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New records and new distribution of known species in the family Orbiliaceae from China

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The family Orbiliaceae belongs to Orbiliales, Orbiliomycetes, Pezizomycotina and Ascomycota. It presently includes *Orbilia*, *Hyalorbilia*, and *Pseudorbilia*, which have caused more attention in due that some members of their 10 anamorphic genera are the nematode-trapping fungi. During the survey of the distribution of Orbiliaceae since the summer of 2005, three new records including *Orbilia xanthostigma*, *Orbilia tenebricosa*, *Hyalorbilia fusispora* and new distribution of five known *Hyalorbilia* species are firstly reported from Mainland China and provided clearer illustrations.

Key words: Orbiliaceae, *Orbilia xanthostigma*, *Orbilia tenebricosa*, taxonomy.

INTRODUCTION

Orbilia Fr., *Hyalorbilia* Baral et al. and *Pseudorbilia* Zhang et al. are the only genera presently accepted in the family Orbiliaceae Nannf (Eriksson et al., 2003; Zhang et al., 2007; Kirk et al., 2008). The model genera *Orbilia* possessed easily separated asci and paraphyses, the excipulum composed of globose cells, the asci arising from H- or L-shaped bases, and on the contrary the main characters of *Hyalorbilia* are that the asci arising from crosiers and conglutinated with the paraphyses by a gel, the excipulum cells composed of rectangular cells; the key features of *Pseudorbilia* are between *Hyalorbilia* and *Orbilia* (Zhang et al., 2007). The shape and size of spore bodies (SBs) and their distribution have been recognized as the key characteristic in specific classification within Orbiliaceae.

Before 2005, Orbiliaceae is rarely studied in China, only 6 species were recorded (Teng, 1939; Zhuang and Korf, 1989; Zhuang, 1997, 1999; Zhuang and Wang, 1998a, b; Zhuang and Hyde, 2001; Liu et al., 2006). During latest eight years, Orbiliaceae and its anamorphs have been studied more in China. Besides a new genus *Pseudorbilia* (Zhang et al., 2007), eight new Orbilia

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species, eight new *Orbilia* records and three new *Hyalorbilia* species were reported from China (Wu et al., 2007; Zhang et al., 2009; Su et al., 2010). Together with anamorphs or single, other scattered new species were reported (Zhang et al., 2006; Liu et al., 2005a, b; Mo et al., 2005a,b; Yu et al., 2006, 2007a, b; Yu et al., 2009a,b; Li et al., 2009; Qiao et al., 2011). In Chinese publication, Liu et al. (2007a, b) and Guo et al. (2007) reported seven new records of *Orbilia* and of *Hyalorbilia*.

During the survey of the distribution of Orbiliaceae since the summer of 2005, three new records including *O. xanthostigma*, *O. tenebricosa*, *H. fusispora* and new distribution of five known *Hyalorbilia* species are firstly reported from Mainland China and provided clearer illustrations.

MATERIALS AND METHODS

The specimens were collected by J.W. Guo and S.F. Li from the south to Qinling-Huai Line including Henan Province, Anhui Province, Jiangsu Province, Jiangxi Province, Hubei Province, Hunan Province, Sichuan Province, Zhejiang Province, Fujian Province, Guangdong Province, Guangxi Province, Guizhou Province and Yunnan Province since September 2005 to July 2010, and deposited in Laboratory for Conservation and Utilization of Bio-Resources of Yunnan University. In addition, the specimens were collected by J.W. Guo and T.Z. Ye in Daweishan Mountain Reserve, Honghe City, Yunnan since October 2011, and deposited in Key Laboratory of Higher Quality and Efficient Cultivation and Security Control of Crops for Yunnan Province, Honghe University.

The living ascospores were observed according to the methods presented by Baral (1992). Specimens were sectioned longitudinally using a freezing microtome at a thickness of 5-10 µm to observe the vertical structure of apothecia. Observations, measurements, and photographs were carried out with an Olympus BX51 microscope of differential interference contrast.

RESULTS

During the samplings Orbiliacious fungi were gathered on rot branches, more than 1500 specimens were collected from the south to Qinling-Huai Line. From these collections eight species of the genera *Orbilia* and *Hyalorbilia* were identified; three of them are first recorded from China and other five known *Hyalorbilia* species are stated new distribution in China.

New records of Orbiliaceae in Mainland, China

Orbilia xanthostigma (Fr.) Fries, Summa Vegetabilium Scandibaviae 2: 357, 1849 (Figure 1)
Basionym*: *Pezzia xanthostigma Fries, Observations Mycologicae 1: 166, 1815.
Calloria xanthostigma (Fr.) W. Phillips, A Manual of the British Discomycetes: 329, 1887
***Specimens examined*:** PR China, Sichuan Province, Jiuzhaigou Nature Reserves, on rotten branch of unidentified broadleaf tree, lying on moist ground under subtropical broadleaf forest, J.W. Guo and S.F. Li, 7 August 2007, lwh-1.

Apothecia massed or scattered on the periderm of a partly decayed branch of unknown deciduous tree, disc smooth at the margin, flat, 0.3-1.2 mm diam., subsessile with a very short and broad obconical base, reddish to wate-r-whitish, semitranslucent. Ectal excipulum composed of polygonal to subglobose cells, hyline, thin-walled, most 5.2-15.2 µm diam. subglobose and larger cells at the frank. Asci cylindrical to clavate, 16.0-22.8 × (2.8-) 3.4-5.3 µm, 8-spored, rounded to truncate at the apex, eventually shrunken down the base and forked. Ascospores hyaline, without septa, symmetrically and crossed arranging in each ascus, slightly helical, strongly curved with sickled-shaped, both ends obtuse, 6.0-8.5(-10.0) × 1.0-1.4 µm, a refractive tear-shaped spore body (SB) at the upper, 1.6-2.5 × 0.5-0.9 µm. Paraphyses hyaline, vacuolar bodies (VBs) globose to cylindrical, slightly inflated up to 2.3-3.5 µm diam. at the apex, exudates 1.0-1.3 µm thick over paraphyses and asci.
***Known distribution*:** Russia, Georgia, Sloviakia, British, Venezuela and so on.
***New distribution*:** Sichuan Province, China.
Orbilia xanthostigma resembles *O. vermiformis*, whereas the spores of the latter are more curving and slender; in addition, it distinguishes that *O. vermiformis* has anamorph *dactylellia*-type but *O. xanthostigma* has anamorph *dicranidion*-type.

Orbilia tenebricosa (Svrček) Baral, Mycotaxon 96: 167, 2006 (Figure 2)
***Basionym*:** *Patinella tenebricosa* Svrček, Česká Mykol. 31(3): 135, 1977
***Specimens examined*:** PR China, Yunnan Province, Kunming City, Xishan Forest Park, on rotten branch in moist evergreen broadleaf forest, J.W. Guo and S.F. Li, 16 May 2007, xs -6.
Apothecia scattered on the tip of decayed branch of unknown tree, 0.7-1.4 mm diam., nonsessile, fresh disc yellowish, flat and semitranslucent, yellow when dried. Asci cylindrical, 22.0-28.0 × 4.3-5.0 µm (living state), 8-spored including 2-3 inverted spores in each ascus; rounded to truncate at the apex, eventually shrunken down the base which forked with “h-” or “k-shaped”. Ascospores hyaline, nonseptate, spindle to rod shaped, slightly curved or straight with both shrunken ends, 5.0-8.0 × 1.1-1.4 µm (living state), a refractive globose- or ellipse-shaped SB at the upper, 0.7-1.5 × 0.5-1.0 µm. Paraphyses 2.0 µm width at the base, slightly inflated up to 2. 5 µm width at the apex, exudates over paraphyses and asci.
***Known distribution*: Czech, Australasia**
***New distribution*:** Yunnan Province, China.
Orbilia tenebricosa similar to *Orbilia rectispora* but having shorter and wider spores (5.0-8.0 × 1.1-1.4 µm vs. 7.0-9.9 × 0.9-1.2 µm).

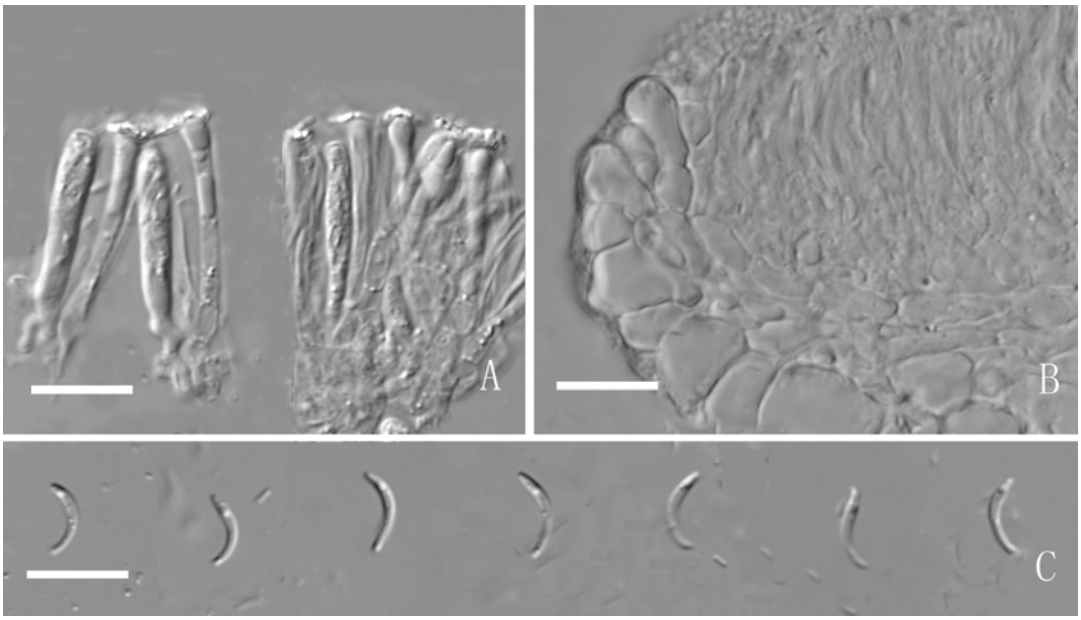

Figure 1. *O. xanthostigma* A. Asci and paraphyses; B. Vertical section of part apothecium; C. Ascospres. Bars: A-C=10 µm.

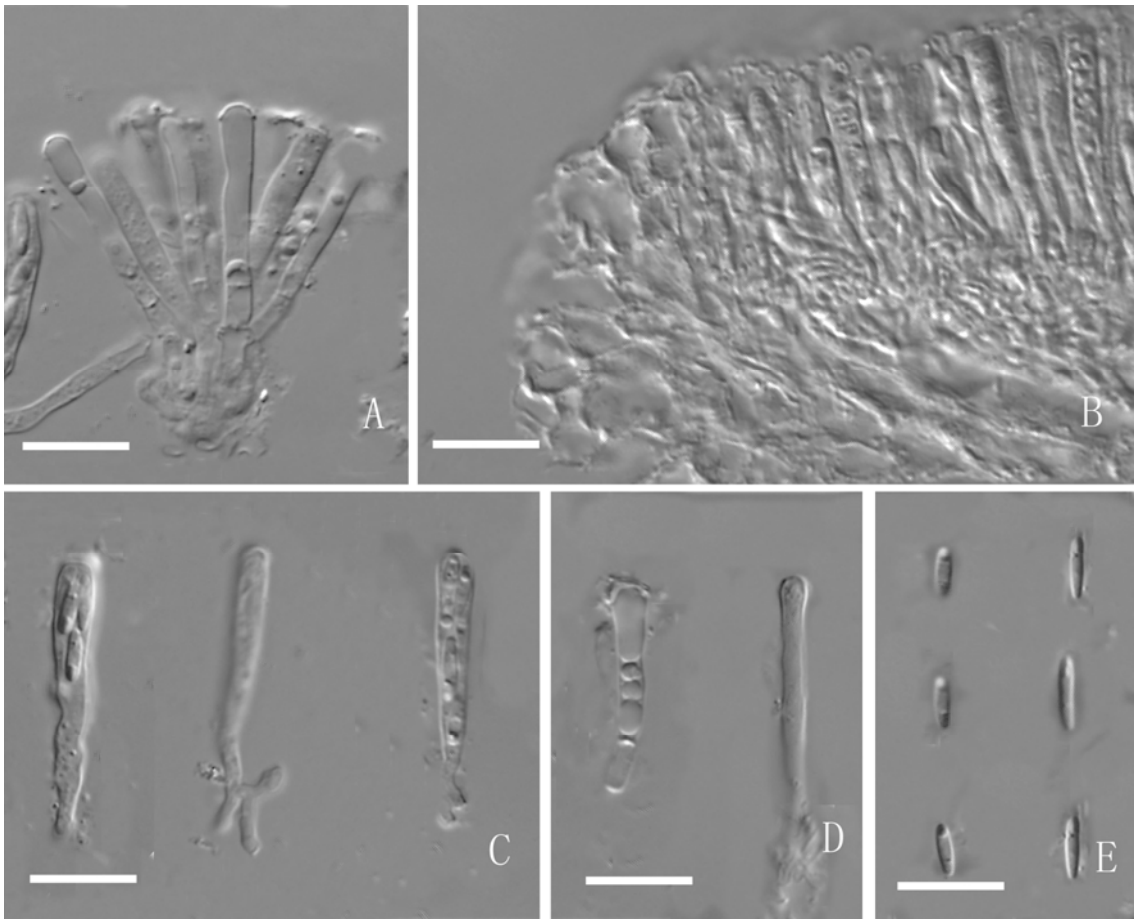

Figure 2. *O. tenebricosa* A. Asci and paraphyses; B. Vertical section of part apothecium; C. Asci; D. Paraphyses; E. Ascospores with spore body. Bar: A-E=10 µm.

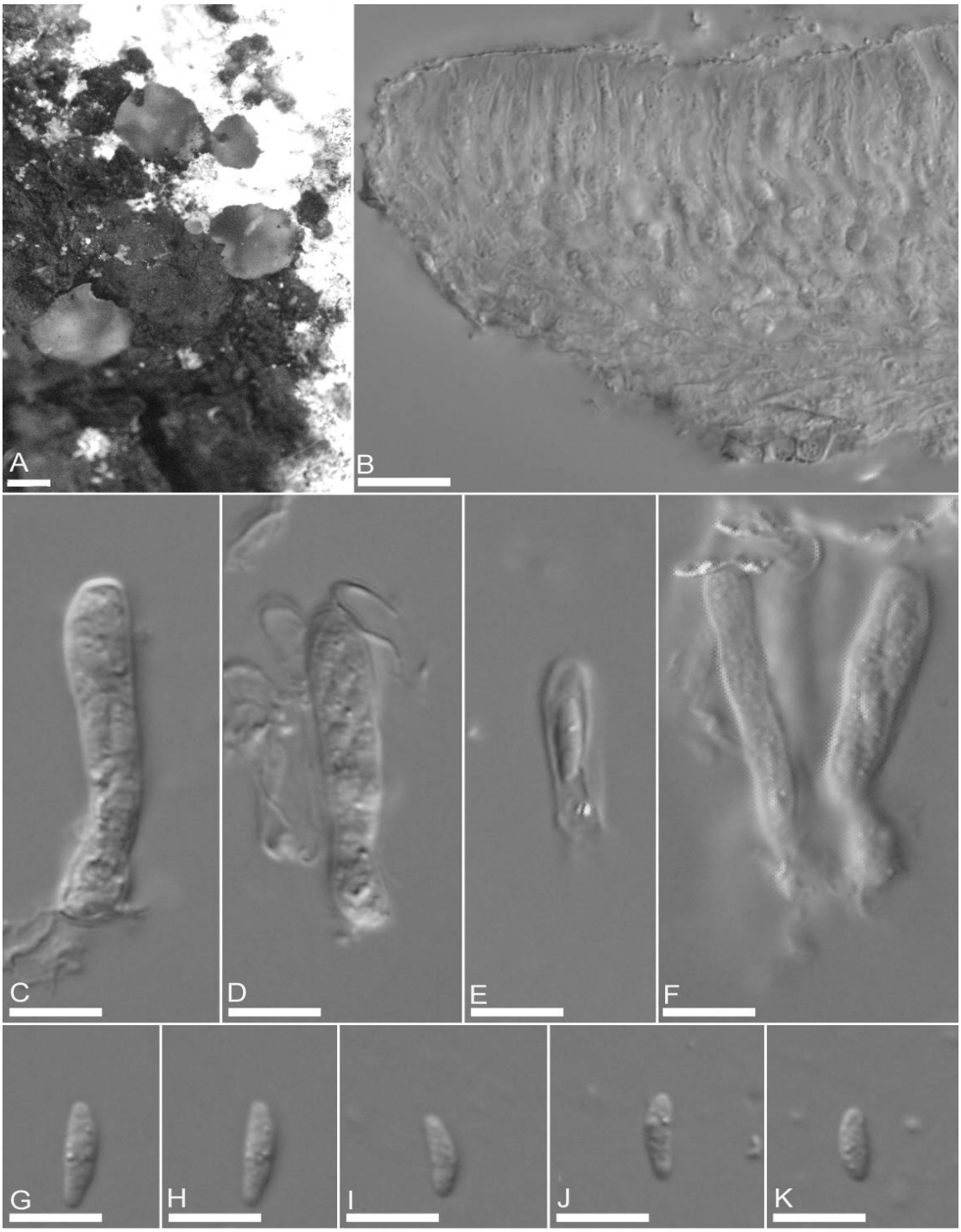

Figure 3. *H. fusispora* A. Rehydrated apothecia; B. Vertical section of part apothecium; C-E. Asci; F. Asci and paraphyses; G-K. Ascospores. Bar: A= 0.5 mm, B= 10 µm, C-K = 5 µm.

Hyalorbilia fusispora (Velen.) Baral & G. Marson, Micologia 2000: 44, 2001 (Figure 3)

Basionym**:** *Orbilia fusispora* Velen., Monogr. Discom. Bohemiae: 96, 1934.

Specimens examined**:** China, Anhui Province, Jiuhuashan, on rotten branch of broadleaf tree, lying on moist ground, J.W. Guo, 28 September 2009, jhs-31; China, Anhui Province, Huangshan, on rotten branch of unidentified tree, lying on moist ground, J.W. Guo, 13 September 2009, hs-7, hs-8 and hs-21; China, Jiangsu

Province, Nanjing City, Zijinshan, on rotten branch of unidentified tree, lying on moist ground, J.W. Guo, 10 September 2009, zjs-34; China, Jiangxi Province, Wuyuan County, Wengong Mountain, on rotten branch of broadleaf tree, lying on moist ground, J.W. Guo, 7 September 2009, wgs-6; China, Zhejiang Province, Linan City, Tianmushan Mountain, on rotten branch of unidentified broadleaf tree, lying on moist ground, J.W. Guo, 3 September 2009, tms-5; China, Yunnan Province, Kunming City, Shuanglong Town, on rotten branch of broadleaf tree, lying on moist ground, J.W. Guo, 19 May 2006, sl-j-6; China, Yunnan Province, Kunming City, Xishan Forest Park, on rotten branch of unidentified tree, lying on moist ground, J.W. Guo, 16 June 2006, xs-j-12; China, Yunnan Province, Yuxi City, Yimen County, Longquanshan Forest Park, on rotten branch of unidentified tree, lying on moist ground, J.W. Guo, 23 August 2006, ym-j-179.

Apothecia scattered, superficial, sparse, slightly concave to cup-shaped and whitish when fresh, flat and straw yellowish when dried, 0.3-1.5 mm diam., sessile or short-stipitate, margin even, waxy, translucent. Ectal excipulum of texture rectangular to texture angular, 12.3-60.0 µm thick, cells hyaline, thin-walled, 5.0-14.5 × 3.2-9.5 µm. Hymenium strongly coherent, 15.4-33.9 µm thick, asci and paraphyses immersed in a gelatinous matrix. Asci cylindrical, apex thin-walled and rounded, unforked at the base, shrunken and curving near the base, 16.6(19.5-)-22.5(-26.2) × 2.8(3.5-)-4.3(-5.9) µm, 8-spored. Ascospores fusoid, straight or some slightly curved, most strongly inflated and slightly curved near one third of one end, hyaline, nonseptate, 4.2(4.5-)-6.1(-6.3) × 1.3(1.6-)-1.6(-1.8) µm, one elongate SB and three to five further peripheral globose SBs (living state) of 0.4-0.5 diam in each end, most of ascospores biseriate or only exceptionally irregularly uniseriate. Paraphyses apex slightly inflated, cylindrical, hyaline, nonseptate, 21.1-28.6 × 1.8-2.6 µm.

***Known distribution*: Czech.**

***New distribution*:** Anhui Province, Jiangsu Province, Jiangxi Province, Zhejiang Province, and Yunnan Province in China.

Orbilia fusispora was firstly described by Velenovský (1934). The key character is the approximately fusoid spores. According to the new taxonomic treatments (Baral and Marson, 2001), it was transferred to *Hyalorbilia*. Liu et al. (2007b) reported *H. fusispora* collected in China distributing in Beijing, Liaoning Province, Henan Province, Hubei Province and Jiangsu Province, but it should be *H. ulicicola* (a new species in the unpublished monograph of H.O. Baral) according to the shape of ascospores.

The similar species is *H. juliae* (Velen.) Baral, Priou & G. Marson. They are similar in the shape of ascospores and the number of SBs, but obviously differ in the distribution of SBs.

New distribution of Orbiliaceae in Mainland, China

Hyalorbilia juliae (Velen.) Baral, Priou & G. Marson, Bull. Mens. Soc. Linn. Lyon, S74: 55, 2005 (Figure 4)

***Basionym*:** *Orbilia juliae* Velen., Monogr. Discom. Bohemiae: 95, 1934.

***Specimens examined*:** China, Anhui Province, Huangshan, on rotten branch of broadleaf tree, lying on moist ground, J.W. Guo, 13 September 2009, hs-11; China, Yunnan Province, Kunming City, Songhuaba Forest, on rotten branch of unidentified tree, lying on moist ground, J.W. Guo, 16 May 2006, shb-j-2; Baoshan City, Shidian County, on rotten branch of unidentified tree, lying on moist ground, J.W. Guo, 12 July 2006, sd-j-5; China, Yunnan Province, Yuxi City, Yimen County, Longquanshan Forest Park on rotten branch of unidentified tree, lying on moist ground, J.W. Guo, 1 August 2006, ym-j-4; China, Sichuan Province, Aba County, Jiuzhaigou Nature Reserves, on rotten branch of unidentified tree, lying on cool and moist ground, J.W. Guo, 8 October 2006, ys-j-8.

Apothecia scattered, superficial, slightly concave to cup-shaped and yellowish when fresh, 0.6-1.0 mm diam., sessile or short-stipitate, margin even, waxy, translucent; marginal hairs, hyaline, septate. Ectal excipulum of rectangular cells, 15.9-47.8 µm thick, cells hyaline, thin-walled, 9.6-17.8 × 3.1-7.6 µm. Hymenium strongly coherent, 26.8-33.9 µm thick, asci and paraphyses immersed in a gelatinous matrix. Asci cylindrical, apex thin-walled and rounded, unforked at the base, shrunken and curving near the base, 19.5-28.1 × 4.3-5.7 µm, 8-spored. Ascospores cylindrical to subfusoid, strongly inflated near one third of one end, straight or slightly curved, hyaline, nonseptate, 7.4-12.8 × 1.2-1.7 µm, four to seven globose SBs of 0.6-0.9 µm diam. in each half, most of ascospores overlapping fascicles and few of them irregularly triseriate. Paraphyses apex slightly inflated, cylindrical, hyaline, nonseptate, 18.9-23.4 × 1.5-2.1 µm.

***Known distribution*:** Europe; Beijing City and Zhejiang Province in China.

***New distribution*:** Anhui Province, Yunnan Province and Sichuan Province in China.

This is a new record of *Hyalorbilia* from China. *Orbilia juliae* was firstly described by Velenovský (1934), the description as follows: asci 25 × 6-8 µm, obtuse cylindric, ascospores 6-10 µm. Svrček (1954) and Spooner (1987) considered it as a synonym of *H. inflatula*. Actually, the latter spores with less SBs in each half are shorter and more thinner than those of *O. juliae*. Finally, Priou (2005) transferred *O. juliae* to *Hyalorbilia*.

Hyalorbilia arcuata H.O. Baral, M.L. Wu & Y.C. Su, Fungal Diversity 25: 235, 2007 (Figure 5)

***Specimens examined*:** China, Yunnan Province, Honghe City, Pingbian County, Daweishan Nature Reserves, on rotten branch of broadeaf tree, lying on moist ground,

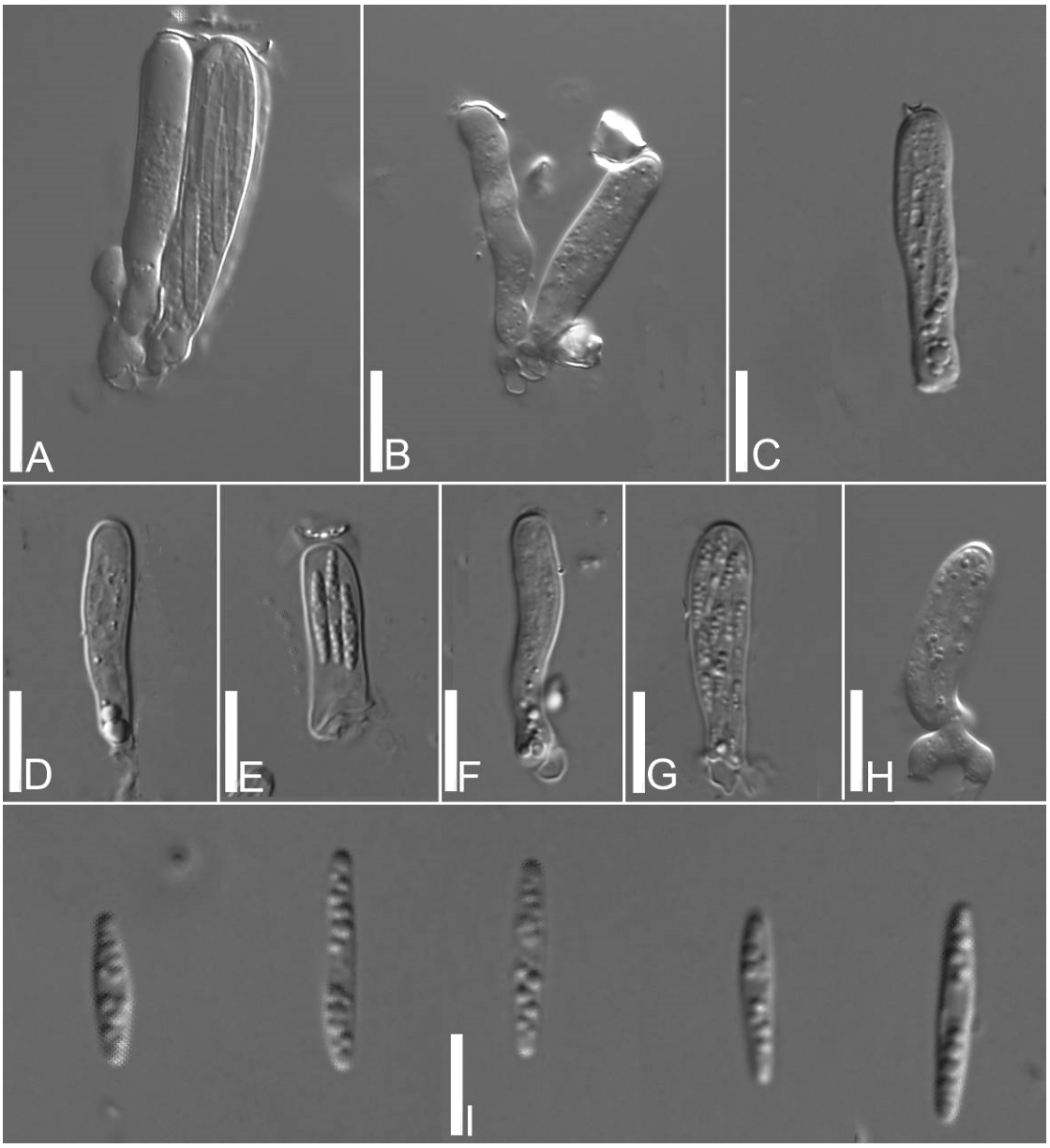

Figure 4. *H. juliae* A-B. Asci and paraphyses; C-H. Asci; I. Ascospores. Bar: A-H = 10 µm, I = 5 µm.

J.W. Guo, 30 October 2013, DWS1-13 and DWS1-25; China, Jiangxi Province, Wuyuan County, Wolonggu Valley, on rotten branch of broadleaf tree, lying on moist ground, J.W. Guo, 7 September 2009, wyg-6, wyg-7 and wyg-29; China, Zhejiang Province, Linan City, Tianmushan Mountain, on rotten branch of unidentified broad-leaved tree, lying on moist ground, J.W. Guo, 3 September 2009, tms-7, tms-28, tms-34 and tms-36; China, Fujian Province, Shanghang City, Meihuashan Mountain, on rotten branch of unidentified broad-leaved tree, lying on moist ground, J.W. Guo, 1 September 2009, MQS-17; China, Hunan Province, Yizhang Couty, Mangshan Nature Reserves, on rotten branch of unidentified broad-leaved tree, lying on moist ground, J.W. Guo, 29 August 2009, CZMS-6 and CZMS-25; China, Guangdong Province, Zhaoqing City, Dinghushan Mountain, on rotten branch of unidentified broad-leaved tree, lying on moist ground, J.W. Guo, 26 August 2009, DHS-14; China, Guangxi Province, Longsheng Couty, Huaping Nature Reserves, on rotten branch of unidentified broadleaf tree, lying on moist ground, J.W. Guo, 24 August 2009, HPH-2; China, Hubei Province, Yizhang Couty, Shennongjia Nature Reserves, on rotten branch of unidentified broadeaf tree, lying on moist ground, J.W. Guo, 20 August 2009, sn1-19; China, Guizhou Province, Yuping Couty, Fanjingshan Mountain,

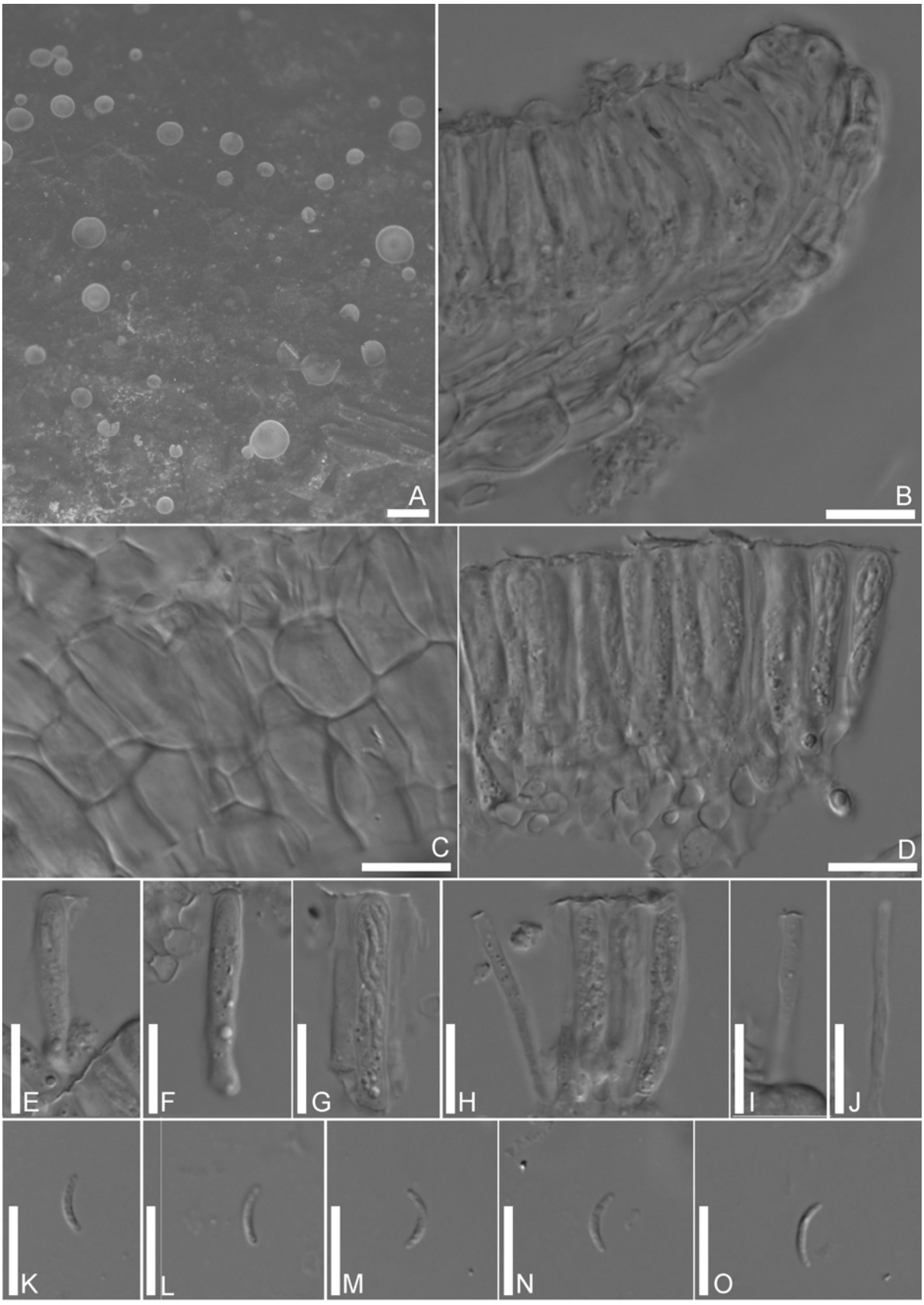

Figure 5. *H. arcuata*. A. Rehydrated apothecia; B. Vertical sections of part apothecium; C. Excipulum cells; D,H. Asci and paraphyses; E-G. Asci; I-J. Paraphyses; K-O. Ascospores. Bars: A = 0.5 mm, B-O = 10 µm.

on rotten branch of unidentified broadleaf tree, lying on moist ground, J.W. Guo, 20 July 2009, FJH-3, FJH-8 and FJH-12; China, Yunnan Province, Kunming City, Shuanglong Town, on rotten branch of unidentified tree, lying on moist ground, J.W. Guo, 19 May 2006, sl-j-9; China, Yunnan Province, Kunming City, Jindian Forest Park, on rotten branch of unidentified tree, lying on moist ground, J.W. Guo, 13 June 2006, jd-j-16.

***Known distribution*:** Taiwan; Kunming City, Yunnan Province, China.

***New distribution*:** Guizhou Province, Guangxi Province, Guangdong Province, Hunan Province, Hubei Province, Fujian Province, Jiangxi Province mentioned above; in addition, some specimens of this species were also collected from Wenshan, Dali, Yuxi and Honghe in Yunnan Province, as well as Sichuan Province, Jiangsu Province, Henan Province, Anhui Province.

Hyalorbilia sp. that was the teleomorph of *Dactylella lignatilis* M.H. Mo & K.Q. Zhang, was firstly reported and widely distributed in Yunnan, China (Mo et al. 2005b). It was given specific name by Wu et al. (2007). The medium to strongly sickle-shaped ascospores is its key character. The shape of the ascospores and the distribution of its SBs of the present specimens are similar to the model species, but there is a slight difference in the size of ascospores [(4.6-)5.8-(-7.4)9.0 × 0.8-1.3 µm vs 5.5-7.5(-8) × 0.9-1.2 µm]. An illustration of the species is also provided here.

Hyalorbilia erythrostigma (Berk. & Broome) Baral & G. Marson, Micologia 2000: 44, 2001 (Figure 6)

***Basionym*:** *Peziza erythrostigma* Berk. & Broome, Ann. Mag. Nat. Hist., ser. 3, 18: 126, 1866

Dasyscyphus erythrostigma (Berk. & Broome) Sacc. Syll. Fung. 8: 453, 1889

***Specimens examined*:** China, Yunnan Province, Pingbian County, Daweishan Nature Reserves, on rotten branch of broadleaf tree, lying on moist ground, J.W. Guo, 7 June 2013, pb-j-1; China, Zhejiang Province, Kaihua Couty, Gutianshan Nature Researves, on rotten branch of unidentified broadleaf tree, lying on moist ground, J.W. Guo, 5 September 2009, GTS-38; PR China, Yunnan Province, Yuxi City, Tonghai County, Xiushan Forest Park, on rotten branch in moist evergreen broadleaf forest, J.W. Guo and S.F. Li, 16 July 2007, Th2-1.

Apothecia moist 0.1-0.3 mm diam., saprotrophic, scattered on inner bark surface of *Dalbergia* sp. under subtropical broad-leaved forest, sometimes parasitic on the black fruiting bodies of unknown fungi or together with *O. sarraziniana* Boud, fresh water-whitish, cupulate, short-stipitate or sessile, smooth at the margin, translucent. Ectal excipulum composed of subglobose to globose cells, 5.0-6.3 × 6.4-9.0 µm, thin-walled, hyaline. Hymenium 21.7-31.6 µm thicken. Asci in the living state 20.2-31.2 × 2.5-4.5 µm, 8-spored, cylindrical, truncate rounded at the apex, thin-walled, unforked below, arising from crosiers. Ascospores 2.5-3.3 × 2.0-2.3 µm in living state, ellipsoid, hyaline, mono-celled, uniseriate; living ascospores with 1 obvious globose SB neighbor to one end. Paraphyses embedded in a gel and not higher than asci, nonseptate, hyaline, 22.0-27.4 × 2.1-3.6 µm.

***Known distribution*:** Europe; Fujian Province and Jiangxi Province in China.

***New distribution*:** Zhejiang Province and Yunnan Province in China.

This is a rarely species in China, and usually parasitic on the ascomata of other fungi [such as *Chaetosphaerella* (Durieu & Mont.) E. Müll. & C. Booth and *Nitschkia acanthostroma* (Mont.) Nannf.]. It is similar to *H. brevistipitata* but its spores have less SBs and larger size.

Hyalorbilia* aff. *inflatula (P. Karst.) Baral & G. Marson, Micologia 2000: 44, 2001 (Figure 7)

Basionym: *Peziza inflatula* P. Karst., Not. Soc. Sällsk. Fauna Fl. Fenn. 10: 175, 1869

Orbilia inflatula (P. Karst.) P. Karst., Not. Sällsk. Fauna Fl. Fenn. 11: 248, 1870

***Specimens examined*:** China, Yunnan Province, Honghe City, Pingbian County, Daweishan Nature Reserves, on rotten branch of broadeaf tree, lying on moist ground, J.W. Guo, 30 October 2013, DWS1-22, DWS1-26 and DWS1-31; China, Jiangxi Province, Wuyuan County, Wolonggu Valley, on rotten branch of broadleaf tree, lying on moist ground, J.W. Guo, 7 September 2009, wyg-2; China, Zhejiang Province, Kaihua Couty, Gutianshan Nature Researves, on rotten branch of unidentified broadleaf tree, lying on moist ground, J.W. Guo, 5 September 2009, GTS-7; China, Fujian Province, Shanghang City, Meihuashan Mountain, on rotten branch of unidentified broadleaf tree, lying on moist ground, J.W. Guo, 1 September 2009, MQS-33; China, Guangdong Province, Zhaoqing City, Dinghushan Mountain, on rotten branch of unidentified broadleaf tree, lying on moist ground, J.W. Guo, 26 August 2009, DHS-6 and DHS-19; China, Guizhou Province, Yuping Couty, Fanjingshan Mountain, on rotten branch of unidentified broadleaf tree, lying on moist ground, J.W. Guo, 20 July 2009, FJH-17; China, Sichuan Province, Jiuzhaigou Nature Reserves, on rotten branch of unidentified broadleaf tree, lying on moist ground under broadleaf forest, J.W. Guo and S.F. Li, 8 October 2006, ys-j-4.

Apothecia moist 0.5-1.0 mm diam., fresh water-whitish, cupulate, short-stipitate or sessile, smooth at the margin, translucent; marginal hairs 1.0-1.3 diam., hyaline, septate. Ectal excipulum 21.6-51.2 µm thicken, composed of rectangular to angular cells, 7.5-18.4 × 3.6-6.8 µm, hyaline, thin-walled. Hymenium 26.7-32.7 µm thicken. Asci in the living state 19.1-19.7 × 1.7-2.8 µm, 8-spored, cylindrical, truncate rounded at the apex, thin-walled, unforked below, arising from crosiers. Ascospores 5.2-6.3 × 0.8-1.0 µm in living state, calvate, hyaline, mono-celled, symmetrically biseriate; living ascospores

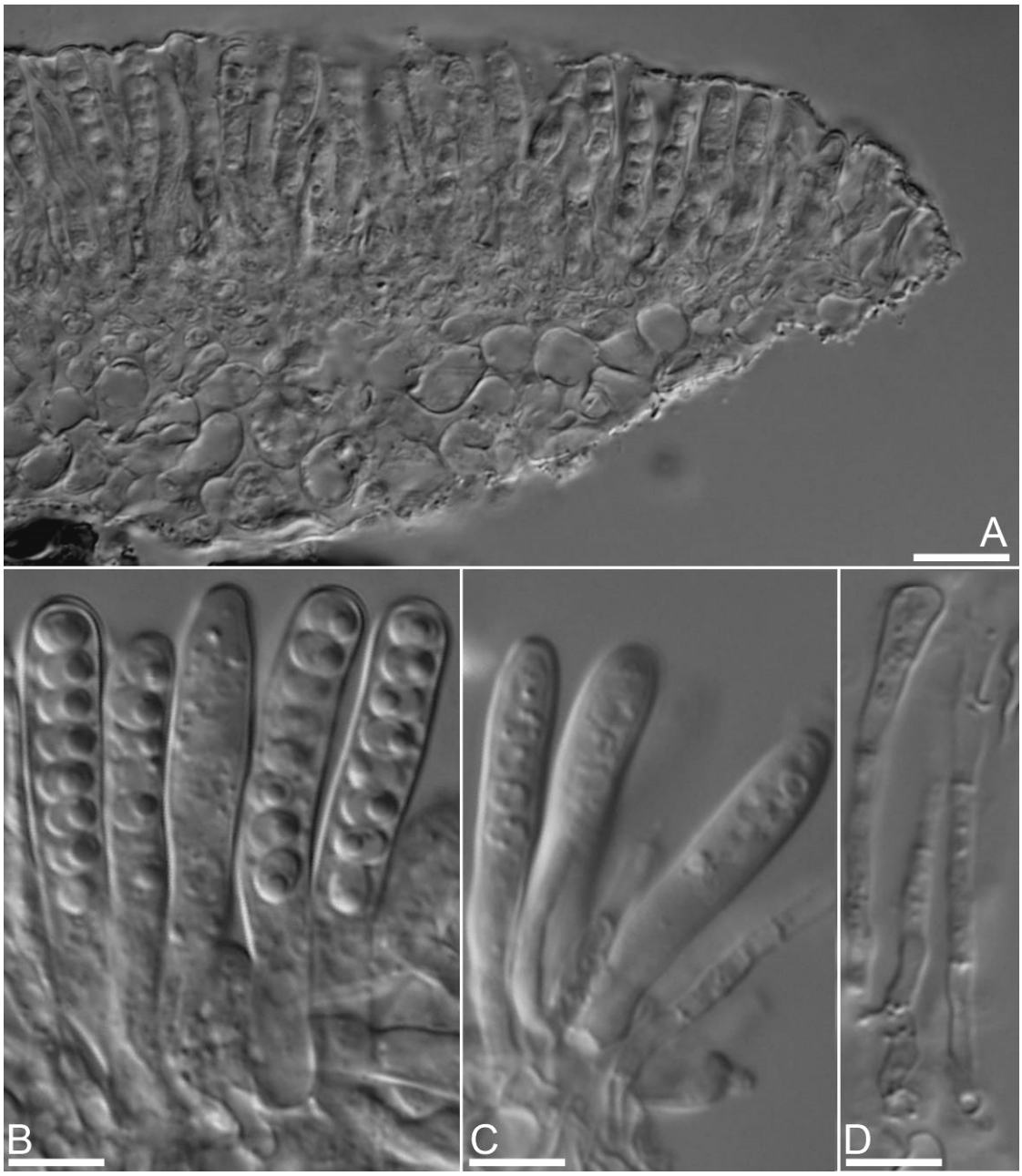

Figure 6. *Hyalorbilia erythrostigma* A. Vertical sections of part apothecium; B-C. Asci and paraphyses; D. Paraphyses. Bars: A = 10 µm, B-D = 5 µm.

with 2-4 obvious globose SB of 0.3-0.5 µm diam. neighbor to one end. Paraphyses embedded in a gel, nonseptate, hyaline, 27.2-30.6 × 1.7-2.4 µm.

H. inflatula is a common species in Europe. Our specimens have smaller size of its spores but resembled the shape with *H. inflatula*. Here these specimens are proposed as *H.* aff. *inflatula*.

Distribution: Henan, Anhui, Jiangsu, Zhejiang, Hunan, Guangdong, Guangxi, Guizhou, Sichuan and Yunnan, China.

Hyalorbilia inflatula (P. Karst.) Baral & G. Marson, Micologia 2000: 44, 2001 (Figure 8)

Basionym: Peziza inflatula P. Karst., Not. Soc. Sällsk. Fauna Fl. Fenn. 10: 175, 1869

Orbilia inflatula (P. Karst.) P. Karst., Not. Sällsk. Fauna Fl. Fenn. 11: 248, 1870

Specimens examined**:** China, Yunnan Province, Honghe City, Pingbian County, Daweishan Nature Reserves, on rotten branch of broadeaf tree, lying on moist ground, J.W. Guo, 30 October 2013, DWS1-21, DWS1-23 and

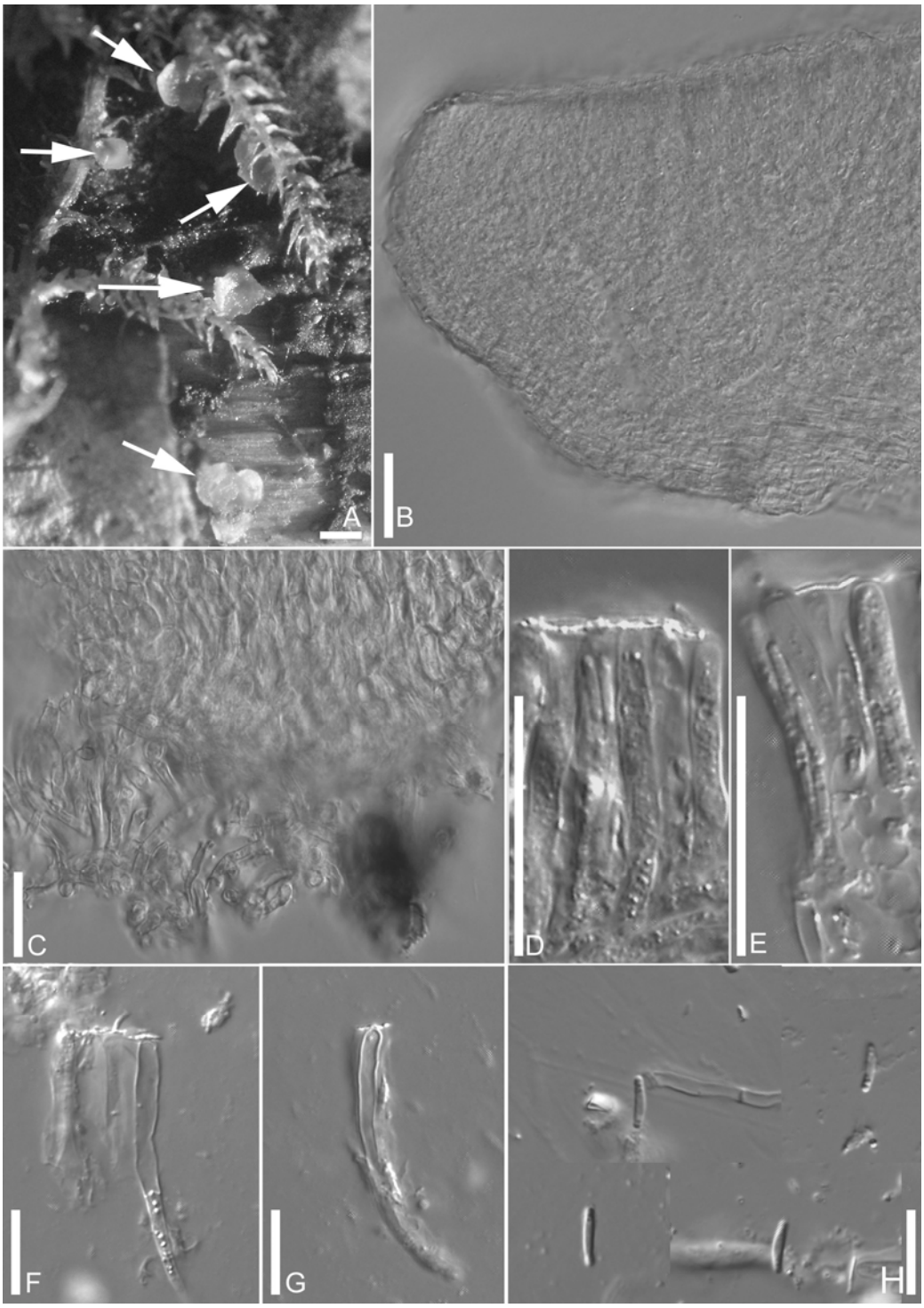

Figure 7. *H.* aff. *inflatula*. A. Rehydrated apothecia (arrows); B. Vertical sections of part apothecium; C. Medullary excipulum cells; D-E. Asci and paraphyses; F-G. Paraphyses; H. Ascospores. Bars: A = 0.5 mm, B-C = F-K = 10 µm, D-E = 20 µm.

DWS1-38; China, Jiangxi Province, Ningdu County, Cuiweifeng Forest Park, on rotten branch of broadleaf tree, lying on moist ground, J.W. Guo, 5 September 2009, cwf-8; China, Yunnan Province, Yuxi City, Yimen County, Longquanshan Forest Park, on rotten branch of unidentified tree, lying on moist ground, J.W. Guo, 13 July 2009, ym092-8; China, Sichuan Province, Jiuzhaigou Nature Reserves, on rotten branch of

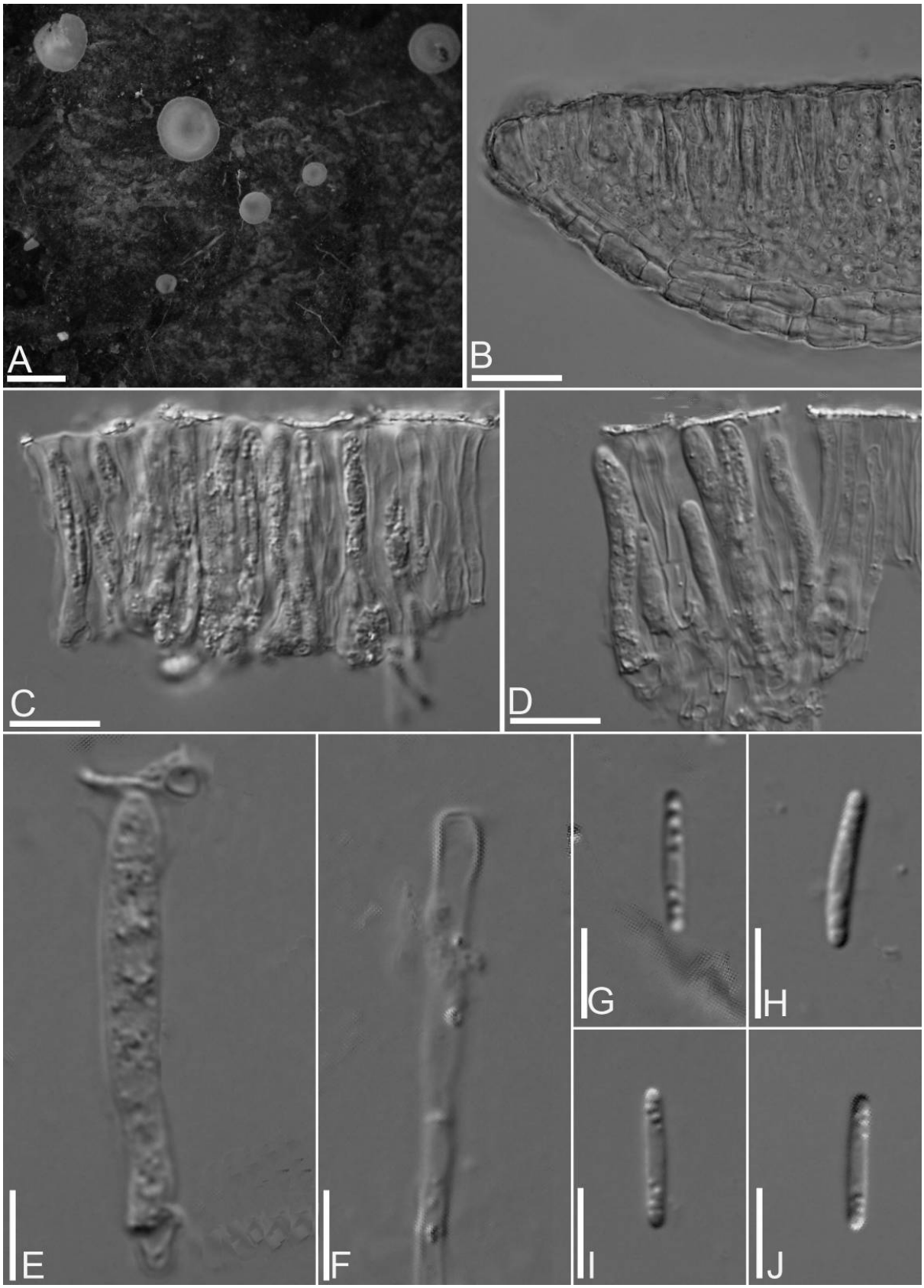

Figure 8. *H. inflatula*. A. Fresh apothecia on bark; B. Vertical sections of part apothecium; C-D. Asci and paraphyses; E. Asci; F. Paraphyses; G-J. Ascospores. Bars: A = 0.5 mm，B = 20 μm，C-D = 10 μm，E-J = 5 μm.

unidentified broadleaf tree, lying on moist ground under broadleaf forest, J.W. Guo and S.F. Li, 7 August 2007, bjy-5.

***Known distribution*:** Europe; Tibet and Hubei, China.

***New distribution*:** Jiangxi, Guangdong, Guangxi, Sichuan and Yunnan, China.

Hyalorbilia inflatula was a widely distributed species in Europe and China. The ascospores of Chinese specimens are 5.9-10.3 × 0.9-1.2 µm and have 3-4 SBs diam. 0.4-0.7 µm at each half.

Hyalorbilia berberidis (Velen.) Baral, Micologia 2000: 44, 2001

Basionym: *Orbilia berberidis* Velen., Monogr. Discom. Bohemiae: 99-100, 1934

***Specimens examined*:** China, Yunnan Province, Yuxi City, Yimen County, Longquanshan Forest Park, on rotten branch of unidentified tree, lying on moist ground, J.W. Guo, 13 June 2009, ym091-16; China, Yunnan Province, Yuxi City, Tonghai County, Xiushan Forest Park, on rotten branch of unidentified tree, lying on moist ground, J.W. Guo, 7 June 2007, Th2-8.

***Known distribution*:** Europe; Kunming City, Yunnan Province in China.

***New distribution*:** Yuxi City, Yunnan Province in China.

Ten samples of this fungus were collected in Kunming City, Yimen County and Tonghai County during May and June of 2005-2010. The sickle spores are similar to *H. arcuata*, but it has more longer spores up to 10-12 µm.

Key to Orbiliaceae from Mainland China

1. Asci arising from crosiers, hymenial elements strongly coherent ……(*Hyalorbilia*) 2
1. Asci mostly branched below, asci with paraphyses easily separated……(*Orbilia*) 6
2. Ascospores ellipsoid, 2.5-3.3 × 2.0-2.3 µm in living state……*H. erythrostigma*
2. Ascospores slightly inflated and clavate……3
2. Ascospores strongly inflated and slightly curved near one third of one end……4
2. Ascospores sickle-shaped……..5
3. Ascospores with 2-4 SBs at each ends, 5.2-6.3 × 0.8-1.0 µm……*H.*aff. *inflatula*
3. Ascospores with 3-4 SBs at each ends, 5.9-10.3 × 0.9-1.2 µm……..*H. inflatula*
4. Ascospores fusoid, 4.2(4.5-)-6.1(-6.3) × 1.3(1.6-)-1.6(-1.8) µm…… *H. fusispora*
4. Ascospores obtuse cylindric, 7.4-12.8 × 1.2-1.7 µm…… *H. juliae*
5. Ascospores, 10.9-13.6 × 1.2-1.4 µm……*H. berberidis*
5. Ascospores, (4.6-) 5.8-(-7.4)9.0 × 0.8-1.3 µm……*H. arcuata*
6. Ascospores spindle to rod shaped, straight or slightly curved, 5.0-8.0 × 1.1-1.4 µm diam. 0.4-0.7 µm at each half
6. Ascospores helical and curved with sickled-shaped, 6.0-8.5(-10.0) × 1.0-1.4 µm……*O. xanthostigma*

Conflict of Interests

The author(s) have not declared any conflict of interests.

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REFERENCES

Baral HO (1992). Vital versus herbarium taxonomy: morphological differences between living and dead cells of Ascomycetes, and their taxonomic implications. Mycotaxon, 44:333-390.

Baral HO, Marson G (2001). Monographic revision of *Gelatinopsis* (Calloriopsideae, Leotiales). In Micologia Asociazione Micologica Bresadola, Trento. 2000:23-46.

Eriksson OE, Baral HO, Currah RS, Hansen K, Kurtzman CP, Læssøe T, Rambold G (2003). Notes on ascomycete systematics. Nos 3580-3623. Myconet, 9:91-103.

Guo JW, Yu ZF, Zhang KQ (2007). A new Chinese record of *Hyalorbilia*. Mycosystema, 26(4):588-590.

Kirk PM, Cannon PF, David JC *et al*. (2008). Ainsworth & Bisby's dictionary of the fungi. 10th ed. CAB International, Wallingford, pp.1-771.

Li SF, Yu ZF, Zhang Y, Qiao M, Guo JW, Zhang KQ (2009). *Arthrobotrys nonseptata*, a new anamorph from an *Orbilia* species. Mycotaxon, 109:247-254.

Liu B, Liu XZ, Zhuang WY (2005a). *Orbilia querci* sp. nov. and its knob-forming nematophagous anamorph. FEMS Microbiol. Lett., 245:99-105.

Liu B, Liu XZ, Zhuang WY (2005b). A new species of *Hyalorbilia* and its anamorph from China. Nova Hedwigia, 81:145-156.

Liu B, Liu XZ, Zhuang WY, Baral HO (2006). Orbiliaceous fungi from Tibet, China. Fungal Diversity, 22:107-120.

Liu B, Liu XZ, Zhuang WY, Huang FC (2007b). New records of *Orbilia* in China. Mycosystema, 26(4):575-581.

Liu B, Liu XZ, Zhuang WY, Qin PS (2007a). New Records of *Hyalorbilia* in China. Mycosystema, 26(4):582-587.

Mo MH, Huang XW, Zhou W, Huang Y, Hao YE, Zhang KQ (2005a). *Arthrobotrys yunnanensis* sp. nov., the fourth ananmorph of *Orbilia auricolor*. Fungal Diversity, 18:107-115.

Mo MH, Zhou W, Huang Y, Yu ZF, Zhang KQ (2005b). A new species of *Dactylella* and its telemorph. Mycotaxon, 91:185-192.

Priou JP (2005). Sur quelques Orbiliaceae récoltées en situation aérienne. Bull. mens. Soc. linn. Lyon, S74:53-63.

Qiao M, Zhang Y, Li SF, Baral HO, Weber E, Su HY, Xu JP, Zhang KQ, Yu ZF (2011). *Orbilia blumenaviensis* and its *Arthrobotrys* anamorph. Mycologcal Progress, 11(1):255-262.

Spooner BM (1987). Helotiales if Australasia: Geoglossaceae, Orbiliaceae, Scelrotiniaceae, Hyaloscyphaceae. Bibliotheca Mycologica 116:1-711.

Su HY, Zhang Y, Baral HO, Yang XY, Mo MH, Cao YH, Chen MH, Yu ZF (2010). Four new species of Orbiliaceae from Yunnan, China. Mycological Progress, 10(3):373-381.

Svrček M (1954). Revise Velenovskeho druhu rodu Orbilia (Discomycetes). Revisio critica J. Velenovskyi specierum generis Orbilia. Sborník Národního Musea v Praze, ser. B, 10:3-23.

Teng SC (1939). High fungi of China. National Institute of Zoology &

Botany. Academia Sinica, Peking.
Velenovský J (1934). Monographia Discocomycetum Bohemiae. Sumptibus Propriis 1-436.
Wu ML, Su YC, Baral HO, Liang SH (2007). Two new species of *Hyalorbilia* from Taiwan. Fungal Divers. 25: 233-244.
Yu ZF, Zhang Y, Qiao M, Baral HO, Weber E, Zhang KQ (2006). *Drechslerella brochopaga*, the anamorph of *Orbilia (Hyalinia) orientalis*. Mycotaxon, 96:163-168.
Yu ZF, Qiao M, Zhang Y, Baral HO, Zhang KQ (2007a). *Orbilia vermisformis* sp. nov. and its anamorph, Mycotaxon, 99:271-278.
Yu ZF, Zhang Y, Qiao M, Zhang KQ (2007b). *Orbilia dorsalia* sp. nov., the teleomorph of *Dactylella dorsalia* sp. nov.. Cryptogamie Mycologie, 28(1):289-294.
Yu ZF, Kong YJ, Zhang Y, Qiao M, Guo JW, Zhang KQ (2009a). A new *Dactylella* species from *Orbilia alba*. The J. Microbiol. 47(3):265-269.
Yu ZF, Qin L, Zhang Y, Qiao M, Kong YJ, Zhang KQ (2009b). A new *Drechslerella* species from *Orbilia*. Mycotaxon, 110: 253-259.
Zhang Y, Yu ZF, Qiao M, Zhang KQ (2006). A new species of *Orbilia* from China. Cryptogamie Mycologie, 27(4):1-6.
Zhang Y, Yu ZF, Baral HO, Qiao M, Zhang KQ (2007). *Pseudorbilia* gen. nov. (Orbiliaceae) from Yunnan, China. Fungal Diversity, 26:305-312.
Zhang Y, Yu ZF, Baral HO, Mo MH, Zhang KQ (2009). New species and records of *Orbilia* (Orbiliaceae, Ascomycota) from China. Fungal Divers. 36:141-153.
Zhuang WY (1997). Fungal flora of the Daba mountains: Discomycetes. Mycotaxon 61:3-12.
Zhuang WY (1999). Discomycetes of tropical China. VI. Additional species of Guangxi. Fungal Diversity, 3:187-196.
Zhuang WY, Korf RP (1989). Some new species and new records of discomycetes in China. III. Mycotaxon, 35: 297-312.
Zhuang WY, Hyde KD (2001). Discomycetes of tropical China. V. Species new to Hong Kong. Fungal Diversity, 6: 181-188.
Zhuang WY, Wang Z (1998a). Discomycetes of tropical China. I. Collections from Hainan island. Mycotaxon, 67: 21-31.
Zhuang WY & Wang Z (1998b). Discomycetes of the tropical China. II. Collections from Yunnan. Mycotaxon, 69: 339-358.