A new species of *Hypoxylon* (Xylariaceae)

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Hypoxylon liviae sp. nov. is described from Norway. The taxon is recorded from six localities in the counties of Nordland and Troms, North Norway, occurring on wood and inner bark of dead *Sorbus aucuparia*, often on still standing trees. Immature stromata have also been found on injured, living trees. The species is mapped, and its ecology discussed. It is thought to prefer a slightly continental climate, avoiding the outer coast regions. The species belongs in *Hypoxylon* sect. *Hypoxylon*, with affinity to *H. rubiginosum*.

Keywords: Distribution, ecology, *Hypoxylon*, Norway, taxonomy.

Earlier studies of Norwegian and Nordic species of *Nemania* Gray and *Hypoxylon* Bull. disclosed a single voucher specimen in the herbarium of Oslo (O), which at first was taken to be either an abnormal *Hypoxylon rubiginosum* (Pers. : Fr.) Fr., or perhaps some 'forma' of that species. The material was collected in North Norway sometime in the second half of the 1800s. From the wood anatomy it was inferred that the host was *Sorbus aucuparia* L. (rowan), an infrequent type of wood for *H. rubiginosum* in any Nordic country. In Granmo et al. (1989) the species concept of *H. rubiginosum* was rather broadly conceived, including both this specimen as well as taxa later on recognized as *Hypoxylon cercidicola* (Peck) Y.-M. Ju & J. D. Rogers, *H. laschii* Nitschke, and *H. salicicola* Granmo (Ju & Rogers, 1996; Granmo, 1999).

Quite unexpectedly, more, and mature material of the 'aberrant' *rubiginosum*-type was found in the interior of North Norway in June 1997, and realising that the material could not be included in *H. rubiginosum*, it was keyed out as *Hypoxylon* sp. by Granmo (1999), but not formally described. However, having now an idea about the taxon's ecology, the chance to discover the species in more localities was substantially improved, resulting in five new specimens found over the past few years. Thus, a well-founded description of the taxon can now be submitted.

Material and methods

Microscopic characters were measured in water mounts and the respective sizes given as a minimum-maximum range, with extreme values in parentheses. The mean values of ascospores and asci are based on measurements of 20 ascospores and 20 asci from each of three different collections. The colour codes are according to Kornerup & Wanscher (1967). The type of substrate for the fungus is noticed (b, bark; w, wood). The vouchers are located by names of county, municipality and place. The author's name is abbreviated (AG) in the list of examined specimens.

Taxonomy

Hypoxylon liviae Granmo, **sp. nov.** – Figs. 1–4.

Anamorph. – *Virgariella*-type.

Stromata in ligno decorticato 0.5–6 × 0.3–1.3 × (0.04–)0.1–0.3 cm, elliptica vel oblongo-elliptica, marginibus convexis bene delimitata; in cortice saepe confluentia et leviter pulviniformia, usque ad 7 × 4 × 0.4 cm; superficies stromatum maturorum plerumque aequata, in cortice interdum scabrida, fusca; pruina alba characteristica saepius conspersa, quae colorem fusco-cinerascentem format. Ectostroma 80 µm crassum, ceraceum, strato pulverulento spadiceo tectum, 70–150 µm crassum. Entostroma carnosum, hepaticum, interdum fibrosum. Perithecia uniseriata, ovoidea, ostiolo excepto 220–450 µm alta, 180–310 µm lata, in medio 330 × 270 µm; ostiola umbilicata vel punctata. Asci p. sp. 70–86(–100) × (6.5–)8–9.5 µm, in medio 80 × 8 µm, stipitibus 74–120 µm, in medio 95 µm, annulo apicali discoideo, in solutione Melzeri dilute caerulescente. Ascosporae 9.5–12.5 × 4.8–6 µm, in medio 11.2 × 5.5 µm, ellipsoideae, fere aequilaterales, aliquot obovoideae, umbrinae, rima germinativa recta longa praeditae. Perisporium in 10 % KOH dehiscens. – Holotypus (AG 3/97-1) in Museo Tromsoeensi (TROM) depositus.

Etymology. – *liviae*, named for Liv Mølster, the first collector of recent mature material.

Stromata 0.5–6 × 0.3–1.3 × (0.04–)0.1–0.3 cm, elliptic, or oblong elliptic when on decorticated wood, and well delimited with steep, convex margins, while on the inner-cortex of the host often confluent and pulvinoid, to 7 × 4 × 0.4 cm. Surface mostly even, or sometimes knotted with irregular stromatic outgrowths, particularly when growing in the cortex. Mature stromata dark brown (6F7, 7F6), often sprinkled with a characteristic white or greyish pruina turning the colour to greyish brown (5D3, 7D3). Immature stromata effused, clay (5D5), pulverulent, with anamorph or remnants of it. – Ectostroma 80 µm thick, waxy, inside dark brown, usually with golden yellow particles in its lower part; covered with a brown (6F6), pulverulent layer, 70–150 µm thick. – Entostroma below perithecia 0.08–0.3 cm, soft, yellowish brown, hard and dark brown at its base,

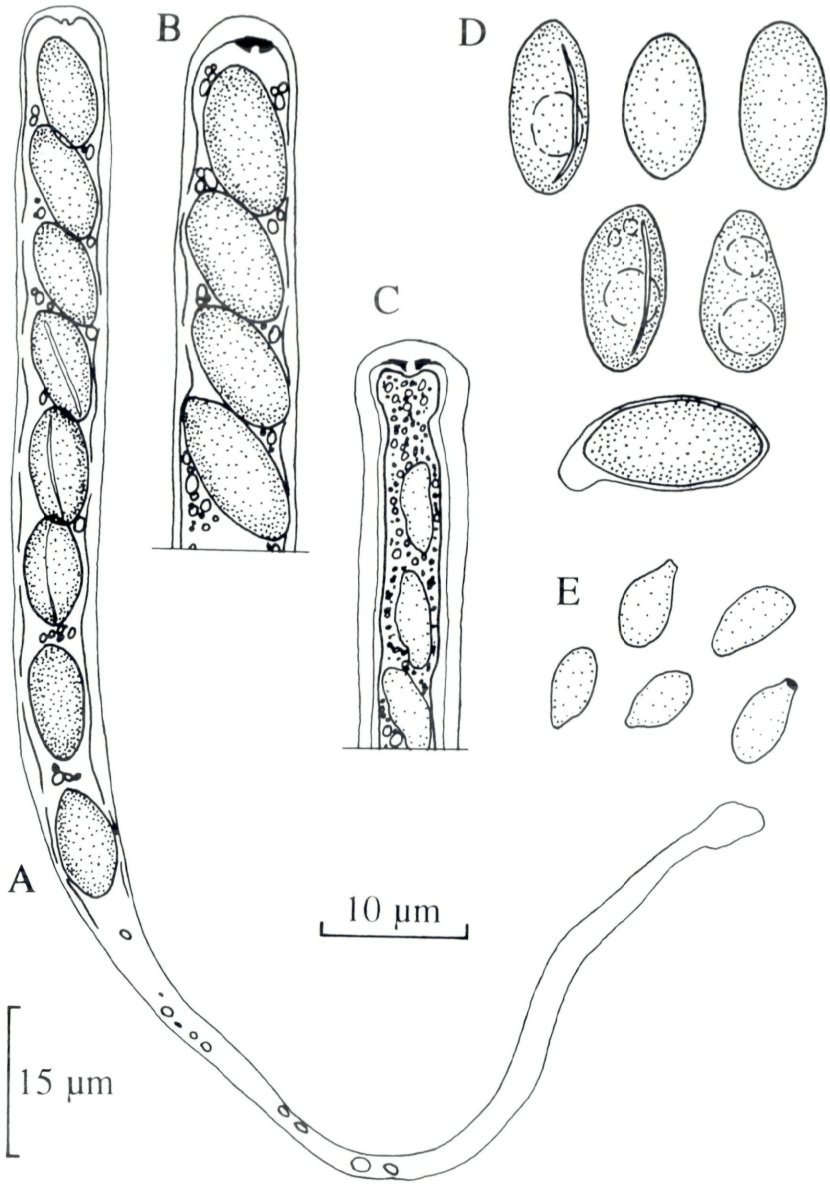

Fig. 1. – *Hypoxylon liviae* sp. nov. – A. Ascus. – B. Apex of mature ascus pretreated with Lugol's solution. – C. Apex of immature ascus pretreated with Lugol's solution. – D. Ascospores; the lowest spore with dehiscing perispore. – E. Conidia from anamorph on young stroma. – All viewed in water.

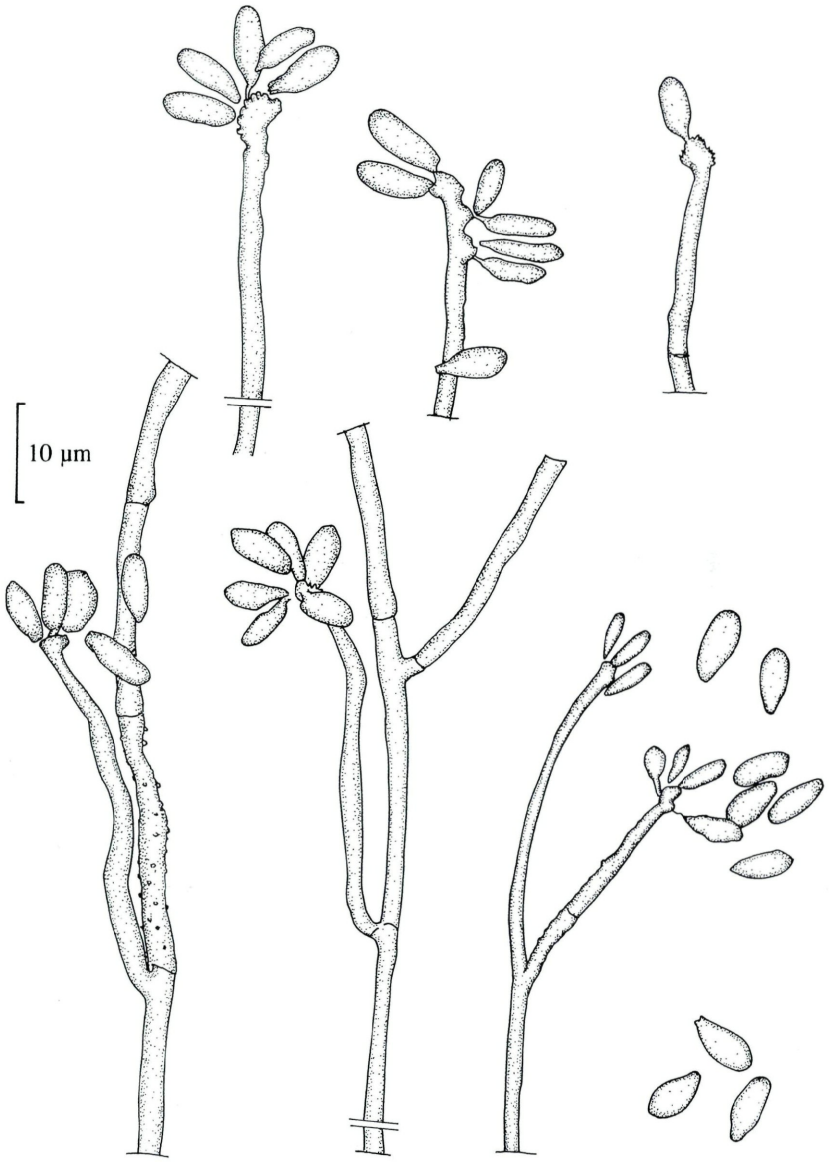

Fig. 2. – *Hypoxylon liviae* sp. nov. – Conidiophores and conidia from anamorph in culture.

at times enclosing remnants of medullary rays from the host. – Perithecia uniseriate, ovoid, 220–450 µm high (excl. of ostiole), 180–310 µm wide, mean 330 × 270 µm, or 180–260 µm in diam., mean 235 µm, peridium 20–35 µm broad; with umbilicate to punctate ostioles. Perithecial contours none, or rarely to one third of perithe-

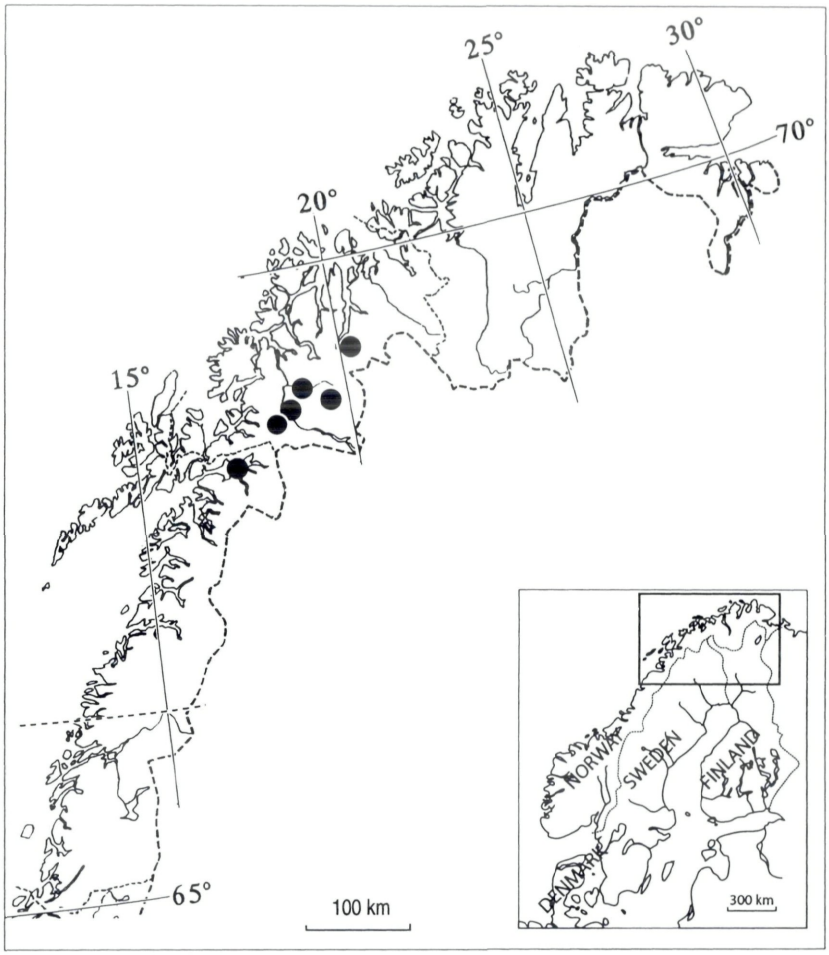

Fig. 3. – *Hypoxylon liviae* sp. nov. – Known distribution.

cial height. – Asci p. sp. 70–86(–100) × (6.5–)8–9.5 µm, mean 80 × 8 µm, stipe 74–120, mean 95 µm, annulus discoid, about 3 µm broad and 1 µm high, pale blue in Melzer's reagent, dark in Lugol's solution. – Paraphyses equal to or exceeding the asci in length, hyaline, septate, tapering to 1.5 µm at apex. – Ascospores 9.5–12.5 × 4.8–6 µm, mean 11.2 × 5.5 µm, ellipsoid, nearly equilateral; usually slightly bipolar, some spores even being obovoid; dark brown (6F7). Germ slit straight, spore-length or almost spore-length. Perispore dehiscent in 10% KOH. Recent spore deposit on white paper is greyish black. – Pigments in 10% KOH on a microscope slide: Fragments of ectostroma including powdery layer yield copious light brown (6D8 to 6E8) pigment, when viewed with the slide against a white background, or between sienna

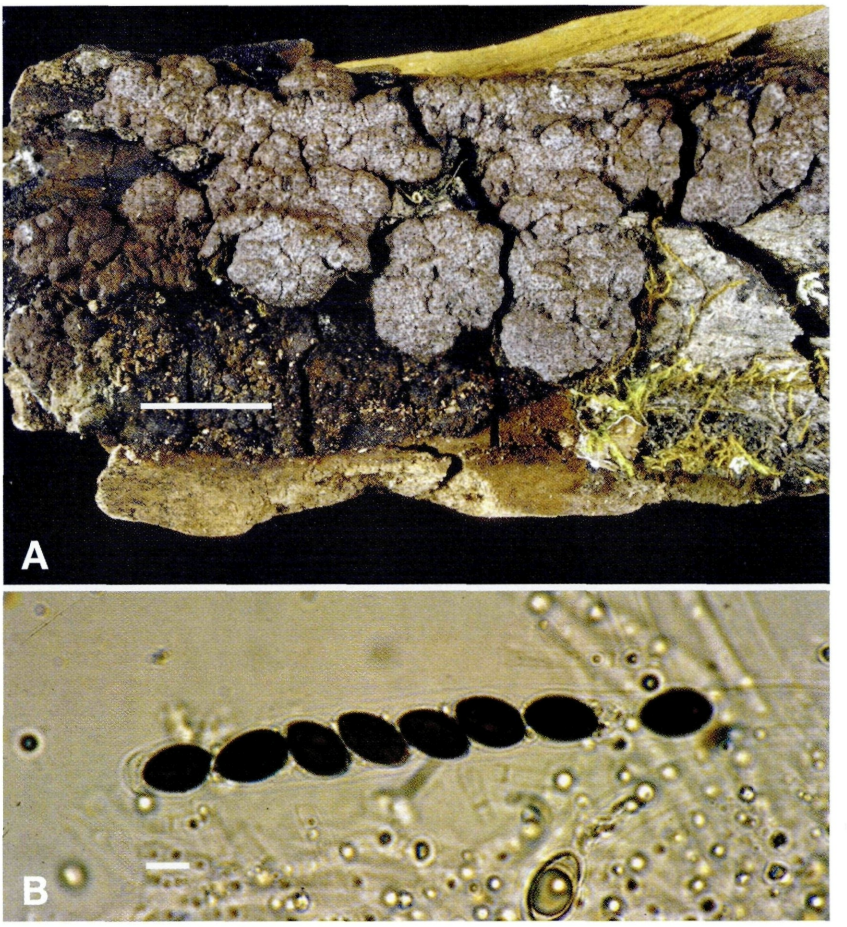

Fig. 4. – *Hypoxylon liviae* (holotypus). – A. Stroma on the inner bark of *Sorbus aucuparia*. Bar: 1 cm. (Photo: H. Lunde). – B. Ascus with spores (in water). Bar: 10 µm. (Photo: A. Granmo).

and umber (Rayner, 1970). The colour approaches a brownish orange (6C8) when there is an excess of golden yellow particles. Entostromal fragments yielded no extractable pigments in KOH.

Anamorph on vegetative (immature) stromata. – Conidiophores produced in the outermost third fraction of the ca. 300 µm thick, pulverulent stroma 80–120 µm long, 3–4 µm wide in the middle, septate, sparingly branched, pale yellowish brown, smooth or usually roughened, terminal cells 15–30 µm long and 2.5–3 µm wide. – Conidia 6–8 × 3–4 µm, mean 7 × 3.5 µm, borne on small denticles, obovate, pale yellow to greyish yellow, smooth to finely uneven or minutely rough.

Culture and anamorph (from ascospores on 2% MA at 20–23°C in continuous daylight). – In 15 days cultures about 2 cm in diam., greyish white, felty (mycelium ca. 0.5 mm high); in 19 days 2.5 cm in diam., and in 25 days 4 cm in diam. with copious conidiophores. During this time the mycelium gradually became rusty spotted, and the slightly rusty colour of the reverse intensified. – Conidiophores hyaline, sympodially to dichotomously branched, terminal cells ca. 2 µm wide and 30–40 µm long, intercalary cells 2–2.5 µm wide and 30–45 µm long, often roughened. – Conidia 6.5–9.5 × 2–3.5 µm, mean 7.6 × 2.9 µm, hyaline to yellowish, smooth; seem to be produced blastogenously.

Habitat. – Saprobe on dry, dead trees, preferably on the inner cortex; may also develop in damaged parts of living trees.

Known host. – *Sorbus aucuparia*.

Known distribution. – Norway.

Specimens examined: NORWAY. NORDLAND: Evenes: Forra, at a brook 0.8 km NE of Hoggvik, 110 m alt., 14 Apr 1995, trunk of living *S. aucuparia* (w), AG (immature); 6 Aug 2001 (same tree, immature), AG 30/01; 6 Aug 2001, *S. aucuparia* (w; another, decayed trunk), AG 32/01 (all in TROM). – TROMS: Bardu: Sørdalen, ca. 1.5 km N of Sørmo, 140 m alt., 11 Jun 1999, *S. aucuparia*, AG 67/99 (w), 68/99 (b), 69/99 (b) (TROM). Sørdalen between Storskreda and Skredbekken, 140-150 m alt., 11 Jun 1999, dead branch of living *S. aucuparia* (b & w), G. Mathiassen, 11384 (TROM). Østerdalen, Strømsmoen between Mogård and roadcross Innset-Bardujord, 11 Jun 1999, *S. aucuparia*, AG & G. Mathiassen, GM 11391 (b), 11392 (b & w), AG 73/99 (w, juvenile stromata) (TROM). Målselv: Alappmo (as 'Aglapmo'), without year [186?], *S. aucuparia* (w), J.M. Norman (O). Rostavatn N-side, at Bjørnheim near the eastern end, 25 Jul 2000, trunk of living *S. aucuparia* (w; immature), AG 13/2000 (TROM). Storfjord: Skibotn, Aksugaikuvarri in a crevice with rivulet running into the nearby Lulle-elva, 200 m alt., Jun 20 1997, *S. aucuparia* (w), ass. with *Nemania colliculosa*, Liv Mølster & Ellen Arneberg (AG 1/97, TROM); Jun 29 1997, *S. aucuparia* (w & b), partly ass. with *Nemania serpens* and *Biscogniaxia repanda*, AG 3/97, HOLOTYPUS AG 3/97-1 (TROM, ISOTYPI in TROM, O, PRM).

Taxonomic affinity

Hypoxylon liviae clearly belongs to the suite of taxa around *Hypoxylon rubiginosum* in sect. *Hypoxylon* ss. Ju & Rogers (1996). It differs from *H. rubiginosum* in its thick, well delimited stromata lacking perithecial contours, similar to that seen in for example *H. vogesiacum* (Currey) Sacc. The dark brown equilateral ascospores, and copious light brown pigment in KOH, similar to the colour of wood-tar, also differ from those of *H. rubiginosum*. Though the anamorph genus is the same as in *H. rubiginosum*, the conidia in

culture seem to be slightly longer than in that species (*H. rubiginosum*: 4–7 × 3–4 µm according to Petrini & Müller, 1986).

Ecology and distribution

Hypoxylon liviae was found exclusively on *Sorbus aucuparia*, either on dead, drying, still standing trunks, or on broken, dried parts attached to living trees, for example on thick branches or dead side trunks with shredding periderm. Sometimes only the anamorph stage is found on such trees, while it may continue to develop on the fallen, dry, decorticated trunks, prevented from direct contact with the ground by stones, boulders etc. In such cases often just the circumference (to about 1 cm thickness) of the trunk is deteriorated, while the inner part is unaffected. Dark zones may, however, penetrate deep into the wood. I twice also collected the juvenile stage on living, injured but otherwise healthy trees. The habitats of the species were warm south-facing slopes or crevices.

I searched for this fungus on *Sorbus aucuparia* for several years in the fjord and coastal districts of North Norway without success. Since 1995, I inspected annually a sterile fungal crust growing on a decorticated part of the stem of otherwise healthy *Sorbus aucuparia* in the fjord district of Ofoten (Evenes; v.s.). The tree was injured by browsing elk [*Alces alces* (L.)]. Although the stromata of the fungus were slowly developing, and later proved to be *Hypoxylon liviae*, it had still not sporulated in late summer 2001. Mature stromata, however, were found on this occasion on a fallen, decaying trunk of rowan, 150 m away from the former tree, confirming the presence of the fungus in the region. To conclude from these observations, it seems that some stromatic pyrenomycetes in North Norway can maintain and force stromatal development for several years, in this case for at least seven years. We do not know whether it will produce mature ascocarps when still on the living tree, or only later when the tree is much more impaired, dried or dead.

The records from the inner fjord districts and interior parts of North Norway (Fig. 3) point to a species preferring a more arid, continental climate than that prevailing near the coast. This is very similar to that observed for the slightly continental *Biscogniauxia repanda* (Fr. : Fr.) Kuntze, which largely occurs on the same host in Fennoscandia (Granmo & al., 1989). Consequently it should be possible to find also *H. liviae* in the interior of Sweden and Finland, because the host is widely distributed in all Fennoscandia, though more scattered in northern Sweden and northern Finland. For the time being we do not know whether we are facing a species with a wide and easterly distribution, or a species with an eastern tendency within a northern distributional centre, comparable with e.g. *Hypoxylon macrosporum* P. Karst. (Granmo, 1999).

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