Hordaland are represented (Map 4).

The other species are less numerous in the present material, with one, two and five localities each. *H. caldaria* has only been collected in the greenhouses in the Botanical Garden at Tøyen, Oslo. The present material contains two specimens from "greenhouse 5" on 28 October 1993, one specimen from "nedre utstillingsdrivhus" on 29 January 1999 and two specimens from "nedre utstillingsdrivhus" on 24 October 2001 (Map 5). This is collectively the same locality as mentioned by Andersson *et al.* (2005) (U. Scheller leg. 1954) and therefore still the only known locality for *H. caldaria* in Norway.

**TABLE 1.** Checklist of Norwegian Symphyla, in comparison with some neighbouring countries. The list is based on Scheller (1978, 1990), Andersson *et al.* (2005, 2008), Lock (2010), GBIF (2013) and British Myriapod and Isopod Group (2013).

Notes: \*) Information from GBIF: records are stated as "Observation" and if this is true, they must be regarded as *Scutigereilla sp.* The same species are regarded as Swedish by Enghoff & Scheller (2013) \*\*) Finland is listed in Scheller (1978) and Andersson *et al.* (2005), but not in Andersson *et al.* (2008). The species is, however, collected many places by Scheller (unpublished data).

Species	Norway	Sweden	Denmark	Finland	Iceland	Belgium	Great Britain
<i>Scutigereilla causeyae</i> Michelbacher, 1942	X	X	-	-	-	X	X
<i>Scutigereilla immaculata</i> (Newport, 1845)	-	??*	-	-	-	-	X
<i>Scutigereilla lineatus</i> Edwards, 1959	-	-	-	-	-	-	X
<i>Scutigereilla linsleyi</i> Michelbacher, 1942	-	-	-	-	-	-	X
<i>Scutigereilla palmonii</i> Michelbacher, 1942	X	??*	-	-	-	X	X
<i>Scutigereilla sp(p)</i> .	-	-	X	X	X	-	-
<i>Hanseniella caldaria</i> (Hansen, 1903)	X	-	X	-	-	X	X
<i>Hanseniella hansenii</i> (Bagnall, 1911)	-	-	-	-	-	-	X
<i>Hanseniella unguiculata</i> (Hansen, 1903)	-	-	-	-	-	-	X
<i>Scolopendrella notacantha</i> Gervais, 1839	-	-	-	-	-	X	X
<i>Scolopendrellopsis arvernorum</i> (Ribaut, 1931)	-	-	-	-	-	-	X
<i>Scolopendrellopsis subnuda</i> (Hansen, 1903)	X	X	X	X**	-	-	X
<i>Symphylella elongata</i> Scheller, 1952	X	X	-	-	-	X	X
<i>Symphylella isabellae</i> (Grassi, 1886)	X	X	-	X	-	X	X
<i>Symphylella major</i> Scheller, 1961	-	-	-	-	-	X	-
<i>Symphylella vulgaris</i> (Hansen, 1903)	X	X	X	X	-	X	X
<b>Number of taxa</b>	<b>7</b>	<b>5(7)</b>	<b>4</b>	<b>3(4)</b>	<b>1</b>	<b>8</b>	<b>14</b>

*Scolopendrellopsis subnuda* was collected on Hovedøya, Oslo on 30 August 1992 (one specimen) and Hujonfjellet, Bærum, Akershus on 7 May 2000 (two specimens) (Map 6). The map indicates, however, due to the Scheller-material, that the species is far more common than these few records suggest.

*Symphylella isabellae* was collected from five localities in the counties Akershus, Oslo, Hedmark and Aust-Agder, with eight specimens (Map 7). The earliest record is from Roligheten skole, Arendal, Aust-Agder on 3 April 1994.

**Distribution.** All the current records (the Olsen-material) are plotted (red dots), together with the material collected by Scheller (blue dots) and older literature and Internet information (green dots) (see Map 1–7). All previous records presented as *Scutigereella immaculata* from Norway are plotted together with *Scutigereella causeyae* (green dots), even though their true identities are not known. Even Olsen's and Scheller's material presented here as *S. causeyae* and *S. palmonii* (red and blue dots on Map 1–2) are only tentatively identified and in need of further investigations.

## Discussion

**Species richness.** The Norwegian fauna contain at least seven species (Table 1). Both the Swedish and the Danish faunas are generally richer than the Norwegian as to both myriapods and other invertebrates, but regarding symphylans, it appears to be the opposite. Countries in continental Europe are usually much richer still, but again Norway show a considerable number of species, for instance almost the same number as Belgium (Lock 2010). Camacho (2009) presents a map, primarily based on Fauna Europaea (Enghoff & Scheller 2013), where the number of species increases gradually towards the south, with more than 20 species present in Spain. Great Britain and Germany are two countries relatively far north with a large number of species. These countries are also probably among the best surveyed in Europe.

Probably more species await discovery in

Norway, as well as in Sweden and Denmark. The seemingly obvious task would be to look for indisputable specimens of *Scutigereella immaculata*. However, an indisputable specimen of *S. immaculata* is at present "an unknown entity" (see below).

### Identification problems in *Scutigereella*.

Whereas the other indigenous Norwegian species are relatively easy to identify, identification within *Scutigereella* is difficult (Scheller 1968). The main challenge is that the first described species in the genus, *Scutigereella immaculata* (Newport, 1845), was established in a period when taxonomy was poorly developed and the delimitation of similar species was a nearly non-existing problem. Even the other early species, *Hanseniella nivea* (Scopoli, 1763) and *Scolopendrella notacantha* Gervais, 1839, have poor descriptions, but have, nonetheless, some good distinguishing characters that make them easily recognizable. *Scutigereella immaculata* later proved to belong to a genus with many similar species that are difficult to distinguish. Before it was evident that the genus had more than one species, *S. immaculata* was reported from numerous localities worldwide. Furthermore, at the beginning of the 20th century, it was observed that large symphylans, at that time regarded as equal to *S. immaculata*, "the garden centipede", caused damages of great economic importance to growing crops. It was reported from all continents except Antarctica, but in many cases without necessary verification. It is evident that many of these reports cannot be trusted and its true distribution is still wrapped in obscurity. Some records have even been found to belong to *Hanseniella*!

In addition, the commonly employed systematic characters in *Scutigereella* have traditionally focused on quantitative traits, such as the degree of emargination of the anterior tergites (strongly emarginated *versus* slightly emarginated), the shape and length of the anterolateral setae of the anterior tergites (long and protruding *versus* shorter and less protruding), the chaetotaxy of the legs (short and sparse setae *versus* longer and more abundant or legs densely setose *versus* sparsely setose). Characters of this type are highly subjective and of very limited

significance.

A further complication is that several of the "older" species have never been properly redescribed and/or typified, but two valuable taxonomic studies on the genus have been published – the first one a synopsis showing that the genus has several species (Michelbacher 1942) and the second one with a redescription of *S. immaculata* (but based on material from Jersey, Channel Isles) (Edwards 1959). Newport's type material is considered lost and the locus typicus is destroyed (nowadays in or close to an underground railway station in London). Unfortunately, neither Michelbacher nor Edwards presented new type material, so the species is still indistinctly defined and it is not possible to establish its identity. Accordingly, it is at present not possible to establish its presence in Norway (or anywhere else, for that matter) and for the same reason the occurrence of e.g. Michelbacher's *S. causeyae* and *S. palmoni* might be questioned.

**Alien species.** Some of the species in Table 1 are aliens to the respective faunas, with records only or mainly from greenhouses and similar places. Norwegian greenhouses are also likely to hold some of these species and a thorough investigation of this "habitat" should be undertaken, not only to look for symphylans, but for all sorts of alien species. In the 2012 Norwegian Black List (Gederaas *et al.* 2012), only *Hanseniella caldaria* is mentioned, although the list is meant also to include *potential* invaders.

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