Sanja Tibell*, Leif Tibell, Ka-Lai Pang and E.B. Gareth Jones A conspectus of the filamentous marine fungi of Sweden

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Abstract: Marine filamentous fungi have been little studied in Sweden, which is remarkable given the depth and width of mycological studies in the country since the time of Elias Fries. Seventy-four marine fungi are listed for Sweden based on historical records and recent collections, of which 16 are new records for the country. New records for the country are based on morphological identification of species mainly from marine wood, and most of them from the Swedish West Coast. In some instances, the identifications have been made by comparisons of sequences obtained from cultures with reference sequences in Gen-Bank. Corollospora angusta, Corollospora filiformis, and Corollospora pulchella, previously known from tropical/ subtropical areas, are recorded for the first time for Sweden. The arctic Havispora longyearbyensis was also found. Kalmusia longispora and Neocamarosporium calvescens were reported for the first time from marine habitats.

Keywords: aquatic fungi; checklist; diversity; ecology; new records.

Introduction

From an international perspective, marine fungi of Sweden have been rather neglected. This is in contrast to the upsurge of interest in this important group of fungi in other parts of the world, for a review see Jones et al. (2009, 2015). Assessments of marine fungal diversity have been mostly based on morphological studies, however often the very small size of these organisms and/or the insufficient morphological distinctive features limit considerably the census of the biodiversity of this component. For marine fungi, the recent application of molecular approaches offers a useful tool for the census of their biodiversity, where a wealth of hidden biodiversity is still to be uncovered. However, there are still different shortcomings and downsides that prevent the extensive use of molecular data without the support of classical taxonomic identification.

Marine wood long remained the main focus for studies of marine filamentous fungi (MFF), however studies by Zuccaro et al. (2008), and Suryanarayanan (2012) have shown a rich diversity of these fungi also associated with marine algae (Jones et al. 2012).

The first report on marine fungi from Sweden was by Cotton (1909). An early Swedish study concerned nutritional requirements of marine fungi (Gustafsson and Fries 1956) and in a subsequent study Fries (1979) described the physiology of what he described as an "algal endophyte", viz. Mycophycias ascophylli (Cotton) Kohlm. et Volkm.-Kohlm. The material used by Gustafsson and Fries was mainly obtained from wooden panels submersed at Kristineberg (now the Sven Lovén Centre for marine infrastructure, Gothenburg University) by Rolf Santesson and the material was identified by him. In a thesis work (Erneholm 1972, in Swedish) the methodology for studying and cultivating marine fungi was described. The investigation was focused on marine fungi occurring on algae from two areas, the Swedish West Coast and Kenya. The paper also included discussions of the ecology of marine fungi and generally aimed as an introduction to marine mycology in Sweden. The thesis of Erneholm remained unpublished and his results were overlooked, although to some extent was referred to by Henningsson (1974). Erneholm reported 12 "deuteromycete" species (asexual morphs) from Sweden. The first paper attempting to uncover the diversity of Swedish MFF was that of Henningsson (1974) on lignicolous marine fungi. The material was mostly obtained from wooden panels exposed in three different areas along the Swedish coasts, including the Baltic, where 34 species (as accepted here) were recorded. Henningsson (1976a,b) also published on wood decay and the physiology of marine fungi. Subsequently, Tibell (2016) documented another seven species previously unknown from Sweden. The aim

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of this paper is to provide a review of earlier research on MFF in Sweden and an updated check-list for the country.

Materials and methods

New and additional records in this paper originate from seven localities in Bohuslän and two in Uppland in Sweden (see http://mapsof.net/sweden/provinces-ofsweden). Most of the material was collected from driftwood and wooden panels submerged for about 1 year at the marine biology stations Sven Lovén Centre for marine infrastructure (Gothenburg University) and Klubban Biological Station (Uppsala University), both located close to Fiskebäckskil at the Gullmar Fjord in Bohuslän.

Cultures were obtained by squashing fungal fruiting bodies from wood in seawater and spreading onto Potato Dextrose Agar (Sigma-Aldrich, USA) plates with seawater, and Kanamycin A added. The mycelial cultures obtained after incubation for 4–16 weeks were used for DNA isolation. The DNeasy Plant Mini Kit (Qiagen, Hillden, Germany) was used for isolating total DNA following the instructions of the manufacturer.

Diluted (1:10) or undiluted DNA (3 µl) was used for PCR amplifications which also included the AccuPower® PCR PreMix (Bioneer, Daejeon, Republic of Korea), adding 1.5 µl of each primer (10 µM) and water to a total volume of 20 µl. Primers used were for ITS: ITS1f (Gardes and Bruns 1993), and ITS 4 (White et al. 1990). Thermal cycling parameters were: initial denaturation for 4 min at 95°C, followed by 35 cycles of 1 min at 94°C, 1 min at 54°C, 45 s at 72°C, and final elongation for 5 min at 72°C. Amplification products were visualized on 0.5% agarose gels stained with gel red and the PCR product was purified using the Illustra[™] ExoStar buffer diluted 10×, following the manufacturer's protocol. Sequencing, automated reaction clean up and visualization were carried out as described by Macrogen Inc., Korea (www.macrogen.com). The ITS sequences obtained were compared with sequences using the UNITE database for molecular identification (https://unite.ut.ee/; Nilsson et al. 2018). Newly produced sequences have been deposited in GenBank.

Results: an annotated list of Swedish species of filamentous marine fungi

The following is an alphabetical list of MFF from Sweden with comments on their ecology and distribution. A

supplementary list is provided for historical taxa insufficiently described for inclusion in the main list (Supplementary Table S1).

1. Alternaria maritima G.K. Sutherl., New Phytol. 15: 46 (1916)

Substrate and distribution: *Zostera*, brown and red algae and marine wood. Bohuslän, Västergötland. **Notes:** Also recorded by Erneholm (1972) and Henningsson (1974). Possibly only facultatively marine.

- Amphitrite annulata S. Tibell, Svensk Mykologisk Tidskrift 37: 45 (2016)
 Substrate and distribution: Marine wood. Bohuslän. Additional record: Bohuslän, Skaftö par., Klubban, 58°15′04″N, 11°27′52″E, on wooden panels submerged for c 1 year, 22.VI 2017, ST 18-76 (UPS).
 Notes: Described from the Swedish West Coast (Tibell 2016).
- Amylocarpus encephaloides Curr., Proc. R. Soc. Lond., B. Biol. Sci. 9: 119 (1857–1859) (Figure 1) Substrate and distribution: Marine wood. Ångermanland, Bohuslän, Medelpad, Västerbotten, Öland. Notes: Reported by Henningsson (1974) from the Baltic. Further reports from the Baltic Coast (Eriksson 2014) and also from the Swedish West Coast (Tibell 2016).
- Arenariomyces trifurcatus Höhnk, Veröff. Inst. Meeresf. Bremerhaven 3: 30 (1954)
 Substrate and distribution: Marine wood. Skåne. Notes: Reported by Henningsson (1974) as Corollospora trifurcata (Höhnk) Kohlm.
- 5. Arthrinium arundinis (Corda) Dyko et B. Sutton, Mycotaxon 8(1): 119 (1979)

Substrate and distribution: Marine wood. Bohuslän, Skaftö par., Fiskebäckskil, Rödbergsviken, 58°15′08″N, 11°27′57″E, 27.VII 2016, ST 16-02 (UPS). <u>New record for Sweden.</u>

Notes: Isolated and cultivated from marine wood, where only pycnidium initials were observed. Identified by ITS-sequence (Isol. ST14): GenBank MN058989. This sequence (Length = 576; database(s) used: UNITE (fungi) + INSD (=GenBank, EMBL, DDBJ) + Envir.) blasted (database: data/unite_full_blastn.fas) with a highest total score of 1040 and E value 0.0 for GenBank: KX533933, with Identities = 576/576 (100%) and UNITE taxon name *Arthrinium arundinis*. *Arthrinium* from marine habitat was reported by Schulz et al. (2008). Occurrences of *Arthrinium* in marine habitat were further given by Hong et al. (2015). A record of *A. arundinis* in sea water was reported by Bovio et al. (2017). See also Réblová et al. (2016).

6. *Botrytis cinerea* Pers., Syn. meth. fung. (Göttingen) 2: 690 (1801)



Figure 1: Amylocarpus encephaloides.

(A–B) Ascomata on the surface of wood. Scale bars = 500 μ m. (C) Section of ascoma with centrum with ascospores. Scale bar = 130 μ m. (D–E) Higher magnification of the ascoma wall. Scale bars = 30 μ m (D) 20 μ m (E). (F–I) Ascospores with radiating appendages. Rehydrated herbarium material (Santesson No. 11392, collected in 1956). Scale bars = 10 μ m.

Substrate and distribution: *Ceramium virgatum*. Bohuslän, Skåne.

Notes: Reported by Erneholm (1972). Isolated from *Ceramium virgatum* in Bohuslän and Skåne. This is a widespread parasite/saprobe on land plants not otherwise reported from marine habitats.

7. *Cadophora fastigiata* Lagerb. *et* Melin, in Lagerberg, Lundberg *et* Melin, Svensk Skogsvårdsförening Tidskr. 25: 263 (1927)

Substrate and distribution: Marine wood. Ångermanland, Bohuslän, Medelpad, Norrbotten, Öland, Södermanland, Uppland.



Figure 2: Marine fungi of Sweden.

(A) Remispora cucullata; (B) Corollospora angusta; (C) Corollospora filiformis; (D) Ocostaspora apilongissima; (E) Lulwoana uniseptata; (F) Argentinomyces sp.; (G) Remispora maritima; (H) Havispora longyearbyenensis; (I) Lautisporopsis circumvestita; (J) Remispora pilleata. Scale bars = 10 μm.

Notes: Reported by Henningsson (1974) as *Phialophora fastigiata* (Lagerb. *et* Melin) Conant. Not included in Eriksson (2014), although present in the database Dyntaxa: https://www.dyntaxa.se/Taxon/Info/6009202?changeRoot=True. *Cadophora* are mainly known as terrestrial pathogens on plants. *Cadophora* was also mentioned to occur in Svalbard (Rämä et al. 2014).

8. *Calycina marina* (Boyd) Rämä *et* Baral, Bot. Mar. 58: 527 (2015)

Substrate and distribution: *Fucus*. Bohuslän, Gotland, Skåne.

Notes: Reported by Eriksson (1973) as *Orbilia marina* Boyd from Bohuslän and Skåne. In Eriksson (2014) also indicated to occur in Gotland, and Tibell (2016) from Gotland as *Cadophora marina*.

9. Ceriosporopsis halima Linder, Farlowia 1(3): 409 (1944)

Substrate and distribution: Marine wood. Öland, Uppland.

Notes: Reported by Henningsson (1974) from both the Swedish Baltic and West coasts.

10. *Cirrenalia macrocephala* (Kohlm.) Meyers *et* R.T. Moore, Am. J. Bot. 47: 347 (1960)

Substrate and distribution: *Ceramium virgatum* and marine wood. Bohuslän, Skåne. <u>Additional</u> <u>record:</u> Bohuslän, Skaftö par., Klubban, 58°15′04″N,

11°27′52″E, on wooden panel, 22. VI 2017, ST 17-32 (UPS).

Notes: Reported by Erneholm (1972) and Henningsson (1974). Teleomorph in the Halosphaeriaceae, Microascales (Jones et al. 2009). The records may refer to *Cirrenalia basiminuta* Raghuk. *et* Zainal, a species quite similar to *Cirrenalia macrocephala*, but not yet described at the time of publication of the records mentioned.

11. Corollospora angusta Nakagiri et Tokura, Trans. Mycol. Soc. Japan 28(4): 417 (1988) [1987] (Figure 2B)

Substrate and distribution: Marine wood. Bohuslän, Skaftö par., Fiskebäckskil, Bökevik, 58°14′51″N, 11°27′10″E. VI 2017. <u>New to Sweden.</u>

Notes: This species also shows large disjunctions in its distribution, having been described from Japan, Portugal (Sridhar et al. 2013) and Korea (Hong et al. 2015).

12. *Corollospora borealis* S. Tibell, Svensk Mykologisk Tidskrift 37: 47 (2016).

Substrate and distribution: Marine wood. Bohuslän. <u>Additional record:</u> Bohuslän, Skaftö par., Klubban, 58°15′04″N, 11°27′52″E, on wooden panels submerged for c 1 year, 22.VI 2017, ST 18-78a (UPS).

Notes: Described from Bohuslän on material collected by Santesson.

13. Corollospora filiformis Nakagiri, in Nakagiri et 18. Didymella glomerata (Corda) Qian Chen et L. Cai, Tokura, Trans. Mycol. Soc. Japan 28(4): 422 (1988) (Figure 2C)

Substrate and distribution: Marine wood. Bohuslän, Skaftö par., Fiskebäckskil, Rödbergsviken, 58°15'08"N, 11°27'57"E, 22.VI 2017, on driftwood, ST 17-25, 17-26 (UPS); Bökevik, 58°14′51″N, 11°27′10″E. New to Sweden.

Notes: Described from Japan and considered to be a subtropical species. It has, however, proven to be rather widespread and has also been reported from India (Mathrubutham et al. 2009) and Thailand (Jones et al. 2006). Nevertheless, the disjunction to northern Europe is considerable.

14. Corollospora maritima Werderm., Notizblatt des Königl. bot. Gartens u. Museum zu Berlin 8: 248 (1922)

Substrate and distribution: Marine wood. Bohuslän, Skåne. Additional records: Bohuslän, Mollösund par., Mollösund, Kattevik, 58°04'32"N, 11°28'08"E, 6.VI 2018, ST 18-23d (UPS), on driftwood; Edshultshall, 58°06'58"N, 11°28'05"E, ST 18-31 (UPS). Skaftö par., Kristineberg, 58°14'59"N, 11°26'49"E, on wooden panels submerged for c 1 year, 5.VI 2018, ST 18-03, 18-89 (UPS); Klubban, 58°15'04"N, 11°27'52"E, on wooden panels submerged for c 1 year, 22.VI 2017, ST 18-75, 18-78b (UPS). Tjärnö par., Sydkoster, Långvik, 58°52'59"N, 11°00'32"E, marine driftwood, 20.VI 2017, ST 18-93 (UPS).

Notes: Reported by Henningsson (1974) and Tibell (2016).

15. Cosmospora butyri (J.F.H. Beyma) Gräfenhan, Seifert et Schroers, in Gräfenhan, Schroers, Nirenberg et Seifert, Stud. Mycol. 68: 96 (2011)

and distribution: Marine Substrate wood. Norrbotten.

Notes: Reported by Henningsson (1974) as Acremonium butyri (J.F.H. Beyma) W. Gams from Norrbotten. Not recorded in Eriksson (2014), although documented in Dyntaxa: (https://www.dyntaxa.se/ Taxon/SearchResult/6009694).

16. Dictyosporium pelagicum (Linder) G.C. Hughes ex E.B.G. Jones [as "pelagica"], Trans. Br. Mycol. Soc. 46(1): 137 (1963)

Substrate and distribution: Marine wood. Uppland, Väddö par., Nothamn, 8.VIII 2018, ST 18-34, 18-39 (UPS). New to Sweden.

17. Didymella fucicola (G.K. Sutherl.) Kohlm., Phytopath. Z. 63: 342 (1968)

Substrate and distribution: Fucus vesiculosus. Bohuslän.

Notes: Reported by Eriksson (2014).

in Chen, Jiang, Zhang, Cai et Crous, Stud. Mycol. 82: 176 (2015)

Substrate and distribution: Marine wood. Öland.

Notes: Reported by Henningsson (1974) as Phoma glomerata (Corda) Wollenw. et Hochapfel. The identification can be questioned considering the multitude of species described in *Phoma* and the ensuing taxonomic and nomenclatural affiliations (www. marinefungi.org). Phoma glomerata is a common parasite on land plants. Not included in Eriksson (2014), although present in the database Dyntaxa (https:// www.dvntaxa.se/). Previously reported from marine habitats.

19. Digitatispora marina Doguet, C. r. hebd. Séanc. Acad. Sci., Paris 254(25): 4338 (1962) Substrate and distribution: Marine wood. Bohuslän and Öland.

Notes: Reported by Henningsson (1974).

20. Diplodia orae-maris Linder, Farlowia 1(3): 403 (1944)

Substrate and distribution: Marine wood. Bohuslän, Skaftö par., Fiskebäckskil, Rödbergsviken, 58°15'08"N, 11°27'57"E, on driftwood, 18.VI 2017, ST 17-15 (UPS). New to Sweden.

Notes: Diplodia belongs in Botryosphaeriaceae, where most species are land-living endophytes, saprobes and plant pathogens and only two species have been recorded from marine habitats.

21. Halenospora varia (Anastasiou) E.B.G. Jones, Fungal Diversity 35: 154 (2009)

Substrate and distribution: Marine wood. Ångermanland, Bohuslän, Uppland. Additional records: Bohuslän, Mollösund par., Mollösund, Kattevik, 58°04'32"N, 11°28'08"E, 6.VI 2018 ST 18-24, 18-80 (UPS), on driftwood. Skaftö par., Fiskebäckskil, Rödbergsviken, 58°15′08″N, 11°27′57″E, on driftwood, 18.VI 2017, ST 17-21 (UPS); Klubban, 58°15'04"N, 11°27′52″E, on wooden panels submerged for c 1 year, 22.VI 2017, ST 17-35 (UPS); Kristineberg, 58°14'59"N, 11°26′49″E, on wooden panels submerged for c 1 year, 5.VI 2018, ST 18-04, 18-07 (UPS). Uppland, Väddö par., Nothamn, 8.VIII 2018, ST 18-56, 18-58 (UPS). New to Uppland.

Notes: Reported by Henningsson (1974) as Zalerion varia Anastasiou from the Swedish Baltic and West Coasts.

22. Haligena elaterophora Kohlm., Nova Hedwigia 3: 87 (1961)

Substrate and distribution: Marine wood. Medelpad, Södermanland, Uppland. Additional records: Bohuslän, Tjärnö par., Sydkoster, Långvik, 58°52′59″N, 11°00′32″E, marine driftwood, 20.VI 2017, ST 18-92, 102 (UPS).

Notes: Reported by Henningsson (1974).

23. *Halobyssothecium obiones* (P. Crouan *et* H. Crouan) Dayar., E.B.G. Jones *et* K.D. Hyde, Mycological Progress 17 (10): 1165 (2018)

Substrate and distribution: Marine wood. Ångermanland, Uppland.

Notes: Reported by Henningsson (1974) from the Swedish Baltic Coast as *Leptosphaeria discors* Sacc. *et* Ellis.

24. *Halokirschsteiniothelia maritima* (Linder) Boonmee *et* K.D. Hyde, in Boonmee, Ko Ko, Chukeatirote, Hyde, Chen, Cai, McKenzie, Jones, Kodsueb *et* Bahkali, Mycologia 104(3): 705 (2012)

Substrate and distribution: Marine wood. Bohuslän, Gotland. Also indicated by Eriksson (2014) to occur in Skåne. <u>Additional records:</u> Bohuslän, Mollösund par., Edshultshall, 58°06′58″N, 11°28′05″E, ST 18-32 (UPS). Skaftö par., Fiskebäckskil, Klubban, 58°15′04″N, 11°27′52″E, 27.III 2016, ST16-18 (UPS); Kristineberg, 58°14′59″N, 11°26′49″E, 18.VI 2017, ST 18-83 (UPS). Tjärnö par., Sydkoster, Långvik, 58°52′59″N, 11°00′32″E, marine driftwood, 20.VI 2017, ST 18-97 (UPS).

Notes: Reported by Eriksson (2014) from Bohuslän (several Santesson collections), and Tibell (2016) from Gotland.

25. Halosphaeria appendiculata Linder, Farlowia 1: 412 (1944)

Substrate and distribution: Marine wood. Bohuslän. <u>Additional records:</u> Bohuslän, Skaftö par., Kristineberg, 58°14′59″N, 11°26′49″E, 27.VII 2016, ST16-01b (UPS); Fiskebäckskil, Bökevik, 58°14′51″N, 11°27′10″E, on driftwood, 18.VI 2017, ST 17-17 (UPS).

Notes: Reported by Henningsson (1974).

26. *Halosphaeriopsis mediosetigera* (Cribb *et* J.W. Cribb) T.W. Johnson, J. Elisha Mitchell scient. Soc. 74: 44 (1958)

Substrate and distribution: *Ceramium, Furcellaria*, and marine wood. Bohuslän, Öland, Skåne, Södermanland, Uppland. <u>Additional record:</u> Bohuslän, Mollösund par., Mollösund, Kattevik, 58°04'32"N, 11°28'08"E, on driftwood, 6.VI 2018 ST 18-26, 18-82a (UPS). <u>New to Uppland.</u>

Notes: Reported by Erneholm (1972) as *Culcitalna achraspora* Meyers *et* R.T. Moore from Bohuslän, and Henningsson (1974) under the same name from Öland and Skåne. Henningsson (1974) also reported it as *Halosphaeria mediosetigera* Cribb *et* J.W. Cribb.

Trichocladium achrasporum (Meyers *et* R.T. Moore) M. Dixon was linked to *H. mediosetigera*, its sexual morph, by Shearer and Crane (1977) and has thus been reduced to a synonym of *H. mediosetigera*.

27. Havispora longyearbyenensis K.L. Pang et Vrijmoed, Mycologia 100(2): 293 (2008) (Figure 2H) Substrate and distribution: Marine wood. Bohuslän, Mollösund par., Mollösund, Kattevik, 58°04'32"N, 11°28'08"E, 6.VI 2018 ST 18-82b (UPS), on driftwood. Tjärnö par., Sydkoster, Långvik, 58°52'59"N, 11°00'32"E, marine driftwood, 20.VI 2017, ST 17-19 (UPS); Sydkoster, Brevik, 58°52'18"N, 11°02'00"E, 20.VI 2017. New to Sweden.

Note: Originally described from Svalbard, this species has now been shown to have a wider distribution occurring also in Bohuslän.

28. Jalapriya toruloides (Corda) D'souza, H.Y. Su, Z. Luo et K.D. Hyde, Fungal Diversity 80: 478 (2016) Substrate and distribution: Marine wood. Bohuslän, Öland, Södermanland. <u>Additional record:</u> Bohuslän, Skaftö par., Fiskebäckskil, Rödbergsviken, 58°15′08″N, 11°27′57″E, on driftwood, 18.VI 2017, ST 17·15 (UPS).

Notes: Reported by Henningsson (1974) as *Dictyosporium toruloides* (Corda) Guég.

29. *Kalmusia longispora* (Verkley, Göker *et* Stielow) Ariyawansa *et* K.D. Hyde, in Ariyawansa, Tanaka, Thambugala, Phookamsak, Tian *et* Campo, Fungal Diversity 68: 85 (2014)

Substrate and distribution: Marine wood. Bohuslän, Skaftö par., Kristineberg, Blåbergsholmen, 58°15′05″N, 11°26′28″E, 27.VII 2016, on driftwood, ST16-07 (UPS; Isol. ST13, GenBank MN058990), ST 16-10 (UPS), 16-11 (UPS), 16-12 (UPS), 16-13 (UPS), 16-14 (UPS), 16-16a (UPS), 16-17a (UPS). <u>New to Sweden.</u>

Notes: This species was repeatedly collected from marine wood in Kristineberg in 2016 and 2017. It has brown, muriform spores. An ITS sequence from culturing (ST13) was identified by sequence comparison (Length=925; Score (Bits) 1669, E Value 0.0), INSD sequence: GenBank: JX496115, with Identities=925/925 (100%), UNITE taxon name: *Kalmusia longispora*.

Based on SSU, LSU, RPB2 and TEF1 sequence data Ariyawansa et al. (2014) transferred *Dendrothyrium longisporum* Verkley, Göker *et* Stielow, in Verkley, Dukik, Renfurm, Göker *et* Stielow to *Kalmusia*. The material studied belongs to the sexual morph. Earlier known as an endophyte of land plants.

30. Lautisporopsis circumvestita (Kohlm.) E.B.G. Jones, Yusoff et S.T. Moss, in Jones, Mycotaxon 67: 1 (1998) (Figure 2I) **Substrate and distribution:** Marine wood. Bohuslän, Mollösund par., Edshultshall, 58°06′58″N, 11°28′05″E, ST 18-33 (UPS). Skaftö par., Fiskebäckskil, Rödbergsviken, 58°15′08″N, 11°27′57″E, 22.VI 2017, on driftwood, ST 18-27 (UPS); Fiskebäckskil, Rödbergsviken, 58°15′08″N, 11°27′57″E, 18.VI 2017. <u>New to Sweden.</u>

31. *Lautitia danica* (Berl.) S. Schatz, Can. J. Bot. 62(1): 31 (1984)

Substrate and distribution: *Chondrus crispus* Stackhouse. Bohuslän.

Notes: Reported by Eriksson (2014) based on Santesson collections.

- 32. Lentithecium rarum (Kohlm., Volkm.-Kohlm. et O.E. Erikss.) Suetrong, Sakay., E.B.G. Jones, Kohlm. et Volkm.-Kohlm., Stud. Mycol. 64: 145–154 (2010) Substrate and distribution: Marine wood. Bohuslän, Skaftö par., Fiskebäckskil, Rödbergsviken, 58°15′08″N, 11°27′57″E, 22.VI 2017, ST 17-15 (UPS). New to Sweden.
- 33. *Leptosphaeria pelagica* E.B.G. Jones, Trans. Br. mycol. Soc. 45(1): 105 (1962)

Substrate and distribution: Marine wood. Bohuslän, Norrbotten, Uppland. <u>Additional records:</u> Bohuslän, Skaftö par., Kristineberg, 58°14′59″N, 11°26′49″E, 18.VI 2017, ST 17-09 (UPS); Fiskebäckskil, Rödbergsviken, 58°15′08″N, 11°27′57″E, 18.VI 2017.

Notes: Reported by Henningsson (1974) as *Leptosphaeria contecta* Kohlm. from Bohuslän, Norrbotten and Uppland. Tibell (2016) as *Leptosphaeria pelagica* from Bohuslän.

34. *Leucosporidium scottii* Fell, Statzell, I.L. Hunter *et* Phaff, Antonie van Leeuwenhoek 35(4): 440 (1970) [1969]

Substrate and distribution: Decaying algae. Uppland.

Notes: Reported by Tibell (2016) from Uppland. *Leucosporidium scottii* is a widely distributed yeast, recorded as abundant in British Columbia (Summerbell 1983), and particularly on brown algae.

35. *Lignincola laevis* Höhnk, Veröff. Inst. Meeresf. Bremerhaven 3: 216 (1955)

Substrate and distribution: Marine wood. Bohuslän, Gotland, Skåne, Småland, Södermanland. <u>Additional</u> <u>records:</u> Bohuslän, Skaftö par., Kristineberg, 58°14′59″N, 11°26′49″E, on wooden panels submerged for c 1 year, 5.VI 2018, ST 18-86 (UPS); Fiskebäckskil, Klubban, 58°15′04″N, 11°27′52″E, on wood panel submerged for 12 months, 22.VI 2017, ST 17-31, 17-33 (both UPS).

Notes: Reported by Henningsson (1974) from Bohuslän, Skåne and Södermanland and by Tibell (2016) from Bohuslän, Gotland and Småland. Lulwoana uniseptata (Nakagiri) Kohlm., Volkm.-Kohlm., J. Campb., Spatafora *et* Gräfenhan, Mycol. Res. 109(5): 562 (2005) (Figure 2E)

Substrate and distribution: *Ceramium, Cladophora*, and marine wood. Ångermanland, Bohuslän, Skåne, Södermanland. <u>Additional records:</u> Bohuslän, Skaftö par., Fiskebäckskil, Klubban, 58°15′04″N, 11°27′52″E, 27.III 2016; ST 17-03 (UPS); Fiskebäckskil, Rödbergsviken, 58°15′08″N, 11°27′57″E, 18.VI 2017; Fiskebäckskil, Bökevik, 58°14′51″N, 11°27′10″E.

Notes: First reported by Gustafsson and Fries (1956) as *Helicoma maritimum* Linder and then also by Erneholm (1972) under the same name from Skåne, Henningsson (1974: 410) from Ångermanland, Södermanland and Bohuslän, and by Tibell (2016) as *Lulwoana uniseptata. Zalerion maritima* (Linder) Anastasiou was connected culturally and phylogenetically with the sexual morph *L. uniseptata* by Nakagiri (1984) and Campbell et al. (2005), respectively. *Zalerion maritima* may be a species complex as Kohlmeyer and Kohlmeyer (1979) reduced four other *Zalerion* species to synonymy.

37. Lulworthia floridana Meyers, Mycologia 49: 515 (1957)

Substrate and distribution: Marine wood. Bohuslän, Skaftö par., Kristineberg, 58°14′59″N, 11°26′49″E, on wooden panels submerged for c 1 year, 5.VI 2018, ST 18-01, 18-87 (UPS). Tjärnö par., Sydkoster, Långvik, 58°52′59″N, 11°00′32″E, marine driftwood, 20.VI 2017, ST 18-101 (UPS). <u>New to Sweden.</u>

 Lulworthia halima (Diehl et Mounce) Cribb et J.W. Cribb, Pap. Dept. Bot. (formerly Biol.) Univ. Qd. 3(10): 80 (1955)

Substrate and distribution: *Zostera*. Bohuslän, Småland, Södermanland.

Notes: Eriksson (1982), as *Lulworthia maritima* fide Eriksson (2014).

39. Lulworthia longirostris (Linder) Cribb et J.W. Cribb, Pap. Dept. Bot. (formerly Biol.) Univ. Qd. 3: 80 (1955)

Substrate and distribution: Marine wood. Bohuslän. <u>Additional records:</u> Bohuslän, Skaftö par., Fiskebäckskil, Rödbergsviken, 58°15′08″N, 11°27′57″E, on driftwood, 22.VI 2017, ST 17-28 (UPS); Fiskebäckskil, Klubban, 58°15′04″N, 11°27′52″E, on wood panel submerged for 12 months, 22.VI 2017, ST 17-30 (UPS). **Notes:** Reported by Tibell (2016) from Bohuslän.

40. Lulworthia medusa (Ellis et Everh.) Cribb et J.W. Cribb, Pap. Dept. Bot. (formerly Biol.) Univ. Qd. 3: 80 (1955)

Substrate and distribution: Marine wood. Ångermanland, Bohuslän. **Notes:** Reported by Henningsson (1974) from Bohuslän and Ångermanland, and tentatively by Tibell (2016) from Bohuslän.

- 41. Lulworthia opaca (Linder) Cribb et J.W. Cribb, Pap. Dept. Bot. (formerly Biol.) Univ. Qd. 3: 79 (1955) Substrate and distribution: Marine wood. Bohuslän. Notes: First reported by Gustafsson and Fries (1956) as *Halophiobolus opacus* Linder. Also recorded by Eriksson (2014) as *Lulworthia opaca* from Bohuslän. Since this study was mostly based on material collected by Rolf Santesson at Kristineberg, it probably originates from Bohuslän. Eriksson (2014) also from Bohuslän. See also comment in Tibell (2016), who included this material in Lulworthia medusa.
- 42. Lulworthia salina (Linder) Cribb et J.W. Cribb, Pap. Dept. Bot. (formerly Biol.) Univ. Qd. 3: 80 (1955) Substrate and distribution: Marine wood. Bohuslän. Notes: First reported by Gustafsson and Fries (1956) as Halophiobolus cfr. salinus (Halophiobolus salinus Linder). Since this study was mostly based on material collected by Rolf Santesson at Kristineberg, it probably originates from there. As indicated by the "cfr.", the identification was, however, only tentative.
- 43. Macrosporium laminarianum G.K. Sutherl., New Phytol. 15: 45 (1916)
 Substrate and distribution: Chorda filum and Furcellaria lumbricalis. Bohuslän, Västergötland.
 Notes: Reported by Erneholm (1972).
- 44. *Magnisphaera spartinae* (E.B.G. Jones) J. Campb., J.L. Anderson *et* Shearer, Mycologia 95(3): 547 (2003)

Substrate and distribution: Marine wood. Uppland. **Notes:** Reported by Henningsson (1974) as *Haligena spartinae* E.B.G. Jones from Uppland.

45. Mycophycias ascophylli (Cotton) Kohlm. et Volkm.-Kohlm., Syst. Ascom. 16(1–2): 3 (1998)
Substrate and distribution: Ascophyllum nodosum. Bohuslän.

Notes: First reported by Cotton (1909: 96) as *Mycosphaerella ascophylli* Cotton from "Sweden West Coast". It was also studied by Fries (1979). Eriksson (2014) noted it to be common in Sweden.

46. Naïs inornata Kohlm., Nova Hedwigia 4: 409 (1962)
Substrate and distribution: Marine wood. Bohuslän. Additional records: Bohuslän, Mollösund par., Mollösund, Kattevik, 58°04'32"N, 11°28'08"E, 6.VI 2018 ST 18-23c (UPS), on driftwood. Skaftö par., Fiskebäckskil, Rödbergsviken, 58°15'08"N, 11°27'57"E, 22.VI 2017, on driftwood, ST 2017-27 (UPS), Fiskebäckskil, Klubban, 58°15'04"N, 11°27'52"E, on wood panel submerged for 12 months, ST 2017-29 (UPS); Kristineberg,

58°14′59″N, 11°26′49″E, on wooden panels submerged for c 1 year, 5.VI 2018, ST 18-11, ST 18-12 (UPS).

Notes: First reported by Tibell (2016) from Bohuslän.

47. *Neocamarosporium calvescens* (Fr. ex Desm.) Ariyaw. *et* K.D. Hyde, in Ariyawansa, Thambugala, Manamgoda, Jayawardena, Camporesi *et* Saranyaphat, Fungal Diversity 71: 120 (2015)

Substrate and distribution: Marine wood. Skåne, Uppland. <u>Additional record:</u> Uppland, Väddö par., Nothamn, 27.III 2016, ST 16-01a (UPS).

Notes: Isolated and cultivated from driftwood, where only pycnidium initials were observed. Identified by ITS-sequence (Isol. L379): GenBank MN058991. This sequence (Length = 545) blasted with a highest total score of 969 and E value 0.0 for GenBank: KY940773, with Identities = 542/545 (99%) and UNITE taxon name *Neocamarosporium calvescens*. Described from Sweden by Fries, Fung. Scler. Suec. Exs. 401 and recorded by Eriksson (2014) as *Leptosphaeria calvescens* (Fr. ex Dezm.) Crivelli to occur in Skåne. Mostly collected on land plants and widely distributed, but not previously observed from marine wood.

48. Nereiospora comata (Kohlm.) E.B.G. Jones, R.G. Johnson et ST Moss, Bot. J. Linn. Soc. 87(2): 206 (1983) Substrate and distribution: Marine wood. In Sweden so far only found in the Baltic: Ångermanland, Södermanland, Uppland.

Notes: Reported by Henningsson (1974) as *Corollospora comata* (Kohlm.) Kohlm.

49. Nereiospora cristata (Kohlm.) E.B.G. Jones, R.G. Johnson et S.T. Moss, Bot. J. Linn. Soc. 87(2): 206 (1983)

Substrate and distribution: Marine wood. Bohuslän, Uppland. <u>Additional records:</u> Bohuslän, Mollösund par., Mollösund, Kattevik, 58°04'32"N, 11°28'08"E, 6.VI 2018 ST 18-20, 18-23b (UPS), on driftwood; Edshultshall, 58°06'58"N, 11°28'05"E, ST 18-70 (UPS). Skaftö par., Fiskebäckskil, Rödbergsviken, 58°15'08"N, 11°27'57"E, 22.VI 2017, ST 17-22 (UPS), ST 6.VI 2018, ST 18-16 (UPS), on driftwood; Kristineberg, 58°14'59"N, 11°26'49"E, on driftwood, 22.VI 2017, ST 17-36 (UPS); Uppland, Väddö par., Nothamn, 8.VIII 2018, ST 18-53 (UPS), on driftwood.

Notes: Reported as *Corollospora cristata* (Kohlm.) Kohlm. from Bohuslän and Uppland. In the literature this species has often been referred to as *Monodictys pelagica* (T.W. Johnson) E.B.G. Jones (the asexual morph).

50. Ocostaspora apilongissima E.B.G. Jones, R.G. Johnson et ST Moss, Bot. Mar. 26(7): 354 (1983) (Figure 2D)

Substrate and distribution: Marine wood. Bohuslän, Skaftö par., Fiskebäckskil, Rödbergsviken, 58°15′08″N, 11°27′57″E, VI 2017. <u>New to Sweden.</u>

51. Orbimyces spectabilis Linder, Farlowia 1: 404 (1944)

Substrate and distribution: Marine wood. Medelpad. **Notes:** Reported by Henningsson (1974). An asexual morph belonging in the Lulworthiales (Jones et al. 2009).

52. Paradendryphiella salina (G.K. Sutherl.) Woudenberg et Crous Stud. Mycol. 75(1): 207 (2013)
Substrate and distribution: Zostera, brown, green and red algae and marine wood. Bohuslän, Skåne, Västergötland. Additional record: Bohuslän, Skaftö par., Fiskebäckskil, Rödbergsviken, 58°15′08″N, 11°27′57″E, on driftwood, 22.VI 2017, ST 17-23b (UPS).

Notes: Swedish collections recorded as *Dendryphiella salina* (G.K. Sutherl.) Pugh *et* Nicot by Erneholm (1972) from Bohuslän, Skåne, and Västergötland. Also, under the same name, in Henningsson (1974) from Bohuslän.

This species name has changed repeatedly as indicated in the above synonymy, the most recent based on molecular data. Jones et al. (2008) (ITS, SSU, LSU), concluded that the marine *Dendryphiella* Bubák *et* Ranoj. species, *Dendryphiella arenaria* Nicot and *Dendryphiella salina*, belong to the Pleosporaceae in a sister clade to the *Pleospora* Rabenh. ex Ces. *et* De Not./*Stemphylium* Wallr. complex. They also showed the type species of *Dendryphiella*, *Dendryphiella vinosa* (Berk. *et* M.A. Curtis) Reisinger, to be only distantly related to *D. arenaria* and *D. salina*. The marine *Dendryphiella* species are morphologically different from *Scolecobasidium* E.V. Abbott as they lack denticles on the conidiogenous cells as described by Ellis (1976).

53. *Phaeosphaeria orae-maris* (Linder) Khashn. *et* Shearer, Mycol. Res. 100(11): 1351 (1996)

Substrate and distribution: Marine wood. Ångermanland, Bohuslän, Södermanland, Skåne, Uppland. <u>Additional records:</u> Uppland, Väddö par., Nothamn, 8.VIII 2018, ST 18-57, 18-64 (UPS). <u>New to Uppland.</u>

Notes: Reported by Henningsson (1974) as *Leptosphaeria orae-maris* Linder from Ångermanland, Bohuslän, Skåne and Södermanland. Tibell (2016) from Bohuslän.

54. Phaeosphaeria spartinaeicola Leuchtm., in Leuchtmann et Newell, Mycotaxon 41(1): 2 (1991) Substrate and distribution: Marine wood. Uppland, Väddö par., Nothamn, 8.VIII 2018, ST 18-69 (UPS). New to Sweden.

- 55. Phycomelaina laminariae (Rostr.) Kohlm., Phytopath. Z. 63: 350 (1968)
 Substrate and distribution: Laminaria. Bohuslän.
 Notes: Reported by Eriksson (2014) from Bohuslän.
- 56. Pleospora spartinae (J. Webster et M.T. Lucas) Apinis et Chesters, Trans. Br. mycol. Soc. 47(3): 432 (1964)

Substrate and distribution: Marine wood. Bohuslän, Uppland. <u>Records:</u> Bohuslän, Mollösund par., Edshultshall, 58°06′58″N, 11°28′05″E, ST 18-73. Skaftö par., Fiskebäckskil, Rödbergsviken, 58°15′08″N, 11°27′57″E, 22.VI 2017, on driftwood, ST 17-02 and 6-7. VI 2018, 18-14, ST 18-28 (UPS); Bökevik, 58°14′51″N, 11°27′10″E, 5.VI 2018, ST 18-10 (UPS). Uppland, Väddö par., Nothamn, 8.VIII 2018, ST 18-45, 18-46, 18-48, 18-49, 18-51 (UPS). <u>New to Sweden.</u>

57. Pleospora triglochinicola J. Webster, Trans. Br. mycol. Soc. 53(3): 481 (1969)

Substrate and distribution: Marine wood. Bohuslän, Uppland. <u>Records</u>: Bohuslän, Fiskebäckskil, Bökevik, 58°14′51″N, 11°27′10″E, on driftwood, 5.VI 2018, ST 18-06 (UPS). Uppland, Väddö par., Nothamn, 8.VIII 2018, ST 18-40 (UPS). <u>New to Sweden.</u>

58. Pseudeurotium zonatum J.F.H. Beyma, Centbl. Bakt. ParasitKde, Abt. II 96 (20-23): 411 (1937) Substrate and distribution: Marine wood. Uppland, Öland.

Notes: Reported by Henningsson (1974). Kept in the CBS-KNAW Collections (http://www.westerdijkinstitute.nl/Collections/), CBS strain database (CBS 391.61); isolated from the warship *Vasa* that sunk in 1628 and was salvaged in 1961.

59. Pseudogymnoascus roseus Raillo, Centbl. Bakt. ParasitKde, Abt. II 78: 520 (1929)
Substrate and distribution: Marine wood. Öland. Notes: Reported by Henningsson (1974). Identified by CBS.

60. *Remispora cucullata* Kohlm., Mycologia 56: 770 (1964) (Figure 2A)

Substrate and distribution: Marine wood. Bohuslän, Tjärnö par., Sydkoster, Långvik, 58°52′59″N, 11°00′32″E. <u>New to Sweden.</u>

Notes: In the literature this species has often been referred to as *Periconia prolifica* Anastasiou (the asexual morph).

61. *Remispora maritima* Linder, Farlowia 1: 410 (1944) (Figure 2G)

Substrate and distribution: Marine wood. Bohuslän, Södermanland. <u>Additional records:</u> Bohuslän, Mollösund par., Mollösund, Kattevik, 58°04'32"N, 11°28'08"E, 6.VI 2018 ST 18-23a (UPS), on driftwood; Edshultshall, 58°06′58″N, 11°28′05″E, ST 18-72a (UPS). Skaftö par., Kristineberg, 58°14′59″N, 11°26′49″E, on wooden panels submerged for c 1 year, 5.VI 2018, ST 18-02, 18-05, 18-84, 18-85, 18-88 (UPS); Fiskebäckskil, Rödbergsviken, 58°15′08″N, 11°27′57″E, 22.VI 2017, ST 2018-90 (UPS), on driftwood.

Notes: Reported by Henningsson (1974) from Bohuslän and Södermanland as *Halosphaeria maritima* (Linder) Kohlm. The record of "*Ceriosporopsis maritime*" (as *nomen nudum* in Kohlmeyer and Kohlmeyer 1979) by Gustafsson and Fries (1956) may also refer to this species.

62. *Remispora pilleata* Kohlm., Nova Hedwigia 6(3-4): 319 (1963) (Figure 2J)

Substrate and distribution: Marine wood. Medelpad, Södermanland, Uppland. <u>Additional record:</u> Uppland, Lidingö par., Brevik Marina, 1. IV 2017, Pereira, ST 17-01a (UPS).

Notes: Reported by Henningsson (1974: 416) as *Halosphaeria pileata* (Kohlm.) Kohlm. [as "*pilleata*"] from Medelpad, Södermanland and Uppland.

63. *Remispora quadri-remis* (Höhnk) Kohlm., Nova Hedwigia 2: 332 (1960)

Substrate and distribution: Marine wood. Bohuslän and Medelpad.

Notes: Reported by Henningsson (1974) as *Halosphaeria quadri-remis* (Höhnk) Kohlm. Henningsson was, however, not sure as to the distinction of this species versus *Remispora stellata* Kohlm., since she noted a variation in appendage number not consistent with the number diagnostic for these two species, viz. 4 vs. 6 at each apex.

64. *Remispora stellata* Kohlm., Nova Hedwigia 2: 334 (1960)

Substrate and distribution: Marine wood. Öland, Södermanland, Skåne, Uppland.

Notes: Tentatively reported by Henningsson (1974) as *Halosphaeria stellata* (Kohlm.) Kohlm. See also under *Remispora quadri-remis* above.

- 65. Saagaromyces glitra (J.L. Crane et Shearer) K.L. Pang et E.B.G. Jones, in Pang, Vrijmoed, Kong et Jones, Mycol. Progr. 2(1): 35 (2003)
 Substrate and distribution: Marine wood. Bohuslän, Uppland. <u>Additional record:</u> Uppland, Lidingö par., Brevik Marina, 1. IV 2017, Pereira, ST 17-01b (UPS). Notes: Reported from Bohuslän by Tibell (2016).
- 66. Sphaerulina orae-maris Linder, Farlowia 1: 413 (1944)

Substrate and distribution: Marine wood. Bohuslän, Skåne, Uppland. <u>Additional records:</u> Bohuslän, Mollösund par., Mollösund, Kattevik, 58°04′32″N, 11°28′08″E, 6.VI 2018 ST 18-25, 18-81b (UPS), on driftwood. Skaftö par., Fiskebäckskil, Rödbergsviken, 58°15′08″N, 11°27′57″E, 22.VI 2017, ST 2018-17 (UPS), on driftwood. Uppland, Väddö par., Nothamn, 8.VIII 2018, ST 18-37 (UPS).

New to Uppland.

Notes: Reported by Gustafsson and Fries (1956). Eriksson (2014) from Bohuslän and Skåne. Tibell (2016) from Bohuslän.

67. *Stagonospora haliclysta* Kohlm., Bot. Mar. 16(4): 213 (1973)

Substrate and distribution: Marine wood. Norrbotten, Södermanland, Uppland.

Bohuslän, Skaftö par., Fiskebäckskil, Bökevik, 58°14′51″N, 11°27′10″E, 18.VI 2017, ST 17-06, 17-08 (UPS). <u>New to Sweden.</u>

68. *Stemphylium triglochinicola* B. Sutton *et* Piroz., Trans. Br. mycol. Soc. 46(4): 519 (1963)

Substrate and distribution: *Triglochin maritima*. Västergötland.

Notes: Reported by Erneholm (1972) from Västergötland.

69. Tetrachaetum elegans Ingold, Trans. Br. mycol. Soc. 25(4): 381 (1942) [1941]

Substrate and distribution: *Furcellaria lumbricalis.* Västergötland.

Notes: Reported by Erneholm (1972). Originally described from decaying leaves in freshwater.

70. Thysanophora penicillioides (Roum.) W.B. Kendr., Can. J. Bot. 39: 820 (1961)
Substrate and distribution: Marine wood.

Södermanland. **Notes:** Reported by Henningsson (1974). Identified by

CBS.

 71. Toriella tubulifera (Kohlm.) Sakay., K.L. Pang et E.B.G. Jones, Fungal Diversity 46("1"): 100 (2011)
 Substrate and distribution: Marine wood. Öland, Skåne, Uppland.

Notes: Reported by Henningsson (1974) as *Ceriosporopsis tubulifera* (Kohlm.) P.W. Kirk ex Kohlm. from localities from the Swedish Baltic and Skåne.

72. *Trichocladium alopalonellum* (Meyers *et* R.T. Moore) Kohlm. *et* Volkm.-Kohlm., Mycotaxon 53: 352 (1995)

Substrate and distribution: Marine wood. Bohuslän, Norrbotten, Uppland. <u>Additional records:</u> Bohuslän, Mollösund par., Edshultshall, 58°06′58″N, 11°28′05″E, ST 18-30 (UPS). Skaftö par., Kristineberg, 58°14′59″N, 11°26′49″E, on driftwood, ST 16-03a (UPS). Uppland, Väddö par., Nothamn, 8.VIII 2018, ST 18-52 (UPS). <u>New</u> to Uppland. **Notes:** Reported by Henningsson (1974) as *Humicola alopalonella* Meyers *et* R.T. Moore.

73. Trichoderma citrinoviride Bissett, Can. J. Bot. 62(5): 926 (1984)

Substrate and distribution: Marine wood. Bohuslän. <u>New to Sweden.</u>

Notes: An ITS sequence from culturing (Isol. ST16): GenBank MN058992. was identified by sequence comparison; Length=534, Score (Bits) 964, E Value 0.0, INSD sequence: GenBank: Z82907, with Identities=534/534 (100%) and UNITE taxon name: *Trichocladium citrinoviride*. This is a cosmopolitan species known from a wide range of terrestrial habitats and also as an algal endosymbiont (Liang et al. 2016). It is a cellulose decomposer.

 74. Trichothecium roseum (Pers.) Link, Mag. Gesell. naturf. Freunde, Berlin 3(1-2): 18 (1809)
 Substrate and distribution: Enteromorpha. Skåne.
 Notes: Reported by Erneholm (1972). This is a widespread parasite/ saprobe on land plants not otherwise reported from marine habitats.

Discussion

A total of 74 MFF, including 73 Ascomycota and 1 Basidiomycota, are here recognized as occurring in Sweden based on a critical assessment of historical records and additions contributed in this paper. Only a few basidiomycetes (except marine yeasts) have been reported from the marine environment (Jones et al. 2015). This paper brings a substantial increase of earlier assessments of marine fungal diversity in Sweden (34 in Henningsson 1974; 31 species of marine ascomycetes in Eriksson 2014; and an additional seven in Tibell 2016). In this paper another 16 species are recorded as new to Sweden. The total of marine fungi documented in this study (74) is comparable to the list prepared in Koch and Petersen (1996) for marine fungi of Denmark. The Danish list only showed the marine fungi occurring on wood and some frequent fungi in Denmark, such as Arenariomyces trifurcatus, Nereiospora comata, Remispora spp., which also occurred in Sweden. However, some others are missing in Sweden such as Marinospora spp., and Appendichordella amicta.

During one of our recent surveys of marine fungi in Sweden, we discovered a potential new species of *Argentinomyces* (Figure 2F). However, the lack of sufficient material did not allow a full description of the species. This discovery shows that new marine fungi can be found in coastal areas of Sweden and a more intensive collection effort is warranted. The wood-inhabiting marine fungi in Tromsø (mainland Norway) were found to be similar to those reported in this paper but those that occurred in Longyearbyen (Svalbard, an Arctic archipelago) were very diverse with many new species (Pang et al. 2011). The dominant orders of marine fungi in Sweden included the Pleosporales, Microascales (all in the Halosphaeriaceae), Lulworthiales and Helotiales. Selected earlier records, some of which only identified to genus, are for different reasons excluded (Supplementary Table S1).

Taxonomically, several *Lulworthia* G.K. Sutherl. species were described by Barghoorn and Linder (1944) but no sequences are available for these species and so they have not gained general acceptance (Kohlmeyer and Kohlmeyer 1979). Here we, however, document some species based on identification via morphological features, viz. *Lulworthia halima, Lulworthia longirostris,* and *Lulworthia medusa*, which were accepted in Jones et al. (2015). Many *Lulworthia* species need to be recollected and sequenced to confirm their placement in the genus.

The number of species listed is rather modest and this certainly reflects the fact that marine fungi are poorly known and that the species so far described only represent a small fraction of their diversity (Jones 2011). Most of the records were obtained from marine wood undoubtedly leaving a rich diversity occurring on marine algae and plants unaccounted for.

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