

# The genus *Ascodesmis* (Pezizales) in Norway

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**Summary:** This report presents the four species of *Ascodesmis* (Ascomycota, Pezizales) recorded in Norway, and an updated map of their distribution. All are coprophilous, and occur on dung of both carnivorous and herbivorous animals. The species are illustrated by scanning electronmicrography of their ascospores, which is the main distinguishing character at species level. Systematics are briefly discussed, and *Ascodesmis* is genetically close to the genus *Eleutherascus*.

**Keywords:** Ascomycota, Pezizales, *Ascodesmidaceae*, *Ascodesmis*, Norway, distribution.

*Ascodesmis* Tiegh. (*Ascodesmidaceae* J. Schröt.), is one of the smallest genera in the Pezizales, comprising six species world-wide, and all are strictly coprophilous. They are rarely collected, but probably overlooked or have escaped attention because of their size, which hardly exceeds 0.5 mm in diameter, or they are really rare. The ascomata are rather simple in anatomy and consist of a bunch of asci with a limited number of colourless paraphyses, and almost no excipulum, with only a few basal cells. The ascospores have the most important characters for the identification of the species. Young spores are hyaline and smooth, before the formation of an ornamentation, which becomes pale to dark brown upon maturity. For further details of the genus, consult BRUMMELEN (1981).

The first record of *Ascodesmis* in Norway was reported by AAS (1978), *A. sphaerospora* W. Obrist on dung of cat in Western Norway. Later on *A. nana* Brumm. and *A. nigricans* Tiegh. were reported by KRISTIANSEN (1994) from SE Norway. New findings have, however, been encountered in recently. Because these species are rarely seen, the purpose of this paper is to extend the knowledge of its distribution in Norway. This is also the first report of *A. microscopica* (P. Crouan & H. Crouan) Seaver in Norway.

## Systematics

The *Ascodesmidaceae* comprises three genera: *Ascodesmis* Tiegh., *Eleutherascus* Arx and *Lasiobolus* Sacc. *Eleutherascus* contains four species, all terrestrial, and very tiny. *Eleutherascus* is an extremely simple organism, and consist exclusively of a few naked asci < 0.1 mm, and represents the simplest ascomata in the *Ascodesmidaceae*. The genus is very much like *Ascodesmis*, and advanced investigation by ultrastructural analyses revealed that the development

and the differentiation of the primary and secondary ascospore wall is equal in every detail in both genera (BRUMMELEN, 1989). This confirms that *Eleutherascus* is genetically closest to *Ascodesmis* and that it should be placed in the *Ascodesmidaceae*. The similarity was later demonstrated by phylogenetic studies, and which indicated also that there is a close relationship between *Ascodesmidaceae* and *Pyronemataceae* (PERRY *et al.*, 2007), and confirms the close relationships of *Ascodesmis*, *Eleutherascus* and *Lasiobolus*, which agree with previous observations of LANDVIK *et al.* (1998).

## Descriptions

***Ascodesmis nana*** Brumm., *Persoonia*, 11 (3): 343 (1981).

**Apothecia** mostly solitary or gregarious, superficial, sessile, < 0.15 mm diameter, barrelshaped or semiglobular, first hyaline then brownish, consisting of a bundle of asci (< 15), surrounded by few paraphyses. **Asci** obovoid or pyriform, 8-spored, (36) 44–50 (72) × 21–30 µm. **Ascospores** irregularly arranged, globular to subglobular, hyaline, turning brown to pale brown upon maturity, (8.7) 9.7–10.7 × (8.9) 9.4–9.6 (10.4) µm, with De Bary bubble in cotton blue, and ornamented with large and small isolated round or somewhat irregular warts, occasional with short crests. **Paraphyses** sparse, septate, simple and hyaline, 4–5 µm broad.

**Material examined:** NORWAY: Østfold, Fredrikstad, Kråkerøy, Allerød, in mixed wood, on fox dung, on a rotten trunk. Collected 27.05.1995; observed in moist chamber 14.06.1995 (RK 95.54). Østfold, Fredrikstad, Torsnes, Mjølnaren close to Tosekilen, on fox dung, in *Pinus* wood. Collected 29.09.2002; observed in moist chamber 4.10.2002 (RK

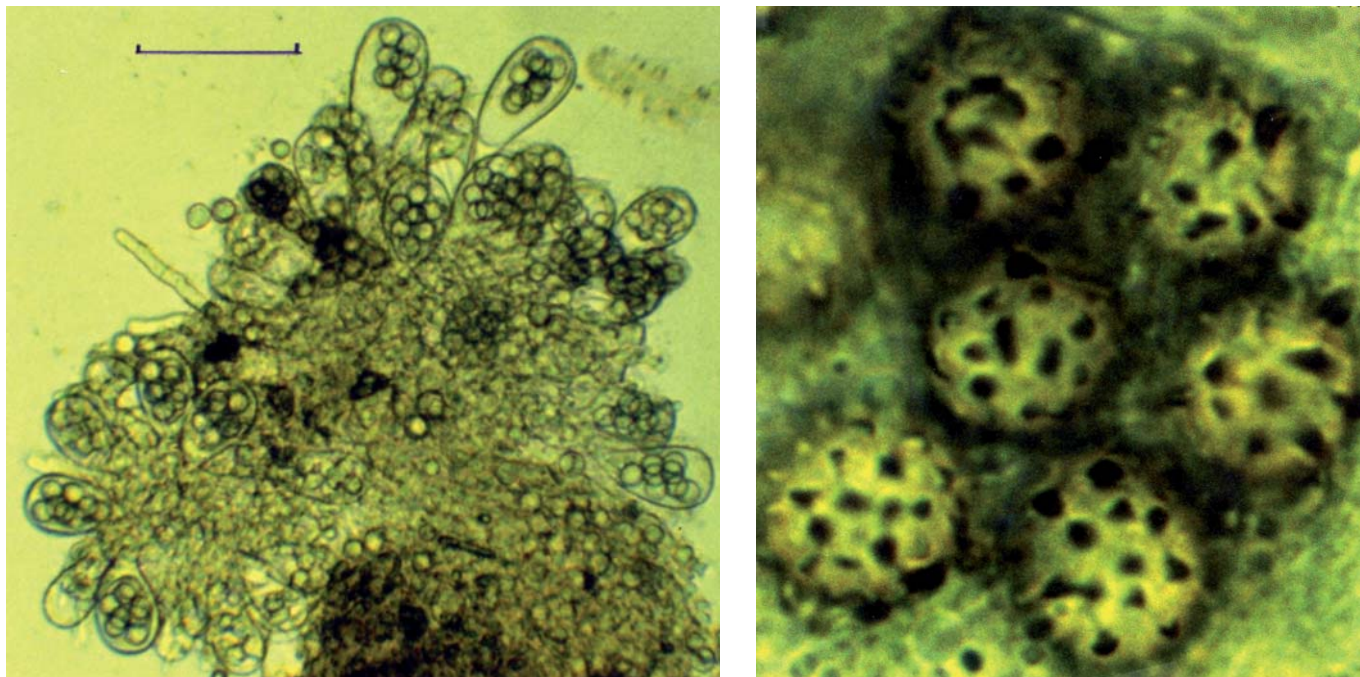


Fig. 1. *Ascodesmis nana*. a. Squashed ascomata in water. b. Ascospores in water. Scale bars: a = 50  $\mu$ m. b = 10  $\mu$ m. Photographs: R. Kristiansen.

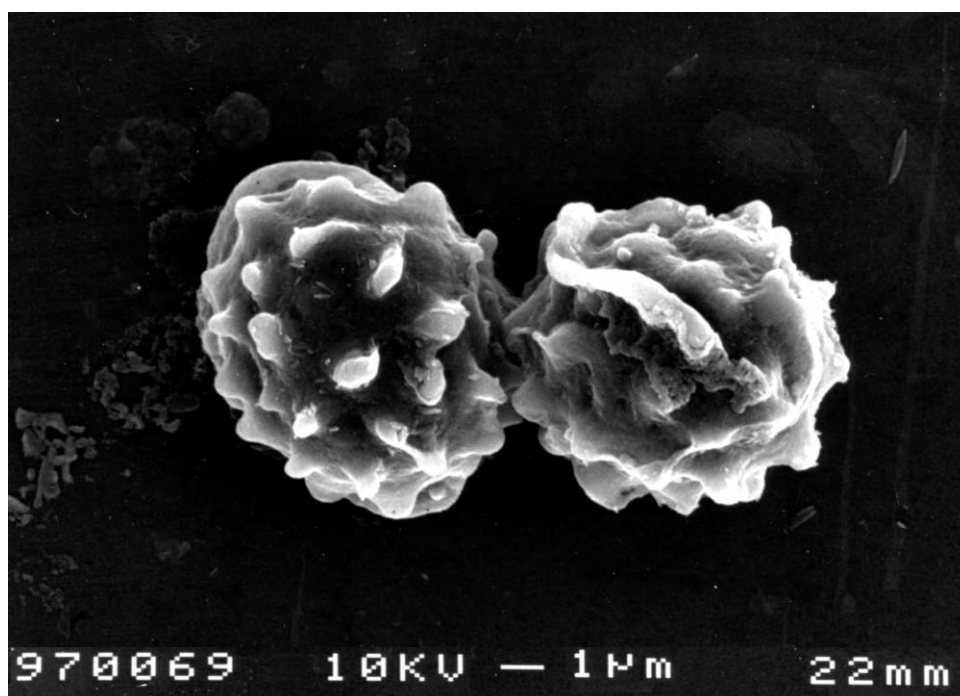


Fig. 2. *Ascodesmis nana*. Scanning electronmicrography of ascospores.

02.28). Østfold, Hvaler, Asmaløy, Huser, on pig dung, in an open field for pigs. Collected September 1992; observed in moist chamber 2.10.1992 (RK 92.52). Herb. (L). Hedmark, Sør-Odal, Skyrud, close to Tangen-bekken, on fox dung, in spruce wood. Collected 5.08.2000 (RK 00.17).

#### Comments

This species is closest to *A. nigricans*, but *A. nana* have smaller and more globose ascospores, and different ornamentation.

The original finding was from Amsterdam Zoo (NL) in 1959 (BRUMMELEN, 1981) on collared peccary (*Tayassu tajacu*). The first find from Norway was on dung of pig, while the next

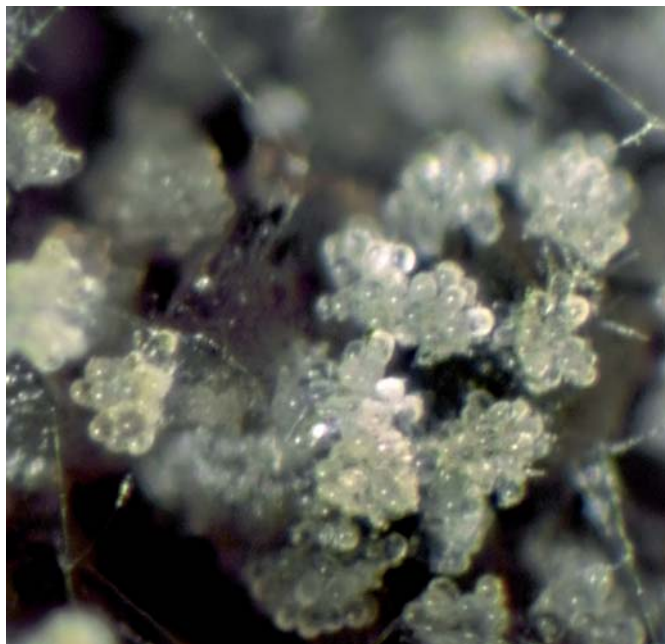
three were on fox dung. *A. nana* has also been reported from Italy on bird dung (DOVERI, 2004).

*Ascodesmis sphaerospora* W. Obrist, *Canad. J. Bot.*, 39 (4): 948 (1961).

Syn. *Ascodesmis microscopica sensu* SEEVER (1916, 1928).

**Apothecia** gregarious, often confluent, superficial, sessile, 0.2–0.3 mm diameter, < 0.2 mm high, first hyaline, becoming brownish upon maturity, obconical, consisting of bundles up to 40 asci. Excipulum absent. **Asci** broadly clavate, 8-spored, 50–92  $\times$  24–30  $\mu$ m. **Ascospores** irregularly





*Ascodesmis nana*. Macroscopic appearance. Photo: R. Kristiansen.

arranged, globular to subglobular, first hyaline, brownish upon maturity,  $10.7-14.2 \times 10.7-13.0 \mu\text{m}$ , ornamented more or less by a regular network of ridges and/or prominent spines. **Paraphyses** up to  $5 \mu\text{m}$  at apex.

**Material examined:** NORWAY: Østfold, Fredrikstad, Kråkerøy, Allerød, in mixed wood, on fox dung, on a rotten trunk. Collected 27.05.1995; observed in moist chamber 14.06.1995 (RK 95.55). Østfold, Hvaler, Asmaløy, Huser, on pig dung, in an open field for pigs. Collected September 1992; observed in moist chamber 2.10.1992 (RK 92.54). Herb. (L).

#### Comments

This taxon seems to be a cosmopolitan species and reported from The Netherlands, Germany, Canada, USA, Brazil, Taiwan, Thailand (JEAMJITT *et al.*, 2007), Venezuela, Japan, Spain

and Norway. It was found on many varieties of dung : lion, tiger, jaguar, ocelot, dog, rabbit, elk (*Alces*), giraffe, toad, and pig (BRUMMELEN, 1981; KRISTIANSEN, 1994)

*Ascodesmis nigricans* Tiegh., *Bull. Soc. bot. Fr.*, 23: 271 (1876).

**Apothecia** gregarious or solitary, superficial, sometimes confluent, sessile, 0.2–0.6 mm diameter, obconical, hyaline, then brownish, 15–25 asci per bundle. **Asci** broadly clavate, 8-spored,  $47-54 \times 21-24 \mu\text{m}$ . **Ascospores** broadly ellipsoid, first hyaline, later dark brown,  $(11.2) 11.8-14.8 \times (7.4) 8.9-10.4 \mu\text{m}$ , ornamented with isolated or anastomosing spines or warts, sometimes confluent, spines flat at their tips. **Paraphyses** equally thick, varying from  $3.0-4.5 \mu\text{m}$ .

**Material examined:** NORWAY: Østfold, Hvaler, Kirkøy, Ørekroken, close to the sea, on fox dung. Collected 19.12.1999; observed in moist chamber 2.01.2000 (RK 99.64). Østfold, Hvaler, Asmaløy, Huser, on pig dung, in an open field for pigs. Collected September 1992; observed in moist chamber 2.10.1992 (RK 92.53). Herb. (L). Østfold, Hvaler, Asmaløy, Landfasten, on fox dung, near a beach. Collected 25.10.1992; observed in moist chamber 8.11.1992 (RK 92.82) (L).

#### Comments

This is another cosmopolitan species and reported from Finland, Denmark, Norway, Sweden, United Kingdom, France, Italy, Libya, Ivory Coast, Kenya, Pakistan, India, Indonesia, Canada, USA, and Venezuela. It was found on dung of dog, fox, rat, pig, sheep, goat, donkey, rabbit, hedgehog, and cattle.

*Ascodesmis microscopica* (P. Crouan & H. Crouan) Seaver, *Mycologia*, 8 (1): 3 (1916).

Basionym: *Ascobolus microscopicus* P. Crouan & H. Crouan, *Ann. sci. nat., bot.*, 4 (7): 175 (1857).

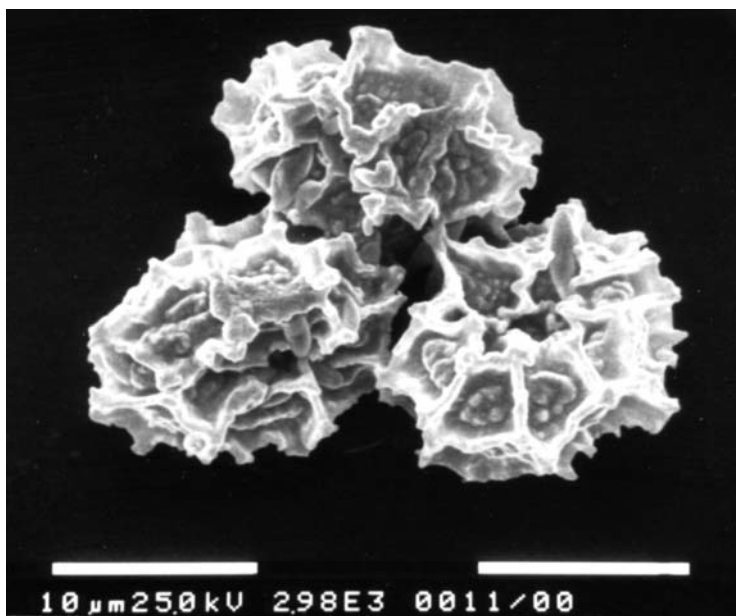
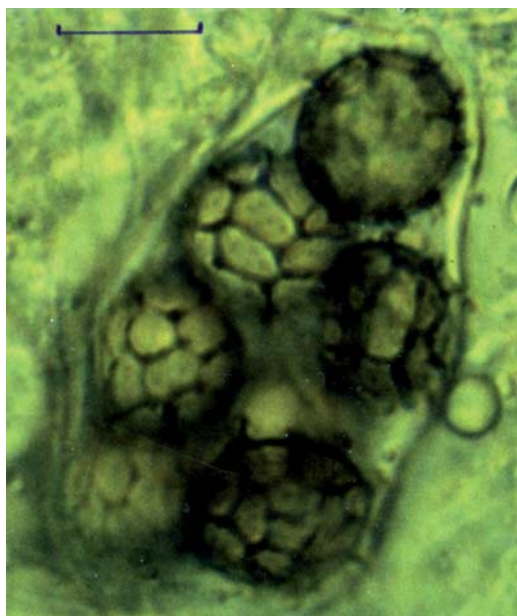


Fig. 3. *Ascodesmis sphaerospora*. a. Ascospores in water. b. Scanning electronmicrography of ascospores. Scale bar : a =  $10 \mu\text{m}$ . Photo: R. Kristiansen.

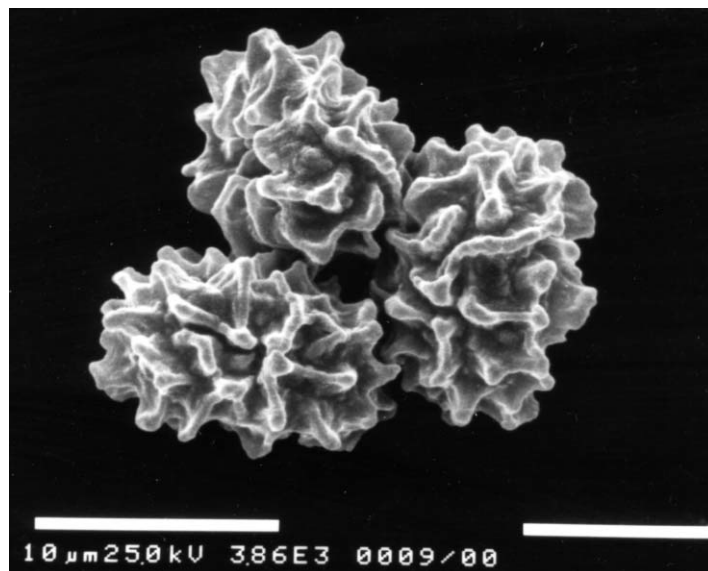


Fig. 4. *Ascodesmis nigricans*. Scanning electronmicrography of ascospores.

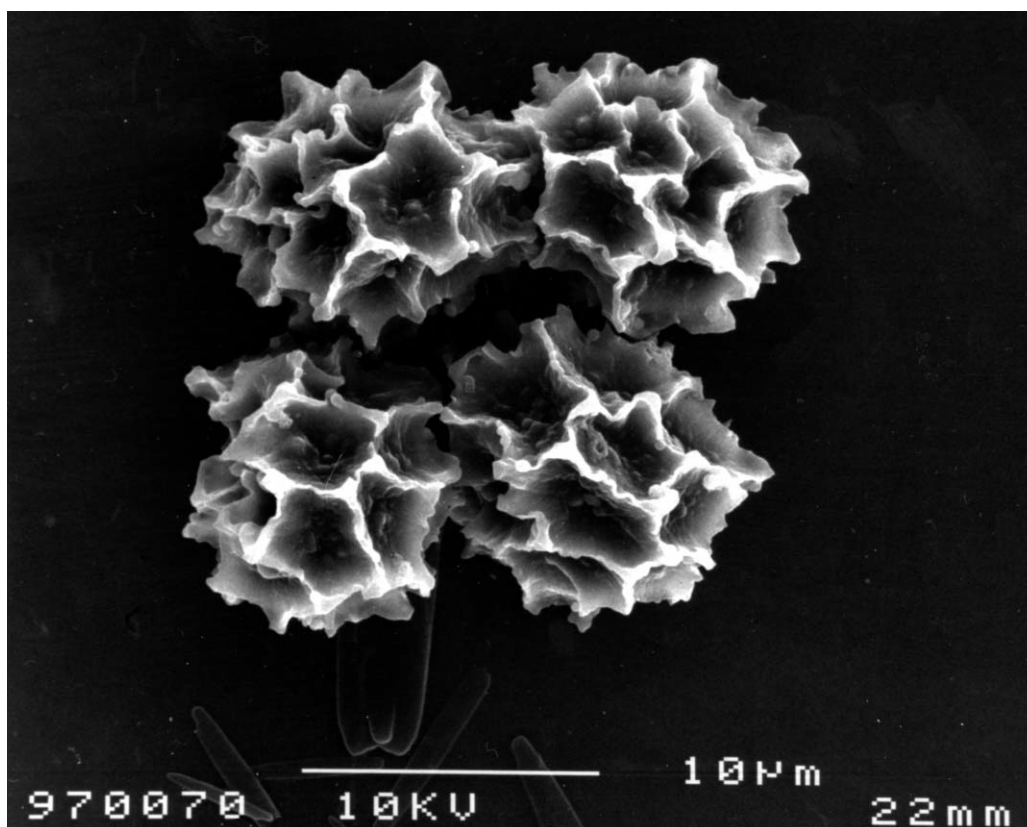


Fig. 5. *Ascodesmis microscopica*. Scanning electronmicrography of ascospores.

**Apothecia** minute, superficial, without excipulum, 0.1–0.25 mm diameter, dark brown when mature. **Asci** broadly clavate to saccate, 88–100 × 24–30 μm, 8-spored. **Ascospores** globose to subglobose, hyaline then brown, 12.0–14.0 μm, ornamented with a reticulated pattern. **Paraphyses** filiform, attenuated at the apex, 3–6 μm wide.

**Material examined:** NORWAY: Østfold, Fredrikstad, Kråkerøy, Allerød, in mixed wood, on fox dung, on a rotten trunk. Collected 27.05.1995; observed in moist chamber 14.06.1995 (RK 95.56). Østfold, Hvaler, Asmaløy, Landfastodden, on fox dung, 15.02.1998 (RK 98.02).

#### Comments

When SEEVER (1916) combined the taxon published by the CROUAN brothers (1857) in *Ascodesmis*, he made a mistake by using this name, because his collection represents another fungus (*Ascodesmis sphaerospora*; see OBRIST, 1961). Although this problem was reported by LE GAL (1949), the combination made by Seaver is valid.

The species is new to Norway, found twice. It seems to be a cosmopolitan species, and reported from United Kingdom, France, Italy, Norway, Ukraine, Germany, Libya, Canada, USA, Venezuela, and Brazil, and found on dung of dog, wolf, rabbit, goat, rat, horse, fox, and hedgehog. *A. microscopica* is



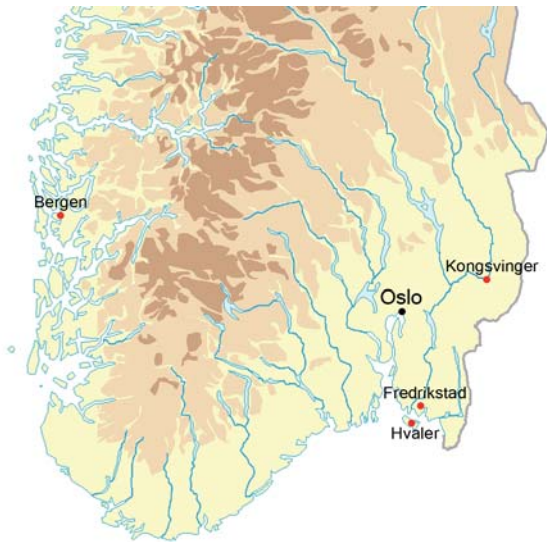


Fig. 6. Distribution of *Ascodesmis* in Norway

closely related to *A. sphaerospora*, but is a distinct species. The ascospores of *A. microscopica* are more ellipsoid and the network is rather irregular and often incomplete, while in *A. sphaerospora* the ascospores are subglobular with a different length/breadth than *A. microscopica*, and ornament is more regular and complete.

## Conclusion

Although *A. nana* has been found on several occasions in Norway, it is still considered to be a rare species, with only two records outside Norway (The Netherlands and Italy). *A. nigricans* and *A. sphaerospora* are probably more common, while *A. microscopica* is less common.

The distribution of the genus in Norway is restricted to parts of the country where mycologists have collected other coprophilous fungi or simply accidental.

Of the two species not yet found in Norway, *A. macrospora* and *A. porcina*, the first is only found once in Europe in Amsterdam Zoo, on crocodile dung (BRUMMELEN, 1981), while the latter has only been found outside Europe.

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I am very grateful to late Henry Dissing and to Sara Landvik for arranging scanningelectron micrographs of ascospores, and to Mike Richardson for reviewing the manuscript. This manuscript benefited from the editorial work of Nicolas Van Vooren

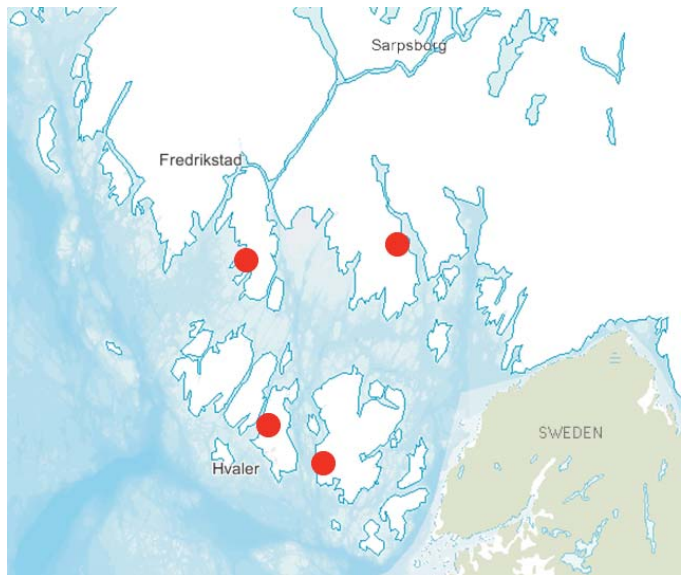


Fig. 7. Distribution of *Ascodesmis* in the county of Østfold

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