In search of lost ergots: phylogenetic re-evaluation of *Claviceps* species in Japan and their biogeographic patterns revealed

E. Tanaka[1*], K. Tanada[1], T. Hosoe[2], B. Shrestha[3], M. Kolařík[4], M. Liu[5]

[1]*Ishikawa Prefectural University, 1-308 Suematsu, Nonoichi, Ishikawa 921-8836, Japan;* [2]*Department of Organic Chemistry, Hoshi University, 2-4-41 Ebara, Shinagawa, Tokyo 142-8501, Japan;* [3]*Madan Bhandari University of Science and Technology, Saibu, Bhaisepati, Lalitpur, Nepal;* [4]*Institute of Microbiology of the Czech Academy of Sciences, Vídeňská 1083, CZ-14220 Prague, Czech Republic;* [5]*Ottawa Research and Development Centre, Agriculture and Agri-Food Canada, 960 Carling Ave. Ottawa, Ontario K1A0C6, Canada*

**Corresponding author*: E. Tanaka, tanakae@ishikawa-pu.ac.jp

Abstract: *Claviceps* (*Clavicipitaceae*, *Hypocreales*) was erected in 1853, although ergotism had been well-known for a much longer time. By 2000, about 70 taxa had been described in *Claviceps*, of which eight species and six varieties were based on Japanese type or authentic specimens. Most of these Japanese *Claviceps* taxa are based on lost specimens or have invalid names, which means many species practically exist only in the scientific literature. The ambiguous identities of these species have hindered taxonomic resolution of the genus *Claviceps*. Consequently, we sought and collected more than 300 fresh specimens in search of the lost Japanese ergots. Multilocus phylogenetic analyses based on DNA sequences from LSU, *TEF-1α*, *TUB2*, *Mcm7*, and *RPB2* revealed the phylogenetic relationships between the Japanese specimens and known *Claviceps* spp., as well as the presence of biogeographic patterns. Based on the phylogenetic analysis, host range and morphology, we re-evaluated Japanese *Claviceps* and recognised at least 21 species in Japan. Here we characterised 14 previously described taxa and designated neo-, lecto- and epi-types for *C. bothriochloae*, *C. imperatae*, *C. litoralis, C. microspora*, *C. panicoidearum* and *C. yanagawaensis*. Two varieties were elevated to species rank with designated neotypes, *i.e. C. agropyri* and *C. kawatanii*. Six new species, *C. miscanthicola*, *C. oplismeni*, *C. palustris*, *C. phragmitis*, *C. sasae* and *C. tandae* were proposed and described.

Key words: *Clavicipitaceae*, *Hypocreales*, Neotypification, New taxa, Phylogeny, Systematics, Taxonomy.

Taxonomic novelties: New species: *Claviceps miscanthicola* E. Tanaka, *Claviceps oplismeni* E. Tanaka, *Claviceps palustris* E. Tanaka, *Claviceps phragmitis* E. Tanaka, *Claviceps sasae* E. Tanaka, *Claviceps tandae* E. Tanaka; **New status and combination:** *Claviceps agropyri* (Tanda) E. Tanaka, *Claviceps kawatanii* (Tanda) E. Tanaka; **Typifications (basionyms): Lecto- and epitypification:** *Claviceps yanagawaensis* Togashi; **Neotypifications**: *Claviceps purpurea* var. *agropyri* Tanda, *Claviceps bothriochloae* Tanda & Y. Muray, *Claviceps imperatae* Tanda & Kawat., *Claviceps microspora* var. *kawatanii* Tanda, *Claviceps litoralis* Kawat., *Claviceps microspora* Tanda, *Claviceps panicoidearum* Tanda & Y. Harada; **Resurrection**: *Claviceps queenslandica* Langdon.

Citation: Tanaka E, Tanada K, Hosoe T, Shrestha B, Kolařík M, Liu M (2023). In search of lost ergots: phylogenetic re-evaluation of *Claviceps* species in Japan and their biogeographic patterns revealed. *Studies in Mycology* **106**: 1–39. doi: 10.3114/sim.2022.106.01
Received: 31 January 2023; **Accepted:** 14 June 2023; **Effectively published online:** 17 July 2023
Corresponding editor: Robert A. Samson

INTRODUCTION

Species in *Claviceps* (*Clavicipitaceae*, *Hypocreales*, *Ascomycota*) parasitise ovaries of grasses (*Poaceae*), sedges (*Cyperaceae*) and rushes (*Juncaceae*), and cause symptoms commonly known as ergot. The type species, *C. purpurea*, produces sclerotia in florets of wheat, rye and other agricultural crops and forage grasses, that are known to cause the disease ergotism in humans and other mammals. Florets infected by *Claviceps* commonly exude copious quantities of sticky honeydew, which is rich in sugars and contains many conidia. Infected ovaries are replaced by ergot sclerotia which are often dark and horn-like in shape. Under favourable environmental conditions, the sclerotia germinate to form stipitate ascostromata (White *et al.* 2003).

Historically, most research on ergots has been done in Europe (Liu *et al.* 2022a). However, the centre of *Claviceps* diversity is presumed to be in tropical and temperate regions (Píchová *et al.* 2018). Multi-locus phylogenetic analysis has recently advanced our understanding of species delimitation in *Claviceps* (Pažoutová *et al*. 2011, 2015; Liu *et al.* 2020, van der Linde *et al*. 2022). By 2000, eight species and six varieties of *Claviceps* had been described based on Japanese specimens, *i.e. C. amamiensis* on *Digitaria setigera* (Tanda 1992a), *C. bothriochloae* on *Capillipedium parviflorum* (Tanda 1991e), *C. imperatae* on *Imperata cylindrica* (Tanda & Kawatani 1976), *C. litoralis* on *Leymus mollis* (Kawatani 1946), *C. microspora* on *Arundinella hirta* (Tanda 1991d), *C. panicoidearum* on *Isachne globosa* (Tanda & Harada 1989), *C. sorghicola* on *Sorghum bicolor* (Tsukiboshi *et al.* 1999b), *C. yanagawaensis* on *Zoysia japonica* (Togashi 1936) and the varieties *C. microspora* var. *kawatanii* on *Spodiopogon cotulifer* (Tanda 1991c), *C. purpurea* var. *agropyri* on *Elymus tsukushiensis* var. *transiens* (Tanda 1981a), *C. purpurea* var. *alopecuri* Tanda on *Alopecurus aequalis* var. *amurensis* (Tanda 1978a), *C. purpurea* var. *dactylidis* on *Dactylis glomerata* (Tanda 1981b), *C. purpurea* var. *phalaridis* on *Phalaris arundinacea* (Tanda 1979c) and *C. purpurea* var. *sasae* on *Sasa yahikoensis* (Tanda 1991a). Amongst the type specimens of Japanese *Claviceps* species, only *C. sorghicola* was located. For the remaining taxa, we were unable to locate type specimens in TUAMH (Mycological Herbarium of the Tokyo University of Agriculture, Japan), where the specimens were likely deposited by Dr. Tanda. They were lost along with that of *C. humidiphila* as described in Liu *et al*. (2022b). In recent years, molecular studies have changed the status of three varieties. Pažoutová *et al*. (2015) proposed *Claviceps humidiphila* based on the description of *C. purpurea* var. *phalaridis* from Japan. Liu *et al*. (2022b) re-validated and re-typified *C. humidiphila*, and also synonymised *C. purpurea* var. *alopecuri* and var. *dactylidis*

with *Claviceps bavariensis* (Fig. 2B, C). To resolve the taxonomy of Japanese *Claviceps*, we collected fresh specimens to designate neotypes and performed multilocus phylogenetic analyses.

MATERIALS AND METHODS

Specimen sampling and isolation

Fresh specimens of Japanese ergot species were collected from areas that include type localities of each species as far as possible. More than 300 specimens were collected (Figs 2–18) and 216 specimens were deposited to the mycological fungarium of the National Museum of Nature and Science Tsukuba, Japan (TNS-F) and some specimens were donated to the Ishikawa Museum of Natural History (ISKW). Additional specimens were borrowed from the National Museum of Nature and Science Tsukuba, Japan and the Herbarium of Hirosaki University, Fungi (HHUF). Fungal isolates were obtained by the following method: ergot sclerotia were surface-sterilised using sodium hypochlorite solution (2 %) for 1 min and washed twice with distilled water, then carefully peeled off their surface layers with a scalpel, afterwards the peeled sclerotia were placed on potato dextrose agar media (Nissui, Japan) at 15 °C. The hyphae growing from them were separately isolated and cultured. The cultures were deposited in the NARO Genebank, and principal cultures were also deposited in the CBS collection (Table 1). Images of cultures on agar media are presented in Supplementary Fig. S1. The ascostromata were induced by the following procedure: ergot sclerotia were placed on moistened quartz-sand in 100 mL plastic cups with screw-cap lids and incubated at 20 °C under fluorescent light/dark (12 h/12 h) conditions, or at 4 °C under dark condition for 3–6 mo, then transferred to 20 °C under fluorescent light/dark (12 h/12 h) conditions. The cups incubated at 4 °C were transferred to 20 °C under fluorescent light/dark (12 h/12 h) conditions. For morphological examinations, asci, ascospores and conidia were mounted with lactophenol cotton blue. Bright-field images were obtained using a differential interference contrast microscope (ECLIPSE Ni, Nikon, Tokyo, Japan) equipped with a digital camera WRAYCAM-NOA2000 (WRAYMER Inc., Osaka, Japan). The images were captured using MicroStudio software (WRAYMER).

DNA extraction, amplification, and sequencing

DNA extraction was conducted either from sclerotia or mycelium from artificial cultures following the protocol of Izumitsu *et al*. (2012). PCR was performed using KOD One PCR master mix (Toyobo, Osaka, Japan). The PCR products were purified with FastGene Gel/PCR Extraction Kit (Nippon Genetics, Japan) and then sequenced using an SeqStudio Genetic Analyzer (Applied Biosystems, Foster City, CA). Sequencing reactions were performed using the ABI PRISM BigDye Terminator v. 3.1 (Applied Biosystems). The nucleotide sequences of the primers for this study are listed in Supplementary Table S1. Five genes were amplified in accordance with previous studies of *Claviceps* and *Aciculosporium* (Píchová *et al*. 2018, Tanaka *et al*. 2021). The internal transcribed spacer (ITS) and the large subunit (LSU) regions were amplified using primers ITS1F and LR5+ and sequenced using primers ITS1F, ITS3, ITS4, NL1, NL4, LR2SM, LR2RSM, and LR5+. A fragment of the mini-chromosome maintenance complex 7 gene (*Mcm7*) was amplified and sequenced with CARCA-F and M456-5R-Cla primers. A region of the translation elongation factor-1α gene (*TEF-1α*) was amplified using primers TEF-983F-Cla and TEF-2218R-Cla and sequenced using primers TEF-983F-Cla, TEF2218R-Cla, TEF-1577F-Cla and TEF-1567R-Cla. A part of β-tubulin gene (*TUB2*) was amplified with Aci-T1 and Aci-T22 primers and sequenced with Aci-T1, T2, T12, T2.5R and Aci-T22 primers. A part of second largest subunit of the RNA polymerase II (*RPB2*) region was amplified using primers fRPB2-5F-Cla and fRPB2-7cR-Cla and sequenced using primers fRPB2-5F-Cla, RPB2-6F2, RPB2-6R2 and fRPB2-7cR-Cla. The sequences were deposited in the DDBJ/EMBL/GenBank nucleotide database (Table 1).

Phylogenetic analyses

The nucleotide sequences of *Claviceps* species were compared with those of known *Claviceps* species and three species of *Aciculosporium* obtained from GenBank (Table 1). The nucleotide sequences of five genes were individually aligned using CLC Main Workbench v. 22 (CLC bio, Aarhus, Denmark), and ambiguously aligned regions and introns were excluded manually. The alignments were concatenated for phylogenetic analyses. The alignments were deposited in the TreeBASE repository (https://treebase.org/; Submission ID 30109). Maximum likelihood (ML) analysis was conducted in CLC Main Workbench, using the GTR+G+T model for each locus analysis that was recommended by the Model Test (AIC model). Support for the tree nodes was determined by analysing 1 000 bootstrap replicates. Maximum parsimony (MP) analysis was conducted by MEGA v. 11 software (Tamura *et al.* 2021) using 1 000 heuristic search replicates. The resultant phylogenetic tree (Fig. 1) was rooted with *Aciculosporium* species.

RESULTS

Sample collection

We obtained fresh specimens putatively identified as *C. bothriochloae*, *C. imperatae*, *C. litoralis*, *C. microspora*, *C. microspora* var. *kawatanii*, *C. panicoidearum*, *C. purpurea* var. *agropyri*, *C. purpurea* var. *sasae*, *C. sorghicola*, and *C. yanagawaensis*, based on their morphological features and host plants. We located syntypes for *C. yanagawaensis* (Togashi 1936) (Fig. 10A).

Phylogenetic analysis

The multilocus phylogenetic tree (LSU, *Mcm7*, *TEF-1α*, *TUB2*, and *RPB2*) confirmed that *Claviceps* species divided into four sections *Citrinae*, *Claviceps*, *Pusillae* and *Paspalorum* (Píchová *et al*. 2018) (Fig. 1). Phylogenetic trees based on *TEF-1α*, *TUB2* and *RPB2*, respectively, had similar topology, but those based on LSU and *Mcm7* were poorly resolved (Supplementary Fig. S2). These phylogenetic analyses showed that the Japanese specimens formed 21 lineages. Six of the lineages corresponded to six species for which molecular data were already available, *i.e. C. africana*, *C. bavariensis*, *C. humidiphila*, *C. paspali*, *C. purpurea* and *C. sorghicola*. Ten lineages corresponded to seven species and three varieties for which molecular data are provided by this study, *i.e. C. bothriochloae*, *C. imperatae*, *C. litoralis*, *C. microspora*, *C. microspora* var. *kawatanii*, *C. panicoidearum*, *C. purpurea* var. *agropyri*, *C. purpurea* var. *sasae*, *C. queenslandica* (Langdon 1954) and *C. yanagawaensis*. Remaining five lineages are recognised here as newly described species.

Taxonomy

Table 1. Materials used in this study with details of their host, locality and GenBank accession numbers. Newly collections in this study and accession numbers of newly generated sequences are indicated in bold.

Species	Isolate	Specimen	Section	Host	Locality	Collector	Year	ITS-LSU	*TEF-1α*	*Mcm7*	*TUB2*	*RPB2*
Aciculosporium take	MAFF 241224			*Phyllostachys pubescens*	Kanazawa, Ishikawa, Japan	E. Tanaka	2007	**LC571753**	**LC572034**	**LC572027**	**LC572041**	**LC572048**
A. oplismeni	MAFF 246966			*Oplismenus undulatifolius*	Minato, Tokyo, Japan	E. Tanaka	2018	LC571760	LC572040	LC572033	LC572047	LC572054
A. phalaridis	CCC 293			*Phalaris tuberosa*	New South Wales, Australia	J. Walker	1996	AJ133399	LT216524	LT216474	FJ711476	LT216598
Claviceps africana	CCC 554		*Pusillae*	*Sorghum bicolor*	Lopburi, Thailand	N. Iamsupasit	1999	AJ011783	LT216517	LT216467	FJ711459	LT216561
C. africana	CCC 489		*Pusillae*	*Sorghum bicolor*	Guanajuato, Mexico	D. Frederickson	1998	LT216447	LT216515	LT216466	FJ711458	LT216562
	MAFF 247564	**TNS-F-96482**	***Pusillae***	***Sorghum bicolor***	**Isahaya, Nagasaki, Japan**	**N. Waseda**	**2019**	**LC681727**	**LC684194**	**LC684590**	**LC684629**	**LC684664**
		TNS-F-96483	***Pusillae***	***Sorghum halepense***	**Mimata, Miyazaki, Japan**	**E. Tanaka**	**2020**	**—**	**LC684195**	**—**	**—**	**—**
		TNS-F-96484	***Pusillae***	***Sorghum bicolor***	**Kirishima, Kagoshima, Japan**	**E. Tanaka**	**2020**	**—**	**LC684196**	**—**	**—**	**—**
	MAFF 247565	**TNS-F-96485**	***Pusillae***	***Sorghum halepense***	**Miyakonojo, Miyazaki, Japan**	**E. Tanaka**	**2020**	**LC681728**	**LC684198**	**LC684591**	**LC684630**	**LC684665**
C. agropyri	**MAFF 247548**		***Claviceps***	***Elymus tsukushiensis* var. *transiens***	**Takashima, Shiga, Japan**	**E. Tanaka**	**2016**	**LC681701**	**LC684138**	**LC684575**	**LC684614**	**LC684649**
	MAFF 247547	**TNS-F-96412**	***Claviceps***	***Elymus tsukushiensis* var. *transiens***	**Kanazawa, Ishikawa, Japan**	**E. Tanaka**	**2016**	**LC681702**	**LC684139**	**LC684576**	**LC684615**	**LC684650**
		TNS-F-96414	***Claviceps***	***Elymus tsukushiensis* var. *transiens***	**Kanazawa, Ishikawa, Japan**	**E. Tanaka**	**2016**	**—**	**LC684140**	**—**	**—**	**—**
	MAFF 247732 [NT], CBS 150006 [NT]	**TNS-F-99334 [NT]**	***Claviceps***	***Elymus tsukushiensis* var. *transiens***	**Chiba, Chiba, Japan**	**E. Tanaka**	**2022**	**LC728644**	**LC728646**	**LC728648**	**LC728650**	**LC728652**
		TNS-F-96416	***Claviceps***	***Elymus racemifer***	**Hodatsu-Shimizu, Ishikawa, Japan**	**E. Tanaka**	**2016**	**—**	**LC684141**	**—**	**—**	**—**
C. arundinellae	CCC 1240 [T]	PREM 63315 [T]	*Pusillae*	*Arundinella nepalensis*	KwaZulu-Natal, South Africa	E.J. van der Linde	2012	LT216451	LT216545	LT216495	LT216560	LT216619
C. arundinis	CCC 956		*Clavicep*	*Phragmites australis*	Aukstaitija, Lithuania	M. Kolařík	2008	JX083477	JX083684	JX083546	JX083408	JX083615
	CCC 1031		*Claviceps*	*Phragmites australis*	Basel, Switzerland	M. Kolařík	2008	JX083481	JX083688	JX083550	JX083412	JX083619
	CCC 1102		*Claviceps*	*Phragmites australis*	Côte-d'Or, France	S. Pažoutová	2009	JX083483	JX083690	JX083552	JX083414	JX083621
C. bavariensis	CCC 434 [T]		*Claviceps*	*Dactylis* sp.	Phillipsreuth, Bavaria, Germany	S. Pažoutová	1998	JX083497	JX083704	JX083566	JX083428	JX083635
	CCC 503		*Claviceps*	*Ammophila arenaria*	Zeebrugge, Belgium	B. Cagaš	1999	JX083498	JX083705	JX083567	JX083429	JX083636
	CCC 691		*Claviceps*	*Phalaris arundinacea*	Dzungar Alatau Mts., Kazakh-stan	A. Chlebicki	2001	JX083501	JX083708	JX083570	JX083432	JX083639
	MAFF 247304	TNS-F-60490	*Claviceps*	*Dactylis glomerata*	Sakura, Chiba, Japan	K. Tanada	2016	**LC681693**	LC598969	**LC684570**	**LC684609**	LC598998
	MAFF 247299	TNS-F-60473	*Claviceps*	*Alopeculus aequalis* var. *amurensis*	Nonoichi, Ishikawa, Japan	E. Tanaka	2016	**LC681692**	LC598974	**LC684569**	**LC684608**	LC599003
C. bothriochloae	**MAFF 247569 [NT], CBS 150007 [NT]**	**TNS-F-96490 [NT]**	***Pusillae***	***Capillipedium parvi-florum***	**Oshima, Kogoshima, Japan**	**E. Tanaka**	**2018**	**LC681732**	**LC684203**	**LC684594**	**LC684633**	**LC684668**
		TNS-F-96491	***Pusillae***	***Capillipedium parvi-florum***	**Amami, Kagoshima, Japan**	**E. Tanaka**	**2019**	**—**	**LC684204**	**—**	**—**	**—**
		TNS-F-96492	***Pusillae***	***Capillipedium parvi-florum***	**Amami, Kagoshima, Japan**	**E. Tanaka**	**2019**	**LC681733**	**LC684205**	**LC684595**	**LC684634**	**LC684669**
C. capensis	CCC 1504 [T]		*Claviceps*	*Ehrharta villosa*	Western Cape, South Africa	E.J. van der Linde	2014	LN846837	LN846862	LN846890	SRPN01000003	LT216564
C. chloridicola	CCC 813 [T]	PRM 915382 [T]	*Pusillae*	*Chloris gayana*	Cedara, KwaZulu-Natal, South Africa	N.W. McLaren	2005	EF057429	LT216511	LT216461	FJ711499	LT216583
C. citrina	CCC 265 [T]		*Citrinae*	*Distichlis spicata*	Texcoco, Mexico	S. Pažoutová	1996	AJ133393	LT216547	LT216497	FJ711473	LT216565

Table 1. (Continued).

Species	Isolate	Specimen	Section	Host	Locality	Collector	Year	ITS-LSU	*TEF-1α*	*Mcm7*	*TUB2*	*RPB2*
C. clavispora	CCC 606	PRM 921841	*Pusillae*	*Urochloa* sp.	Guanajuato, Mexico	G. Odvody	2000	FR732000	LT216548	LT216498	FJ711465	LT216566
	CCC 610 T	PRM 915366 T	*Pusillae*	*Paspalum* sp.	Guanajuato, Mexico	S. Pažoutová	2000	AJ605995	LT216549	LT216499	FJ711466	LT216567
C. cynodontis	CCC 651		*Pusillae*	*Cynodon dactylon*	Matopos, Zimbabwe	D. Frederickson	2001	LT216452	LT216550	LT216500	FJ711492	LT216568
	CCC 807		*Pusillae*	*Cynodon dactylon*	Beeville, Texas, USA	G. Odvody	2004	AJ867219	LT216551	LT216501	FJ711500	LT216569
C. cyperi	CCC 1217		*Claviceps*	*Cyperus esculentus*	Villiers, Free State, South Africa	E.J. van der Linde	—	LN846853	LN846866	LN846883	LN846878	LT216570
	CCC 1219		*Claviceps*	*Cyperus esculentus*	Kempton Park, Gauteng, South Africa	E.J. van der Linde	—	LN846852	LN846865	LN846884	LN846879	LT216571
C. digitariae	CCC 659		*Pusillae*	*Digitaria eriantha*	Botswana	A. Glatzle	—	AJ605999	LT216552	LT216502	FJ711468	LT216572
C. eriochloae	CCC 859 T		*Pusillae*	*Eriochloa sericea*	Kingsville, Texas, USA	G. Odvody	2006	EF473864	LT216503	LT216453	EF473875	LT216573
C. eulaliae	CCC 1247 T	PREM 60679 T	*Pusillae*	*Eulalia villosa*	KwaZulu-Natal, South Africa	E.J. van der Linde	2011	LT216450	LT216544	LT216494	LT216559	LT216618
C. fimbristylidis	CCC 1209		*Claviceps*	*Fimbristylis complanata*	KwaZulu-Natal, South Africa	E.J. van der Linde	2010	LN846855	LT216504	LT216454	LT216553	LT216574
	CCC 1472 T		*Claviceps*	*Fimbristylis complanata*	Bronkhorstspruit, Gauteng, South Africa	E.J. van der Linde	2014	LN846841	LN846859	LN846885	LN846872	LT216575
C. fredericksoniae	CCC 1427 T	PREM 63316 T	*Pusillae*	*Miscanthus junceus*	KwaZulu-Natal, South Africa	E.J. van der Linde	2013	OU720018	OU720054	OK491997	OU720086	
C. fusiformis	CCC 525		*Pusillae*	*Pennisetum glaucum*	Shamva, Mashonaland Central, Zimbabwe	N. McLaren	1999	AJ626727	LT216506	LT216456	EF473867	LT216576
	CCC 846		*Pusillae*	*Pennisetum glaucum*	Karnataka, India	R. Angadi	2005	EF052276	LT216507	LT216457	EF473877	LT216578
C. gigantea	CCC 336		*Pusillae*	*Zea mays*	Santa Maria Jajalpa, Mexico, Mexico	L. Fučíkovský	1996	LT216446	LT216509	LT216459	LT216554	LT216580
	CCC 279		*Pusillae*	*Zea mays*	Amecameca, Mexico, Mexico	S. Pažoutová	1996	LT216445	LT216508	LT216458	FJ711460	LT216579
C. grohii	CBS 124.47		*Claviceps*	*Carex* sp.	Milner, British Columbia, Canada	J.H. Craigie	1947	AJ133395	LN846870	LN846893	FJ711480	LT216581
C. hirtella	CCC 786	BRIP43959	*Pusillae*	*Brachiaria* sp.	Australia	R. Shivas	2004	EF052280	LT216510	LT216460	EF473872	LT216582
C. humidiphila	MAFF 247310 NT, CBS 150008 NT	TNS-F-60506 NT	*Claviceps*	*Phalaris arundinacea*	Chiba, Chiba, Japan	E. Tanaka	2017	**LC681691**	LC598958	**LC684568**	**LC684607**	LC598987
	MAFF 247302	TNS-F-60478	*Claviceps*	*Phalaris arundinacea*	Uchinada, Ishikawa, Japan	E. Tanaka	2016	**LC681690 / LC598881**	LC598960	**LC684567**	**LC684606**	LC598989
	MAFF 247308	TNS-F-60498	*Claviceps*	*Phleum pratense*	Takayama, Gifu, Japan	K. Tanada	2016	—	—	—	—	LC598993
	MAFF 247309	TNS-F-60500	*Claviceps*	*Phalaris arundinacea*	Nikko, Tochigi, Japan	K. Tanada	2016	LC598883	—	—	—	LC598996
C. hypertheliae	CCC 1438 T	PREM 63317 T	*Pusillae*	*Hyperthelia dissoluta*	Limpopo, Constantia Mineral Baths, South Africa	E.J. van der Linde	2013	OU720037	OU720069	—	—	—
C. imperatae	**MAFF 247731 NT, CBS 150009 NT**	**TNS-F-99336 NT**	***Claviceps***	***Imperata cylindrica***	**Mobara, Chiba, Japan**	**E. Tanaka**	**2022**	**LC728645**	**LC728647**	**LC728649**	**LC728651**	**LC728653**
C. inconspicua	CCC 570		*Pusillae*	*Hyparrhenia rufa*	Matopos, Zimbabwe	D. Frederickson	2000	AJ605994	LT216530	LT216480	FJ711457	LT216563
C. kawatanii	**MAFF 247557 NT, CBS 150010 NT**	**TNS-F-96441 NT**	***Pusillae***	***Spodiopogon sibiribus***	**Sagamihara, Kanagawa, Japan**	**K. Tanada**	**2015**	**LC681717**	**LC684164**	**LC684583**	**LC684622**	**LC684657**
	MAFF 247558	**TNS-F-96443**	***Pusillae***	***Spodiopogon sibiribus***	**Ueda, Nagano, Japan**	**Y. Degawa**	**2021**	**LC681718**	**LC684165**	**LC684584**	**LC684623**	**LC684658**
C. langdonii	CCC 820 T	PRM 915383	*Pusillae*	*Dichanthium annulatum*	Corpus Christi, Texas, USA	G. Odvody	2004	EF057428	LT216512	LT216462	FJ711462	LT216584
C. litoralis	**MAFF 247555 NT, CBS 150011 NT**	**TNS-F-96439 NT**	***Claviceps***	***Leymus molis***	**Shibetsu, Hokkaido, Japan**	**T. Asanuma**	**2014**	**LC681715**	**LC684162**	**LC684581**	**LC684620**	**LC684655**

Table 1. (Continued).

Species	Isolate	Specimen	Section	Host	Locality	Collector	Year	ITS-LSU	*TEF-1α*	*Mcm7*	*TUB2*	*RPB2*
C. loudetiae	CCC 656[T]	PRM 921843[T]	*Pusillae*	*Loudetia flavida*	Matopos, Zimbabwe	D. Frederickson	2001	AJ605997	LT216513	LT216463	FJ711467	
C. lovelessii	CCC 647[T]		*Pusillae*	*Eragrostis* sp.	Matopos, Zimbabwe	D. Frederickson	2001	AJ605996	LT216515	LT216465	EF473868	LT216585
	CCC 642		*Pusillae*	*Urochloa mosambicensis*	Matopos, Zimbabwe	D. Frederickson	2001	EF052282	LT216514	LT216464	EF473870	LT216586
C. macroura	CCC 1482[T]		*Claviceps*	*Pennisetum macrourum*	Hogsback, Eastern Cape, South Africa	E.J. van der Linde	2014	LN846844	LN846863	LN846886	LN846873	LT216597
C. maximensis	CCC 640	PRM 921844	*Pusillae*	*Urochloa maxima*	Matopos, Zimbabwe	D. Frederickson	2001	FJ685998	LT216519	LT216469	FJ711508	LT216588
	CCC 816	PRM 921846	*Pusillae*	*Panicum coloratum*	Kingsville, Texas, USA	G. Odvody	2004	FJ686000	LT216521	LT216471	FJ711506	LT216590
C. microspora	**MAFF 247562[NT], CBS 150012[NT]**	**TNS-F-96479[NT]**	***Pusillae***	***Arundinella hirta***	**Nomi, Ishikawa, Japan**	**E. Tanaka**	**2017**	**LC681725**	**LC684191**	**LC684588**	**LC684627**	**LC684662**
		TNS-F-96480	***Pusillae***	***Arundinella hirta***	**Komatsu, Ishikawa, Japan**	**E. Tanaka**	**2017**	**—**	**LC684192**	**—**	**—**	**—**
	MAFF 247563	**TNS-F-96481**	***Pusillae***	***Arundinella hirta***	**Miyakonojo, Miyazaki, Japan**	**E. Tanaka**	**2020**	**LC681726**	**LC684193**	**LC684589**	**LC684628**	**LC684663**
C. miscanthicola		**TNS-F-96444**	***Pusillae***	***Miscanthus sinensis***	**Kanazawa, Ishikawa, Japan**	**E. Tanaka**	**2015**	**—**	**LC684166**	**—**	**—**	**—**
		TNS-F-96445	***Pusillae***	***Miscanthus sinensis***	**Hakusan, Ishikawa, Japan**	**E. Tanaka**	**2016**	**—**	**LC684167**	**—**	**—**	**—**
		TNS-F-96448	***Pusillae***	***Miscanthus sinensis***	**Takayama, Gifu, Japan**	**E. Tanaka**	**2016**	**—**	**LC684168**	**—**	**—**	**—**
		TNS-F-96449	***Pusillae***	***Miscanthus condensatus***	**Miyakejima, Tokyo, Japan**	**T. Akema**	**2016**	**—**	**LC684169**	**—**	**—**	**—**
		TNS-F-96450	***Pusillae***	***Miscanthus tinctorius***	**Komatsu, Ishikawa, Japan**	**E. Tanaka**	**2016**	**LC681719**	**LC684170**	**—**	**—**	**—**
		TNS-F-96451	***Pusillae***	***Miscanthus sinensis***	**Murakami, Niigata, Japan**	**K. Tanada**	**2016**	**LC681720**	**LC684171**	**—**	**—**	**—**
		TNS-F-96454	***Pusillae***	***Miscanthus sinensis***	**Utsunomiya, Toshigi, Japan**	**K. Tanada**	**2016**	**LC681721**	**LC684172**	**—**	**—**	**—**
	MAFF 247559[T], CBS 150013[T]	**TNS-F-96455[T]**	***Pusillae***	***Miscanthus sinensis***	**Nanjo, Fukui, Japan**	**E. Tanaka**	**2016**	**LC681722**	**LC684173**	**LC684585**	**LC684624**	**LC684659**
	MAFF 247561	**TNS-F-96458**	***Pusillae***	***Imperata cylindrica***	**Kagamiishi, Fukushima, Japan**	**Y. Nomura**	**2016**	**LC681723**	**LC684174**	**LC684586**	**LC684625**	**LC684660**
		TNS-F-96459	***Pusillae***	***Miscanthus sinensis***	**Yamanashi, Yamanashi, Japan**	**K. Tanada**	**2017**	**—**	**LC684175**	**—**	**—**	**—**
		TNS-F-96460	***Pusillae***	***Miscanthus sinensis***	**Fuji-Kawaguchiko, Yamanashi, Japan**	**K. Tanada**	**2017**	**—**	**LC684176**	**—**	**—**	**—**
		TNS-F-96461	***Pusillae***	***Miscanthus sinensis***	**Aiko, Kanagawa, Japan**	**K. Tanada**	**2017**	**—**	**LC684177**	**—**	**—**	**—**
		TNS-F-96462	***Pusillae***	***Miscanthus sinensis***	**Itoigawa, Niigata, Japan**	**E. Tanaka**	**2017**	**—**	**LC684178**	**—**	**—**	**—**
		TNS-F-96463	***Pusillae***	***Miscanthus sinensis***	**Joetsu, Niigata, Japan**	**E. Tanaka**	**2017**	**—**	**LC684179**	**—**	**—**	**—**
		TNS-F-96465	***Pusillae***	***Miscanthus sinensis***	**Ome, Tokyo, Japan**	**S. Shibata**	**2018**	**—**	**LC684180**	**—**	**—**	**—**
	MAFF 247560	**TNS-F-96467**	***Pusillae***	***Miscanthus sinensis***	**Mt. Jinba, Kanagawa, Japan**	**E. Tanaka**	**2019**	**LC681724**	**LC684181**	**LC684587**	**LC684626**	**LC684661**
		TNS-F-96468	***Pusillae***	***Miscanthus sinensis***	**Amami, Kagoshima, Japan**	**E. Tanaka**	**2019**	**—**	**LC684182**	**—**	**—**	**—**
		TNS-F-96471	***Pusillae***	***Miscanthus sinensis***	**Hachinohe, Aomori, Japan**	**T. Hoshino**	**2020**	**—**	**LC684183**	**—**	**—**	**—**
		TNS-F-96472	***Pusillae***	***Miscanthus sinensis***	**Aomori, Aomori, Japan**	**T. Hoshino**	**2020**	**—**	**LC684184**	**—**	**—**	**—**
		TNS-F-96473	***Pusillae***	***Miscanthus sinensis***	**Iida, Nagano, Japan**	**E. Tanaka**	**2020**	**—**	**LC684185**	**—**	**—**	**—**
		TNS-F-96474	***Pusillae***	***Miscanthus sinensis***	**Miyazaki, Miyazaki, Japan**	**E. Tanaka**	**2020**	**—**	**LC684186**	**—**	**—**	**—**
		TNS-F-96475	***Pusillae***	***Miscanthus sinensis***	**Mimata, Miyazaki, Japan**	**E. Tanaka**	**2020**	**—**	**LC684187**	**—**	**—**	**—**

Table 1. (Continued).

Species	Isolate	Specimen	Section	Host	Locality	Collector	Year	ITS-LSU	*TEF-1α*	*Mcm7*	*TUB2*	*RPB2*
		TNS-F-96476	***Pusillae***	***Miscanthus sinensis***	**Kirishima, Kagoshima, Japan**	**E. Tanaka**	**2020**	**—**	**LC684188**	**—**	**—**	**—**
		TNS-F-96477	***Pusillae***	***Miscanthus sinensis***	**Chiba, Chiba, Japan**	**E. Tanaka**	**2021**	**—**	**LC684189**	**—**	**—**	**—**
		TNS-F-96478	***Pusillae***	***Miscanthus sinensis***	**Sakura, Chiba, Japan**	**E. Tanaka**	**2021**	**—**	**LC684190**	**—**	**—**	**—**
C. monticola	CCC 1222		*Claviceps*	*Brachypodium flexum*	KwaZulu- Natal, South Africa	E.J. van der Linde	—	LN846851	LN846864	LN846888	LN846881	LT216591
	CCC 1483 T		*Claviceps*	*Brachypodium flexum*	Hogsback, Eastern Cape, South Africa	E.J. van der Linde	2014	LN846845	LN846860	LN846889	LN846875	LT216592
C. nigricans	CCC 802		*Claviceps*	*Eleocharis palustris*	Milešov, Czech Republic	M. Kolařík	2004	AM039814	LN846869	LN846894	FJ711479	LT216593
C. occidentalis	DAOMC 250578 T	DAOM 970958T	*Claviceps*	*Bromus inermis*	Alberta, Canada	W. P. Cambell	1956	**MH477805**	MH397448	**ON783862**	MH477859	MH349056
	DAOMC 250577	LM77	*Claviceps*	*Phleum pratense*	Alberta, Canada	W. P. Cambell	1956	**MH477806**	MH397447	**ON783861**	MH477858	MH349055
	DAOMC 250590	LM84	*Claviceps*	*Bromus inermis*	British Columbia, Canada	W. P. Cambell	1956	**MH477803**	MH397450	**ON783864**	MH477856	MH349058
C. oplismeni	**MAFF 247567 T, CBS 150014 T**	**TNS-F-96493 T**	***Pusillae***	***Oplismenus undulatifolius***	**Kanazawa, Ishikawa, Japan**	**E. Tanaka**	**2015**	**LC681734**	**LC684206**	**LC684596**	**LC684635**	**LC684670**
		TNS-F-96494	***Pusillae***	***Oplismenus undulatifolius***	**Kahoku, Ishikawa, Japan**	**E. Tanaka**	**2016**	**LC681735**	**LC684207**	**—**	**—**	**—**
	MAFF 247568	**TNS-F-96495**	***Pusillae***	***Oplismenus undulatifolius***	**Shimoina, Nagano, Japan**	**E. Tanaka**	**2020**	**LC681736**	**LC684208**	**LC684597**	**LC684636**	**LC684671**
		TNS-F-96496	***Pusillae***	***Oplismenus undulatifolius***	**Joetsu, Niigata, Japan**	**E. Tanaka**	**2021**	**—**	**LC684209**	**—**	**—**	**—**
C. palustris	**MAFF 247552 T, CBS 150015 T**	**TNS-F-96429 T**	***Claviceps***	***Phragmites australis***	**Komatsu, Ishikawa, Japan**	**E. Tanaka**	**2016**	**LC681708**	**LC684152**	**LC684579**	**LC684618**	**LC684653**
		TNS-F-96430	***Claviceps***	***Phragmites australis***	**Wakasa, Fukui, Japan**	**E. Tanaka**	**2016**	**LC681709**	**LC684153**			
	MAFF 247553	**TNS-F-96431**	***Claviceps***	***Phragmites australis***	**Sakyo, Kyoto, Japan**	**E. Tanaka**	**2016**	**LC681710**	**LC684154**	**LC684580**	**LC684619**	**LC684654**
		TNS-F-96432	***Claviceps***	***Phragmites australis***	**Morioka, Iwate, Japan**	**E. Tanaka**	**2017**	**—**	**LC684155**	**—**	**—**	**—**
		TNS-F-96433	***Claviceps***	***Phragmites australis***	**Takasaki, Gunma, Japan**	**K. Tanada**	**2017**	**LC681711**	**LC684156**	**—**	**—**	**—**
		TNS-F-96434	***Claviceps***	***Phragmites australis***	**Joetsu, Niigata, Japan**	**E. Tanaka**	**2017**	**LC681712**	**LC684157**	**—**	**—**	**—**
		TNS-F-96435	***Claviceps***	***Phragmites australis***	**Gifu, Gifu, Japan**	**E. Tanaka**	**2017**	**LC681713**	**LC684158**	**—**	**—**	**—**
		TNS-F-96436	***Claviceps***	***Phragmites australis***	**Kure, Hiroshima, Japan**	**K. Tanada**	**2018**	**LC681714**	**LC684159**	**—**	**—**	**—**
		TNS-F-96437	***Claviceps***	***Phragmites australis***	**Katsushika, Tokyo, Japan**	**E. Tanaka**	**2019**	**—**	**LC684160**	**—**	**—**	**—**
	MAFF 247554	**TNS-F-96438**	***Claviceps***	***Phragmites japonicus***	**Miyakonojo, Miyazaki, Japan**	**E. Tanaka**	**2020**	**—**	**LC684161**	**—**	**—**	**—**
C. panicoidearum	**MAFF 247570**	**TNS-F-96497**	***Pusillae***	***Isachne globosa***	**Kanazawa, Ishikawa, Japan**	**E. Tanaka**	**2016**	**LC681737**	**LC684210**	**LC684598**	**LC684637**	**LC684672**
	MAFF 247571 NT, CBS 150016 NT	**TNS-F-96498 NT**	***Pusillae***	***Isachne globosa***	**Hirosaki, Aomori, Japan**	**Y. Harada**	**2016**	**LC681738**	**LC684211**	**LC684599**	**LC684638**	**LC684673**
		TNS-F-96499	***Pusillae***	***Isachne globosa***	**Hakusan, Ishikawa, Japan**	**E. Tanaka**	**2020**	**—**	**LC684212**	**—**	**—**	**—**
C. paspali	CCC 130		*Paspalorum*	*Paspalum* sp.	Montgomery, Alabama, USA	—	—	AJ133398	LT216522	LT216472	FJ711472	LT216594
	ILB388		*Paspalorum*	*Paspalum plicatulum*	Tacuarembó, Villa Ansina, Uruguay	Hector Oberti	2018	JABAEC 010000250.1	JABAEC 010000013.1	JABAEC 010000027.1	JABAEC 010000046.1	JABAEC 010000001.1
		TNS-F-96500	***Paspalorum***	***Paspalum dilatatum***	**Shizuoka, Shizuoka, Japan**	**E. Tanaka**	**2016**	**LC681739**	**LC684213**	**—**	**—**	**—**
		TNS-F-96502	***Paspalorum***	***Paspalum urvillei***	**Shizuoka, Shizuoka, Japan**	**E. Tanaka**	**2016**	**LC681740**	**LC684214**	**—**	**—**	**—**

Table 1. (Continued).

Species	Isolate	Specimen	Section	Host	Locality	Collector	Year	ITS-LSU	*TEF-1α*	*Mcm7*	*TUB2*	*RPB2*
	MAFF 247572	**TNS-F-96503**	***Paspalorum***	***Paspalum distchum***	**Shizuoka, Shizuoka, Japan**	**E. Tanaka**	**2016**	**LC681741**	**LC684215**	**LC684600**	**LC684639**	**LC684674**
		TNS-F-96504	***Paspalorum***	***Paspalum thunbergii***	**Kanazawa, Ishikawa, Japan**	**E. Tanaka**	**2016**	**LC681742**	**LC684216**	**—**	**—**	**—**
		TNS-F-96506	***Paspalorum***	***Paspalum dilatatum***	**Toda, Saitama, Japan**	**K. Tanada**	**2016**	**—**	**LC684217**	**—**	**—**	**—**
		TNS-F-96507	***Paspalorum***	***Paspalum dilatatum***	**Fujioka, Tochigi, Japan**	**K. Tanada**	**2016**	**—**	**LC684218**	**—**	**—**	**—**
	MAFF 247573	**TNS-F-96508**	***Paspalorum***	***Paspalum dilatatum***	**Wakasa, Fukui, Japan**	**E. Tanaka**	**2016**	**LC681743**	**LC684219**	**LC684601**	**LC684640**	**LC684675**
		TNS-F-96509	***Paspalorum***	***Paspalum dilatatum***	**Sakyo, Kyoto, Japan**	**E. Tanaka**	**2016**	**—**	**LC684220**	**—**	**—**	**—**
		TNS-F-96510	***Paspalorum***	***Paspalum dilatatum***	**Chiyoda, Tokyo, Japan**	**E. Tanaka**	**2017**	**—**	**LC684221**	**—**	**—**	**—**
		TNS-F-96512	***Paspalorum***	***Paspalum urvillei***	**Amami, Kagoshima, Japan**	**E. Tanaka**	**2018**	**LC681744**	**LC684222**	**—**	**—**	**—**
		TNS-F-96513	***Paspalorum***	***Paspalum dilatatum***	**Hikone, Shiga, Japan**	**E. Tanaka**	**2019**	**—**	**LC684223**	**—**	**—**	**—**
		TNS-F-96514	***Paspalorum***	***Paspalum dilatatum***	**Tsu, Mie, Japan**	**E. Tanaka**	**2019**	**—**	**LC684224**	**—**	**—**	**—**
		TNS-F-96515	***Paspalorum***	***Paspalum dilatatum***	**Hanyu, Saitama, Japan**	**E. Tanaka**	**2019**	**—**	**LC684225**	**—**	**—**	**—**
		TNS-F-96516	***Paspalorum***	***Paspalum dilatatum***	**Funabashi, Chiba, Japan**	**E. Tanaka**	**2019**	**—**	**LC684226**	**—**	**—**	**—**
		TNS-F-96517	***Paspalorum***	***Paspalum dilatatum***	**Atsugi, Kanagawa, Japan**	**E. Tanaka**	**2019**	**—**	**LC684227**	**—**	**—**	**—**
		TNS-F-96519	***Paspalorum***	***Paspalum distchum***	**Katsushika, Tokyo, Japan**	**E. Tanaka**	**2019**	**—**	**LC684228**	**—**	**—**	**—**
		TNS-F-96520	***Paspalorum***	***Paspalum urvillei***	**Miyakonojo, Miyazaki, Japan**	**E. Tanaka**	**2020**	**—**	**LC684229**	**—**	**—**	**—**
		TNS-F-96521	***Paspalorum***	***Paspalum dilatatum***	**Miyakonojo, Miyazaki, Japan**	**E. Tanaka**	**2020**	**—**	**LC684230**	**—**	**—**	**—**
C. pazoutovae	CCC 1495		*Claviceps*	*Ehrharta erecta* var. *erecta*	KwaZulu-Natal, South Africa	E.J. van der Linde	2014	LN846838	LN846861	LN846892	LN846874	LT216596
	CCC 1485 ^{T}		*Claviceps*	*Stipa dregeana*	Hogsback, Eastern Cape, South Africa	E.J. van der Linde	2014	LN846840	LN880554	LN846891	LN880555	LT216595
C. perihumidiphila	DAOMC 252161 ^{T}	DAOM 867490^{T}	*Claviceps*	*Agrostis capillaris*	Canada	Z-D Wang and M Liu	2018	—	MN068367	—	—	MN062133
	DAOMC 250581	LM81	*Claviceps*	*Elymus albicans*	Alberta, Canada	W. P. Cambell	1956	**MH477804**	MH397449	**ON783863**	MH477857	MH349057
C. phragmitis		**TNS-F-96418**	***Claviceps***	***Phragmites australis***	**Hirosaki, Aomori, Japan**	**Y. Harada**	**2016**	**—**	**LC684142**	**—**	**—**	**—**
		TNS-F-96419	***Claviceps***	***Phragmites australis***	**Hirosaki, Aomori, Japan**	**Y. Harada**	**2016**	**—**	**LC684143**	**—**	**—**	**—**
		TNS-F-96420	***Claviceps***	***Phragmites australis***	**Hirosaki, Aomori, Japan**	**Y. Harada**	**2016**	**—**	**LC684144**	**—**	**—**	**—**
		TNS-F-96421	***Claviceps***	***Phragmites australis***	**Murakami, Niigata, Japan**	**K. Tanada**	**2016**	**LC681703**	**LC684145**	**—**	**—**	**—**
	MAFF 247549^{T}, CBS 150017^{T}	**TNS-F-96422^{T}**	***Claviceps***	***Phragmites japonicus***	**Hirosaki, Aomori, Japan**	**Y. Harada**	**2016**	**LC681704**	**LC684146**	**LC684577**	**LC684616**	**LC684651**
		TNS-F-96423	***Claviceps***	***Phragmites japonicus***	**Hirosaki, Aomori, Japan**	**Y. Harada**	**2016**	**—**	**LC684147**	**—**	**—**	**—**
		TNS-F-96425	***Claviceps***	***Phragmites australis***	**Itoigawa, Niigata, Japan**	**E. Tanaka**	**2017**	**LC681705**	**LC684148**	**—**	**—**	**—**
	MAFF 247550	**TNS-F-96426**	***Claviceps***	***Phragmites australis***	**Shikoku, Ehime, Japan**	**K. Tanada**	**2018**	**LC681706**	**LC684149**	**—**	**—**	**—**
		TNS-F-96427	***Claviceps***	***Phragmites australis***	**Akita, Akita, Japan**	**E. Tanaka**	**2019**	**—**	**LC684150**	**—**	**—**	**—**
	MAFF 247551	**TNS-F-96428**	***Claviceps***	***Phragmites australis***	**Toyama, Toyama, Japan**	**E. Tanaka**	**2020**	**LC681707**	**LC684151**	**LC684578**	**LC684617**	**LC684652**
C. purpurea	CCC 767		*Claviceps*	*Elymus athericus*	Mont St. Michel, Normandie, France	S. Pažoutová	2003	JX083523	JX083730	JX083592	JX083454	JX083661
	CCC 771 ^{T}		*Claviceps*	*Secale cereale*	Bezdědice, Czech Republic	S. Pažoutová	2003	JX083524	JX083731	JX083593	JX083455	JX083662
	CCC 954		*Claviceps*	*Poa compressa*	Vosges, France	S. Pažoutová	—	JX083528	JX083735	JX083597	JX083459	JX083666

Table 1. (Continued).

Species	Isolate	Specimen	Section	Host	Locality	Collector	Year	ITS-LSU	*TEF-1α*	*Mcm7*	*TUB2*	*RPB2*
	MAFF 305387		*Claviceps*	*Arrhenatherum elatius*	Tochigi, Japan	N. Nishihara	1973	**LC681686**	—	—	—	—
C. purpurea		**TNS-F-96393**	***Claviceps***	***Lolium multiflorum***	**Kanazawa, Ishikawa, Japan**	**E. Tanaka**	**2016**	—	**LC684116**	—	—	—
	MAFF 247544	**TNS-F-96394**	***Claviceps***	***Lolium multiflorum***	**Atsugi, Kanagawa, Japan**	**K. Tanada**	**2017**	**LC681687**	**LC684117**	**LC684565**	**LC684604**	**LC684643**
		TNS-F-96395	***Claviceps***	***Oloptum miliaceum***	**Osaka, Osaka, Japan**	**K. Tanada**	**2017**	—	**LC684118**	—	—	—
		TNS-F-96396	***Claviceps***	***Lolium perenne***	**Osaka, Osaka, Japan**	**K. Tanada**	**2017**	—	**LC684119**	—	—	—
	MAFF 247543	**TNS-F-96397**	***Claviceps***	***Lolium arundinaceum***	**Hakusan, Ishikawa, Japan**	**E. Tanaka**	**2017**	**LC681688**	**LC684120**	**LC684566**	**LC684605**	**LC684644**
		TNS-F-96524	***Claviceps***	***Calamagrostis breviligulata***	**Shimokita, Aomori, Japan**	**T. Hoshino**	**2019**	**LC681689**	—	—	—	—
C. pusilla	CCC 602		*Pusillae*	*Bothriochloa insculpta*	Matopos, Zimbabwe	D. Frederickson	2000	FJ685996	LT216526	LT216476	FJ711490	LT216599
	CCC 845[ET]		*Pusillae*	*Hyparrhenia* sp.	Cedara, KwaZulu-Natal, South Africa	N.W. McLaren	2005	AM408174	LT216527	LT216477	FJ711489	LT216600
	CCC 1261	CS 202	*Pusillae*	*Cymbopogon excavatus*	KwaZulu-Natal, South Africa	E.J. van der Linde	—	—	OU720058	—	—	—
"C. pusilla"	CCC 499		*Pusillae*	*Dichanthium aristatum*	Atherton Tablelands, Queensland, Australia	M. Ryley	1999	—	LT216525	LT216475	LT216555	LT216601
C. quebecensis	DAOMC 251898[T]	DAOM 867491[T]	*Claviceps*	*Calamagrostis breviligulata*	Quebec, Canada	J. Cayouette, Y. Dalpe	2015	**MH477795**	MH397459	**ON783868**	MH477847	MH349067
	DAOMC 251846		*Claviceps*	*Calamagrostis breviligulata*	Quebec, Canada	J. Cayouette, Y. Dalpe	2015		MH397458	—	—	MH349066
C. queenslandica	**MAFF 306124**		***Paspalorum***	***Paspalum scrobiculatum***	**Chichijima, Tokyo, Japan**	**T. Sato**	**1990**	**LC681745**	**LC684231**	**LC684602**	**LC684641**	**LC684676**
	MAFF 247574, CBS 150018	**TNS-F-96522**	***Paspalorum***	***Paspalum scrobiculatum***	**Oshima, Kagoshima, Japan**	**E. Tanaka**	**2018**	**LC681746**	**LC684232**	**LC684603**	**LC684642**	**LC684677**
		TNS-F-96523	***Paspalorum***	***Paspalum scrobiculatum***	**Amami, Kagoshima, Japan**	**E. Tanaka**	**2019**	—	**LC684233**	—	—	—
C. rhynchelytri	CCC 652		*Pusillae*	*Melinis repens*	Matopos, Zimbabwe	D. Frederickson	2001	AJ605998	LT216528	LT216478	FJ711501	LT216602
C. ripicola	DAOMC 251844[T]	DAOM 550246a[T]	*Claviceps*	*Calamagrostis breviligulata*	Quebec, Canada	J. Cayouette	2014	—	MH397456	—	—	MH349064
	DAOMC 251843	LM218	*Claviceps*	*Phalaris arundinacea*	Manitoba, Canada	J.G. Menzies	2014	**MH477801**	MH397452	**ON783865**	MH477854	MH349060
	DAOMC 251845	DAOM 550246b	*Claviceps*	*Calamagrostis breviligulata*	Quebec, Canada	J. Cayouette	2015	**MH477797**	MH397457	**ON783867**	MH477849	MH349065
	DAOMC 250812	LM220	*Claviceps*	*Phalaris arundinacea*	Manitoba, Canada	J.G. Menzies	2014	**ON783869**	**ON783871**	**ON783866**	**ON783872**	**ON783870**
C. sasae	**MAFF 247545[NT], CBS 150019[NT]**	**TNS-F-96406[NT]**	***Claviceps***	***Sasa yahikoensis***	**Nikko, Tochigi, Japan**	**K. Tanada**	**2015**	**LC681697**	**LC684133**	**LC684573**	**LC684612**	**LC684647**
		TNS-F-96407	***Claviceps***	***Sasa* sp.**	**Takayama, Gifu, Japan**	**K. Tanada**	**2016**	**LC681698**	**LC684134**	—	—	—
		TNS-F-96408	***Claviceps***	***Sasa* sp.**	**Matsumoto, Nagano, Japan**	**K. Tanada**	**2016**	**LC681699**	**LC684135**	—	—	—
		TNS-F-96410	***Claviceps***	***Sasa palmata***	**Mt. Hakusan, Ishikawa, Japan**	**E. Tanaka**	**2020**	—	**LC684136**	—	—	—
	MAFF 247546	**TNS-F-96411**	***Claviceps***	***Sasa palmata***	**Yamanouchi, Nagano, Japan**	**E. Tanaka**	**2020**	**LC681700**	**LC684137**	**LC684574**	**LC684613**	**LC684648**
C. setariicola	CCC 794	PRM 915374	*Pusillae*	*Setaria vulpiseta*	Kingsville, Texas, USA	J. L. Reilly	2002	EF057431	LT216531	LT216481	FJ711496	LT216604

Table 1. (Continued).

Species	Isolate	Specimen	Section	Host	Locality	Collector	Year	ITS-LSU	*TEF-1α*	*Mcm7*	*TUB2*	*RPB2*
	CCC 876	PRM 921848	*Pusillae*	*Setaria vulpiseta*	Kingsville, Texas, USA	G. Odvody	2006	—	LT216532	LT216482	FJ711497	LT216605
	CCC 405[T]	PRM 915379[T]	*Pusillae*	*Setaria geniculata*	Passo Fundo, Rio Grande do Sul, Brazil	E. M. Reis	1997	AJ557074	LT216533	LT216483	FJ711493	LT216606
C. sorghi	CCC 632		*Pusillae*	*Sorghum bicolor*	Gulbarga, Karnataka, India	N. Johnson	2000	AJ306621	LT216536	LT216486	LT216558	LT216608
	CCC 1028		*Pusillae*	*Chrysopogon fallax*	Halls Creek, Western Australia, Australia	McTaggart, Marney, Thompson, Ryley, Shivas	2007	LT216449	LT216535	LT216485	LT216557	LT216609
C. sorghicola	CCC 439		*Pusillae*	*Sorghum*	Japan	P. Mantle	1998	AJ011591	LT216539	LT216489	FJ711469	LT216612
	MAFF 306571		*Pusillae*	*Sorghum bicolor*	Nasushiobara, Tochigi, Japan	T. Tsukiboshi	1995	**LC681729**	**LC684199**	**LC684592**	**LC684631**	**LC684666**
		TNS-F-96486	***Pusillae***	***Sorghum bicolor***	**Tamana, Kumamoto, Japan**	**T. Takai**	**2016**	**LC681730**	**LC684200**	**—**	**—**	**—**
		TNS-F-96487	***Pusillae***	***Sorghum bicolor***	**Isahaya, Nagasaki, Japan**	**N. Waseda**	**2019**	**—**	**LC684201**	**—**	**—**	**—**
	MAFF 247566	**TNS-F-96488**	***Pusillae***	***Sorghum bicolor***	**Miyakonojo, Miyazaki, Japan**	**E. Tanaka**	**2020**	**LC681731**	**LC684202**	**LC684593**	**LC684632**	**LC684667**
C. spartinae	CCC 513		*Claviceps*	*Spartina anglica*	Newtown, Isle of Wight, UK	A. Raybould	1998	JX083532	JX083739	JX083601	JX083463	JX083670
	CCC 535		*Claviceps*	*Spartina anglica*	Marchwood, Hampshire, UK	A. Raybould	1999	JX083533	JX083740	JX083602	JX083464	JX083671
	CCC 726		*Claviceps*	*Spartina densiflora*	Celpa Marsh, Argentina	A. Fisher	—	JX083542	JX083749			
C. sulcata	CCC 400	PRM 915390	*Pusillae*	*Brachiaria brizantha*	Passo Fundo, Rio Grande do Sul, Brazil	E. M. Reis	1997	FJ686001	LT216538	LT216488	FJ711502	LT216610
	CCC 328		*Pusillae*	*Brachiaria brizantha*	Sete Lagoas, Minas Gerais, Brazil	S. Pažoutová	1997	FJ686004	LT216537	LT216487	FJ711503	LT216611
C. tandae	**MAFF 247311[T], CBS 150020[T]**	**TNS-F-60509[T]**	***Claviceps***	***Phalaris arundinacea***	**Morioka, Iwate, Japan**	**K. Tanada**	**2017**	**LC681694**	**LC684126**	**LC684571**	**LC684610**	**LC684645**
	MAFF 247312	**TNS-F-60510**	***Claviceps***	***Phalaris arundinacea***	**Shizukuishi, Iwate, Japan**	**K. Tanada**	**2017**	**—**	**LC684127**	**—**	**—**	**LC728654**
	MAFF 247313	**TNS-F-60511**	***Claviceps***	***Agrostis nigra***	**Shizukuishi, Iwate, Japan**	**K. Tanada**	**2017**	**LC681695**	**LC684128**	**LC684572**	**LC684611**	**LC684646**
		TNS-F-60513	***Claviceps***	***Phalaris arundinacea***	**Yamanashi, Yamanashi, Japan**	**K. Tanada**	**2017**	**LC681696**	**LC684129**	**—**	**—**	**LC728655**
		TNS-F-60515	***Claviceps***	***Phalaris arundinacea***	**Miyako, Iwate, Japan**	**E. Tanaka**	**2019**	**—**	**LC684130**	**—**	**—**	**LC728656**
		TNS-F-60517	***Claviceps***	***Festuca rubra***	**Miyako, Iwate, Japan**	**E. Tanaka**	**2019**	**—**	**LC684131**	**—**	**—**	**LC728657**
		TNS-F-96525	***Claviceps***	***Calamagrostis breviligulata***	**Shimokita, Aomori, Japan**	**T. Hoshino**	**2019**	**—**	**LC684132**	**—**	**—**	**—**
C. tenuispora	CCC 782	PRM 915373	*Pusillae*	*Pennisetum glaucum*	Corpus Christi, Texas, USA	G. Odvody	2003	FR732001	LT216541	LT216491	FJ711494	LT216614
C. texensis	CCC 776		*Pusillae*	*Pennisetum glaucum*	Corpus Christi, Texas, USA	G. Odvody	2003	EF052278	LT216540	LT216490	EF473874	LT216613
C. truncatispora	CCC 578[T]	PRM 915380[T]	*Pusillae*	*Hyparrhenia rufa*	Matopos, Zimbabwe	D. Frederickson	2000	FJ686005	LT216542	LT216492	FJ711488	LT216615
C. tulasnei	CCC 1235[T]	PREM 60655[T]	*Pusillae*	*Setaria sphacelata*	Magaliesberg, North West Province, South Africa	E.J. van der Linde	2011	LT216448	LT216529	LT216479	LT216556	LT216603
C. viridis	CBS 125.63		*Pusillae*	*Oplismenus compositus*	India	G.W. Padwick	—	AJ133404	LT216543	LT216493	EF473865	LT216616
C. yanagawaensis	**MAFF 247556[ET], CBS 150021[ET]**	**TNS-F-96440[ET]**	***Claviceps***	***Zoysia japonica***	**Miyako, Iwate, Japan**	**E. Tanaka**	**2019**	**LC681716**	**LC684163**	**LC684582**	**LC684621**	**LC684656**

Table 1. (Continued).

Species	Isolate	Specimen	Section	Host	Locality	Collector	Year	ITS-LSU	*TEF-1α*	*Mcm7*	*TUB2*	*RPB2*
C. zizaniae	CCM 8231		*Claviceps*	*Zizania aquatica*	Canada	L. Marvanová	1996	AJ133405	LN846868	LN846895	FJ711478	LT216617

NT = neotype or ex neotype culture, T = type or ex-type culture, ET = epitype or ex-epitype culture.

Abbreviations of culture and herbarium collections: BRIP, Queensland Plant Pathology Herbarium, Brisbane, Australia; CBS, Westerdijk Fungal Biodiversity Institute, Utrecht, Netherlands; CCC, Culture Collection of *Clavicipitaceae*, Institute of Microbiology, Academy of Sciences of the Czech Republic, Prague, Czech Republic; CCM, Changchun College of Traditional Chinese Medicine, Jilin, China; DAOMC, Canadian Collection of Fungal Cultures, Ottawa, Canada; ILB, INIA Las Brujas Fungal Collection, Uruguay; MAFF, Ministry of Agriculture, Forestry and Fisheries, Ibaraki, Japan; PREM, National Collection of Fungi, Pretoria, South Africa; PRM, National Museum, Prague, Czech Republic. TNS, National Museum of Nature and Science, Tsukuba, Ibaraki, Japan.

ITS: internal transcribed spacers and intervening 5.8S nrDNA; LSU: partial 28S large subunit RNA gene; *TEF-1α*: partial translation elongation factor 1-alpha gene; *Mcm7*: A fragment of the mini-chromosome maintenance complex 7 gene; *TUB2*: partial beta-tubulin gene; *RPB2*: partial DNA-directed RNA polymerase II second largest subunit gene.

– indicates unavailable sequences or unknown collection data.

Based on the morphological examination and phylogenetic analysis, we have recognised 21 *Claviceps* spp. in Japan. *Claviceps amamiensis* was not confirmed by us as specimens were not available. We here propose six new species and elevate two varieties to species rank. Description and notes are provided for all the species.

Claviceps Tul., Ann. Sci. Nat., Bot., sér. 3 20: 43. 1853.

Type: *Claviceps purpurea* (Fr.) Tul. 1853 (**lectotype**).

Sect. *Claviceps* Tul.

Claviceps purpurea (Fr.) Tul., Ann. Sci. Nat., Bot., sér. 3 20: 45. 1853. Fig. 2A–D.
Basionym: *Sphaeria purpurea* Fr., Syst. Mycol. (Lundae) 2: 325. 1823.
Synonym: *Cordyceps purpurea* (Fr.), Summa vegetabilium Scandinaviae 2: 381. 1849.

Typus: **Czech Republic**, Bohemia, Bezdědice, Lat. 50.48576056, Long. 14.70364667, on *Secale cereale*, 2003, S. Pažoutová (**neotype** PRM922706).

Description: See Pažoutová *et al*. (2015).

Known geographical distribution: Australia, Eurasia, North and South America, South Africa and Japan.

Known hosts in Japan: *Pooideae*; *Arrhenatherum elatius*, *Calamagrostis breviligulata*, *Lolium* spp., *Oloptum miliaceum* (new host in Japan), *Secale cereale* and *Triticum* spp.

Specimens examined: **Japan**, Chiba Pref., Chose, Shirako (35°26'46"N 140°23'17"E), on *Lolium perenne,* 10 Jul. 2015, K. Tanada (TNS-F-96391); Chiba Pref., Chose, Shirako (35°26'48"N 140°22'52"E), on *Triticum aestivum*, 10 Jul. 2015, K. Tanada (TNS-F-96392); Ishikawa Pref., Kanazawa, Kagatsume (36°37'34"N 136°38'43"E), on *Lolium multiflorum*, 22 Jun. 2016, E. Tanaka (TNS-F-96393); Kanagawa Pref., Atsugi, Nurumizu (35°26'17"N 139°20'56"E), on *L. multiflorum*, 16 Jun. 2017, K. Tanada (TNS-F-96394; culture MAFF 247544); Osaka Pref., Osaka city, Hirabayashi-Minami (34°36'41"N 135°26'49"E), on *Oloptum miliaceum*, 27 Jun. 2017, K. Tanada (TNS-F-96395); Osaka Pref., Osaka city, Hirabayashi-Minami (34°36'41"N 135°26'49"E), on *L. perenne*, 27 Jun. 2017, K. Tanada (TNS-F-96396); Ishikawa Pref., Hakusan, Shiramine (36°10'31"N 136°37'36"E), on *Lolium arundinaceum*, 28 Jun. 2017, E. Tanaka (TNS-F-96397; culture MAFF 247543); Hiroshima Pref., Kure, Tenno (34°17'20"N 132°30'56"E), on *L. perenne*, 29 Jun. 2017, K. Tanada (TNS-F-96398); Hokkaido Pref., Saru, Biratori, Nina, on *L. arundinaceum*, 21 Jul. 2017, Y. Harada (TNS-F-96399); Kanagawa Pref., Ebina, Kawaraguchi (35°26'55"N 139°23'14"E), on *L. perenne*, 25 Jul. 2017, K. Tanada (TNS-F-96400); Iwate Pref., Miyako, Kuzakai (39°39'05"N 141°21'19"E), on *L. arundinaceum*, 7 Aug. 2019, E. Tanaka (TNS-F-96401); Aomori Pref., Higashidori, Odanosawa-Hamadori (41°13'47"N 141°24'08"E), on *Calamagrostis breviligulata*, 2 Oct. 2019, T. Hoshino (TNS-F-96524); Aomori Pref., Yokohama, Sunahama (41°03'37"N 141°14'36"E), on *C. breviligulata*, 1 Dec. 2019, T. Hoshino (TNS-F-96526).

Culture examined: **Japan**, Tochigi Pref., Nasushiobara, on *Arrhenatherum elatius*, 1973, N. Nishihara, MAFF 305387.

Notes: The host plants of *C. purpurea* are not Japanese native species. Tanda (1978c), Tanda (1980a, b),) and Tanda & Sugimoto (1981) identified *C. purpurea* on *A. elatius*, *Bromus* spp., *Lolium* spp. and *Secale cereale*. We also identified *C. purpurea* on many grasses belonging to *Pooideae*.

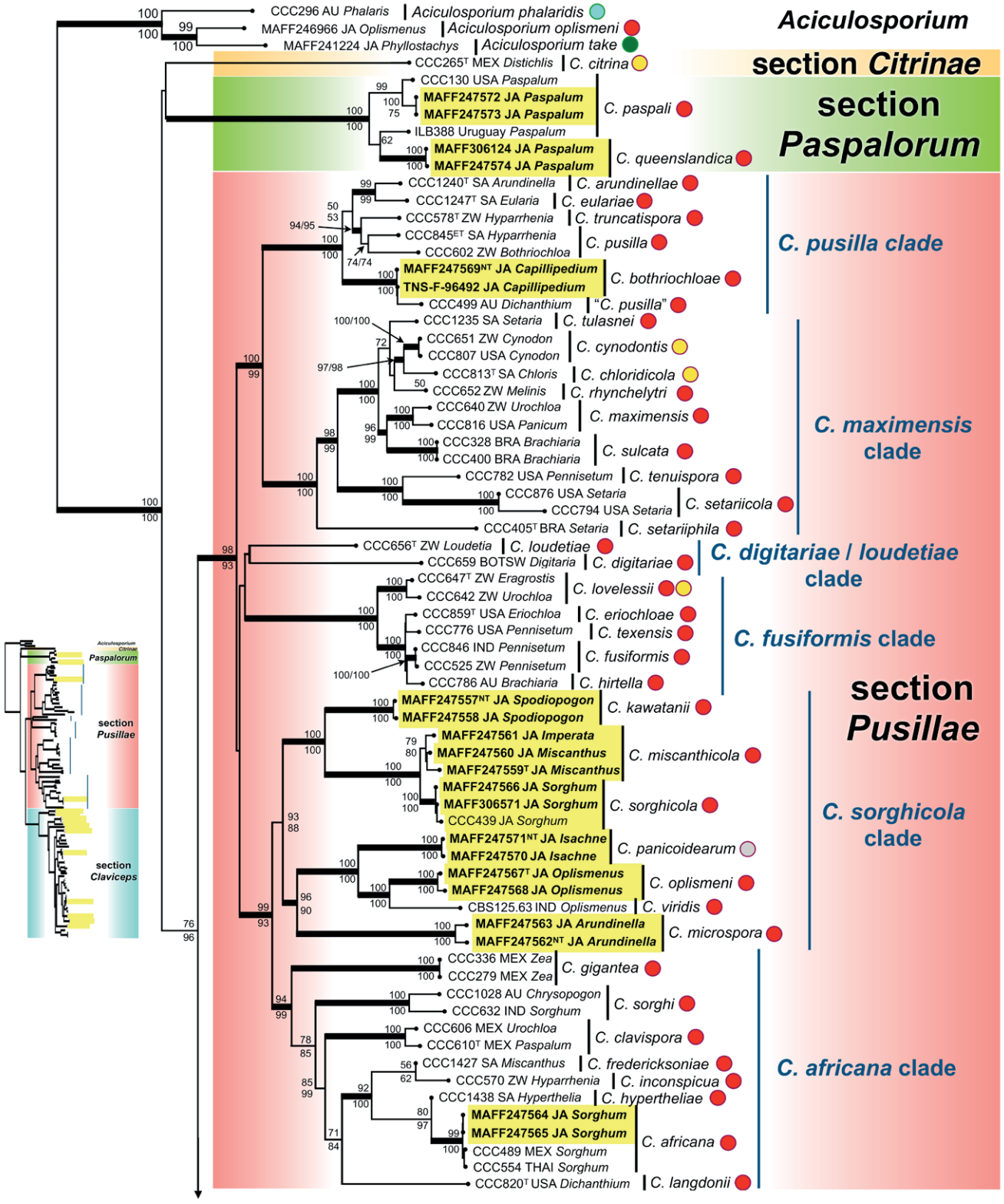

Fig. 1. Maximum likelihood phylogenetic tree based on five gene (LSU, *TEF-1α*, *Mcm7*, *TUB2* and *RPB2*) dataset. Bootstrap (BS) support values from ML and MP analyses are shown at branch (MLBS/MPBS). Both MLBS and MPBS are high (> 90) are indicated by thick branches. MLBS < 50 are not shown. Culture collection number or specimen numbers, country code and host genus name are presented after species name. Ergots analysed in this study are in bold. Ergots collected in Japan are marked by the yellow boxes. The scale represents the number of nucleotide substitutions per site. T = ex-holotype, NT = ex-neotype, ET = ex-epitype. Abbreviated country code; ARG = Argentina, AU = Australia, BELG = Belgium, BOTSW = Botswana, BRA = Brazil, CA = Canada, CZ = Czech Republic, FRA = France, GER = Germany, IND = India, JA = Japan, KAZ = Republic of Kazakhstan, LIT = Lithuania, MEX = Mexico, SA = South Africa, SWI = Switzerland, THAI = Thailand, UK = United Kingdom, USA = United States of America, ZW = Zimbabwe.

Claviceps agropyri (Tanda) E. Tanaka, ***stat. et comb. nov.*** MycoBank MB 847078. Fig. 3.

Basionym: *Claviceps purpurea* var. *agropyri* Tanda, J. Agric. Sci. Tokyo Nogyo Daigaku, Commemoration: 99. 1981.

Typus: **Japan**, Tokyo Pref., Setagaya, Sakuragaoka, on *Elymus tsukushiensis* var. *transiens* (as *Agropyron tsukushiense* var. *transiens*), 15 Jul. 1969, S. Tanda (**lost holotype** TUAMH-AS914). Chiba Pref., Chiba city, Wakaba, Sakuragi (35°37'24"N 140°10'00"E), on *E. tsukushiensis* var. *transiens*, 18 Jun. 2022, E. Tanaka (**neotype** designated here

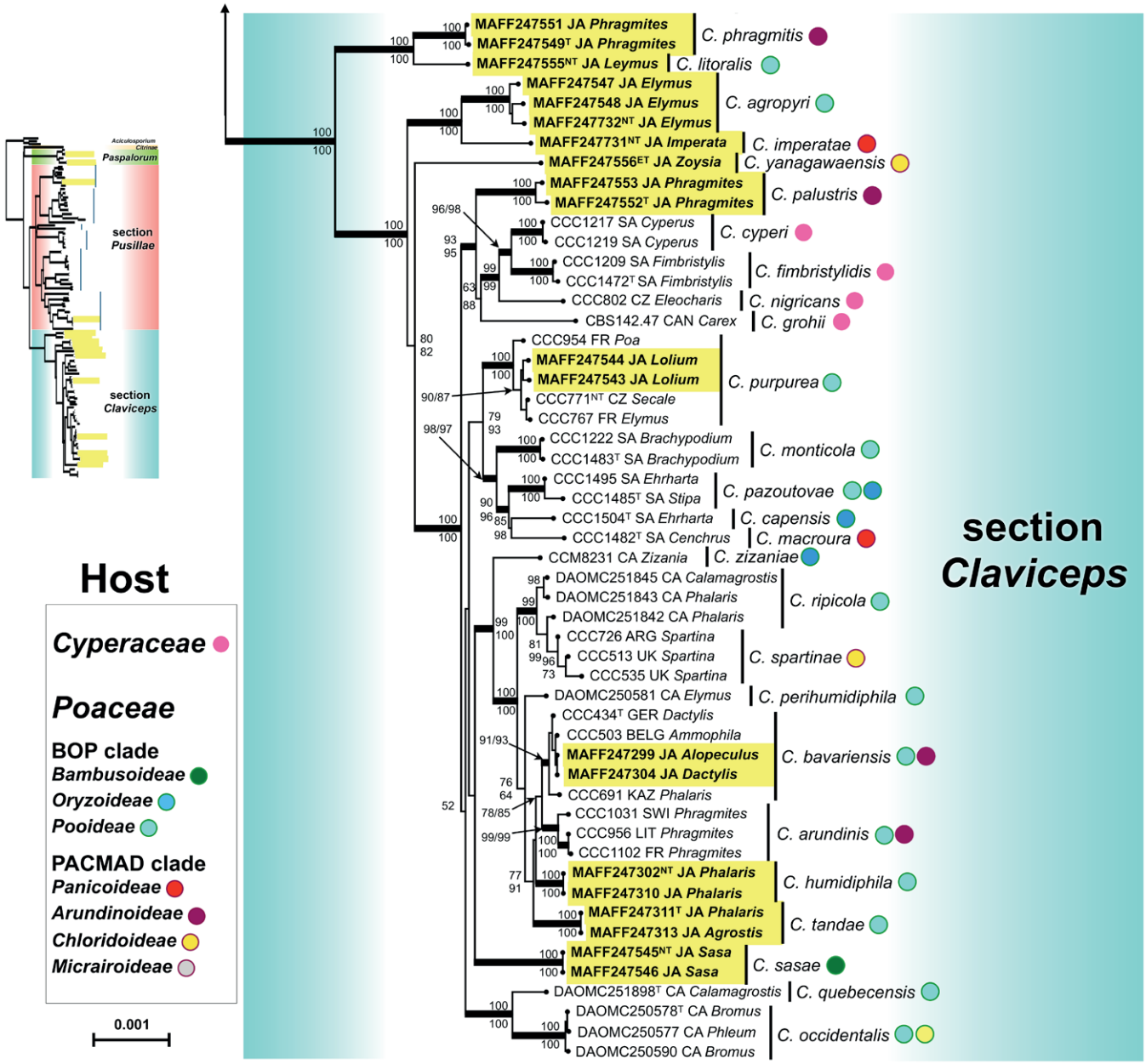

Fig. 1. (Continued).

TNS-F-99334; MBT 10010679; ex-neotype culture MAFF 247732 = CBS 150006); Gene sequences LC728644 (ITS-LSU), LC728646 (*TEF-1α*), LC728648 (*Mcm7*), LC728650 (*TUB2*), LC728652 (*RPB2*).

Description supplement to the original description by Tanda (1981a): *Sclerotia* cylindrical, acute, straight or curved, dark purple to black, 1.5–37 × 0.7–4.1 mm. *Ascostromata* 3–30 per sclerotium, frequently having two or three branches; stipes cylindrical, glabrous, reddish brown to dark brown, 0.2–19 × 0.2–1.7 mm; *capitula* subglobose, slightly protruding with ostioles, reddish brown to dark brown, 0.3–2.5 mm diam; *perithecia* semi-immersed, ovoid or obpyriform, slightly protruding from the surface of the capitulum, 159–293 × 79–183 µm; *asci* hyaline, eight-spored, 53–147 × 1.5–4.2 µm; *ascospores* hyaline, filiform, aseptate, 60–144 µm in length. *Conidia* hyaline, one-celled, oblong, ovoid, ellipsoid, somewhat fusiform, 3.6–10.4 × 1.4–3.7 µm, L/W ratio 2.5–2.8.

Known geographical distribution: China, Japan.

Known hosts: *Elymus tsukushiensis* var. *transiens* and *E. racemifer.*

Specimens examined: **Japan**, Yamaguchi Pref., Yamaguchi city (previously Yamaguchi Pref., Yoshiki, Kamiunorei), on *E. racemifer*, 2 Jul. 1893, J. Nikaido (TNS-F-25699); Tokyo Pref., on *E. tsukushiensis* var. *transiens*, 13 Jul. 1899, S. Kusano (TNS-F-192586); Niigata Pref., Nagaoka, on *E. tsukushiensis* var. *transiens*, 9 Jun. 1906 (TNS-F-226252); Okayama Pref., Maniwa, on *E. tsukushiensis* var. *transiens*, 7 Jul. 1927, C. Miyake (TNS-F-244910); Okayama Pref., Niimi, on *E. tsukushiensis* var. *transiens*, 11 Jul. 1928, C. Miyake (TNS-F-244904); Tokyo Pref., Hachioji, on *E. tsukushiensis* var. *transiens*, 1 Jul. 1931, R. Imazeki (TNS-F-25696); Tokyo Pref., Shitayose, on *E. tsukushiensis* var. *transiens*, 17 Jul. 1932, R. Noguchi (TNS-F-190038); Shiga Pref., Takashima, Kutsuki (35°21'03"N 135°54'58"E), on *E. tsukushiensis* var. *transiens*, 17 Jun. 2006, E. Tanaka (MAFF 247548); Ishikawa Pref., Kanazawa, Kamiwakunami (36°34'52"N 136°43'43"E), on *E. tsukushiensis* var. *transiens*, 19 Jun. 2016, E. Tanaka (TNS-F-96412; culture MAFF 247547); (TNS-F-99341 fruiting bodies derived from TNS-F-96412); Ishikawa Pref., Kanazawa, Higashinagae (36°34'19"N 136°42'09"E), on *E. tsukushiensis* var. *transiens*, 21 Jun. 2016, E. Tanaka (TNS-F-96413); Ishikawa Pref., Kanazawa, Nukadani (36°30'25"N 136°37'56"E), on *E. tsukushiensis* var. *transiens*, 28 Jun. 2016, E. Tanaka (TNS-F-96414); (TNS-F-99340 fruiting bodies derived from TNS-F-96414); Ishikawa Pref., Nomi, Todashino (36°26'43"N 136°35'54"E), on *E. tsukushiensis* var. *transiens*, 30 Jun. 2016, E. Tanaka

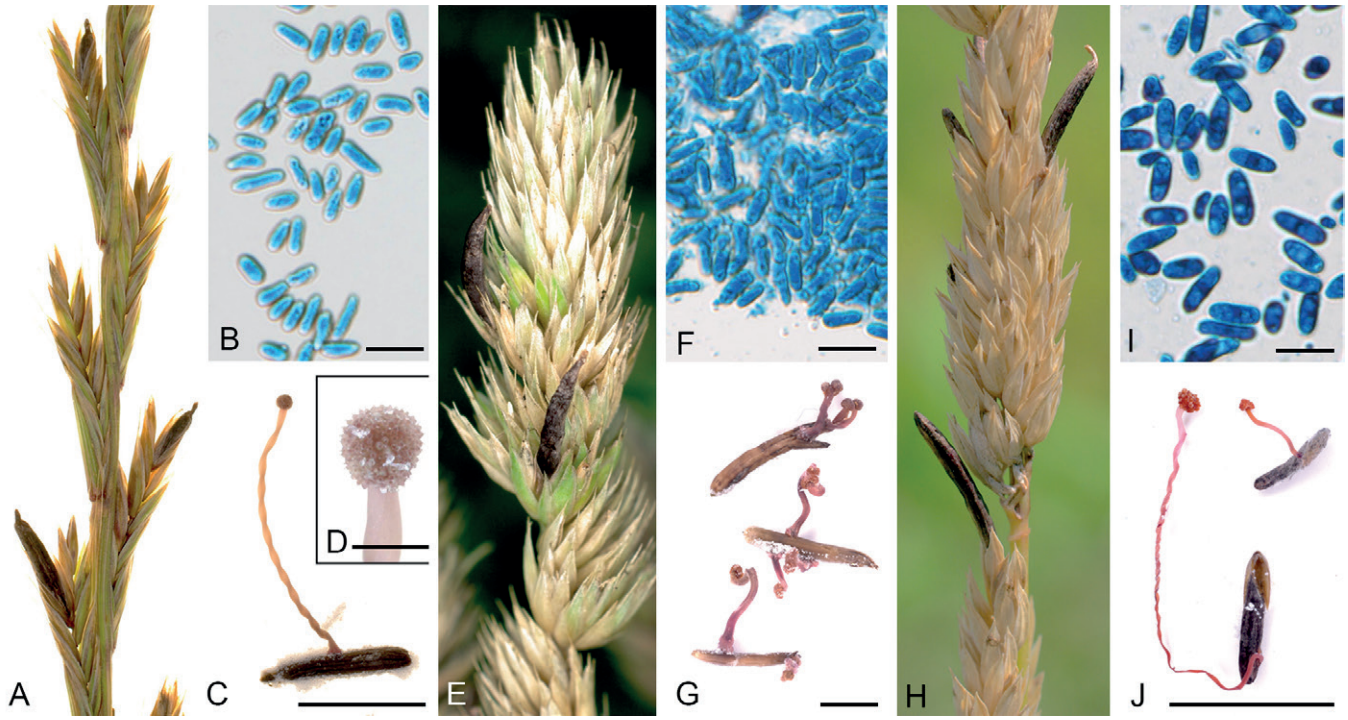

Fig. 2. *Claviceps purpurea*, *C. bavariensis* and *C. humidiphila*. **A–D.** *Claviceps purpurea*. **A.** Sclerotia on *Lolium multiflorum* (TNS-F-96393). **B.** Conidia. **C.** Ascostroma of *C. purpurea* from *Triticum aestivum*. **D.** Capitulum. **E–G.** *C. bavariensis*. **E.** Sclerotia on *Dactylis glomerata* (TNS-F-60475). **F.** Conidia. **G.** Ascostromata of *C. bavariensis* from *D. glomerata* (TNS-F-60523). **H–J.** *C. humidiphila*. **H.** Sclerotia on *Phalaris arundinacea* (TNS-F-60478). **I.** Conidia. **J.** Ascostromata of *C. humidiphila* from *P. arundinacea* (TNS-F-60525). Scale bars: B, F, I = 10 µm; C, G, J = 1 cm; D = 1 mm.

(TNS-F-96415); Ishikawa Pref., Kanazawa, Nukadani (36°30'25"N 136°37'56"E), on *E. tsukushiensis* var. *transiens*, 21 Jun. 2017, E. Tanaka (ISKW-My-9); Ishikawa Pref., Hodatzu-Shimizu, Kitakawajiri (36°48'15"N 136°44'03"E), on *E. racemifer*, 22 Jun. 2018, E. Tanaka (TNS-F-96416); Chiba Pref., Chiba city, Wakaba, Sakuragi (35°37'24"N 140°10'00"E), on *E. tsukushiensis* var. *transiens*, 18 Jun. 2022, E. Tanaka (**neotype** TNS-F-99334; MBT 10010679; ex-neotype culture MAFF 247732 = CBS 150006); Yamaguchi Pref., Mine, Akiyoshi, Akiyoshi (34°12'29"N 131°18'04"E), on *E. tsukushiensis* var. *transiens*, 25 Jun. 2022, E. Tanaka (TNS-F-99339).

Notes: Tanda (1981a) validly published this taxon as a variety of *C. purpurea* because its somewhat fusiform-shaped conidial features differed from *C. purpurea*. Pažoutová *et al.* (2015) considered this taxon as a synonym of *C. purpurea*. Our phylogenetic analysis revealed this taxon as a distinct species. We could not find this species in the type locality, which is now an urban area. Consequently, we have designated a neotype (TNS-F-99334), which was collected about 50 km away from the type locality.

The hosts of *C. agropyri*, *E. tsukushiensis* var. *transiens* (*Pooideae*, *Triticeae*) and *E. racemifer*, are indigenous to Japan. The specific epithet of this ergot fungus is retained under Art. 24B.2, International Code of Nomenclature for algae, fungi, and plants (Turland *et al.* 2018). Tanda (1981a) reported that this species could parasitise and form sclerotia on *Aegilops* spp., *Bromus* spp., *Hordeum* spp., *Poa* spp., *Secale cereale*, and *Triticum aestivum* by artificial inoculation. Tanda (1980b) identified an ergot fungus on *Bromus pauciflorus* as *C. purpurea* var. *agropyri*, but we have not confirmed it.

The ITS region sequence of this species matches with that of ergot on *E. tsukushiensis* in China (KM453977). For this reason, we added China as a habitat distribution of this species. Doi *et al.* (2022b, 2023) revealed that this fungus produces a higher amount of clavin-type ergot alkaloids (agroclavine, festuclavine and pyroclavine), than *C. purpurea*.

Claviceps bavariensis M. Kolařík *et al.*, Mycotaxon 137: 80. 2022. Fig. 2E–G.

Synonyms: *Claviceps humidiphila sensu* epitype of Pažoutová *et al.* (2015), *non* Tanda (1979c).

Claviceps purpurea var. *alopecuri* Tanda, J. Agric. Sci. Tokyo Nogyo Daigaku 22: 295. 1977.

Claviceps purpurea var. *dactylidis* Tanda, J. Agric. Sci. Tokyo Nogyo Daigaku 25: 266. 1980.

Typus: **Germany**, Bavaria, Philippsreut, Lat. 48.856434, Long. 13.676332, on *Dactylis* sp., 1988, Pažoutová (**holotype** PRM922708, dried culture on T2 media; ex-type culture CCC434).

Description based on Japanese specimens: *Sclerotia* cylindrical, acute, somewhat curved, brownish purple to blackish brown, 1.2–12 × 0.3–1.7 mm. *Ascostromata* 1–4 per sclerotium, frequently having two or three branches; stipes filiform or cylindrical, glabrous, reddish brown to purple, 1–14 × 0.1–1.4 mm; *capitula* subglobose, pale orange to reddish brown, 0.3–1.5 × 0.3–2.3 mm; *perithecia* immersed, 140–270 × 60–168 µm; asci hyaline, eight-spored, 75–158 × 1.8–5.3 µm; *ascospores* hyaline, filiform, aseptate, 63–151 µm in length. *Conidia* hyaline, one-celled, ovate, 4.0–16.6 × 1.8–5.0 µm, L/W ratio 1.9–3.0.

Known geographical distribution: Europe, North America, Japan.

Known hosts in Japan: *Alopecurus aequalis* var. *amurensis*, *Agrostis* spp., *Calamagrostis breviligulata*, *Calamagrostis epigejos*, *Dactylis glomerata*, *Elymus tsukushiensis* var. *transiens* (exceptional case), *Festuca rubra* (new host), *Hordeum vulgare*, *Phalaris arundinacea*, *Phleum pratense*, *Poa* spp. and *Polypogon fugax*.

Specimens examined: Most of Japanese specimens we obtained were already examined in Liu *et al.* (2022b). **Japan**, Ishikawa Pref., Kanazawa, Higashi-Kagatsume (36°37'55"N 136°39'47"E), on *Festuca rubra*, 25 Jun. 2016, E. Tanaka (TNS-F-96402); Nagano Pref., Nagano city, Togakushi (36°46'16"N 138°05'24"E), on *F. rubra*, 1 Aug. 2018, E.

Fig. 3. *Claviceps agropyri*. **A, B.** Sclerotia on *Elymus tsukushiensis var. transiens*. **A.** TNS-F-99334. **B.** TNS-F-96412. **C.** Conidia. **D.** Ascostroma (TNS-F-99340). **E.** Capitulum. **F.** Asci. Scale bars: A, B, D = 1 cm; C, F = 10 µm; E = 1 mm.

Tanaka (TNS-F-96404); Ishikawa Pref., Kanazawa, Konan (36°39'24"N 136°41'14"E), on *E. tsukushiensis* var. *transiens*, 2 Jul. 2019, E. Tanaka (TNS-F-96405); Chiba Pref., Togane, Tanaka (35°33'39"N 140°19'58"E), on *P. fugax*, 18 Jun. 2022, E. Tanaka (TNS-F-99335). Ishikawa Pref., Hakusan, on *Hordeum vulgare*, 25 May 2023, E. Tanaka (ISKW-My-6).

Notes: This species is distinguished from *C. humidiphila* based on the phylogenetic analysis (Liu *et al.* 2022b). Our study showed that there is no DNA variation in *TEF-1α*, ITS and LSU regions among Japanese specimens of *C. bavariensis*. This indicates that this species may have been recently introduced into Japan with pasture grasses, such as orchard grass (*D. glomerata*). Alternatively, its wide host range may indicate that *C. bavariensis* has a wide distribution across Eurasia, from Europe to Japan.

Claviceps bavariensis mainly parasitises grasses in the supertribe *Poeae.* Tanda (1981a) reported that *C. bavariensis* (as *C. purpurea* var. *alopecuri*) could infect *E. tsukushiensis* var. *transiens* by artificial inoculation. We confirmed that *C. bavariensis* infrequently infected *E. tsukushiensis* var. *transiens* (TNS-F-96405) naturally. We included *F. rubra* as a host, although Tanda (1981c) identified ergot on *F. rubra* as *C. purpurea*. Tanda (1979a, d) identified *C. bavariensis* (as *C. purpurea* var. *alopecuri*) on *Trisetum bifidum* and *Holcus lanatus*, but we have not confirmed this. We have confirmed *Alopecurus*, *Agrostis* spp., *C. epigejos*, *D. glomerata*, *P. fugax, P. pratense* and *Poa* spp. as hosts of *C. bavariensis*, as found by Tanda (1978a, b, 1979b, c, d, 1981b, d) and Tanda & Kawatani (1980a).

Claviceps humidiphila Pažoutová & M. Kolařík, Fungal Biol. 119: 22. 2015. Fig. 2H–J.
Basionym: *Claviceps purpurea* var. *phalaridis* Tanda, J. Agric. Sci. Tokyo Nogyo Daigaku 24: 84. 1979.

Typus: **Japan**, Chiba Pref., Chiba city, Yukijirushi Farm on *Phalaris arundinacea*, 1 Aug. 1969, S. Tanda (**lost holotype** TUAMH-PA 921); Chiba Pref., Chiba city, Inage (type locality, 35°40'02"N 140°08'07"E), on *P. arundinacea*, 23 Jun. 2017, E. Tanaka (**neotype** TNS-F-60506; MBT 395372; ex-neotype culture MAFF 247310 = CBS 150008).

Description modified from the original description by Tanda (1979c): *Sclerotia* cylindrical, acute, somewhat curved, dark purple to black, 4–15 × 0.8–1.4 mm. *Ascostromata* 1–11 per sclerotium; stipes filiform, glabrous, pale red to reddish orange, 2–13 × 0.1–0.9 mm; *capitula* globose or subglobose, pale red to reddish purple, 0.1–1.6 × 0.2–1.9 mm; *perithecia* immersed, obovoid or obpyriform, slightly protruding from the surface of the capitulum, 140–267 × 70–186 µm; *asci* hyaline, eight-spored, 74–151 × 1.8–4.2 µm; *ascospores* hyaline, filiform, aseptate, 72–137 µm in length. *Conidia* hyaline, one-celled, allantoid, oblong, ovoid, ellipsoid, lunate, 4.4–16.9 × 2.4–5.9 µm, L/W ratio 2.3–2.6.

Known geographical distribution: Japan.

Known hosts: *Phalaris arundinacea*, *Phleum pratense* and *Festuca rubra* (new host).

Specimens examined: Most of specimens were already examined by Liu *et al.* (2022b). **Japan**, Tochigi Pref., Nikko, Okukinu (36°52'23"N 139°24'25"E), on *F. rubra*, 15 Aug. 2016, E. Tanaka (TNS-F-96403); Ishikawa Pref., Kanazawa, Okuwa (36°32'22"N 136°40'37"E), on *P. arundinacea*, 28 Jun. 2019, E. Tanaka (ISKW-My-10); Yamaguchi Pref., Yamaguchi city, Ouchi (34°09'51"N 131°28'50"E), on *P. arundinacea*, 24 Jun. 2022, E. Tanaka (TNS-F-99337); Yamaguchi Pref., Yamaguchi city, Yoshida (34°09'02"N 131°28'07"E), on *P. arundinacea*, 24 Jun. 2022, E. Tanaka (TNS-F-99338).

Notes: *Phalaris arundinacea* in Japan is frequently infected by *C. humidiphila*. Tanda (1979c) established *C. purpurea* var. *phalaridis* because of its large size of conidia and the results of inoculation tests. Pažoutová *et al.* (2015) recognised *C. purpurea* var. *phalaridis* as a distinct species and gave a new name *C. humidiphila*. We added *P. pratense* and *F. rubra* as new host species based on our research. Tanda (1979c) identified ergot fungus on *C. epigejos* and *C. pseudophragmites* as *C. humidiphila* (as *C. purpurea* var. *phalaridis*), but we have not confirmed them. Doi *et al.* (2023) showed that some sclerotia of this fungus contain agroclavine, ergosine/inine, ergotamine, *α*-ergocryptine/inine, ergocristine/inine and pyroclavine (minor).

Claviceps imperatae Tanda & Kawat., Trans. Mycol. Soc. Japan 17: 289. 1976. Fig. 4.

Typus: **Japan**, Tochigi Pref., Akama (previously Tochigi Pref., Shimotsuga, Lakeside Akama), on *Imperata cylindrica* (L.) Beauv. var. *koenigii* (Retz.) Benth *ex* Pilger**,** 26 Jun. 1960, T. Kawatani (**lost holotype** TUAMH-IC601); Chiba Pref., Mobara, Yumiwatashi (35°28'27"N 140°20'58"E), on *I. cylindrica*, 18 Jun. 2022, E. Tanaka (**neotype** designated here TNS-F-99336; MBT 10010680; ex-neotype culture MAFF 247731 = CBS 150009); Gene sequences LC728645 (ITS-LSU), LC728647 (*TEF-1α*), LC728649 (*Mcm7*), LC728651 (*TUB2*), LC728653 (*RPB2*).

Description supplement to the original description by Tanda & Kawatani (1976): *Sclerotia* almost straight, somewhat curved, cylindraceous, ovoid or subglobose, surface smooth, cracked or ridged, purplish brown to dark brown, 1.2–10.5 × 0.6–2.8 mm. *Ascostromata* one per sclerotium, frequently having two or three branches; stipes filiform, glabrous, brownish purple to reddish grey, 6–12 × 0.2–0.9 mm; *capitula* globose or subglobose, maroon or reddish brown, 0.7–1.4 × 1.0–1.5 mm, darker than stipe in colour; *perithecia* immersed, ovoid, slightly protruding from the surface of the capitulum, 134–189 × 67–122 µm*; asci* hyaline, eight-spored, 47–90 × 2.0–5.5 µm; *ascospores* hyaline, filiform, aseptate, 32–63

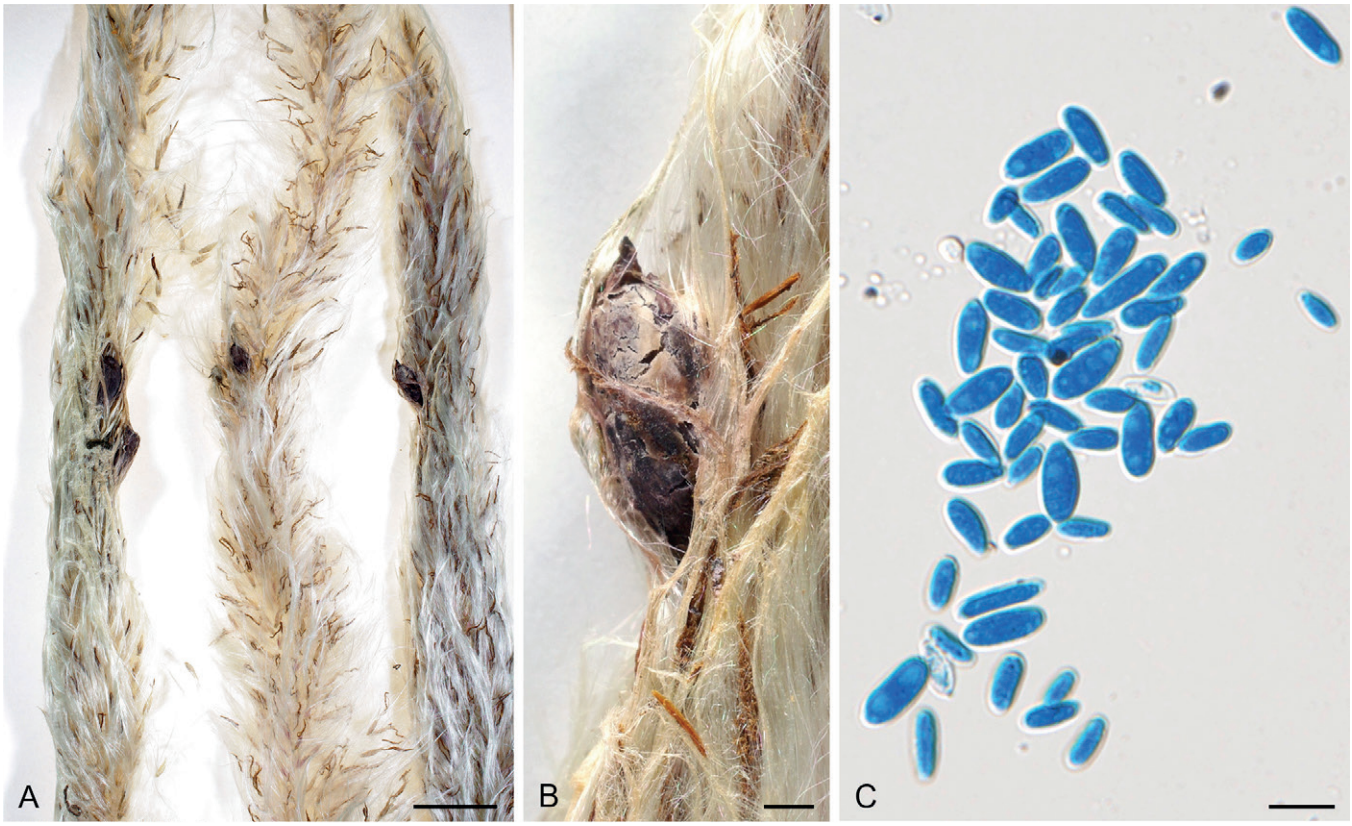

Fig. 4. *Claviceps imperatae*. **A, B.** Sclerotia on *Imperata cylindrica* (TNS-F-99336). **C.** Conidia. Scale bars: A = 1 cm; B = 1 mm; C = 10 µm.

µm in length. *Conidia* hyaline, one-celled, elliptical or oblong, 6.7–27.5 × 3.7–9.2 µm.

Specimens examined. **Japan**, Yamaguchi Pref., Yamaguchi city, Miyano (previously Suo, Yoshiki, Miyano), on *I. cylindrica*, 2 Jul. 1893, Juro Nikaido (TNS-F-25701); Chiba Pref., Mobara, Yumiwatashi (35°28'27"N 140°20'58"E), on *I. cylindrica*, 18 Jun. 2022, E. Tanaka (**neotype** TNS-F-99336; MBT 10010680; ex-neotype culture MAFF247731 = CBS 150009).

Known geographical distribution: Japan.

Known host: *Imperata cylindrica.*

Notes: The host *I. cylindrica* (*Panicoideae*, *Andropogoneae*) is indigenous to Japan, blooms in early summer and widely distributed in Asia, Africa and Australia. We have explored this species many times in many locations based on past collection records. Despite the host plant being common in Japan, we only obtained one sample in the 8th season, and designated it as neotype. The neotype specimen (TNS-F-99336) was collected about 100 km away from the original type locality. Although we could not obtain the sexual stage of this species, we identified our specimen as *C. imperatae* based on the host species and morphological characteristics of its asexual stage. Tanda & Kawatani (1976) reported that when this species was artificially inoculated on 15 grass species, this species could parasitise only *E. tsukushiensis* var. *transiens* but did not form sclerotia. According to Tanda *et al.* (1968), ergot on *I. cylindrica* in Japan had a toxicity to mice.

Claviceps litoralis Kawat., Bot. Mag. Tokyo 59: 90. 1946. ***emend.*** Fig. 5.

Typus: **Japan**, Hokkaido Pref., Nemuro, Nosappu, on *Leymus mollis*, 25 Jul. 1970, T. Yasunaga (**lost neotype** TUAMH-EM006); Hokkaido Pref., Shibetsu, Kunbetsu (43°47'52"N 145°03'45"E), on *L. mollis*, T. Asanuma, Sep. 2013 (**replacement neotype** designated here TNS-F-96439; MBT 10010968; ex-neotype culture MAFF 247555 = CBS 150011); Gene sequences LC681715 (ITS-LSU), LC684162 (*TEF-1α*), LC684581 (*Mcm7*), LC684620 (*TUB2*), LC684655 (*RPB2*).

Description supplement to the original description by Kawatani (1946): *Sclerotia* cylindrical, somewhat curved, brownish purple to blackish brown, 3.1–36.5 × 1.2–6.0 mm. *Ascostromata* 5–60 per sclerotium; *stipes* cylindrical, glabrous, light reddish brown to dark purple, 1–25 × 0.4–1.3 mm; *capitula* subglobose or depressed globose, light orange or light reddish brown, 0.4–2.6 × 0.8–2.5 mm; *perithecia* immersed, obpyriform or ovoid, slightly protruding from the surface of the capitulum, 132–250 × 68–150 µm; *asci* hyaline, eight-spored, 75–160 × 2.1–4.3 µm; *ascospores* hyaline, filiform, aseptate, 61–140 µm in length. *Conidia* hyaline, one-celled, oblong, ovoid, ellipsoid, 2.8–18.5 × 2.1–7.6 µm, L/W ratio 2.0–2.3.

Known geographical distribution: Coastal sand dunes in northern Japan (Hokkaido, Aomori) and in the Russian Far East.

Known host: *Leymus mollis.*

Specimens examined: **Japan**, Hokkaido Pref., Kushiro, 8 Aug. 1919, (TNS-F-228908); Hokkaido Pref., on *L. mollis*, 23 Jul. 1921, Nakayama (TNS-F-184957); Hokkaido Pref., Nemuro, on *L. mollis*, 19 Jul. 1924, N. Hiratzuka (TNS-F-184955); Hokkaido Pref., Kushiro, on *L. mollis*, 19 Sep. 1933, Y. Tokunaga (TNS-F-184956); Hokkaido Pref., Nemuro, on *L. mollis*, 2 Aug. 1940, T. Maekawa (TNS-F-184953); Hokkaido Pref., Shibetsu, Kunbetsu (43°47'52"N 145°03'45"E), on *L. mollis*, Sep. 2013, T. Asanuma (**neotype** TNS-F-96439; MBT 10010968; ex-neotype culture MAFF 247555 = CBS 150011). **Russia**, Sakhalin, Noda (present address Sakahalinskaya, Chekhov), on *L. mollis*, 1 Aug. 1928, T. Mutsui (HHUF 714); Sakhalin, on *L. mollis*, Aug. 1940, U. Kimoto (TNS-F-184954); Kamchatka, on *L. mollis*, 14 Sep. 1940 (TNS-F-184952).

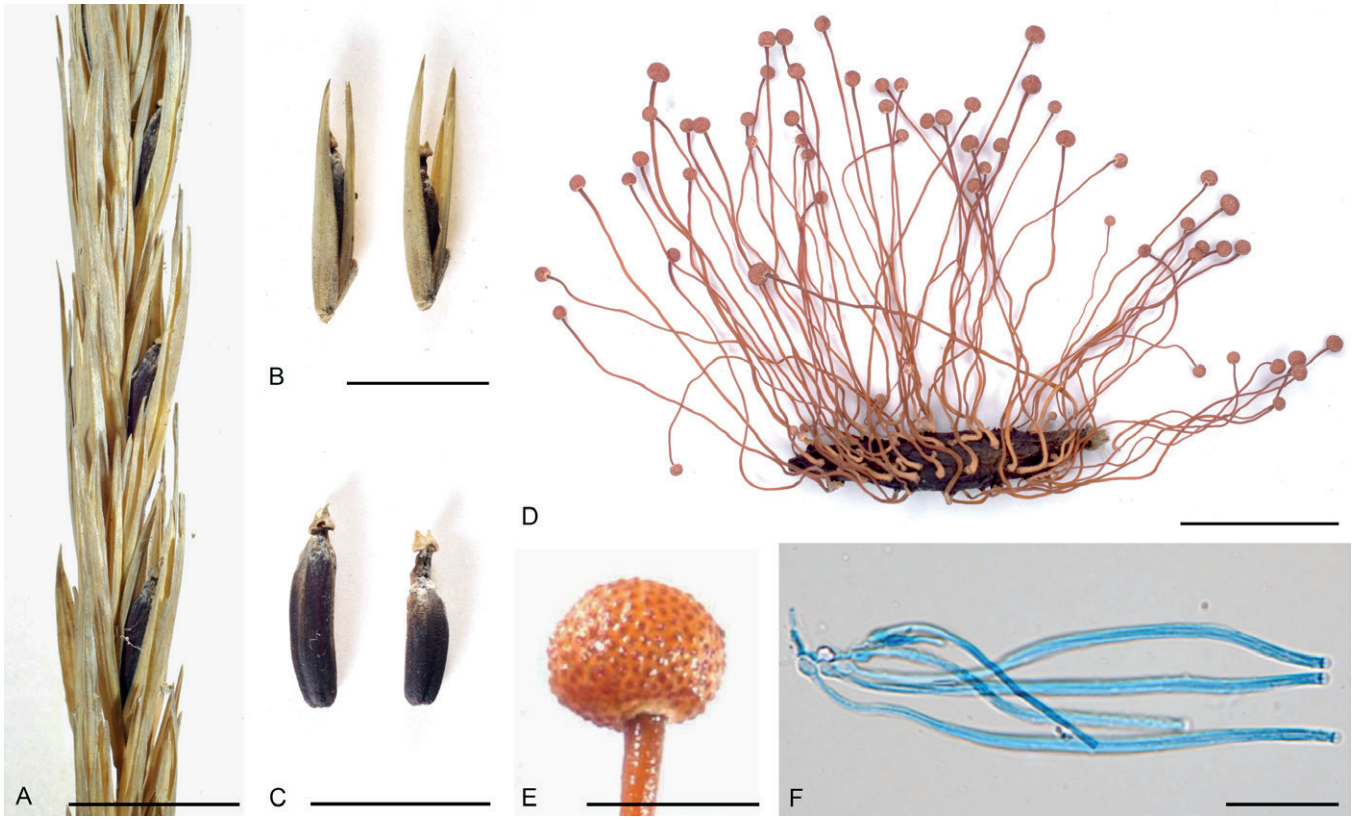

Fig. 5. *Claviceps litoralis*. **A–C.** Sclerotia on *Leymus mollis*. **D.** Ascostroma (TNS-F-96439). **E.** Capitulum. **F.** Asci. Scale bars: A–D = 1 cm; E = 1 mm; F = 10 µm.

Notes: This study confirmed that *C. litoralis* is a distinct species. This species was considered by Langdon (1952) as *C. purpurea*. Furthermore, Pažoutová *et al.* (2015) referred to this species as a doubtful name and thought that this species was either *C. purpurea* or *C. bavariensis* (as *C. humidiphila*). They also showed that ergot specimens on *L. mollis* on the Pacific coast of Canada belonged to *C. purpurea*. The host *L. mollis* (*Pooideae*, *Hordeeae*) is indigenous to Japan, and distributed along the coast from Northeast Asia to North America, but the distribution of parasitic fungus may be different.

Although the original description of Kawatani (1946) did not specify any type materials or illustration, this taxon name was validly published (Art. 40.1). Kawatani (1946) published this taxon with a Latin description based on a specimen from Japan. Later, Tanda & Kawatani (1980b) designated TUAMH-EM006 as neotype, but the neotype was lost. Therefore, we designated a replacement neotype which was collected about 75 km away from the original locality. This species forms abundant fruiting bodies from a single sclerotium. We emended the original description based on the replacement neotype, since the sclerotia size of replacement neotype are larger than that of previous description. No conidia were found on our specimens. Tanda & Kawatani (1980b) reported that this species could infect and form sclerotia on some species of *Aegilops*, *Bromus*, *Elymus*, *Festuca*, *Hordeum*, *Milium*, *Poa* and *Secale* by artificial inoculation.

Claviceps palustris E. Tanaka, ***sp. nov.*** MycoBank MB 847071. Fig. 6.

Etymology: Latin *palustris* meaning from marshes, which is the habitat of the host of this species.

Typus: **Japan**, Ishikawa Pref., Komatsu, Imae (36°22'35"N 136°26'56"E), on *P. australis*, 25 Oct. 2016, E. Tanaka (**holotype** designated here

Fig. 6. *Claviceps palustris*. **A, D.** Sclerotia on *Phragmites australis* (TNS-F-96429). **B.** Sclerotia on *Phragmites japonicus* (TNS-F-96438). **C.** Conidia. **E.** Ascostroma (TNS-F-99343). **F.** Capitulum. **G.** Asci. Scale bars: A, D, E = 1 cm; B = 5 mm; C, G = 10 µm; F = 0.5 mm.

TNS-F-96429; ex-holotype culture MAFF 247552 = CBS 150015); Gene sequences LC681708 (ITS-LSU), LC684152 (*TEF-1α*), LC684579 (*Mcm7*), LC684618 (*TUB2*), LC684653 (*RPB2*).

Description: *Sclerotia* cylindrical, acute, somewhat curved, dark brown to black, 2.7–13.5 × 0.5–0.9 mm. *Ascostromata* 1–3 per sclerotium; stipes cylindrical, glabrous, orange to brown, 10–25 × 0.2–0.3 mm long; *capitula* subglobose or depressed globose, light brown to brown, slightly protruding with ostioles, 0.4–1.5 × 0.3–0.4 mm, concolourous with stipe or darker than stipe in colour; *perithecia* semi-immersed, ovoid, remarkably protruding from the surface of the capitulum, 154–309 × 88–137 µm; *asci* hyaline, cylindrical with hyaline cap at apex, eight-spored, 54–108 × 2.3–3.3 µm; *ascospores* hyaline, filiform, aseptate, 40–95 µm in length. *Conidia* hyaline, one-celled, oblong, ovoid, ellipsoid, 2.5–8.5 × 1.4–3.5 µm, L/W ratio 1.5–3.7.

Known geographical distribution: Japan.

Known hosts: *Phragmites australis* and *P. japonicus.*

Specimens examined: **Japan**, Ishikawa Pref., Komatsu, Imae (36°22’35”N 136°26’56”E), on *P. australis*, 25 Oct. 2016, E. Tanaka (**holotype** TNS-F-96429; ex-holotype culture MAFF 247552 = CBS 150015); (TNS-F-99343 ascostromata derived from TNS-F-96429); Fukui Pref., Mikata-Kaminaka, Wakasa, Kiyama (35°34’13”N 135°54’22”E), on *P. australis*, 30 Nov. 2016, E. Tanaka (TNS-F-96430); Kyoto Pref., Kyoto city, Sakyo, Kami-Takano (35°03’48”N 135°47’52”E), on *P. australis*, 15 Dec. 2016, E. Tanaka (TNS-F-96431; culture MAFF 247553); Iwate Pref., Morioka, Zenkunen (39°42’54”N 141°07’47”E), on *P. australis*, 27 Apr. 2017, E. Tanaka (TNS-F-96432); Gunma Pref., Takasaki, Kurabuchi (36°25’26”N 138°47’32”E), on *P. australis*, 7 Nov. 2017, K. Tanada (TNS-F-96433); Niigata Pref., Joetsu, Kokufu (37°09’55”N 138°13’26”E), on *P. australis*, 22 Nov. 2017, E. Tanaka (TNS-F-96434); Gifu Pref., Gifu city, Akutami-Nagayama (35°27’27”N 136°50’48”E), on *P. australis*, 20 Dec. 2017, E. Tanaka (TNS-F-96435); Hiroshima Pref., Kure, Souyamada (34°16’02”N 132°33’37”E), on *P. australis*, 4 Jan. 2018, K. Tanada (TNS-F-96436); Tokyo Pref., Katsushika, Mizumoto-Koen (35°46’51”N 139°52’29”E), on *P. australis*, 15 Dec. 2019, E. Tanaka (TNS-F-96437); Miyazaki Pref., Miyakonojo, Yoshio (31°45’06”N 131°04’59”E), on *P. japonicus*, 20 Nov. 2020, E. Tanaka (TNS-F-96438; culture MAFF 247554).

Notes: Tanda (1977a) identified ergot fungi on *Phragmites* spp. in Japan as *Claviceps microcephala*, which is currently named *C. arundinis*. Our study uncovered that two undescribed ergot species that are not *C. arundinis* parasitise *P. australis* (*Arundinoideae*, *Molinieae*) in Japan based on their morphological characteristics and phylogenetic positions. Here we named one as *C. palustris* after the habitat, and the other as *C. phragmitis* after the host genus (see next species). *Claviceps palustris* is closely related to ergot species on *Cyperaceae*, *e.g. C. cyperi*, but its hosts are clearly different. This species can be distinguished from other ergot species on *Phragmites* spp., *i.e. C. arundinis*, European *C. bavariensis* and *C. phragmitis*, by relatively small size of conidia and colour of ascostromata.

Doi *et al.* (2023) detected ergosine/inine, ergotamine, α-ergocryptine/inine, ergocristine/inine from the sclerotia of this species and showed that and ergot alkaloid profiles of this fungus are different from that of *C. phragmitis* (*e.g.* the sclerotia of this fungus contain ergocrystine/nine and ergotamine but not that of *C. phragmitis*).

Claviceps phragmitis E. Tanaka, ***sp. nov.*** MycoBank MB 847072. Fig. 7.

Etymology: Referring to the host genus *Phragmites*.

Typus: **Japan,** Aomori Pref., Hirosaki, Ichinowatari, on *P. japonicus*, 18 Nov. 2016, Y. Harada (**holotype** designated here TNS-F-96422; ex-holotype culture MAFF 247549 = CBS 150017); Gene sequences LC681704 (ITS-LSU), LC684146 (*TEF-1α*), LC684577 (*Mcm7*), LC684616 (*TUB2*), LC684651 (*RPB2*).

Description: *Sclerotia* cylindrical, straight, black to purplish black, 5.1–13.9 × 0.5–1.3 mm. *Ascostromata* 2–5 per sclerotium; stipes cylindrical, glabrous, reddish orange or pale red, 1–10 × 0.3–0.5 mm; *capitula* globose or sub globose, pale orange to reddish purple, punctate with perithecial ostioles, 0.5–1.3 × 0.6–1.4 mm, lighter than stipe in colour; *perithecia* oblong or obovate, slightly protruding from the surface of the capitulum, 199–331 × 101–176 µm; *asci* hyaline, cylindrical with hyaline cap at apex, eight-spored, 65–130 × 1.6–3.3 µm; *ascospores* hyaline, filiform, aseptate, 50–104 µm in length. *Conidia* hyaline, one-celled, oblong-ellipsoid, ovoid, allantoid, 5.1–17.0 × 1.7–2.8 µm, L/W ratio 1.8–5.7.

Known geographical distribution: Japan.

*Known host*s: *Phragmites* spp. and *Hakonechloa macra.*

Specimens examined: **Japan**, Aomori Pref., Hirosaki, Matsukitai, on *P. australis*, 17 Nov. 2002, Y. Harada (HHUF 27702); Aomori Pref., Hirosaki, Ichinowatari (40°31’22”N 140°26’22”E), on *P. australis*, 2 Dec. 2015, Y. Harada (TNS-F-96417); Aomori Pref., Hirosaki, Sakuraba, on *P. australis*, 4 Nov. 2016, Y. Harada (TNS-F-96418); Aomori Pref., Hirosaki, Sakamoto, Nashinoki, on *P. australis*, 14 Nov. 2016, Y. Harada (TNS-F-96419); Aomori Pref., Hirosaki, Hyakuzawa, Sanbonyanagi, on *P. australis*, 16 Nov. 2016, Y. Harada (TNS-F-96420); Niigata Pref., Murakami, Komogawa 38°17’9”N 139°34’27”E), on *P. australis*, 16 Nov. 2016, K. Tanada (TNS-F-96421); Aomori Pref., Hirosaki, Ichinowatari, on *P. japonicus*, 18 Nov. 2016, Y. Harada (**holotype** TNS-F-96422; ex-holotype culture MAFF 247549 = CBS 150017); (TNS-F-99342 ascostromata derived from TNS-F-96422); Aomori Pref., Hirosaki, Ichinowatari (40°31’22”N 140°26’22”E), on *P. australis*, 2 Dec. 2015, Y. Harada (TNS-F-96423); Aomori Pref., Hirosaki, Kokuriyama, Inakarizawa, on *P. australis*, 24 Nov. 2016, Y. Harada (TNS-F-96424); Niigata Pref., Itoigawa, Rendaiji (37°02’01”N 137°52’13”E), on *P. australis*, 22 Nov. 2017, E. Tanaka (TNS-F-96425); Ehime Pref., Shikoku-Chuo, Kinsei, Yamadai, (34°00’23”N 133°35’04”E), on *P. japonicus*, 9 Jan. 2018, K. Tanada (TNS-F-96426; culture MAFF 947550); Akita Pref., Akita city, Kanaashi, Niozaki, Hakodate (39°48’46”N 140°04’42”E), on *P. australis*, 26 May 2019, E. Tanaka (TNS-F-96427); Toyama Pref., Toyama city, Yatsuo, Shimaji (36°28’49”N 137°04’41”E), on *P. australis*, 22 Jun. 2020, E. Tanaka (TNS-F-96428; culture MAFF 247551); Toyama Pref., Toyama city, Yatsuo, Shimaji (36°28’49”N 137°04’41”E), on *P. australis*, 10 Nov. 2022, E. Tanaka (ISKW-My-2).

Notes: *Claviceps phragmitis* is closely related to *C. litoralis*, but its hosts are clearly different. This species can be distinguished from *C. palustris* by the relatively elongated sclerotia and the very few conidia on the surface of the sclerotia. The morphological characteristics of Japanese ergots on *Phragmites* spp. reported by Tanda (1977a) appears to be mixed with those of *C. palustris* and *C. phragmitis*. All our specimens of this species had very few or no conidia on the surface of the sclerotia. Tanda (1977b) also identified ergot fungus on *H. macra* as *C. arundinis* (as *C. microcephala*) and its morphological characteristics resemble those of *C. phragmitis*. Doi *et al.* (2023) detected agroclavine (minor), ergosine/inine, ergocornine/inine, α-ergocryptine/inine (major) from the sclerotia of this species.

Claviceps sasae E. Tanaka, ***sp. nov.*** MycoBank MB 847079. Fig. 8.

Synonyms: *Claviceps purpurea* var. *sasae* Tanda, The reports of the Fuji bamboo garden 18: 39. 1973 (*nom. inval.* Art. 36.1).

Claviceps purpurea var. *sasae* Tanda & Kawat., Mycological studies on the ergot in Japan: 285. 1991 (*nom. inval.* Art. 30.9).

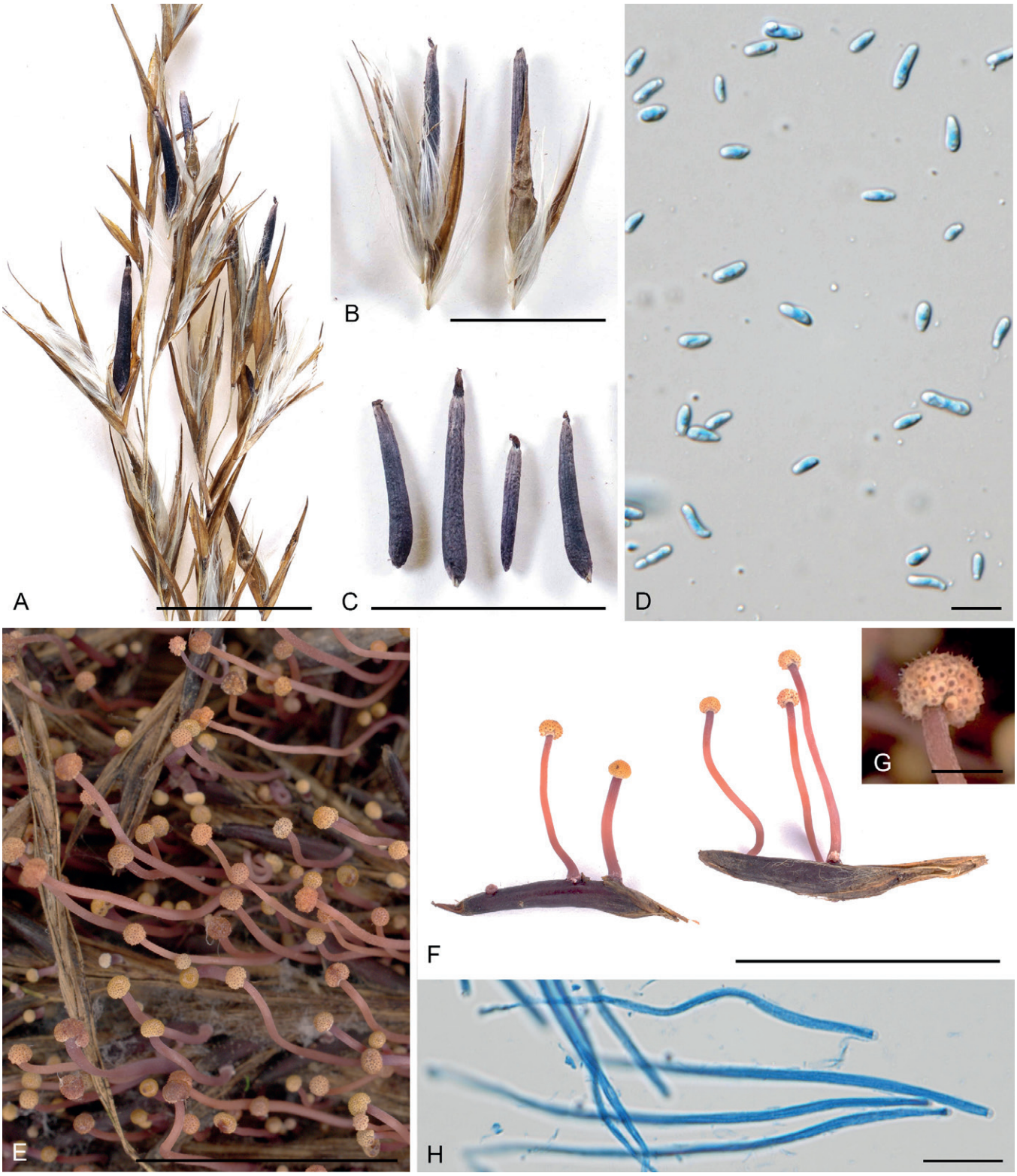

Fig. 7. *Claviceps phragmitis*. **A–C.** Sclerotia on *Phragmites japonicus* (TNS-F-96422). **D.** Conidia. **E, F.** Ascostromata (TNS-F-99342). **G.** Capitulum. **H.** Asci. Scale bars: A–C, F = 1 cm; D, H = 10 µm; G = 1 mm.

Etymology: Referring to the host genus *Sasa*.

Typus: **Japan**, Tochigi Pref., Nikko, Kawamata (36°52'06"N 139°23'40"E), on *Sasa yahikoensis*, 12 Aug. 2015, K. Tanada (**holotype** designated here TNS-F-96406; ex-holotype culture MAFF 247545 = CBS 150019); Gene sequences LC681697 (ITS-LSU), LC684133 (*TEF-1α*), LC684573 (*Mcm7*), LC684612 (*TUB2*), LC684647 (*RPB2*).

Description: *Sclerotia* cylindrical or reniform, dark purple to black, surface frequently cracked, 3.8–25.5 × 1.2–8.0 mm. *Ascostromata* 1–7 per sclerotium; stipes cylindrical, reddish brown, 2–14 × 0.3–1.4 mm; capitula globose or subglobose, yellowish orange to reddish brown, 0.3–3.2 mm, lighter than stipe in colour; *perithecia* immersed, obovate, slightly protruding from the surface of the capitulum, 193–343 × 88–182 µm; *asci* hyaline, cylindrical with hyaline cap at apex, eight-spored, 119–196 × 3.5–6.2 µm; *ascospores* hyaline, filiform, aseptate, 112–179 µm in length. *Conidia* hyaline, one-celled, ovoid to cylindrical, 4.7–24.8 × 2.5–8.6 µm, L/W ratio 2.2–3.1.

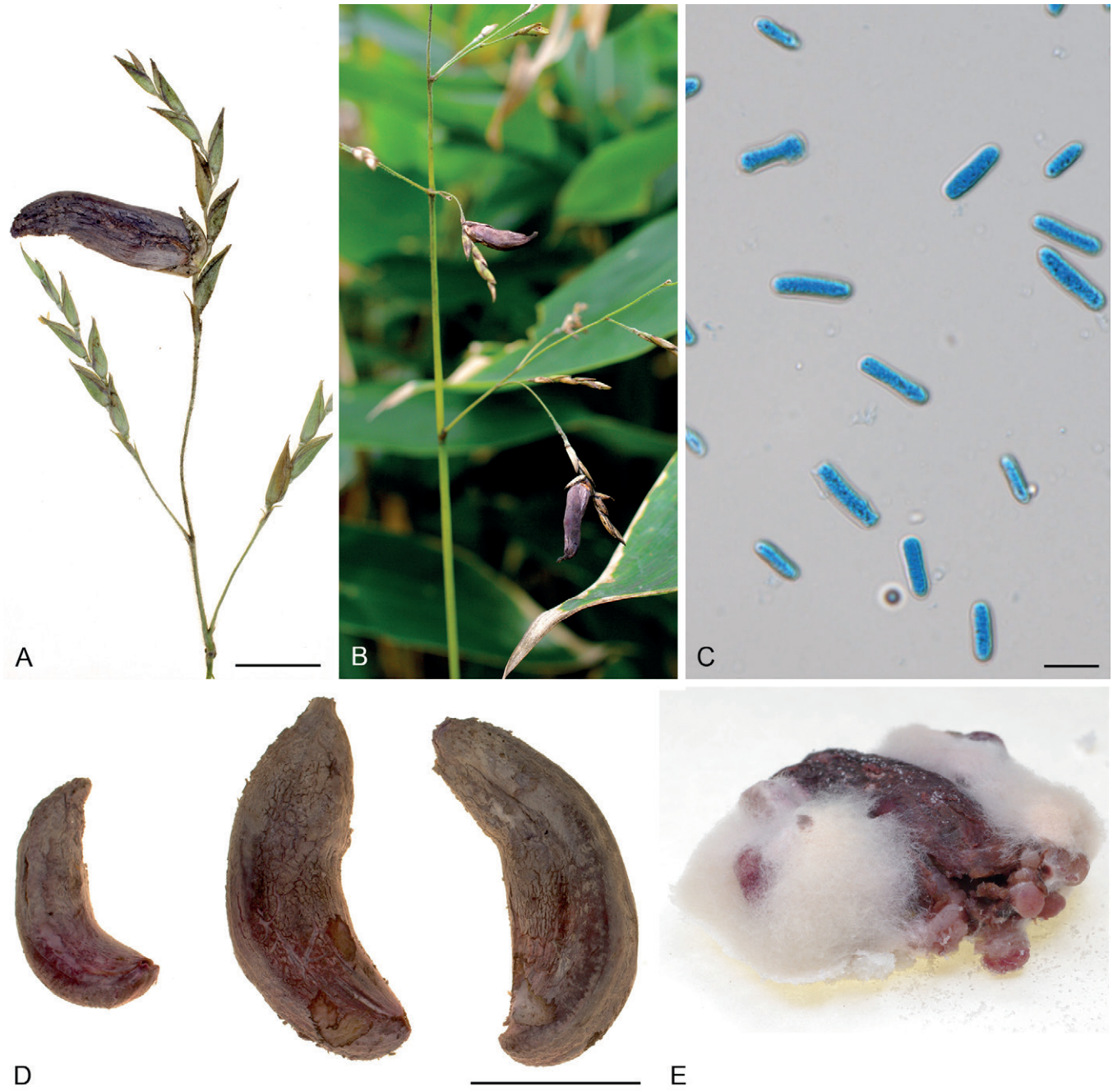

Fig. 8. *Claviceps sasae*. **A, D.** Sclerotia on *Sasa yahikoensis* (TNS-F-96406). **B.** Sclerotia on *Sasa palmata* (TNS-F-96411). **C.** Conidia. **E.** Immature ascostroma. Scale bars: A, D = 1 cm; C = 10 µm.

Known geographical distribution: Japan (alpine or subalpine regions).

Known hosts: *Sasa* spp. and *Sasamorpha* spp.

Specimens examined: **Japan**, Hokkaido Pref., Kushiro, Mt. Meakan, on *Sasa paniculate*, 15 Sep. 1925, N. Hiratsuka (TNS-F-184896); Hokkaido Pref., Kushiro, Mt. Meakan, on *S. paniculata*, 15 Sep. 1933, Y. Tokunaga (TNS-F-184897); Gunma Pref., Manza, on *Sasa veitchii*, 25 Aug. 1941, I. Miyashita (TNS-F-184899); Nagano Pref., Mt. Yatsugatake, on *S. veitchii*, 1941, Kariyone (TNS-F-184900); Tochigi Pref., Nikko, Okunikko, Yumoto, on *Sasa* sp. 23 Aug. 1983, Y. Harada (HHUF 14424); Tochigi Pref., Nikko, Kawamata (36°52'06"N 139°23'40"E, Alt. 1 340 m), on *Sasa yahikoensis*, 12 Aug. 2015, K. Tanada (**holotype** TNS-F-96406; ex-holotype culture MAFF 247545 = CBS 150019); Gifu Pref., Takayama, Okuhida (36°11'39"N 137°33'13"E, Alt. 1 260 m), on *Sasa* sp., 14 Aug. 2016, K. Tanada (TNS-F-96407); Nagano Pref. Matsumoto, Kamikochi (36°14'35.4"N 137°37'49.4"E, Alt. 1 500 m), on *Sasa* sp., K. Tanada (TNS-F-96408); Ishikawa Pref., Hakusan, Mt. Hakusan (36°08'23"N 136°45'15"E, Alt. 2 001 m), on *Sasa palmata*, 19 Aug. 2020, E. Tanaka (TNS-F-96410); Nagano Pref., Yamanouchi (36°42'35"N 138°29'35"E, Alt. 1 585 m), on *S. palmata*, 28 Oct. 2020, E. Tanaka (TNS-F-96411; culture MAFF 247546).

Notes: The name *C. purpurea* var. s*asae* Tanda (Tanda 1973) is *nom. inval.* (provisional name; Art. 39.1, Art. 40.1, Art. 32A.1, Art. 36.1). Tanda (1991a) later published *C. purpurea* var. *sasae* Tanda & Kawat. in his doctoral thesis. The doctoral thesis is also *nom. inval.,* although it included a word "holotypus" and a phrase "var. *nov.*", and was accompanied by a Latin description for the taxon, because it is not an effective publication (Art. 30.9). Here, we describe this taxon as a new species *Claviceps sasae* E. Tanaka. This taxon differs from *C. purpurea* because of its significant large conidial size and long ascospores. Our phylogenetic analysis revealed that this taxon is delimited as a distinct species. The

holotype (TNS-F-96406) was collected at the locality and on the host of the lost specimen (TUAMH-SI202) of Tanda (1991a) . Our description is based on the Latin description by Tanda (1991a) with the addition of information based on our specimens. Tanda (1991a) also reported that this species could infect and form sclerotia on *Aegilops* spp., *Bromus remotiflorus*, *Elymus tsukushiensis* var. *transiens*, *Festuca parvigluma, Holcus lanatus, Secale cereale*, *S. montanum* and *Triticum aestivum* by artificial inoculation. The hosts *Sasa* spp. (*Bambusoideae*, *Arundinarieae*) are indigenous to Japan. Doi *et al.* (2023) detected only ergosine/inine from the sclerotia of this fungus and no other ergot alkaloids. According to Tanda *et al.* (1968), ergot on *Sasa* spp. in Japan had a toxicity to mice.

Tanda (1973) obtained only one germinated ergot from 40 ergots and described the morphological characteristics derived from its sexual morph. In our experiment, only one ergot germinated to form immature ascostromata (Fig. 8E), but then rotted. The sexual morph of this fungus could not form under the same conditions as other ergot fungi did, presumably because this fungus is distributed in high mountain regions covered with snow for more than six months a year at altitudes higher than 1 300 m above the sea level. The distribution of the host plants in alpine and subalpine regions suggests that the snow cover for more than six months a year might be necessary for the development of sexual morph of this fungus.

Claviceps tandae E. Tanaka, ***sp. nov.*** MycoBank MB 847074. Fig. 9.

Etymology: Named after Dr Seinosuke Tanda for his contributions to studies on many Japanese ergots.

Typus: **Japan**, Iwate Pref., Morioka, Teshiromori (39°39'N 141°11'E), on *P. arundinacea*, 8 Jul. 2017, K. Tanada (**holotype** designated here TNS-F-60509; ex-holotype culture MAFF 247311 = CBS 150020); Gene sequences LC681695 (ITS-LSU), LC684128 (*TEF-1α*), LC684572 (*Mcm7*), LC684611 (*TUB2*), LC684646 (*RPB2*).

Description: *Sclerotia* cylindrical, acute, straight or curved, dark brown to black, 2.1–13.5 × 0.3–1.1 mm. *Ascostromata* 1–6 per sclerotium; stipes cylindrical, glabrous, reddish brown or pale red, 1–19 × 0.1–0.7 mm; *capitula* globose or subglobose, pale orange to reddish brown or purplish brown, roughly punctate with perithecial ostioles, 0.5–1.5 × 0.4–1.4 mm; *perithecia* semi-immersed, obovate, remarkably protruding from the surface of the capitulum,

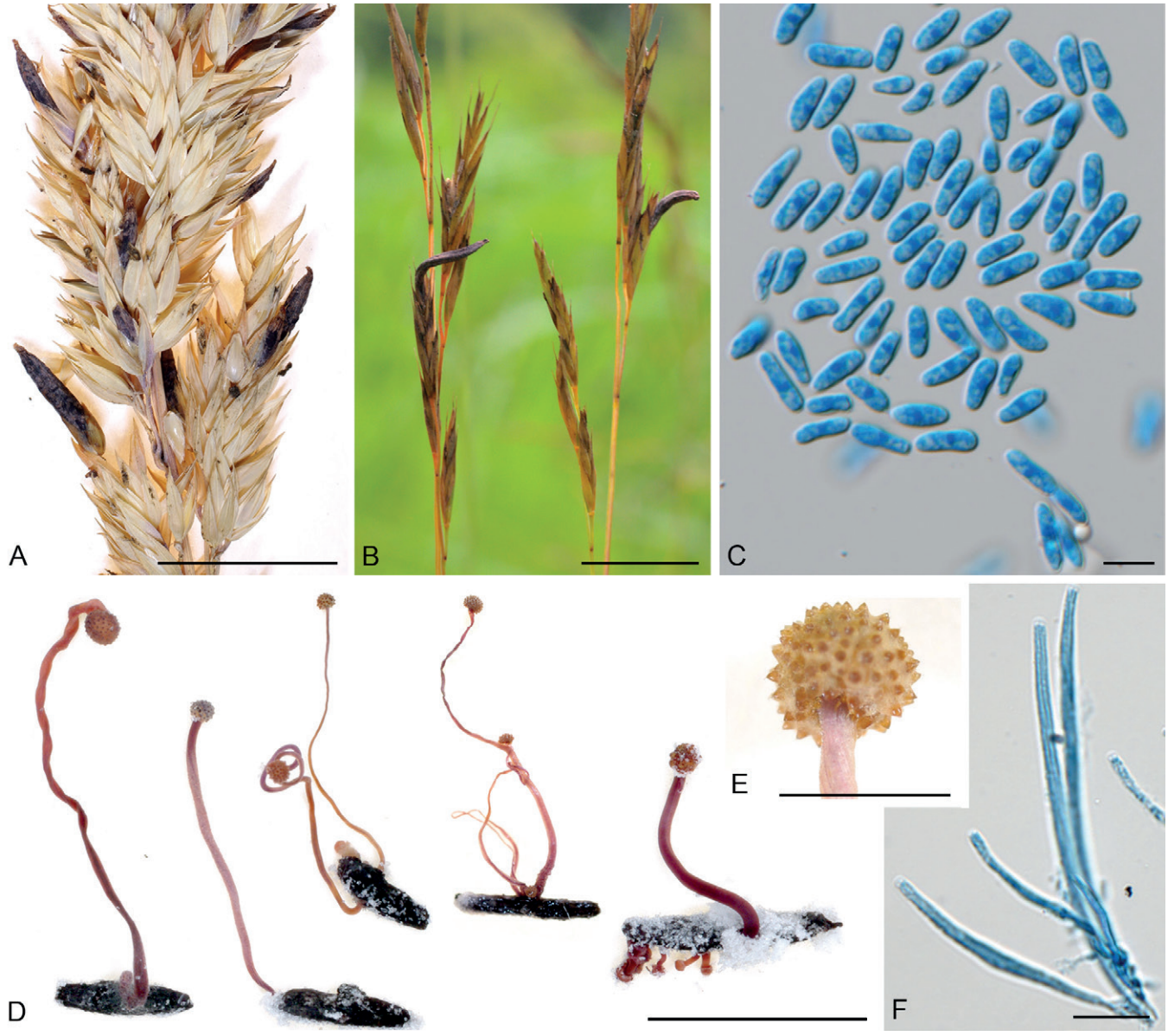

Fig. 9. *Claviceps tandae*. **A.** Sclerotia on *Phalaris arundinacea* (TNS-F-60509). **B.** Sclerotia on *Festuca rubra* (TNS-F-60517). **C.** Conidia. **D.** Ascostroma (TNS-F-60526). **E.** Capitulum. **F.** Asci. Scale bars: A, B, D = 1 cm; C, F = 10 µm; E = 1 mm.

185–225 × 119–154 µm; *asci* hyaline, cylindrical, with hyaline cap at apex, eight-spored, 49–105 × 2.2–4.9 µm; *ascospores* hyaline, filiform, aseptate, 40–81 µm in length. *Conidia* hyaline, one-celled, oblong, ovoid, 4.0–16.2 × 1.8–5.1 µm, L/W ratio 1.4–5.7.

Known geographical distribution: Japan.

Known hosts: *Agrostis nigra*, *Calamagrostis breviligulata*, *Festuca rubra* and *Pharalis arundinacea.*

Specimens examined: **Japan**, Iwate Pref., Morioka, Teshiromori (39°39'N 141°11'E), on *P. arundinacea*, 8 Jul. 2017, K. Tanada (**holotype** TNS-F-60509; ex-holotype culture MAFF 247311 = CBS 150020); (TNS-F-60526 ascostromata derived from TNS-F-60509); Iwate Pref., Shizukuishi, Oushuku (39°37'37"N 140°54'48"E), on *P. arundinacea*, 9 Aug. 2017, K. Tanada (TNS-F-60510; culture MAFF 247312); Iwate Pref., Shizukuishi, Oushuku (39°37 '37"N 140°54'48"E), on *A. nigra*, 9 Aug. 2017, K. Tanada (TNS-F-60511; culture MAFF 247313); Yamanashi Pref., Yamanashi city, Mt. Kentoku, Kokushigahara (35°48'45"N 138°43'07"E), on *P. arundinacea*, 11 Oct. 2017, K. Tanada (TNS-F-60513); Iwate Pref., Miyako, Kuzakai (39°39'06"N 141°21'16"E), on *P. arundinacea*, 7 Aug. 2019, E. Tanaka (TNS-F-60515); (TNS-F-99352 ascostromata derived from TNS-F-60515); Iwate Pref., Miyako, Kuzakai (39°39'08"N 141°21'43"E), on *F. rubra*, 7 Aug. 2019, E. Tanaka (TNS-F-60517); Aomori Pref., Shimokita, Higashidori, Odanosawa (41°13'47"N 141°24'08"E), on *C. breviligulata*, 9 Nov. 2019, T. Hoshino (TNS-F-96525).

Notes: This species is distinct phylogenetically from the allied species, *i.e. C. arundinis*, *C. bavariensis*, *C. humidiphila* and *C. perihumidiphila*, by forming a distinct clade at all five loci. The host range of this species overlaps with *C. bavariensis* and *C. humidiphila* in Japan. This species cannot be distinguished from *C. humidiphila* in the ITS region, but there are obvious nucleotide variations in other regions, such as at least seven constant nucleotide difference in the *TEF-1α* region. Morphologically, this species can be distinguished from *C. bavariensis* and *C. humidiphila* by its relatively small asci. The host species belong to the tribe *Poeae*. Most of the specimens were collected from cool areas of Iwate prefecture in Japan. Doi *et al.* (2023) showed that the sclerotia of this species contain agroclavine, festuclavine, pyroclavine, ergosine/inine (major), ergotamine, ergocornine/inine and α-ergocryptine/inine.

Claviceps yanagawaensis Togashi, Trans. Sapporo nat. Hist. Soc. 14: 281. 1936. Fig. 10.

Typus: **Japan**, Iwate Pref., Morioka, Yanagawa, on *Zoysia japonica*, 10 Aug. 1934, K. Togashi (**lectotype** designated here TNS-F-184963; MBT 10010969); Iwate Pref., Miyako, Kuzakai (39°39'15"N 141°21'28"E), 7 Aug. 2019, E. Tanaka (**epitype** designated here TNS-F-96440; MBT 10010970; ex-epitype culture MAFF 247556 = CBS 150021); Gene sequences LC681716 (ITS-LSU), LC684163 (*TEF-1α*), LC684582 (*Mcm7*), LC684621 (*TUB2*), LC684656 (*RPB2*).

Description modified from the original description by Togashi (1936): *Sclerotia* depressed cylindrical, attenuate, purplish black to black, surface light yellowish green with conidia, 1.5–15 × 0.4–1.3 mm. *Ascostromata* 1–7 per sclerotium; stipes cylindrical, glabrous, pale purple to dark purple, 0.7–20 × 0.4–1.5 mm; *capitula* subglobose, pale-brown to dark purple or brownish-black, 0.2–2.0 mm × 0.2–1.6 mm wide; *perithecia* almost superficial or semi-immersed, elongate-obovate, remarkably protruding from the surface of the capitulum, 165–320 × 67–190 µm; *asci* hyaline, eight-spored, 85–223 × 4.0–8.0 µm; ascospores hyaline, filiform, aseptate, 75–180 × 0.8–2.25 µm. *Conidia* greenish in mass, one-celled, fusiform to triquetrous oblong, 5.0–15.2 × 3.2–6.6 µm.

Known geographical distribution: Japan (Northern areas or subalpine areas).

Known host: *Zoysia japonica.*

Specimens examined on Z. japonica: **Japan**, Nagano Pref., Mt. Izuna, 1 Aug. 1910, T. Furukawa (TNS-F-185070); Iwate Pref., Morioka, Yanagawa, 10 Aug. 1934, K. Togashi (**lectotype** TNS-F-184963; MBT 10010969); 2 Oct. 1934, K. Togashi (**paralectotype** TNS-F-184964); 3 Oct. 1934, K. Togashi (**paralectotype** TNS-F-184965); 16 Oct. 1934, K. Togashi (**paralectotype** TNS-F-184966); 16 Oct. 1934, K. Togashi (**paralectotype** TNS-F-184967); 4 Nov. 1934, K. Togashi (**paralectotype** TNS-F-184968); 27 Sep. 1935, K. Togashi (**paralectotype** TNS-F-184969); 12 Oct.1935, K. Togashi (**paralectotype** TNS-F-184970); 19 Oct. 1935, K. Togashi (**paralectotype** TNS-F-184971); 12 May 1935, K. Togashi (**paralectotype** TNS-F-184972); 11 Jun. 1935, K. Togashi (**paralectotype** TNS-F-184973); 17 Jul. 1935, K. Togashi (**paralectotype** TNS-F-184974); Aomori Pref., Hirosaki, Mt. Iwaki, Ubaishi, 16 Sep. 1973, Y. Harada (HHUF 4632); Iwate Pref., Miyako, Kuzakai (39°39'15"N 141°21'28"E), 7 Aug. 2019, E. Tanaka (**epitype** TNS-F-96440; MBT 10010970; ex-epitype culture MAFF 247556 = CBS 150021); (TNS-F-99344 ascostromata derived from TNS-F-96440).

Notes: The original description provided by Togashi (1936) referred to 11 syntype specimens but did not specify where they were preserved. We found those specimens in the TNS and examined them and selected a lectotype after careful examination. However, DNA sequencing from the syntype series was not successful. We could not find this species in the type locality of Yanagawa pastureland nor elsewhere recorded in Togashi (1942). The epitype specimen (TNS-F-96440) was collected about 3 km away from the original type locality. Several previous studies (*e.g.* White *et al.* 2003, Alderman *et al.* 2004) have cited this species as "*C. yanagawensis*", but since there are no orthographic or other errors, the original spelling of epithet "*C. yanagawaensis*" should be retained (Art. 60).

This ergot has a pale yellowish green colour and triangular-shaped conidia, which are quite a different phenotype from other species of the section *Claviceps*. Doi *et al.* (2023) revealed that the sclerotia contain a small amount of agroclavine, festuclavine, pyroclavine and ergosine/inine. According to Tanda *et al.* (1968), ergot on *Z. japonica* in Japan had a strong toxicity to mice. In addition, Doi *et al.* (2022a) showed that some secalonic acid analogues and a benzoic analog isolated from this fungus have cytotoxicity against cancer cells.

The host *Zoysia japonica* (*Chloridoideae*, *Zoysieae*) is indigenous to Japan and extremely common, but so far *C. yanagawaensis* has been found only in Northern areas (Iwate and Aomori prefectures) or high mountain areas (Mt. Myojingatake in Kanagawa prefecture and Mt. Izuna in Nagano prefecture) in Japan (Tanda 1981e), indicating that this species maybe glacial relict and the growth environmental condition for this fungus is quite restricted. This species has also been found to occur on *Zoysia matrella* and *Z. japonica* in United States (Alderman *et al.* 2004), but these records are thought to be derived from *Z. japonica* imported from Japan (Lefebvre 1942).

Sect. *Pusillae* M. Kolařík & K. Píchová

Claviceps africana Freder. *et al*., Mycol. Res. 95: 1106. 1991. Fig. 11A–C.

Typus: **Zimbabwe,** Matopos, on *Sorghum bicolor*, Mar. 1988 (**holotype** IMI 343772).

Description based on Japanese specimens: *Microconidia* hyaline, one-celled, subglobose to ellipsoid, 2.5–5.0 × 2.5–3.8 µm, L/W

Fig. 10. *Claviceps yanagawaensis*. **A–C.** Sclerotia on *Zoysia japonica*. **A.** Lectotype (TNS-F-184963). **B, C.** Epitype (TNS-F-96440). **D.** Conidia. **E.** Ascostroma (TNS-F-99344). **F.** Capitula. Scale bars: C, E = 1 cm; D = 10 µm; F = 1 mm.

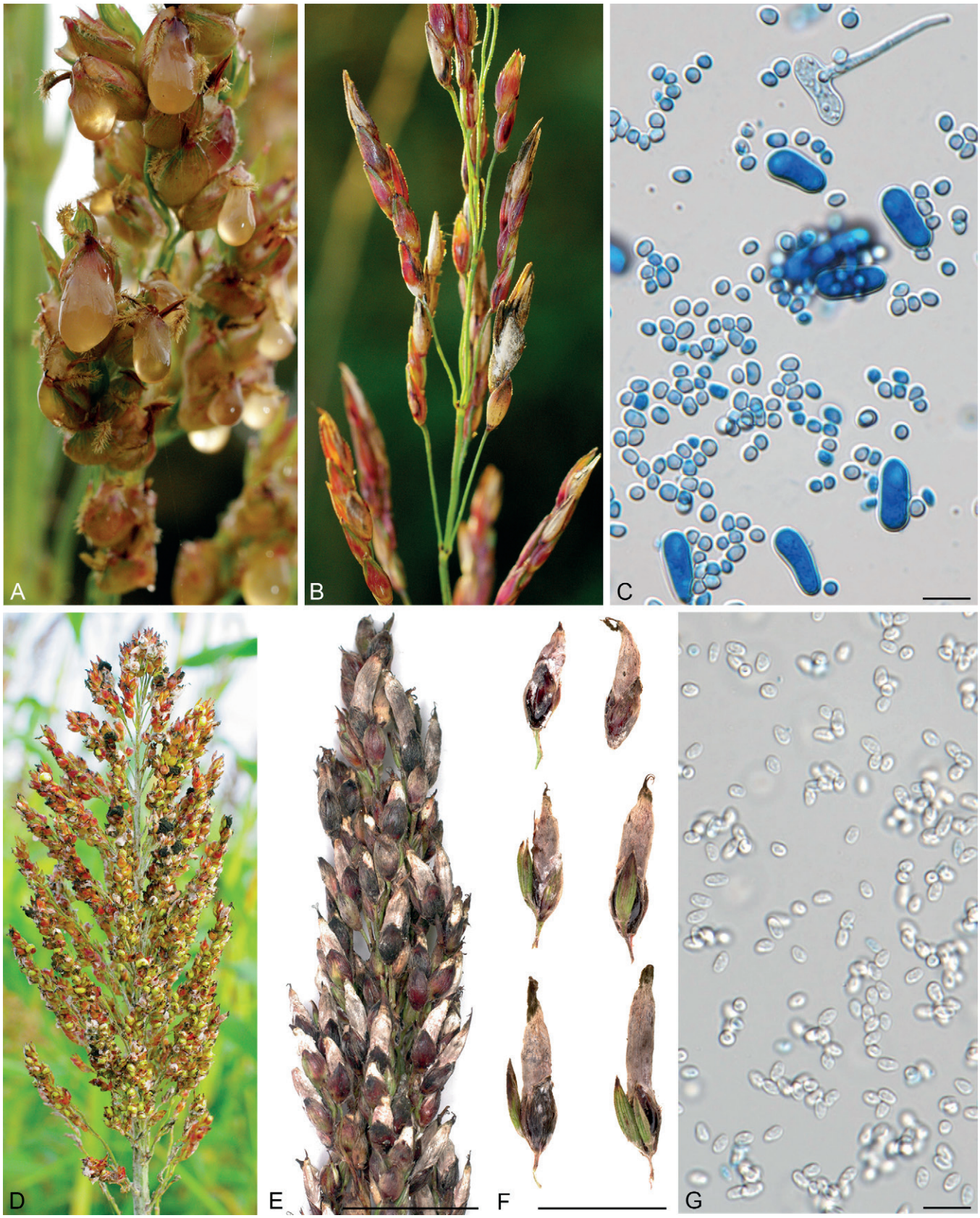

Fig. 11. *Claviceps africana* and *C. sorghicola*. **A–C.** *C. africana*. **D–G.** *C. sorghicola*. **A.** Honey dew by *C. africana* on *Sorghum bicolor* (TNS-F-96484). **B.** Infected *Sorghum halepense* (TNS-F-96483). **C, G.** Conidia. **D.** Infected *S. bicolor* (TNS-F-96489) with secondary infection by *Epicoccum andropogonis*. **E.** Sclerotia on *S. bicolor* (TNS-F-96486). **F.** Sclerotia. Scale bars: C, G = 10 µm; E–F = 1 cm.

ratio 1.0–1.5. *Macroconidia* hyaline, one-celled, ellipsoid, 8.8–16.3 × 5.0–8.8 µm, L/W ratio 1.8–2.7.

Known geographical distribution: Sorghum-producing areas of the world.

Known hosts: *Sorghum bicolor* and *S. halepense.*

Specimens examined: **Japan**, Nagasaki Pref., Isahaya, on *S. bicolor*, Nov. 2019, N. Waseda (TNS-F-96482; culture MAFF 247564); Miyazaki Pref., Mimata, Miyamura (31°42'36"N 131°06'37"E), on *S. halepense*, 18 Nov. 2020, E. Tanaka (TNS-F-96483); Kagoshima Pref., Kirishima,

Nagamizu (31°47'25"N 130°49'46"E), on *S. bicolor*, 19 Nov. 2020, E. Tanaka (TNS-F-96484); Miyazaki Pref., Miyakonojo, Yoshio (31°45'02"N 131°04'22"E), on *S. halepense*, 20 Nov. 2020, E. Tanaka (TNS-F-96485; culture MAFF 247565).

Notes: This species is native to Africa, and the original description was provided by Frederickson *et al.* (1991). In Japan, this species was first recorded in 1991 on *S. bicolor* and *S. halepense*, and was reported as the asexual morph *Sphacelia sorghi* due to the lack of its sexual morph (Tsukiboshi *et al.* 1999a). This fungus produces extremely high amounts of ergot honeydew on sorghum (Fig. 11A), but rarely produces sclerotia in Japan. Furthermore, we observed that it is common for this species to co-parasitise sorghum panicles where ergots of *C. sorghicola* occur.

Claviceps bothriochloae Tanda & Y. Muray., J. Agric. Sci. Tokyo Nogyo Daigaku 36: 38. 1991. ***emend.*** Fig. 12.

Typus: **Japan**, Kagoshima Pref., Kikaijima Island, on *Capillipedium parviflorum* (as *Bothriochloae parviflorae*), 10 Dec. 1974, Y. Murayama (**lost holotype** TUAMH-BPa 401); Kagoshima Pref., Amami-Oshima Island, Oshima, Tatsugo, Sedome (28°24'42"N 129°35'33"E), on *C. parviflorum*, 22 Nov. 2018, E. Tanaka (**neotype** designated here TNS-F-96490; MBT 10010982; ex-neotype culture MAFF 247569 = CBS 150007); Gene sequences LC681732 (ITS-LSU), LC684203 (*TEF-1α*), LC684594 (*Mcm7*), LC684633 (*TUB2*), LC684668 (*RPB2*).

Description supplement to the original description by Tanda (1991e): *Sclerotia* cylindrical or obclavate, acuminate or rarely truncate apex, dark brown to dark purple, surface whitish with conidia, 1.9–5.6 × 0.5–1.1 mm. *Ascostromata* 1–2 per sclerotium; stipes filiform, glabrous, light yellow, 7.8–25 × 0.2–1.0 mm; *capitula* depressed globose or subglobose, rough on the surface with protruding perithecial ostioles,

Fig. 12. *Claviceps bothriochloae*. **A, B.** Sclerotia on *Capillipedium parviflorum* (TNS-F-96490). **C.** Conidia. **D.** Sclerotia. **E.** Ascostromata (TNS-F-99345). **F.** Capitulum. Scale bars: C = 10 µm; D–E = 1 cm; F = 1 mm.

pale yellow, 0.6–1.1 × 0.5–0.9 mm, concolourous with stipe; *perithecia* semi-immersed, ellipsoidal or obpyriform, slightly protruding from the surface of the capitulum, 170–203 × 98–123 µm; *asci* hyaline, eight-spored, 106–114 × 4.6–5.1 µm; *ascospores* hyaline, filiform, one-celled, 63–104 µm in length. *Microconidia* hyaline, aseptate, ellipsoidal or rarely oval, 2.6–8.0 × 1.8–3.2 µm, L/W ratio 1.5–2.8. *Macroconidia* hyaline, one-celled, ovoid to triangular, 8.5–15.5 × 5.0–11 µm, L/W ratio 1.6–1.8.

Known geographical distribution: Japan (Amami-Oshima Island and Kikaijima Island).

Known host: *Capillipedium parviflorum.*

Specimens examined: **Japan**, Kagoshima Pref., Amami-Oshima Island, Oshima, Tatsugo, Sedome (28°24’42”N 129°35’33”E), on *C. parviflorum*, 22 Nov. 2018, E. Tanaka (**neotype** TNS-F-96490; MBT 10010982; ex-neotype culture MAFF 247569 = CBS 150007); (TNS-F-99345 ascostromata derived from TNS-F-96490); Amami-Oshima Island, Amami, Kasari, Wano (28°25’18”N 129°41’60”E), on *C. parviflorum*, 26 Nov. 2019, E. Tanaka (TNS-F-96491); Amami-Oshima Island, Amami, Naze, Daikuma (28°24’33”N 129°30’50”E), on *C. parviflorum*, 27 Nov. 2019, E. Tanaka (TNS-F-96492).

Notes: The neotype specimen (TNS-F-96490) was collected at Amami-Oshima Island about 40 km from Kikaijima Island. The host *Capillipedium parviflorum* (*Panicoideae*, *Andropogoneae*) is indigenous to Japan, and broadly distributed in Asia, Australia and the Pacific islands.

Tanda (1991e) distinguished this fungus from *C. pusilla* on the basis that *C. pusilla* has triangular macroconidia. In this study, we have found triangular macroconidia and hence amended the description. Our phylogenetic analyses confirmed the close relationship between *C. bothriochloae* and *C. pusilla* in that *C. bothriochloae* is located in the *C. pusilla* clade and clustered with “*C. pusilla*” (CCC 499) from Australia. All the species in the *C. pusilla* clade have similar triangular macroconidia (Pažoutová *et al.* 2011, van der Linde *et al.* 2022), thus this type of macroconidia can be considered a morphological synapomorphy.

Interestingly, African ex-epitype *C. pusilla* (CCC 845) and Australian “*C. pusilla*” (CCC 499) belonged to two different lineages on the phylogenetic tree. The former is the most closely related with *C. truncatispora*, whereas the latter is clustered with *C. bothriochloae*. Based on this result, the Australian “*C. pusilla*” might belong to *C. bothriochloae* or to be a distinct species. The two are slightly different in the colour of ascostromata, that of Australian “*C. pusilla*” is straw colour (Langdon 1950), while that of *C. bothriochloae* is yellow. Langdon (1950) also identified ergot fungi on several plants in the subtribe *Andropogoninae*, from Australia and New Guinea as *C. pusilla*. Further studies of ergot fungi on the *Andropogoninae* plants in these regions are needed. Doi *et al.* (2023) did not detect any ergot alkaloids from the sclerotia of this species.

Claviceps kawatanii (Tanda) E. Tanaka, ***stat. et comb. nov., emend.*** MycoBank MB 847080. Fig. 13.
Basionym: *Claviceps microspora* var. *kawatanii* Tanda, Trans. Mycol. Soc. Japan 32: 497. 1991.

Typus: **Japan**, Tokyo Pref., Hachioji, Mt Jinba, on *Spodiopogon cotulifer* (Thumnb.) Hack., 23 Oct. 1972, S. Tanda (**lost holotype** TUAMH-EC201); Kanagawa Pref., Sagamihara, Mt. Jinba (type locality), on *Spodiopogon sibiricus*, 10 Oct. 2015, K. Tanada (**neotype** designated here TNS-F-96441; MBT 10010983; ex-neotype culture MAFF 247557 = CBS 150010); Gene sequences LC681717 (ITS-LSU), LC684164 (*TEF-1α*), LC684583 (*Mcm7*), LC684622 (*TUB2*), LC684657 (*RPB2*).

Description supplement to the original description by Tanda (1991c): *Sclerotia* ovoid or cylindrical, acute, dark brown to black, surface whitish with conidia, 1.9–13.1 × 0.8–2.8 mm. *Ascostromata* 1–10 per sclerotium; stipes cylindrical, glabrous, light purplish brown, 1–23 × 0.2–1.2 mm; *capitula* globose or subglobose, dark purple, punctate with perithecial ostiole, 0.6–2.5 × 0.5–2.0 mm, darker than stipe in colour; *perithecia* semi-immersed, oblong or ovoid, slightly protruding from the surface of the capitulum, 182–308 × 81–200 µm; *asci* hyaline, eight-spored, 125–242 × 2.6–4.3 µm; *ascospores* hyaline, filiform, aseptate, 70–179 µm in length. *Microconidia* hyaline, one-celled, subglobose or broadly ellipsoidal, 2.8–6.3 × 2.3–2.8 µm, L/W ratio 1.2–2.2. *Macroconidia* hyaline, one-celled, oblong or elliptical, 5.5–12.5 × 2.8–4.0 µm, L/W ratio 1.8–3.7.

Known geographical distribution: Japan.

Known hosts: *Spodiopogon sibiricus* and *S. cotulifer.*

Specimens examined: **Japan**, Yamanashi Pref., Uenohara, on *S. sibiricus*, 14 Nov. 1911, S. Kusano (TNS-F-195663); Iwate Pref., Morioka, Yanagawa, on *S. sibiricus*, 20 Oct. 1938, K. Togashi (TNS-F-184938); Ibaraki Pref., Mt. Nantai, on *S. sibiricus*, 3 Nov. 1939, K. Watanabe (TNS-F-184939); Aomori Pref., Kamikita, Koochi, Otsutomo, on *S. sibiricus*, 25 Oct. 1940, S. Murai (TNS-F-184940); Aomori Pref., Shimokita, Tanabu, on *S. sibiricus*, 25 Oct. 1940, S. Murai (TNS-F-184941); Yamanashi Pref., Mt. Mitsutoge, on *S. sibiricus*, Oct. 1954, (TNS-F-25702); Aomori Pref., Hirosaki, Mt. Iwaki, Hyakuzawa, on *S. sibiricus*, 9 Aug. 1975, M. Terui (HHUF 4625); Kanagawa Pref., Sagamihara, Mt Jinba (35°39’08”N 139°09’59”E), on *S. sibiricus*, 10 Oct. 2015, K. Tanada (**neotype** TNS-F-96441; MBT 10010983; ex-neotype culture MAFF 247557 = CBS 150010); (TNS-F-99346 ascostromata derived from TNS-F-96441); Kanagawa Pref., Sagamihara, Mt Jinba (35°39’10”N 139°09’58”E), on *S. sibiricus*, 3 Nov. 2019, E. Tanaka (TNS-F-96442); Nagano Pref., Ueda, Sugadaira (36°31’27”N 138°21’03”E), on *S. sibiricus*, 21 Nov. 2021, Y. Degawa (TNS-F-96443; culture MAFF 247558).

Notes: This taxon was described as a variety, namely *C. microspora* var. *kawatanii*, by Tanda (1991c) based on an ergot fungus on *S. cotulifer* (*Panicoideae*, *Andropogoneae*) because of the morphological different features of the sexual morph. Later, Tanda (1991d) identified an ergot fungus on *S. sibiricus* as the same variety. Since we were not able to find new specimens on *S. cotulifer*, we designated a specimen on *S. sibiricus* from the type locality as a neotype. The host plants *S. sibiricus* and *S. cotulifer* are indigenous to Japan. Tanda (1991d) identified an ergot fungus on *S. sibiricus* from Korea as *C. microspora* var. *kawatanii*, but we have not confirmed it. Ergots on *S. sibiricus* have been reported from USA (Alderman *et al.* 2004), Spain (Ilana-Esteban 2008) and Lithuania (Mikaliūnaitė & Dabkevičius 2009), but we have no information to identify them.

Even though Tanda (1991c, d) designated this taxon as a variety of *C. microspora* because the characteristics of this taxon, *i.e.* morphology, culture, alkaloid production and inoculation test, coincided with those of *C. microspora*, the two taxa are not even sister-species phylogenetically, and their host plants differ too. Therefore, this taxon is delimited as a distinct species. This species is related to *C. miscanthicola* and *C. sorghicola*, but its host are clearly different. We emended the description, with the characteristics of newly found macroconidia that were not mentioned in the original description. Doi *et al.* (2023) did not detect any ergot alkaloids from the sclerotia of this species. According to Tanda *et al.* (1968), ergot on *S. sibiricus* in Japan had no toxicity to mice.

Fig. 13. *Claviceps kawatanii*. **A, B.** Sclerotia on *Spodiopogon sibiricus*. **A.** TNS-F-96442. **B.** TNS-F-96441. **C.** Conidia. **D.** Sclerotia. **E.** Ascostromata (TNS-F-99346). **F.** Capitulum. **G.** Asci. Scale bars: B, D, E = 1 cm; C, G = 10 µm; F = 1 mm.

Claviceps microspora Tanda, J. Agric. Sci. Tokyo Nogyo Daigaku 30: 94. 1985. ***emend.*** Fig. 14.

Typus: **Japan**, Tochigi Pref., Utsunomiya city, Utsunomiya University, on *Arundinella hirta* (Thunb) C. Tanaka, 16 Oct. 1972, T. Sugimoto (**lost holotype** TUAMH-AH 206); Ishikawa Pref., Nomi, Wasadani (36°26'24"N 136°37'36"E), on *A. hirta*, 15 Nov. 2017, E. Tanaka (**neotype** designated here TNS-F-96479; MBT 10010984; ex-neotype culture MAFF 247562 = CBS 150012); Gene sequences LC681725 (ITS-LSU), LC684191 (*TEF-1α*), LC684588 (*Mcm7*), LC684627 (*TUB2*), LC684662 (*RPB2*).

Description supplement to the original description by Tanda (1985): *Sclerotia* cylindrical, acuminate or truncate apex, blackish brown to black, 1.5–8.0 × 0.4–1.1 mm. *Ascostromata* 1–2 per sclerotium; stipes cylindrical, glabrous, brown to dark purple or light black, 1–15 × 0.2–0.4 mm; *capitula* globose or slightly depressed globose, purple to dark purple, roughly punctate with perithecial ostiole, 0.3–0.9 × 0.3–1.3 mm, concolourous with stipe or darker than stipe in colour; *perithecia* semi-immersed, oblong or ovoid, remarkably protruding from the surface of the capitulum, 147–214 × 63–123 µm; *asci* hyaline, eight-spored, 95–161 × 2.1–3.9 µm; *ascospores* hyaline, filiform, aseptate, 88–158 µm in length. *Microconidia* hyaline, one-celled, ellipsoid to subglobose, 2.2–5.1 × 1.3–2.9 µm, L/W ratio 1.0–1.8. *Macroconidia* hyaline, one-celled, oblong to elliptical, 4.0–9.1 × 2.5–4.0 µm, L/W ratio 1.5–2.3.

Known geographical distribution: Japan.

Known host: *Arundinella hirta.*

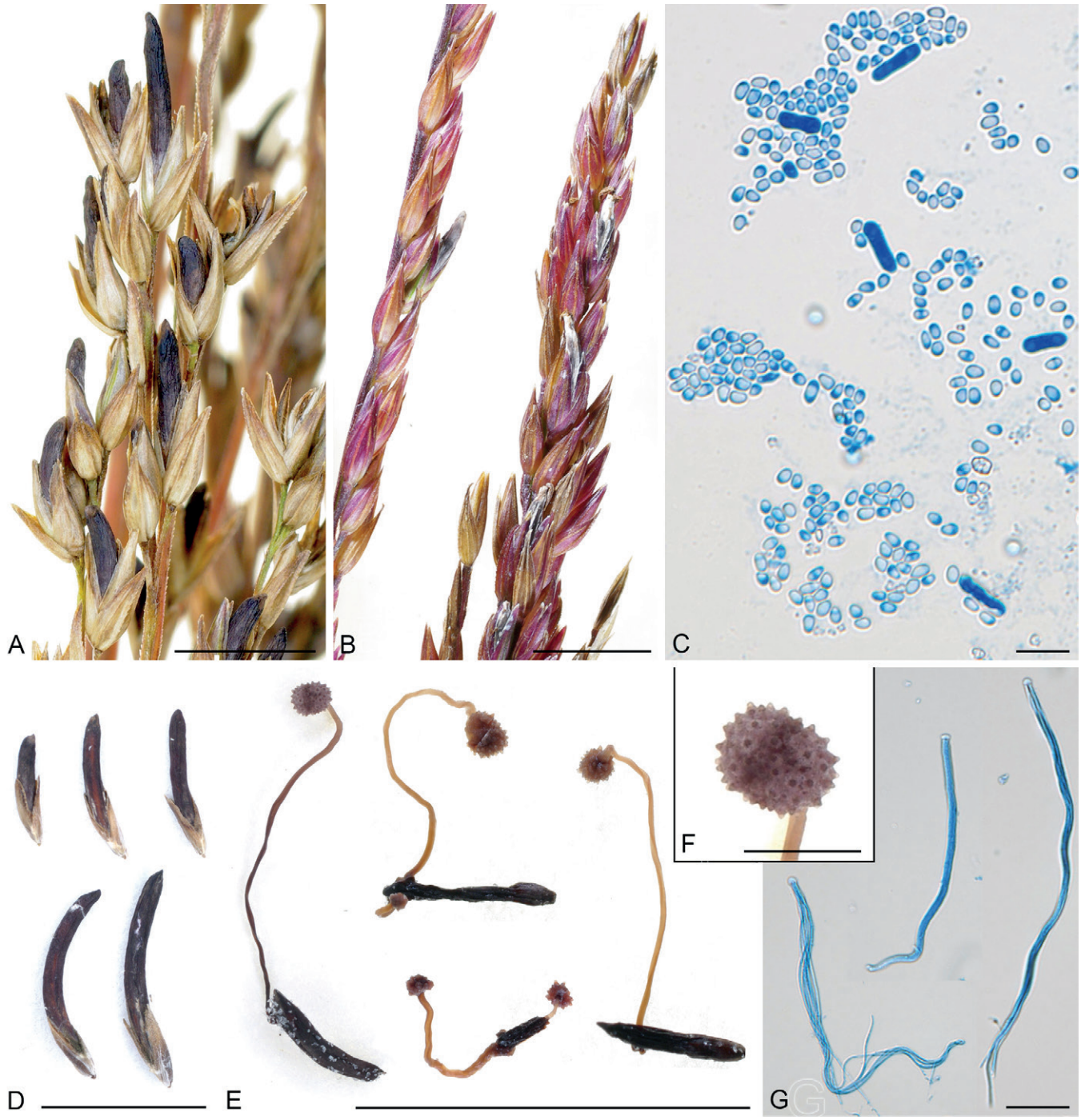

Fig. 14. *Claviceps microspora*. **A, B.** Sclerotia on *Arundinella hirta*. **A.** TNS-F-96479. **B.** ISKW-My-1. **C.** Conidia. **D.** Sclerotia. **E.** Ascostromata (TNS-F-99347). **F.** Capitulum. **G.** Asci. Scale bars: A–B = 5 mm; C, G = 10 µm; D–E = 1 cm; F = 1 mm.

Specimen examined: **Japan**, Hokkaido Pref., Chitose, Iburi, on *A. hirta*, 13 Oct. 1932, Y. Tokunaga (TNS-F-184887); Ishikawa Pref., Nomi, Wasadani (36°26'24"N 136°37'36"E), on *A. hirta*, 15 Nov. 2017, E. Tanaka (**neotype** TNS-F-96479; MBT 10010984; ex-neotype culture MAFF 247562 = CBS 150012); (TNS-F-99347 ascostromata derived from TNS-F-96479); Ishikawa Pref., Komatsu, Rendaiji (36°22'16"N 136°28'10"E), on *A. hirta*, 21 Nov. 2017, E. Tanaka (TNS-F-96480); Miyazaki Pref., Miyakonojo, Yoshio (31°45'04"N 131°04'51"E), on *A. hirta*, 19 Nov. 2020, E. Tanaka (TNS-F-96481; culture MAFF 247563); Ishikawa Pref., Nomi, Wasadani (36°26'24"N 136°37'36"E), on *A. hirta*, 4 Nov. 2022, E. Tanaka (ISKW-My-1).

Notes: The host *A. hirta* (*Panicoideae*, *Arundinelleae*) is indigenous to Japan and East Asia. We tried to collect this species from the type locality, but the host grass *A. hirta* was not seen in the region. The neotype specimen (TNS-F-96479) was collected about 300 km away from the original type locality. The morphological characteristics of the neotype matched closely with the original description. In addition, we have found macroconidia and emended the description based on the neotype. Tanda (1985) identified an ergot fungus on *A. hirta* from Korea as *C. microspora*, but we have not confirmed it. Another ergot on *A. hirta*, *C. arundinellae*, occurs in Africa (van der Linde *et al.* 2022) and is phylogenetically distant from *C. microspora* (Fig. 1). Doi *et al.* (2023) did not detect any ergot alkaloids from the sclerotia of this species. According to Tanda *et al.* (1968), ergot on *A. hirta* in Japan had no toxicity to mice.

Claviceps miscanthicola E. Tanaka, ***sp. nov.*** MycoBank MB 847075. Fig. 15.

Etymology: Referring to the host genus *Miscanthus*.

Typus: **Japan**, Fukui Pref., Minami-Echizen, Makiya (35°49'44"N 136°11'60"E), on *Miscanthus sinensis*, 30 Nov. 2016, E. Tanaka (**holotype** designated here TNS-F-96455; ex-holotype culture MAFF 247559 = CBS 150013); Gene sequences LC681722 (ITS-LSU), LC684173 (*TEF-1α*), LC684585 (*Mcm7*), LC684624 (*TUB2*), LC684659 (*RPB2*).

Description: *Sclerotia* cylindrical, acute, straight or somewhat curved, blackish purple to black, frequently surface whitish with conidia, 1.8–11.8 × 0.3–1.7 mm. *Ascostromata* 1–12 per sclerotium; *stipes* cylindrical, glabrous, yellowish brown to pale purplish brown, 1–24 × 0.1–1.0 mm; *capitula* globose or depressed globose, purple to dark purple, 0.3–1.3 × 0.3–1.8 mm, darker than stipe in colour; *perithecia* semi-immersed, oblong or ovoid, remarkably protruding from the surface of the capitulum, 154–311 × 77–189 µm; *asci* hyaline, eight-spored, 53–232 × 2.1–5.4 µm; *ascospores* hyaline, filiform, aseptate, 57–168 µm in length. *Conidia* hyaline, one-celled, ellipsoid to subglobose, 2.0–6.6 × 1.3–3.6 µm, L/W ratio 1.5–2.1.

Known geographical distribution: Japan.

Known hosts: *Miscanthus* spp. and rarely *Imperata cylindrica*.

Specimens examined: **Japan**, Aomori Pref., Hirosaki, Mt. Iwaki, on *M. sinensis*, 9 Aug. 1975, Y. Harada (HHUF-4636); Tokyo Pref., Hachijojima Island, Oga, on *M. condensatus*, 13 Feb. 1986, Y. Harada (HHUF 15907); Ishikawa Pref., Kanazawa, Onuka (36°30'24"N 136°38'09"E), on *M. sinensis*, 27 Oct. 2015, E. Tanaka (TNS-F-96444); Ishikawa Pref., Hakusan, Shiramine (36°09'58"N 136°38'05"E), on *M. sinensis*, 23 Sep. 2016, E. Tanaka (TNS-F-96445); Ishikawa Pref., Hakusan, Ozo (36°16'05"N 136°42'49"E), on *M. sinensis*, 6 Oct. 2016, E. Tanaka (TNS-F-96446); Ishikawa Pref., Hakusan, Chugu (36°15'37"N 136°45'03"E), on *M.*

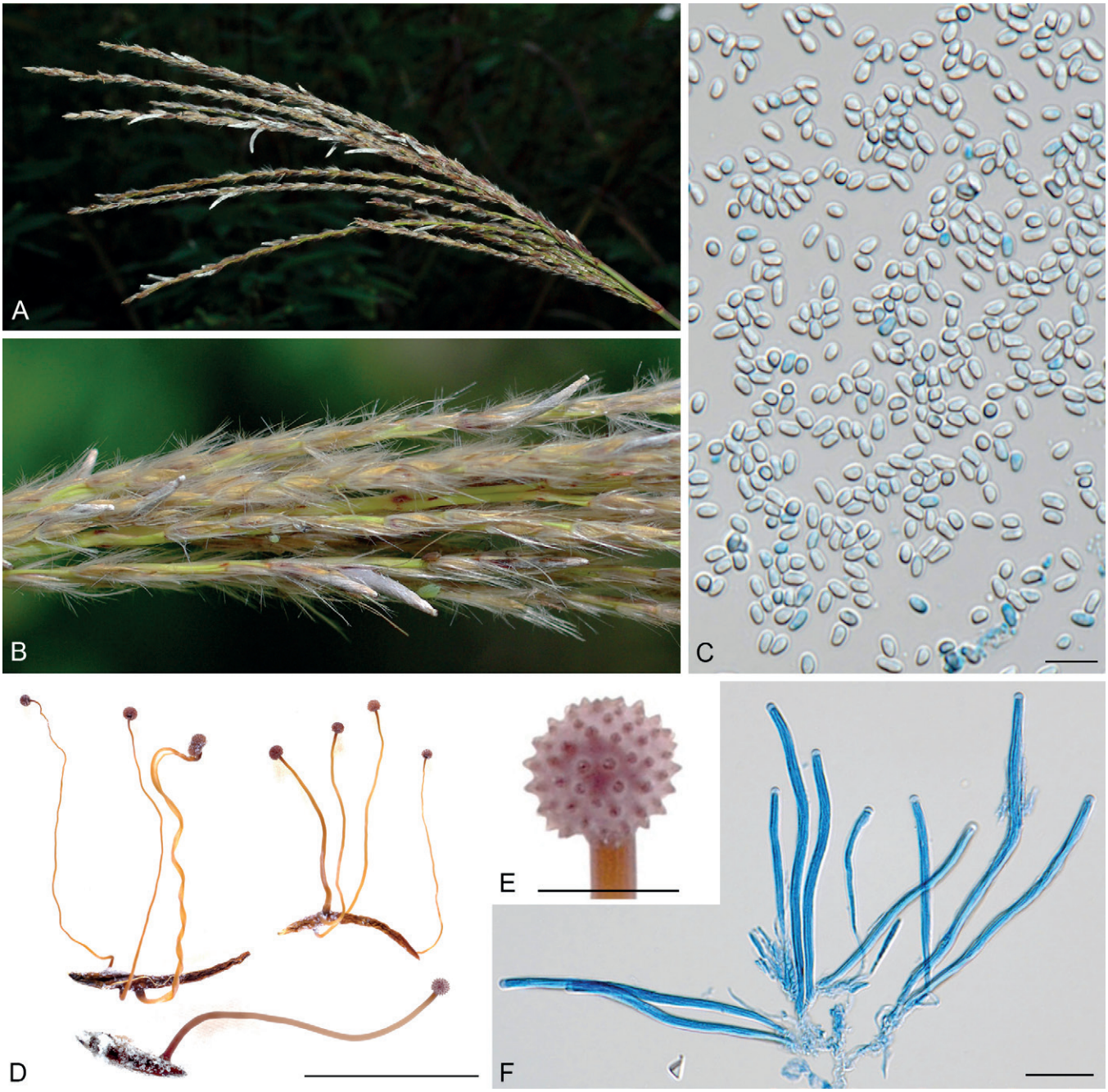

Fig. 15. *Claviceps miscanthicola*. **A, B.** Sclerotia on *Miscanthus sinensis*. **A.** TNS-F-96447. **B.** TNS-F-96469. **C.** Conidia. **D.** Ascostromata (TNS-F-99348). **E.** Capitulum. **F.** Asci. Scale bars: C, F = 10 µm; D = 1 cm; E = 1 mm.

sinensis, 6 Oct. 2016, E. Tanaka (TNS-F-96447); Gifu Pref., Takayama, Matsunoki (36°08'57"N 137°16'40"E), on *M. sinensis*, 22 Oct. 2016, E. Tanaka (TNS-F-96448); Tokyo Pref., Miyakejima Island (34°04'47"N 139°33'15"E), on *M. condensatus*, Nov. 2016, T. Akema (TNS-F-96449); Ishikawa Pref., Komatsu, Hanasaka (36°23'01"N 136°29'20"E), on *M. tinctorius*, 10 Nov. 2016, E. Tanaka (TNS-F-96450); Niigata Pref., Murakami, Asahi (38°16'52"N 139°31'35"E), on *M. sinensis*, 16 Nov. 2016, K. Tanada (TNS-F-96451); Niigata Pref., Murakami, Sarusawa (38°16'53"N 139°31'34"E), on *M. sinensis*, 16 Nov. 2016, K. Tanada (TNS-F-96452); Gifu Pref., Shirakawago (36°15'28"N 136°54'10"E), on *M. sinensis*, 19 Nov. 2016, E. Tanaka (TNS-F-96453); Tochigi Pref., Utsunomiya, Nissato (36°37'55"N 139°49'49"E), on *M. sinensis*, 29 Nov. 2016, K. Tanada (TNS-F-96454); Fukui Pref., Minami-Echizen, Makiya (35°49'44"N 136°11'60"E), on *M. sinensis*, 30 Nov. 2016, E. Tanaka (**holotype** TNS-F-96455; ex-holotype culture MAFF 247559 = CBS 150013); Fukui Pref., Wakasa, Torihama (35°33'18"N 135°54'03"E), on *M. sinensis*, 30 Nov. 2016, E. Tanaka (TNS-F-96456); Kyoto Pref., Kyoto city, Sakyo, Yase-Nose (35°04'07"N 135°48'37"E), on *M. sinensis*, 15 Dec. 2016, E. Tanaka (TNS-F-96457); Fukushima Pref., Kagamiishi, Midori (37°15'01"N 140°21'12"E), on *I. cylindrica*, 30 Dec. 2016, Y. Nomura (TNS-F-96458; culture MAFF 247561); Yamanashi Pref., Yamanashi city, Mitomi-Tokuwa (35°47'35"N 138°43'22"E), on *M. sinensis*, 11 Oct. 2017, K. Tanada (TNS-F-96459); Yamanashi Pref., Fuji-Kawaguchiko, Kodachi (35°30'42"N 138°45'03"E), on *M. sinensis*, 12 Oct. 2017, K. Tanada (TNS-F-96460); Kanagawa Pref., Aiko, Kiyokawa (35°28'59"N 139°16'37"E), on *M. sinensis*, 1 Nov. 2017, K. Tanada (TNS-F-96461); Niigata Pref., Itoigawa, Rendaiji (37°01'59"N 137°52'04"E), on *M. sinensis*, 22 Nov. 2017, E. Tanaka (TNS-F-96462); Niigata Pref., Joetsu, Kokufu (37°09'47"N 138°13'34"E), on *M. sinensis*, 22 Nov. 2017, E. Tanaka (TNS-F-96463); Gifu Pref., Gifu city, Akutami-Nagayama (35°27'27"N 136°50'48"E), on *M. sinensis*, 20 Dec. 2017, E. Tanaka (TNS-F-96464); Tokyo Pref., Ome, Mitake-Honcho (35°48'08"N 139°10'47"E), on *M. sinensis*, 5 Nov. 2018, S. Shibata (TNS-F-96465); Ibaraki Pref., Tsukuba, Azuma (36°05'02"N 140°07'04"E), on *M. sinensis*, 21 Mar. 2019, E. Tanaka (TNS-F-96466); Kanagawa Pref., Sagamihara, Mt. Jinba (35°39'12"N 139°10'01"E), on *M. sinensis*, 3 Nov. 2019, E. Tanaka (TNS-F-96467; culture MAFF 247560); Kagoshima Pref., Amami-Oshima Island, Amami, Naze-Daikuma (28°24'33"N 129°31'19"E), on *M. sinensis*, 27 Nov. 2019, E. Tanaka (TNS-F-96468); Ishikawa Pref., Kanazawa, Nukadani (36°30'21"N 136°38'16"E), on *M. sinensis*, 10 Jan. 2020, E. Tanaka (TNS-F-96469); (TNS-F-99348 ascostromata derived from TNS-F-96469); Ibaraki Pref., Tsukuba, Azuma (36°05'02"N 140°07'04"E), on *M. sinensis*, 20 Feb. 2020, E. Tanaka (TNS-F-96470); Aomori Pref., Hachinohe, Myo-Obiraki (40°28'46"N 141°33'40"E), on *M. sinensis*, 26 Oct. 2020, T. Hoshino (TNS-F-96471); Aomori Pref., Aomori city, Nonai-Kikukawa (40°51'N 140°49'E), on *M. sinensis*, 28 Oct. 2020, T. Hoshino (TNS-F-96472); Nagano Pref., Iida, Kami-Tonooka (35°30'01"N 137°48'27"E), on *M. sinensis*, 29 Oct. 2020, E. Tanaka (TNS-F-96473); Miyazaki Pref., Miyazaki city, Tano (31°50'02"N 131°13'48"E), on *M. sinensis*, 18 Nov. 2020, E. Tanaka (TNS-F-96474); Miyazaki Pref., Miymata, Miyamura (31°42'30"N 131°06'23"E), on *M. sinensis*, 19 Nov. 2020, E. Tanaka (TNS-F-96475); Kagoshima Pref., Kirishima, Kirishima-Taguchi (31°51'13"N 130°52'09"E), on *M. sinensis*, 19 Nov. 2020, E. Tanaka (TNS-F-96476); Chiba Pref., Chiba city, Inage (35°40'00"N 140°08'04"E), on *M. sinensis*, 30 Dec. 2021, E. Tanaka (TNS-F-96477); Chiba Pref., Sakura, Kamishizuhara (35°41'34"N 140°08'29"E), on *M. sinensis*, 30 Dec. 2021, E. Tanaka (TNS-F-96478).

Notes: Although Tanda (1991b) identified an ergot fungus on some *Miscanthus* spp. (*Panicoideae*, *Andropogoneae*) in Japan as *C. panicoidearum*, a species on *Isachne globosa*, our study indicated that the two samples from *Miscanthus* and one sample from *Imperata* formed a distinct clade. Morphologically, the conidial mass of these samples does not have a greenish colour as those of *C. panicoidearum*. Based on the differences in their phylogenetic positions, hosts and the colour of conidial mass, we consider it as a separate species from *C. panicoidearum*.

This species is closely related to *C. sorghicola*, but its hosts are clearly different. Sawada reported a species on *Miscanthus floridulus* in Taiwan (Sawada 1944) as *Claviceps miscanthi*, but this name is invalid (Art. 39.1). Due to the lack of a description and type material, it is not possible to determine whether *C. miscanthi* is the same species as *C. miscanthicola* in Japan. Tanda (1991b) also identified ergot fungi on *Miscanthus* spp. from China, Korea, Taiwan as the same species with an ergot fungus on *Miscanthus* spp. from Japan, but we have not been able to confirm it. Another ergot on *Miscanthus*, *C. fredericksoniae* (van der Linde *et al.* 2022), occurs in Africa and is phylogenetically distant from *C. miscanthicola* (Fig. 1).

Besides *Miscanthus* spp., we found one specimen of *C. miscanthicola* on *I. cylindrica*, which flowered unseasonably in the fall (TNS-F-96458). In Japan, *I. cylindrica* usually blooms in May to June (Nomura *et al.* 2022). We speculate that *C. miscanthicola* had an opportunity to parasitise *I. cylindrica* because *I. cylindrica* bloomed exceptionally during the flowering period of *Miscanthus* spp. Although both *Miscanthus* and *Imperata* belong to the tribe *Andropogoneae*, it is a rare case in the section *Pusillae* that a species (*C. miscanthicola*) has hosts in different genera. Doi *et al.* (2023) did not detect any ergot alkaloids from the sclerotia of this species. According to Tanda *et al.* (1968), ergot on *Miscanthus* spp. in Japan had a strong toxicity to mice.

Claviceps oplismeni E. Tanaka, ***sp. nov.*** MycoBank MB 847076. Fig. 16.

Etymology: Referring to the host genus *Oplismenus.*

Typus: **Japan**, Ishikawa Pref., Kanazawa, Nukadani, on *Oplismenus undulatifolius*, 29 Oct. 2016, E. Tanaka (**holotype** designated here TNS-F-96493; ex-holotype culture MAFF 247567 = CBS 150014); Gene sequences LC681734 (ITS-LSU), LC684206 (*TEF-1α*), LC684596 (*Mcm7*), LC684635 (*TUB2*), LC684670 (*RPB2*).

Description: *Sclerotia* ovoid or cylindrical, acute or acuminate, blackish brown to black, surface nearly smooth, greenish or olivaceous with conidia, 1.9–8.1 × 0.8–1.9 mm. *Ascostromata* 1–2 per sclerotium; stipes cylindrical, glabrous, yellowish brown or light olivaceous, 3–31 × 0.3–0.9 mm; *capitula* globose or depressed globose, roughly punctate with perithecial ostioles, yellowish brown to dark olivaceous, 0.3–3.2 mm diam, concolourous with stipe; *perithecia* immersed entirely in the capitulum, ovoid, oblong or obpyriform, slightly protruding from the surface of the capitulum, 197–377 × 111–180 µm; *asci* hyaline, eight-spored, 137–252 × 2.1–3.6 µm; *ascospores* hyaline, filiform, aseptate, 119–182 µm in length. *Microconidia* greenish in mass, one-celled, ovoid to ellipsoid, 2.8–7.4 × 1.7–3.1 µm, L/W ratio 1.4–2.6. *Macroconidia* hyaline, one-celled, oblong or elliptical, 7.4–20.5 × 2.3–4.1 µm, L/W ratio 2.6–6.0.

Known geographical distribution: Japan.

Known host: *Oplismenus undulatifolius.*

Specimens examined: **Japan**, Ishikawa Pref., Kanazawa, Nukadani (36°30'24"N 136°38'02"E), on *O. undulatifolius*, 29 Oct. 2015, E. Tanaka (**holotype** TNS-F-96493; ex-holotype culture MAFF 247567 = CBS 150014); (TNS-F-99349 ascostromata derived from TNS-F-96493); Ishikawa Pref., Kanazawa, Nukadani (36°30'24"N 136°38'02"E), on *O. undulatifolius*, 18 Oct. 2016, E. Tanaka (ISKW-My-7); Ishikawa Pref., Kahoku, Shimoyamada (36°42'59"N 136°43'38"E), on *O. undulatifolius*, 30 Oct. 2016, E. Tanaka (TNS-F-96494); Nagano Pref., Shimoina, Takagi (35°29'38"N 137°53'43"E), on *O. undulatifolius*, 29 Oct. 2020, E. Tanaka (TNS-F-96495; culture MAFF 247568); Niigata Pref., Joetsu, Daizu (37°08'50"N 138°12'35"E) on *O. undulatifolius*, 7 Nov. 2021, E. Tanaka (TNS-F-96496).

Notes: Based on its morphological characteristics and host genus, Tanda (1992b) identified the ergot fungus on *O. undulatifolius*

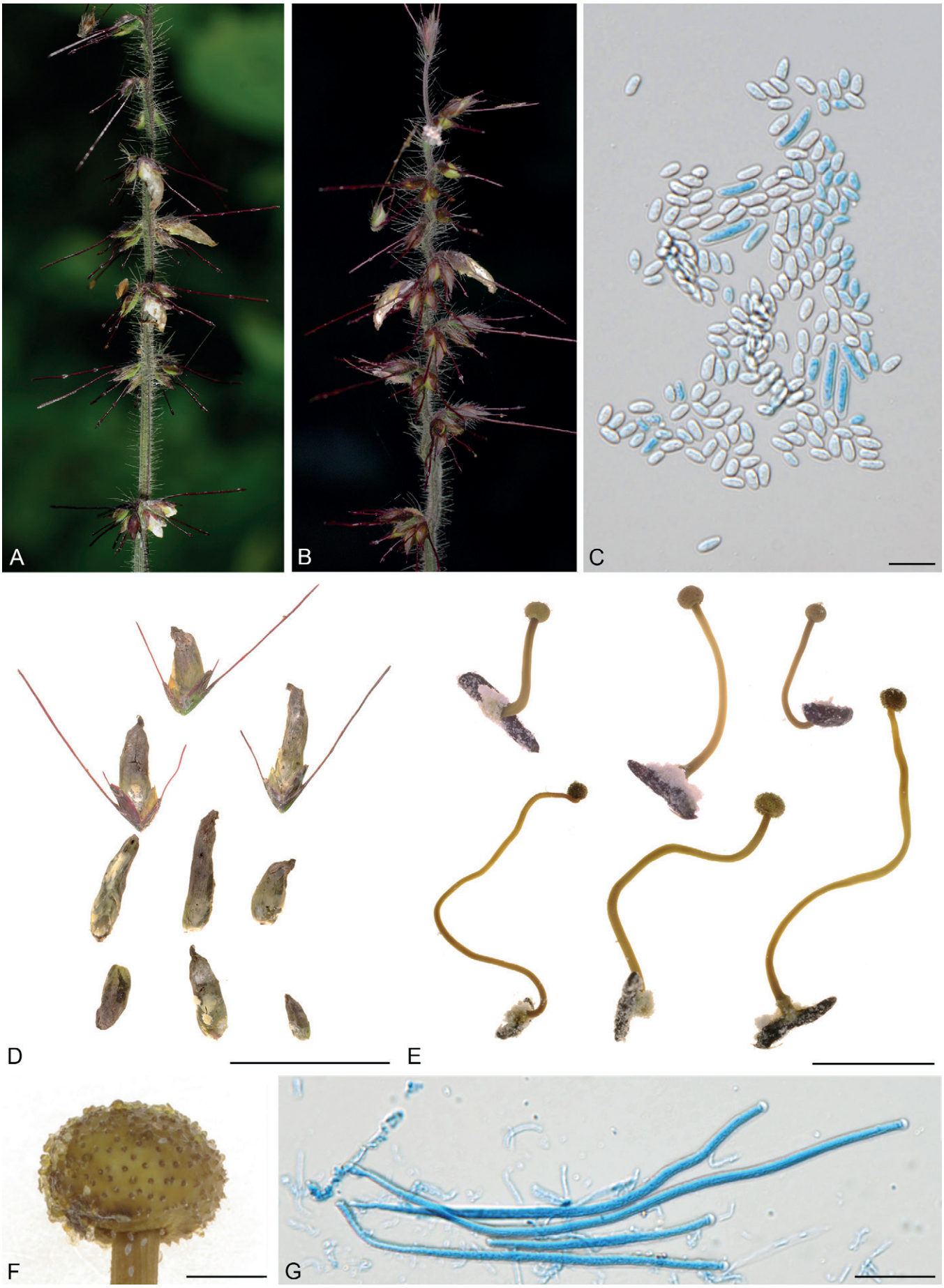

Fig. 16. *Claviceps oplismeni*. **A, B.** Sclerotia on *Oplismenus undulatifolius* (TNS-F-96493). **C.** Conidia. **D.** Sclerotia. **E.** Ascostroma (TNS-F-99349). **F.** Capitulum. **G.** Asci. Scale bars: C, G = 10 µm; D–E = 1 cm; F = 1 mm.

(*Panicoideae*, *Paniceae*) as *C. viridis*, a species of Indian origin on *Oplismenus compositus* (Padwick & Azmatullah 1943). Although there is some degree of morphological similarity between *C. viridis* and *C. oplismeni*, they are well separated in both geographical distribution and phylogenetic placement. For this reason, we considered that this fungus and *C. viridis* should be treated as different species. Doi *et al.* (2023) also did not detect any ergot alkaloids from the sclerotia of this species.

Claviceps panicoidearum Tanda & Y. Harada, Trans. Myc. Soc. Japan 30: 105. 1989. ***emend.*** Fig. 17.

Typus: **Japan**, Aomori Pref., Hirosaki, Matukitai, on *Isachne globosa* (Thunb.) O. Kuntze, 1 Nov. 1979, Y. Harada (**lost holotype** TUAMH-IG901); Aomori Pref., Hirosaki, Sakuraba (40°35'N 140°19'E), on *Isachne globosa*, 4 Nov. 2016, Y. Harada (**neotype** designated here TNS-F-96498; MBT 10010985; ex-neotype culture MAFF 247571 = CBS 150016); Gene sequences LC681738 (ITS-LSU), LC684211 (*TEF-1α*), LC684599 (*Mcm7*), LC684638 (*TUB2*), LC684673 (*RPB2*).

Description supplement to the original description by Tanda & Harada (1989): *Sclerotia* oblong, ovoid or obclavate, somewhat flattened, dark purple or black, surface nearly smooth, dark greenish or greenish brown with conidia, 1.7–22 × 0.8–2.5 mm. *Ascostromata* 1–5 per sclerotium; stipes cylindrical, glabrous, yellowish brown to blackish purple, 1–17 × 0.1–0.9 mm; *capitula* subglobose or depressed globose, brown to black, 0.3–1.6 mm in diam, darker than stipe in colour; *perithecia* semi-immersed, oblong or ovoid, remarkably protruding from the surface of the capitulum, 219–312 × 122–194 µm; *asci* hyaline, eight-spored, 126–252 × 2.5–3.5 µm; *ascospores* hyaline, filiform, aseptate, 95–193 µm in length. *Microconidia* greenish in mass, one-celled, ellipsoid or ovoid, 2.5–8.5 × 1.6–3.4 µm, L/W ratio 1.3–3.0. *Macroconidia* hyaline, one-celled, oblong, 8.0–17.0 × 2.8–4.3 µm, L/W ratio 2.5–4.0.

Known geographical distribution: Japan.

Known host: *Isachne globosa.*

Specimens examined: **Japan**, Aomori Pref., Horosaki, Matukitai, Serizawa, on *I. globosa*, 29 Nov. 1978, Y. Harada (HHUF 4624); Aomori Pref., Shimokita, Ooma, Oomadaira, 24 Oct. 1988, Y. Harada (HHUF 18910); Ishikawa Pref., Kanazawa, Kamiwakunami (36°34'37"N 136°43'53"E), on *I. globosa*, 22 Aug. 2016, E. Tanaka (TNS-F-96497; culture MAFF 247570); Aomori Pref., Hirosaki, Sakuraba (40°35'N 140°19'E), on *I. globosa*, 4 Nov. 2016, Y. Harada (**neotype** TNS-F-96498; MBT 10010985; ex-neotype culture MAFF 247571 = CBS 150016); (TNS-F-99350 ascostromata derived from TNS-F-96498); Ishikawa Pref., Kanazawa, Kamiwakunami (36°34'37"N 136°43'53"E), on *I. globosa*, 26 Jul. 2019, E. Tanaka (ISKW-My-8); Ishikawa Pref., Hakusan, Shiramine (36°07'07"N 136°40'30"E), on *I. globosa*, 14 Oct. 2020, E. Tanaka (TNS-F-96499).

Notes: The neotype specimen (TNS-F-96498) was collected about 15 km away from the original type locality. We observed that a distinctive characteristic of this species is the greenish surface of the ergots, which, however, was not mentioned in the original description (Tanda & Harada 1989). The holotype (now lost) was collected in November, although *I. globosa* usually flowers from June to August in Japan. Hence, it is likely that the conidia on surface of sclerotia were either withered or faded at the time of collection.

The host *I. globosa* (*Micrairoideae*, *Isachneae*) is indigenous to Japan. To the best of our knowledge, *C. panicoidearum* is the only ergot species parasitising the species in *Micrairoideae*. *Isachne* was formerly classified in the subfamily *Panicoideae* (Sánchen-Ken *et al.* 2007), thus the fungus was so named. Tanda (1991b) identified the ergot species on *Miscanthus* spp. as *C. panicoidearum*. However, our study revealed that the ergot fungus on *Miscanthus* spp. is not *C. panicoidearum*, but *C. miscanthicola* (see Notes in *C. miscanthicola* section). Doi *et al.* (2023) also did not detect any ergot alkaloids from the sclerotia of this species.

Claviceps sorghicola Tsukib. *et al*., Mycol. Res. 103: 1405. 1999. Fig. 11D–G.

Typus: **Japan**, Tochigi Pref., Nasushiobara, Senbonmatsu, on *Sorghum bicolor*, 1 Dec. 1988, T. Tsukiboshi (**holotype** NIAES 20510).

Description supplement to the original description by Tsukiboshi et al. (1999b): *Sclerotia* cylindrical or conical, straight or curved, blackish purple to black, frequently surface whitish with conidia, 2.5–20 × 1.9–3.5 mm. *Ascostromata* 1–4 per sclerotium; stipes cylindrical, glabrous, bronze to brown, 3.5–17 × 0.1–1.0 mm; *capitula* globose or subglobose, dark brown, 0.5–1.6 mm; *perithecia* immersed, ovate or obpyriform, remarkably protruding from the surface of the capitulum, 215–300 × 105–140 µm; *asci* hyaline, eight-spored, 122–215 × 2.5–3.8 µm; *ascospores* hyaline, filiform, aseptate, 92–205 µm in length. *Conidia* hyaline, one-celled, ellipsoid to subglobose, 4.0–5.7 × 2.5–3.1 µm, L/W ratio 1.5–1.9.

Known geographical distribution: Japan.

Known host: *Sorghum bicolor.*

Specimens examined: **Japan**, Kumamoto Pref., Tamana, on *S. bicolor*, 6 Dec. 2016, T. Takai (TNS-F-96486); Nagasaki Pref., Isahaya, on *S. bicolor*, Nov. 2019, N. Waseda (TNS-F-96487); Miyazaki Pref., Miyakonojo, Takasaki, on *S. bicolor*, 19 Nov. 2020, E. Tanaka (TNS-F-96488; culture MAFF 247566); Miyazaki Pref., Miyakonojo, Yoshio, on *S. bicolor*, 20 Nov. 2020, E. Tanaka (TNS-F-96489).

Cultures examined: **Japan**, Tochigi Pref., Nasushiobara, Senbonmatsu, on *S. bicolor*, Dec. 1995, T. Tsukiboshi (MAFF 306571); Tochigi Pref., Nasushiobara, Senbonmatsu, on *S. bicolor,* T. Tsukiboshi (MAFF 511349).

Notes: Sorghum ergot disease was reported in Japan in 1983 (Tanda 1991a). Tanda (1991a) described "*C. sorghi* Tanda" as the causal agent of the sorghum ergot disease in Japan in a thesis submitted to a university for the purpose of obtaining a degree. "*C. sorghi* Tanda" was invalidly published, because it is not an effective publication (Art. 30.9) as mentioned above under Notes of *C. sasae*. Moreover, the name is illegitimate because "*C. sorghi*" is a later homonym (Art. 53.1) to *Claviceps sorghi* B.G.P. Kulk., Seshadri & Hegde 1976. Later, Tsukiboshi *et al.* (1999b) independently described *C. sorghicola* as the causal agent of the sorghum ergot disease in Japan. The description of *C. sorghicola* is almost the same as that of "*C. sorghi* Tanda", except that the macroconidia are not found in *C. sorghicola*. Tanda's description was based on TUAMH-SV603 (now lost), which might have been contaminated with the macroconidia of *C. africana*. In fact, in our observations, both *C. africana* and *C. sorghicola* often parasitise the same inflorescence of sorghum. A secondary infection by *Epicoccum andropogonis* is commonly seen on infected florets by *C. sorghicola* (Fig. 11D). According to Tsukiboshi (1999b), this ergot contained a paliclavine-like alkaloid.

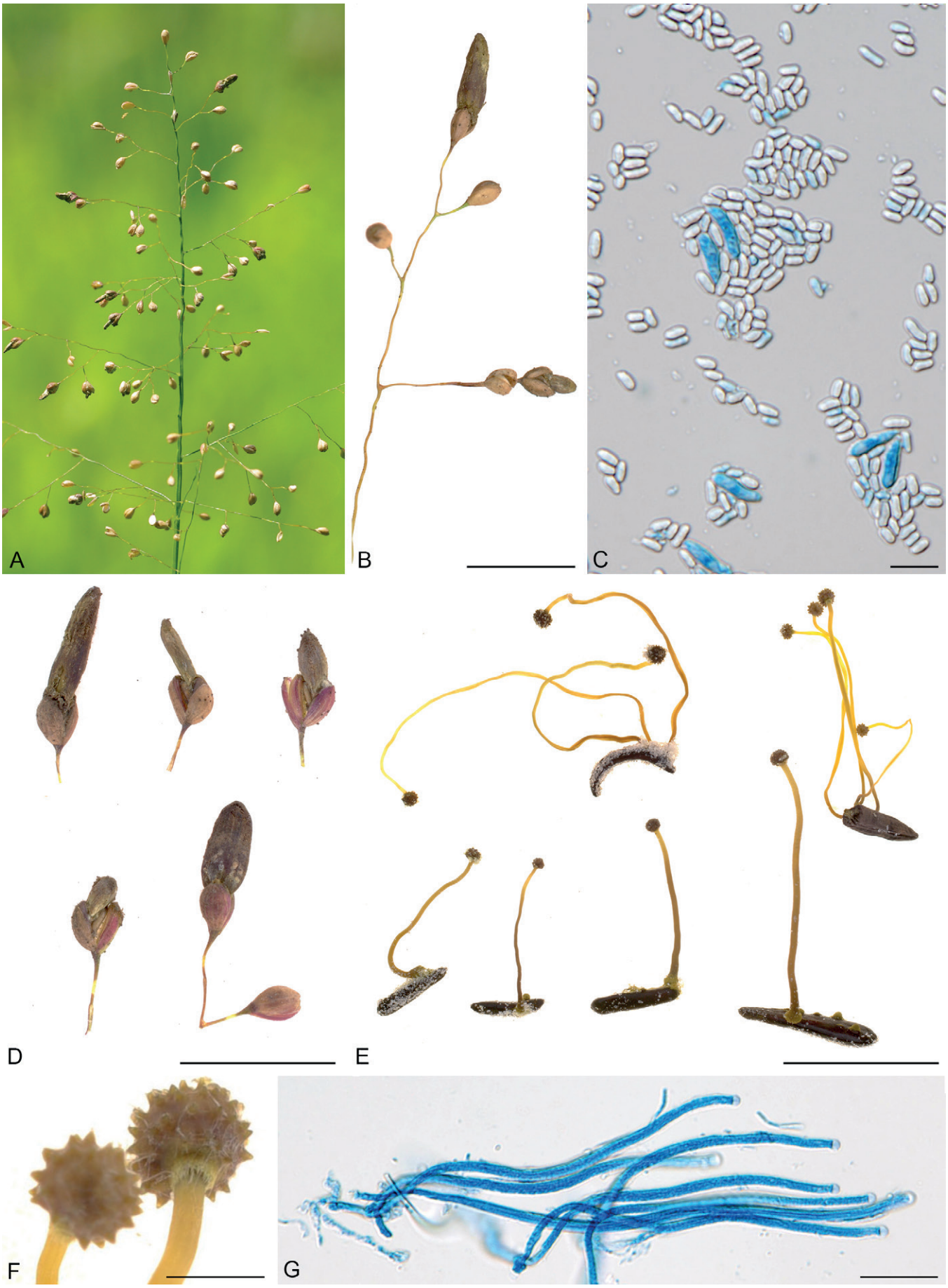

Fig. 17. *Claviceps panicoidearum*. **A, B.** Sclerotia on *Isachne globosa* (TNS-F-96497). **C.** Conidia. **D.** Sclerotia. **E.** Ascostroma (TNS-F-99350). **F.** Capitula. **G.** Asci. Scale bars: B, D = 5 mm; C, G = 10 µm; E = 1 cm; F = 1 mm.

Sect. *Paspalorum* M. Kolařík & K. Píchová

Claviceps paspali F. Stevens & J.G. Hall, Bot. Gaz. 50: 462. 1910. Fig. 18A–G.

Typus: **USA**, North Carolina, Raleigh, on *Paspalum dilatatum*, Oct. 1906, Stevens 628 (**type** BPI 633398).

Description based on Japanese specimens by Tanda (1992c): *Sclerotia* globose or subglobose, greyish white, surface cracked and rough, 1.8–4.2 × 1.1–3.8 mm. *Ascostromata* 1–5 per sclerotium; stipes cylindrical, glabrous, light yellow, 1.3–12.0 × 0.3–2.2 mm; *capitula* depressed globose or subglobose, yellow, 0.3–1.7 × 0.4–3.6 mm, concolourous with stipe or slightly darker than stipe in colour; *perithecia* immersed, obpyriform or ovoid, slightly protruding from the surface of the capitulum, 189–328 × 77–175 µm; *asci* hyaline, eight-spored, 84–221 × 2.5–4.9 µm; *ascospores* hyaline, filiform, aseptate, 49–119 µm in length. *Conidia* hyaline, oblong or cylindrical, one-celled, 5.0–20.5 × 2.9–7.2 µm, L/W ratio 2.2–2.5.

Known geographical distribution: Africa, Australia, Europe, North America, South America, Oceania, Japan.

Known hosts in Japan: *Paspalum dilatatum*, *P. distichum*, *P. thunbergii*, *P. urvillei* (new host in Japan).

Specimens examined: **Japan**, Shizuoka Pref., Shizuoka city, Aoi, Asabata marsh (35°01’08”N 138°23’17”E), on *P. dilatatum*, 29 Sep. 2016, E. Tanaka (TNS-F-96500); (TNS-F-99351 ascostromata derived from TNS-F-96500); Shizuoka Pref., Shizuoka city, Suruga, Toro (34°57’19”N 138°24’37”E), on *P. dilatatum*, 30 Sep. 2016, E. Tanaka (TNS-F-96501); Shizuoka Pref., Shizuoka city, Suruga, Toro (34°57’19”N 138°24’37”E), on *P. urvillei*, 30 Sep. 2016, E. Tanaka (TNS-F-96502); Shizuoka Pref., Shizuoka city, Suruga, Toro (34°57’19”N 138°24’37”E), on *P. distichum*, 30 Sep. 2016, E. Tanaka (TNS-F-96503; culture MAFF 247572); Ishikawa Pref., Kanazawa, Higashi-Kagatsume (36°38’02”N 136°39’51”E), on *P. thunbergii*, 11 Oct. 2016, E. Tanaka (TNS-F-96504); Ishikawa Pref., Kanazawa, Okobata (36°37’02”N 136°38’21”E), on *P. distichum*, 20 Nov. 2016, E. Tanaka (TNS-F-96505); Saitama Pref., Toda, Uchiya (35°49’15”N 139°38’10”E), on *P. dilatatum*, 27 Nov. 2016, K. Tanada (TNS-F-96506); Tochigi Pref., Fujioka, Shitamiya (36°12’35”N 139°39’55”E), on *P. dilatatum*, 28 Nov. 2016, K. Tanada (TNS-F-96507); Fukui Pref., Mikatakaminaka, Wakasa, Torhihama (35°33’16”N 135°54’03”E), on *P. dilatatum*, 30 Nov. 2016, E. Tanaka (TNS-F-96508; culture MAFF 247573); Kyoto Pref., Kyoto city, Sakyo, Iwakura-Osagi (35°03’52”N 135°47’14”E), on *P. dilatatum*, 8 Dec. 2016, E. Tanaka (TNS-F-96509); Tokyo Pref., Chiyoda (35°40’46”N 139°45’36”E), on *P. dilatatum*, 20 Oct. 2017, E. Tanaka (TNS-F-96510); Kanagawa Pref., Sagamihara, Minami, Shimomizo (35°32’14”N 139°23’18”E), on *P. dilatatum*, 2 Nov. 2017, K. Tanada (TNS-F-96511); Kagoshima Pref., Amami-Oshima Island, Amami, Naze, Sadaikuma (28°23’28”N 129°30’19”E), on *P. urvillei*, 21 Nov. 2018, E. Tanaka (TNS-F-96512); Shiga Pref., Hikone, Sone (35°14’31”N 136°11’49”E), on *P. dilatatum*, 20 Sep. 2019, E. Tanaka (TNS-F-96513); Mie Pref., Tsu, Kamihama (34°44’32”N 136°30’10”E), on *P. dilatatum*, 2 Oct. 2019, E. Tanaka (TNS-F-96514); Saitama Pref., Hanyu, Hinoteshinden (36°10’18”N 139°35’45”E), on *P. dilatatum*, 1 Nov. 2019, E. Tanaka (TNS-F-96515); Chiba Pref., Funabashi, Jinbou (35°45’50”N 140°03’45”E), on *P. dilatatum*, 2 Nov. 2019, E. Tanaka (TNS-F-96516); Kanagawa Pref., Atsugi, Shimo-Ogino (35°28’51”N 139°19’52”E), on *P. dilatatum*, 3 Nov. 2019, E. Tanaka (TNS-F-96517); Tokyo Pref., Katsushika, Higashi-Kanamachi (35°46’43”N 139°52’59”E), on *P. dilatatum*, 15 Dec. 2019, E. Tanaka (TNS-F-96518); Tokyo Pref., Katsushika, Mizumoto-Koen (35°46’50”N 139°52’33”E), on *P. distichum*, 15 Dec. 2019, E. Tanaka (TNS-F-96519); Miyazaki Pref., Miyakonojo, Yamanokuchi, Tomiyoshi (31°45’26”N 131°08’55”E), on *P. urvillei*, 18 Nov. 2020, E. Tanaka (TNS-F-96520); Miyazaki Pref., Miyakonojo, Yamanokuchi, Tomiyoshi (31°45’26”N 131°08’55”E), on *P dilatatum*, 18 Nov. 2020, E. Tanaka (TNS-F-96521).

Notes: The original description of *C. paspali* was provided by Stevens & Hall (1910). Our description is based on Japanese specimens collected by Tanda (1992c). Among the *Paspalum* spp. (*Panicoideae*, *Paspaleae*), *P. thunbergii* is indigenous to Japan, but others (*P. dilatatum*, *P. distichum* and *P. urvillei*) are exotic to Japan. Among the Japanese samples, there are no variations in *TEF-1α* regions. The low DNA sequence variance suggests the potential recent introduction of this fungus, perhaps by the importation of forage grasses (probably dallisgrass, *P. dilatatum*).

Claviceps queenslandica Langdon, Pap. Dept. Bot. (formerly Biol.) Univ. Qd. 3: 39. 1954. Fig. 18H–J.
Synonym: *Claviceps paspali* var. *queenslandica* Tanda, J. Agric. Sci. Tokyo Nogyo Daigaku, 36: 301. 1992.

Typus: **Australia**, Queensland, Bruce Highway, on *Paspalum orbiculare* (=*P. scrobiculatum*), 1949 (**holotype** UQ 497).

Description based on Japanese specimens by Tanda (1992c): *Sclerotia* globose or subglobose, greyish white, surface cracked and rough, 1.6–3.4 × 1.3–3.1 mm. *Ascostromata* 1–3 per sclerotium; stipes cylindrical, glabrous, light yellow, 3.0–5.5 × 0.4–0.7 mm; *capitula* depressed globose or subglobose, yellow, 0.8–1.3 × 1.2–1.8 mm, concolourous with stipe or slightly darker than stipe in colour; *perithecia* immersed, obpyriform or ovoid, slightly protruding from the surface of capitulum, 200–287 × 84–137 µm; *asci* hyaline, eight-spored, 130–242 × 3.2–4.9 µm; *ascospores* hyaline, filiform, aseptate, 88–147 µm in length. *Conidia* hyaline, one-celled, oblong or cylindrical, 7.0–21.6 × 3.5–6.2 µm, L/W ratio 2.5.

Known geographical distribution: Australia, Japan (Amami-Oshima Island and Bonin islands), Taiwan Island.

Known host: *Paspalum scrobiculatum.*

Specimens examined: **Taiwan**, Keelung, Nuannuan, on *P. scrobiculatum*, 16 Nov. 1919, K. Sawada (TNS-F-978). **Japan**, Kagoshima Pref., Amami-Oshima Island, Oshima, Tatsugo, Yanyu (28°24’48”N 129°36’04”E), on *P. scrobiculatum*, 22 Nov. 2018, E. Tanaka (TNS-F-96522; culture MAFF 247574 = CBS 150018); Kagoshima Pref., Amami-Oshima Island, Amami, Kasari, Wano (28°25’01”N 129°41’47”E), on *P. scrobiculatum*, 26 Nov. 2019, E. Tanaka (TNS-F-96523).

Culture examined: **Japan**, Tokyo Pref., Bonin Islands (Chichi-jima), Susaki, on *P. scrobiculatum*, 1990, T. Sato (MAFF 306124).

Notes: Tanda (1992c) identified an ergot on *P. orbiculare* (a synonym of *P. scrobiculatum*) in Amami-Oshima Island (Kagoshima, Japan) as *C. queenslandica* since the ascospores were longer than that of *C. paspali*, and reduced it to a variety as *C. paspali* var. *queenslandica*. The original description of *C. queenslandica* was provided by Langdon (1954) based on an Australian specimen. Our description is based on Japanese specimens collected by Tanda (1992c). Our phylogenetic analysis provided molecular evidence to support it as a distinct species from *C. paspali*. The species is therefore resurrected here. We could not obtain the sexual morph of this species, but identified our specimens as *C. queenslandica* based on the host and locality. We found a specimen on *P. scrobiculatum* from Taiwan (TNS-F-978) referred to in Sawada (1944) and identified it as this species. Since the type locality of this species is Australia, an epitype designation based on an Australian specimen and molecular data from it are desired for further studies. The host *P. scrobiculatum* (*Panicoideae*, *Paspaleae*) is indigenous to Japan, and widely distributed in tropical Asia, pacific islands to Australia.

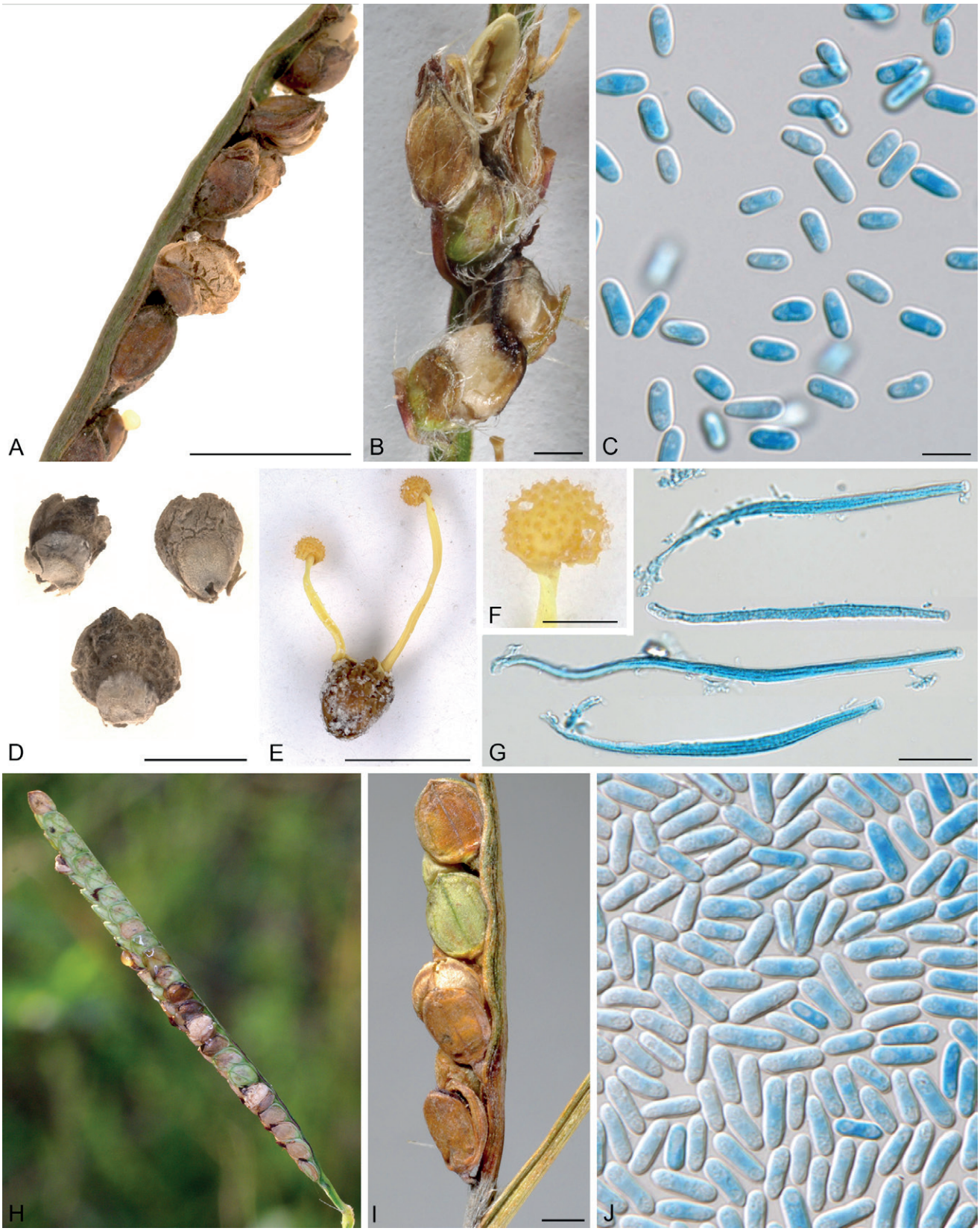

Fig. 18. *Claviceps paspali* and *C. queenslandica*. **A–G.** *C. paspali*. **H–J.** *C. queenslandica*. **A.** Sclerotia on *Paspalum thunbergii* (TNS-F-96502). **B.** Sclerotia on *Paspalum urvillei* (TNS-F-96522). **C, J.** Conidia. **D.** Sclerotia. **E.** Ascostroma (TNS-F-99351). **F.** Capitulum. **G.** Asci. **H, I.** Sclerotia on *Paspalum scrobiculatum* (TNS-F-96522). Scale bars: A, D, E = 5 mm; B, F, I = 1 mm; C, G and J = 10 µm.

Not assessed *Claviceps* sp. in Japan

Claviceps amamiensis Tanda, J. Agric. Sci. Tokyo Nogyo Daigaku 36: 186. 1992.

Typus: **Japan**, Kagoshima Pref., Amami-Oshima Island, Amami, Naze, on *Digitaria setigera* (as *D. microbachne*), 20 Nov. 1974, Y. Murayama (**lost holotype** TUAMH-DM 401).

Description modified from the original description by Tanda (1992a): *Sclerotia* cylindrical, straight or curved, blackish purple or black, 1.2–5.6 × 0.4–1.0 mm. *Ascostromata* 1–4 per sclerotium; stipes

cylindrical, glabrous, light purplish brown, 2–6 × 0.1–0.6 mm; *capitula* globose, dark purple, 0.4–1.0 mm; *perithecia* elliptic or obpyriform, 172–247 × 84–126 µm; *asci* hyaline, eight-spored, 140–235 × 2.5–4.6 µm; ascospores hyaline, filiform, one-celled, 91–133 µm. *Microconidia* hyaline, aseptate, elliptic or subglobose, 2.4–5.6 × 2.0–3.5 µm. *Macroconidia* hyaline, one-celled, fusoid or allantoid, 9.8–14.6 × 2.0–4.1 µm.

Known geographical distribution: Japan (only Amami-Oshima Island).

Known host: *Digitaria setigera* (synonym *D. microbachne*).

Notes: *Claviceps amamiensis* could not be assigned to the new classification system not only because the type specimens were lost, but also because no new specimens have been collected. In Amami-Oshima Island (Japan, Kagoshima), where the type specimen was collected, we searched for this species three times in 2016, 2018 and 2019. However, no new specimens of this species could be collected, despite the fact that the host species grows commonly in this area. Since the host plant itself is not native to Japan, this species might be exotic to Japan. According to Tanda's description (Tanda 1992a), the morphology of this species is very similar to that of *Claviceps glabra* on *Digitaria longiflora* in Australia. In addition, Sawada (1944) invalidly described *Claviceps syntherismae* on *Digitaria ciliaris* (as *Syntherisma sanguinalis* var. *ciliaris*) in Taiwan. Thus, a comparative study of these species is needed.

Excluded *Claviceps* species

Claviceps sorghi Tanda, Mycological studies on the ergot in Japan: 267. 1991 (*nom. inval*., Art. 30.9, Art. 53.1), *non* B.G.P Kulk., Seshadri & Hegde, 1976.
Asexual morph: *Sphacelia sorghi* McRae, Madras Agricultural Department Year book 1917: 109. 1917.

Notes: This name was not effectively published (Art. 30.9). Furthermore, the species description is invalid because it is a later homonym. Not only that, the description probably contains the characteristics of two species, *C. sorghicola* and *C. africana* that parasitise *Sorghum*.

Claviceps species of doubtful existence in Japan

Claviceps nigricans Tul.
This species was recorded in "A list of Japanese fungi hitherto known" (Shirai 1917), but without any references or descriptions of collection sites or specimen numbers. No other collection records have been found in Japan, so there is no evidence that this species exists in Japan.

Species transferred from *Claviceps*

Villosiclava virens (Nakata) E. Tanaka & C. Tanaka (Tanaka *et al.* 2008).
Synonyms: *Claviceps virens* M. Sakurai *ex* Nakata, Illustration of Crop Diseases, 1st Ed.: 18. 1934.
Claviceps oryzae-sativae Hashioka, Riso 20: 328. 1971 (*nom. illegit*.).

DISCUSSION

Multilocus phylogenetic analysis of Japanese *Claviceps* specimens revealed interspecific relationships among species. The analysis inferred that there are at least 21 valid *Claviceps* species recorded in Japan. Sixteen of them are based on Japanese type specimens: *C. agropyri*, *C. bothriochloae*, *C. humidiphila*, *C. imperatae*, *C. kawatanii*, *C. litoralis*, *C. microspora*, *C. miscanthicola*, *C. oplismeni*, *C. palustris*, *C. panicoidearum*, *C. phragmitis*, *C. sasae*, *C. sorghicola*, *C. tandae* and *C. yanagawaensis*. The other five species are *C. africana*, *C. bavariensis*, *C. paspali*, *C. purpurea* and *C. queenslandica*. Neotypes are designated for species that have lost type specimens, *i.e. C. agropyri*, *C. bothriochloae*, *C. imperatae*, *C. kawatanii*, *C. litoralis*, *C. microspora*, and *C. panicoidearum*; lectotype and epitype were designated here for *C. yanagawaensis*. Of the *Claviceps* species found in Japan, *C. africana*, *C. bavariensis*, *C. paspali* and *C. purpurea* are distributed worldwide, probably because their hosts are pasture grasses associated with human activities. The validity of the name *Claviceps amamiensis* is pending its rediscovery.

Within *Claviceps*, which has a host spectrum across various *Poaceae*, it is seen that closely related Japanese ergot species in the section *Claviceps* infect completely unrelated host groups (Fig. 1). For example, *C. agropyri* and *C. imperatae* formed a clade, but their host taxa belong to different subfamilies, *Pooideae* (BOP clade) and *Panicoideae* (PACMAD clade), respectively. Similarly, *C. litoralis* and *C. phragmitis* formed a clade, however their host taxa belong to the subfamily *Pooideae* (BOP clade) and *Arundinoideae* (PACMAD clade). These facts suggest that ecological speciation occurred via host jumping, which often occurs in fungal plant pathogens (Giraud *et al.* 2010). As Wyka *et al.* (2021) showed by whole-genome comparative analysis, these host jumps may be attributed to the fact that species in the section *Claviceps* have adaptive genomes and consequently a broader host range. On the other hand, the hosts of Japanese ergot species in the section *Pusillae* clustered in the PACMAD clade without exception, as did those of the known ergot species in the section *Pusillae*.

Our new collections are important for understanding the evolution of the section *Claviceps*. Especially, *C. agropyri*, *C. imperatae*, *C. litoralis*, *C. phragmitis*, and *C. yanagawaensis* diverged earlier than any species in the section *Claviceps* indicated by Píchová *et al.* (2018). This fact indicates that ancestral species are conserved in Japan. Among Japanese *Claviceps* species, *C. litoralis*, *C. tandae*, *C. yanagawaensis* and *C. sasae* are distributed in cool regions of Japan, which suggests that the origin of section *Claviceps* might be cool regions. In addition, *C. litoralis* and *C. agropyri* are distributed in Russia and China, respectively. Studies on the genetic diversity of ergot in Northeastern Asia will shed light on the origin of the section *Claviceps*.

Our phylogenetic analysis showed that a biogeographic pattern in the evolution of the section *Pusillae*. The evolutionary history of ergot is presumed to have been driven by encounters with new host plants after spreading to new geographical regions, and the origin of the section *Pusillae* is thought to be Africa (Píchová *et al.* 2018). In our phylogenetic tree (Fig. 1), six Japanese species, *C. kawatanii*, *C. microspora*, *C. miscanthicola*, *C. oplismeni*, *C. panicoidearum*, *C. sorghicola* and Indian *C. viridis* formed a strongly supported clade (named "*C. sorghicola* clade"). It demonstrated that the species in the *C. sorghicola* clade are likely the result of speciation after an ancestral species spread into Asia and acquired new hosts. This hypothesis is supported by the presence of ergot fungi that parasitise *Arundinella*, *Miscanthus* and *Sorghum* in other clades. In the future, phylogenetic analysis of other Asian, American and Australian ergot fungi will provide a picture of evolution in the *Pusillae* section.

Taken together, *Claviceps* species on Japanese native plants are not only diverse, but also reveal biogeographical patterns. Furthermore, our results suggested that *C. bothriochloae* and *C. queenslandica*, distributed on subtropical islands in the Pacific Ocean, are closely related to Australian *Claviceps* species. These regions also have the greatest diversity of the genus

Aciculosporium (Píchová *et al.* 2018), which is ancestral to *Claviceps*. Japan thus appears to be one of the centres of origin of the entire *Aciculosporium*/*Claviceps* group, which needs verification by ancestral reconstruction methods and molecular dating. Our taxonomic evaluation and provision of molecular data on Japanese *Claviceps* species will advance the study of *Claviceps* species in Asia, Australia and around the world.

ACKNOWLEDGEMENTS

This work was supported by JSPS KAKENHI Grant Number 16K07238. We gratefully acknowledge Dr Tsuyoshi Hosoya (National Museum of Nature and Science, Japan) for the loan of TNS specimens, and Prof. Keiichi Motohashi (Tokyo University of Agriculture), Prof. Hiromitsu Negishi (Tokyo University of Agriculture) and Dr Seinosuke Tanda for their efforts to search for type specimens. We also thank Dr Kazuaki Tanaka (Hirosaki University), Dr Yukio Harada, Dr Yousuke Degawa (University of Tsukuba), Dr Yasuyuki Nomura (Ryukoku University), Dr Saho Shibata (Chiba University), Dr Tomoyuki Takai (NARO), MSc Tamio Akema (Forestry and Forest Products Research Institute), Dr Takao Tsukiboshi (NARO), MSc Nana Waseda (Nagasaki prefecture) and Prof. Tamotsu Hoshino (Hachinohe Institute of Technology) for providing us their collections of *Claviceps* species. We acknowledge Dr Pedro Crous for nomenclatural discussions, Dr Roger Shivas for his helpful comments and constructive review and an unknown reviewer for the careful reading and valuable comments. We also thank Dr Akira Hashimoto (RIKEN) and Dr Koya Sugawara (NARO) for their helpful advice. The authors would also like to thank to Shirayama-hime shrine and the Ministry of the Environment, Japan for permission to sample in Hakusan National Park. We also thank the Molecular Technologies Laboratory (MTL) at the Ottawa Research & Development Centre, Canadian Collection of Fungal Cultures (CCFC) and Ms Parivash Shoukouhi for technical support.

DECLARATION ON CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

REFERENCES

Alderman SC, Halse RR, White JF (2004). A re-evaluation of the host range and geographical distribution of *Claviceps* species in the United States. *Plant Disease* **88**: 63–81.

Doi Y, Wakana D, Kitaoka S, *et al.* (2022a). Secalonic acid and benzoic acid analogues exhibiting cytotoxicity against cancer cells isolated from *Claviceps yanagawaensis*. *Advances in Microbiology* **12**: 649–670.

Doi Y, Wakana D, Kitaoka S, *et al.* (2023). Ergot alkaloids in sclerotia collected in Japan: synthetic profiles and induction of apoptosis by Clavine-type compounds. *Journal of Natural Medicines* **77**: 306–314.

Doi Y, Wakana D, Takeda H, *et al.* (2022b). Production of ergot alkaloids by the Japanese isolate *Claviceps purpurea* var. *agropyri* on rice medium. *Advances in Microbiology* **12**: 254–269.

Frederickson DE, Mantle PG, Milliano WAJD (1991). *Claviceps africana sp. nov.*; the distinctive ergot pathogen of sorghum in Africa. *Mycological Research* **95**: 1101–1107.

Gardes M, Bruns TD (1993). ITS primers with enhanced specificity for basidiomycetes-application to the identi- fication of mycorrhizae and rusts. *Molecular Ecology* **2**: 113–118.

Giraud T, Gladieux P, Gavrilets S (2010). Linking the emergence of fungal plant diseases with ecological speciation. *Trends in Ecology and Evolution* **25**: 387–395.

Ilana-Esteban C (2008). El cornezuelo del centeno (I): biología, historia y ergotismo. *Bol. Soc. Micol. Madrid* **32**: 293–306 (Spanish with English summary).

Izumitsu K, Hatoh K, Sumita T, *et al.* (2012). Rapid and simple preparation of mushroom DNA directly from colonies and fruiting bodies for PCR. *Mycoscience* **53**: 396–401.

Kawatani T (1946). *Clavicipitis species nova parasitica ad Elymum mollem* Trin. *Botanical Magazine, Tokyo* **59**: 90–91 (In Japanese).

Langdon RFN (1950). Studies in Australian ergots 1. *Claviceps pusilla* Cesati. *University of Queensland Papers Department of Botany* **2**: 3–12.

Langdon RFN (1952). *Studies on ergot*. Ph.D. dissertation. University of Queensland, Brisbane, Australia.

Langdon RFN (1954). New species of *Claviceps*. *Papers of the Department of Botany University of Queensland* **3**: 39–40.

Lefebvre CL (1942). *Claviceps yanagawaensis* in imported seed of Japanese lawn grass. *Phytopathology* **32**: 809–812.

van der Linde EJ, Píchová K, Pažoutová S, *et al.* (2022). Pre-invasion assessment on African invasive grasses revealed five new species of ergot fungi, *Claviceps* section *Pusillae*. *Fungal Biology* **126**: 752–763.

Liu M, Kolařík M, Tanaka E (2022a). The 168-year taxonomy of *Claviceps* in the light of variations: From three morphological species to four sections based on multigene phylogenies. *Canadian Journal of Plant Pathology* **44**: 783–792.

Liu M, Overy DP, Cayouette J, *et al.* (2020). Four phylogenetic species of ergot from Canada and their characteristics in morphology, alkaloid production, and pathogenicity. *Mycologia* **112**: 974–988.

Liu M, Tanaka E, Kolařík M (2022b). Neotypification of *Claviceps humidiphila* and recognition of *C. bavariensis sp. nov. Mycotaxon* **137**: 73–87.

Mikaliūnaitė R, Dabkevičius Z (2009). The spread of ergot (*Claviceps purpurea*) on *Poaceae* plants and incidence on cereals in Lithuania. *Žemdirbystė-Agriculture* **96**: 246–259.

Nomura Y, Shimono Y, Mizuno N, *et al.* (2022). Drastic shift in flowering phenology of F1 hybrids causing rapid reproductive isolation in *Imperata cylindrica* in Japan. *Journal of Ecology* **110**: 1548–1560.

O'Donnell KL (1993). *Fusarium* and its near relatives. In: *The fungal holomorph: mitotic, meiotic and pleomorphic speciation in fungal systematics* (Reynolds DR, Taylor JW, eds). CAB international, UK: 225–233.

O'Donnell KL, Cigelnik E (1997). Two divergent intragenomic rDNA ITS2 types within a monophyletic lineage of the fungus *Fusarium* are nonorthologous. *Molecular Phylogenetics and Evolution* **7**: 103–116.

Padwick GW, Azmatullah MD (1943). *Claviceps purpurea* (Fr.) Tul. and a new species from Simla. *Current Science* **12**: 257.

Pažoutová S, Odvody GN, Frederickson DE, *et al.* (2011). New *Claviceps* species from warm-season grasses. *Fungal Diversity* **49**: 145–165.

Pažoutová S, Pešicová K, Chudíčková M, *et al.* (2015). Delimitation of cryptic species inside *Claviceps purpurea*. *Fungal Biology* **119**: 7–26.

Píchová K, Pažoutová S, Kostovčík M, *et al.* (2018). Evolutionary history of ergot with a new infrageneric classification (*Hypocreales*: *Clavicipitaceae*: *Claviceps*). *Molecular Phylogenetics and Evolution* **123**: 73–87.

Sánchen-Ken JG, Clark LG, Kellogg EA, *et al.* (2007). Reinstatement and emendation of subfamily *Micrairoideae* (*Poaceae*). *Systematic Botany* **32**: 71–80.

Sawada K (1944). Descriptive catalogue of the Formosan fungi V. *Report of the department of agriculture government research institute of Formosa* **87**: 1–93 (in Japanese).

Shirai M (1917). *A list of Japanese fungi hitherto known*. 2nd ed. Tokyo Shuppan, Tokyo.

Stevens FL, Hall JG (1910). Three interesting species of *Claviceps*. *Botanical Gazette Crawfordsville* **50**: 460–463.

Sullivan RF, Bills GF, Hywel-Jones NL, White JF Jr. (2000). *Hyperdermium:* a new clavicipitalean genus for some tropical epibionts of dicotyledonous plants. *Mycologia* **92**: 908–918.

Tamura K, Stecher G, Kumar S (2021). MEGA11: Molecular Evolutionary Genetics Analysis Version 11. *Molecular Biology and Evolution* **38**: 3022–3027.

Tanaka E, Ashizawa T, Sonoda R, *et al.* (2008). *Villosiclava virens gen. nov., comb. nov.*, teleomorph of *Ustilaginoidea virens*, the causal agent of rice false smut. *Mycotaxon* **106**: 491–501.

Tanaka E, Hosoe T, Degawa Y, *et al.* (2021). Revision of the genus *Aciculosporium* (*Clavicipitaceae*) with a description of a new species on wavyleaf basketgrass, and proline-containing cyclic dipeptide production by *A. take*. *Mycoscience* **62**: 166–175.

Tanaka E, Shrestha B, Shivas RG (2020). *Commelinaceomyces*, *gen. nov.*, for four clavicipitaceous species misplaced in *Ustilago* that infect *Commelinaceae*. *Mycologia* **112**: 649–660.

Tanda S (1973). Notes of *Claviceps purpurea* var. *sasae* on *Sasa iwakiana* and *S. nikkoensis*. *The reports of the Fuji Bamboo Garden* **18**: 30-39 (in Japanese).

Tanda S (1977a). Mycological studies on the ergot in Japan (01). Ergots on *Phragmites* spp. *Journal of Agricultural Science, Tokyo Nogyo Daigaku* **22**: 193–203 (in Japanese with English summary).

Tanda S (1977b). Mycological studies on the ergot in Japan (02). *Claviceps microcephala* (Wallr.) Tul. parasitic on *Hakonechloa macra* Makino. *Journal of Agricultural Science, Tokyo Nogyo Daigaku* **22**: 204–207 (in Japanese with English summary).

Tanda S (1978a). Mycological studies on the ergot in Japan (03). A new variety of *Claviceps purpurea* Tul. parasitic on *Alopecurus aequalis* Sobol. var. *amurensis* Ohwi. *Journal of Agricultural Science, Tokyo Nogyo Daigaku* **22**: 293–299 (in Japanese with English summary).

Tanda S (1978b). Mycological studies on the ergot in Japan (04). Two varieties of *Claviceps purpurea* Tul. parasitic on timothy *Phleum pratense* L. *Journal of Agricultural Science, Tokyo Nogyo Daigaku* **23**: 141–150 (in Japanese with English summary).

Tanda S (1978c). Mycological studies on the ergot in Japan (05). *Claviceps purpurea* Tul. var. *purpurea* parasitic on tall oatgrass, *Arrhenatherum elatius* Mert. et Koch. *Journal of Agricultural Science, Tokyo Nogyo Daigaku* **23**: 151–157 (in Japanese with English summary).

Tanda S (1979a). Mycological studies on the ergot in Japan (06) A physiologic race of *Claviceps purpurea* Tul. var. *alopecuri* Tanda collected from *Trisetum bifidum* Ohwi. *Journal of Agricultural Science, Tokyo Nogyo Daigaku* **23**: 207–214 (in Japanese with English summary).

Tanda S (1979b). Mycological studies on the ergot in Japan (08). Ergots on *Calamagrostis* spp. *Journal of Agricultural Science, Tokyo Nogyo Daigaku* **24**: 67–78 (in Japanese with English summary).

Tanda S (1979c). Mycological studies on the ergot in Japan (09). Distinct variety of *Claviceps purpurea* Tul. on *Phalaris arundinacea* L. and *P. arundinacea* var. *picta* L. *Journal of Agricultural Science, Tokyo Nogyo Daigaku* **24**: 79–95 (in Japanese with English summary).

Tanda S (1979d). Mycological studies on the ergot in Japan (10). Ergots on velvet grass, *Holcus lanatus* L. *Journal of Agricultural Science, Tokyo Nogyo Daigaku* **24**: 145–148 (in Japanese with English summary).

Tanda S (1980a). Mycological studies on the ergot in Japan (13). Ergots on rye, *Secale cereale* L. *Journal of Agricultural Science, Tokyo Nogyo Daigaku* **24**: 293–304 (in Japanese with English summary).

Tanda S (1980b). Mycological studies on the ergot in Japan (15). Ergot on two brome grasses (*Bromus* spp.). *Journal of Agricultural Science, Tokyo Nogyo Daigaku* **25**: 180–186 (in Japanese with English summary).

Tanda S (1981a). Mycological studies on the ergot in Japan (14). Ergots on *Agropyron* spp. *Journal of Agricultural Science, Tokyo Nogyo Daigaku* **Commemorat**: 85–114.

Tanda S (1981b). Mycological studies on the ergot in Japan (16). Ergots on orchard grass *Dactylis glomerata* L. *Journal of Agricultural Science, Tokyo Nogyo Daigaku* **25**: 263–271 (in Japanese with English summary).

Tanda S (1981c). Mycological studies on the ergot in Japan (17). Ergot on four fescues (*Festuca* spp.). *Journal of Agricultural Science, Tokyo Nogyo Daigaku* **26**: 82–100 (in Japanese with English summary).

Tanda S (1981d). Mycological studies on the ergot in Japan (19). Ergot on bluegrasses (*Poa* spp.). *Journal of Agricultural Science, Tokyo Nogyo Daigaku* **26**: 179–192 (in Japanese with English summary).

Tanda S (1981e). Mycological Studies on the ergot in Japan (20). *Claviceps yanagawaensis* Togashi parasitic on *Zoysia japonica* Steud. *Journal of Agricultural Science, Tokyo* **26**: 193–199 (in Japanese with English summary).

Tanda S (1985). Mycological studies on the ergot in Japan (21). A new species of *Claviceps* parasitic on *Arundinella hirta* (Thunb.) C. Tanaka. *Journal of Agricultural Science, Tokyo Nogyo Daigaku* **30**: 94–99.

Tanda S (1991a). *Mycological studies on the ergot in Japan*. Ph.D. dissertation. Tokyo University of Agriculture, Tokyo, Japan.

Tanda S (1991b). Mycological studies on the ergot in Japan (23). Taxonomic reexamination of ergots on eulalia (*Miscanthus sinensis*) and its allies. *Journal of Agricultural Science, Tokyo Nogyo Daigaku* **35**: 213–229 (in Japanese with English summary).

Tanda S (1991c). Mycological studies on the ergot in Japan (24). A new variety of *Claviceps microspora* on *Eccoilopus cotulifer*. *Transactions of the Mycological Society of Japan* **32**: 495–500.

Tanda S (1991d). Mycological studies on the ergot in Japan (25). Determination of taxonomic position of ergot on *Spodiopogon sibiricus*. *Journal of Agricultural Science, Tokyo Nogyo Daigaku* **36**: 28–35.

Tanda S (1991e). Mycological studies on the ergot in Japan (26). A new ergot, *Claviceps bothriochloae* parasitic on *Bothriochloa parviflora*. *Journal of Agricultural Science, Tokyo Nogyo Daigaku* **36**: 36–42.

Tanda S (1992a). Mycological studies on the ergot in Japan (27). An undescribed species of *Claviceps* on *Digitaria*. *Journal of Agricultural Science, Tokyo Nogyo Daigaku* **36**: 182–188.

Tanda S (1992b). Mycological studies on the ergot in Japan (28). An ergot new to Japan, *Claviceps viridis* parasitic on *Oplismenus*. *Transactions of the Mycological Society of Japan* **33**: 343–348.

Tanda S (1992c). Mycological studies on the ergot in Japan (29). Two ergot fungi parasitic on *Papalum* grasses. *Journal of Agricultural Science, Tokyo Nogyo Daigaku* **36**: 292–312.

Tanda S, Harada Y (1989). Mycological studies on the ergot in Japan (22). A new ergot parasitic on *Isachne globosa*. *Transactions of the Mycological Society of Japan* **30**: 105–109.

Tanda S, Kawatani T (1976). A new species of *Claviceps* parasitic on *Imperata cylindrica* Beauv. var. *koenigii* Durand et Schinz. *Transactions of the Mycological Society of Japan* **17**: 289–294.

Tanda S, Kawatani T (1980a). Mycological studies on the ergot in Japan (11). Ergot on *Polypogon fugax*. *Transactions of the Mycological Society of Japan* **21**: 97–101 (in Japanese with English summary).

Tanda S, Kawatani T (1980b). Mycological studies on the ergot in Japan (12). Host range and morphology of *Claviceps litoralis* Kawatani. *Journal of Agricultural Science, Tokyo Nogyo Daigaku* **24**: 281–292 (In Japanese with English sumary).

Tanda S, Sugimoto T (1981). Mycological studies on the ergot in Japan (18). Ergots on ryegrasses, *Lolium multiflorum* Lam. and *L. perenne* L. *Journal of Agricultural Science, Tokyo Nogyo Daigaku* **26**: 101–114 (in Japanese with English summary).

Tanda S, Tadakuma Y, Matsunami Y (1968). The fundamental studies on ergotial fungi (8) Poisonous experiments of ergot to mouse. *Journal of Agricultural Science, Tokyo Nogyo Daigaku* **13**: 61–67 (in Japanese with English summariy).

Togashi K (1936). New species of parasitic fungi-I. *Transactions of the Sapporo Natural History Society* **14**: 280–285.

Togashi K (1942). Morphological and ecological studies on the ergot fungus of *Zoysia japonica*. *Japanese Journal of Phytopathology* **12**: 1–13 (In Japanese).

Tsukiboshi T, Shimanuki T, Koga H (1999a). A new pathogen, *Sphacelia sorghi,* causing ergot of *Sorghum* occurs in Japan. *Annals of the Phytopathological Society of Japan* **65**: 318–320 (In Japanese with English summary).

Tsukiboshi T, Shimanuki T, Uematsu T (1999b). *Claviceps sorghicola sp. nov*., a destructive ergot pathogen of sorghum in Japan. *Mycological Research* **103**: 1403–1408.

Turland NJ, Wiersema JH, Barrie FR, *et al.* (2018). *International Code of Nomenclature for algae, fungi, and plants (Shenzhen Code) adopted by the Nineteenth International Botanical Congress Shenzhen, China, July 2017. Regnum Vegetabile 159*. Koeltz botanical books, Glashütten.

Vilgalys R, Hester M (1990). Rapid genetic identification and mapping of enzymatically amplified ribosomal DNA from several *Cryptococcus* species. *Journal of Bacteriology* **172**: 4238–4246.

White F, Bacon CW, Hywel-jones NL, *et al.* (2003). *Clavicipitalean Fungi - Evolutionary Biology, Chemistry and Cultural Impacts*. CRC Press, U.S.A.

White TJ. Bruns T, Lee S, Taylor J (1990). Amplification and direct sequencing of fungal ribosomal RNA genes for phylogenetics. In: *PCR protocols: a guide to methods and applications* (Innis MA, Gelfand DH, Sninsky JJ, White TJ, eds). Academic Press, USA: 315–322.

Wyka SA, Mondo SJ, Liu M, *et al.* (2021). Whole-genome comparisons of ergot fungi reveals the divergence and evolution of species within the genus *Claviceps* are the result of varying mechanisms driving genome evolution and host range expansion. *Genome Biology and Evolution* **13**: 1–21.

Supplementary Material: https://studiesinmycology.org/

Fig. S1. Cultures of *Claviceps* spp. Three-point inoculation on petri dishes (52 mm diam) with 5 mL T2 agar (sucrose 100 g, L-asparagine 10 g, yeast extract 0.1 g, KH_2PO_4 0.25 g, $MgSO_4 \cdot 7H_2O$ 0.25 g, $FeSO_4 \cdot 7H_2O$ 0.02 g, $ZnSO_4 \cdot 7H_20$ 0.015 g, KCl 0.12 g, $Ca(NO_3)_2 \cdot 4H_2O$ 1.0 g, agar 20 g; pH 5.2, 1000 mL). The plates were incubated in dark at 20 °C for 20 days. The morphology of ergot colonies is an unstable feature as it often changes with age. The colonies of the same isolates were shown with a light blue background. T = ex-type, NT = ex-neotype, ET = ex-epitype.

Fig. S2. Maximum likelihood phylogenetic tree based on each gene (LSU, *TEF-1α*, *Mcm7*, *TUB2* and *RPB2*). Bootstrap (BS) support values from ML and MP analyses are shown at branch (MLBS/MPBS). MLBS < 50 are not shown. Culture collection number or specimen numbers, country code and host genus name are presented after the species name. Ergots analysed in this study are in bold. Ergots collected in Japan are marked by the yellow boxes. The scale represents the number of nucleotide substitutions per site. T = ex-type, NT = ex-neotype, ET = ex-epitype. Abbreviated country code; ARG = Argentina, AU = Australia, BELG = Belgium, BOTSW = Botswana, BRA = Brazil, CA = Canada, CZ = Czech Republic, FRA = France, GER = Germany, IND = India, JA = Japan, KAZ = Republic of Kazakhstan, LIT = Lithuania, MEX = Mexico, SA = South Africa, SWI = Switzerland, THAI = Thailand, UK = United Kingdom, USA = United States of America, ZW = Zimbabwe.

Table S1. Nucleotide sequences of primers used in this study.