

Korean Species of *Aristaea* Meyrick, 1907 (Lepidoptera: Gracillariidae: Gracillariinae)

Da-Som Kim and Bong-Kyu Byun^{1*}

Basic Science Division, National Science Museum of Korea, Daejeon 34143, Korea

¹Department of Biological Science and Biotechnology, Hannam University, Daejeon 34054, Korea

한국미기록 *Aristaea*屬 (나비목: 가는나방과: 가는나방亞科) 및 2未記錄種 보고

김다솜 · 변봉규^{1*}

국립중앙과학관 기초과학과, ¹한남대학교 생명시스템과학과

ABSTRACT: In this study, genus *Aristaea* Meyrick, 1907 and two species, *A. bathracma* (Meyrick, 1912) and *A. pavoniella* (Zeller, 1847) are reported for the first time from Korea. All the known species are enumerated with their available information. Adults and genitalia of the species are briefly redescribed and illustrated.

Key words: Gracillariinae, New record, *Aristaea*, Leafminer, Korea

초록: 본 연구를 통해 가는나방과의 *Aristaea*屬 이 우리나라에서 처음으로 보고되며, 본 屬의 2종 <*A. bathracma* (Meyrick, 1912) 쭉부쟁이가는나방 (신칭) 및 *A. pavoniella* (Zeller, 1847) 국화가는나방 (신칭)>이 한국미기록종으로 기록된다. 본 연구에서 보고되는 모든 종에 대한 분류 및 기주식물 정보를 종합하여 정리하였으며 성충 및 생식기의 특징을 도해와 함께 재기재하였다.

검색어: 가는나방아과, 미기록종, 잠엽성, *Aristaea*屬, 분류학

In Korea, 89 species, belonging to 24 genera of the family Gracillariidae have been reported to date (Park, 1983; Byun et al., 2009; Shin et al., 2015; Kim and Byun, 2016, 2017, 2019, 2022a, b; Kim et al., 2022a, b, c, d; Lee et al., 2017; Lee and Jeun, 2022; Park and Lee, 2021). Of them, 28 species belonging to 4 genera of the subfamily Gracillariinae have been reported from Korea to date (Park, 1983; Byun et al., 2009; Lee and June, 2022; Park and Lee, 2021; Kim et al., 2022b).

Aristaea Meyrick, 1907 is one of the smaller genera in the family Gracillariidae, comprising only 15 species worldwide

(De Prins and De Prins, 2006-2022).

It was established by Meyrick (1907), based on the type species, *Aristaea periphanes* Meyrick, 1907. The members of the genus are distributed mainly in the Australian region, Palearctic region, Ethiopian region and partly in the Oriental region. Most of the larvae of the genus are leaf miners of several plant families, such as Asteraceae, Verbenaceae and Myrtaceae (De Prins and De Prins, 2006-2022).

It has not been known in Korea to date. During the course of the intensive study on the family Gracillariidae, we found the genus *Aristaea* with two species, *A. bathracma* (Meyrick, 1912) and *A. pavoniella* (Zeller, 1847), for the first time from Korea. The aim of the present study is to report the genus

*Corresponding author: bkbyun@hnu.kr

Received October 25 2022; Revised November 17 2022

Accepted November 22 2022

Aristaea with two newly recorded species in Korea.

Materials and Methods

Material examined in the present study is deposited in the Systematic Entomology Laboratory, Hannam University, Daejeon, Korea (HNSUEL). Male and female genitalia were dissected and mounted with Euparal solution, according to Holloway et al. (1987). Photos of the adult were taken using a digital camera (Canon EOS 600D, Canon Inc., Ota, Tokyo, Japan). Images of genitalia were taken using a digital camera attached to the microscope, LEICA M205C (© Leica Microsystems, Wetzlar, Hesse, Germany).

Abbreviations in this study for locality in Korea are as follows: IC (Incheon), GG (Gyeonggi-do), GW (Gangwon-do), JN (Jeollanam-do), TL (type locality), TD (type depository).

Also, the specimen depositories in this study were examined from the following collections:

HNUSEL Hannam University, Korea

KNAE Entomological Collection, Korea National Arboretum, Korea

TMSA Transvaal Museum, Pretoria, South Africa

Systematic Accounts

Order Lepidoptera Linnaeus, 1758

Family Gracillariidae Stainton, 1854

Genus *Aristaea* Meyrick, 1907

Aristaea Meyrick, 1907: 49, 52.

Type species: *Aristaea periphanes* Meyrick, 1907.

Diagnosis. The genus *Aristaea* Meyrick, 1907 is distinguished by the broader apex of forewing than other genera of Gracillariinae with lanceolate-shaped apex in forewing. Also, male genitalia similar to *Caloptilia* in shape of valva, tegumen and vinculum, however can be distinguished with an apical spine of aedeagus. Also, female genitalia of *Aristaea* with two long signa which occupying almost the entire or 2/3 of corpus bursae.

Distribution. Australian, Palearctic, Ethiopian, Oriental regions.

Remarks. The genus *Aristaea* has been reported with 15 described species in the world. In this study, this genus is reported for the first time from Korea with 2 newly recorded species.

Key to the species of the genus *Aristaea* in Korea

1. White fascia of forewing narrower than intervals; male genitalia vinculum longer than tegumen and apical margin straight *Aristaea bathracma*
- White fascia of forewing broader than intervals; male genitalia vinculum as long as tegumen and apical margin round *A. pavoniella*

Aristaea bathracma (Meyrick, 1912) **쑥부쟁이가는나방 (신칭)** (Fig. 1A,1B,1C)

Parectopa bathracma Meyrick, 1912: 25. TL: South Africa.
TD: TMSA (Holotype; Paratypes).

Aristaea asteris Kumata, 1977: 20-23.

Redescription. Adult (Fig. 1A). Wingspan 8.5mm. Head white with silvery gray median striae; frons and face white; maxillary palpus shiny white with a dorsum fuscous band on first segment; labial palpus white with lateral fuscous spots on each segment; antenna fuscous; scape fuscous dorsally and white ventrally. Thorax goldish ochreous with two narrow striae; legs white and fuscous; fore coxa white with apical fuscous band and median part mixed with tiny fuscous spots; fore femur and tibia fuscous with a white basal spot on inner side of tibia; fore tarsus white with four fuscous bands, fuscous only laterally from base to first band; middle femur fuscous with a subapical white spot; middle tibia and tarsus with a total of five fuscous bands at same intervals.

Forewing ground color goldish ochreous with narrow white fasciae and streak with black edges; a basal streak between wing fold and dorsal margin extending 1/3 to base and broader at apically; first costal fascia extends along costal margin at 1/3 to base, oblique to outward and meets or leaves an extreme gap with first dorsal fascia; second costal fascia at 2/3 to base, rather short, down to dorsal margin nearly longitudinally and then extends to apex horizontally; first dorsal fascia at a half of

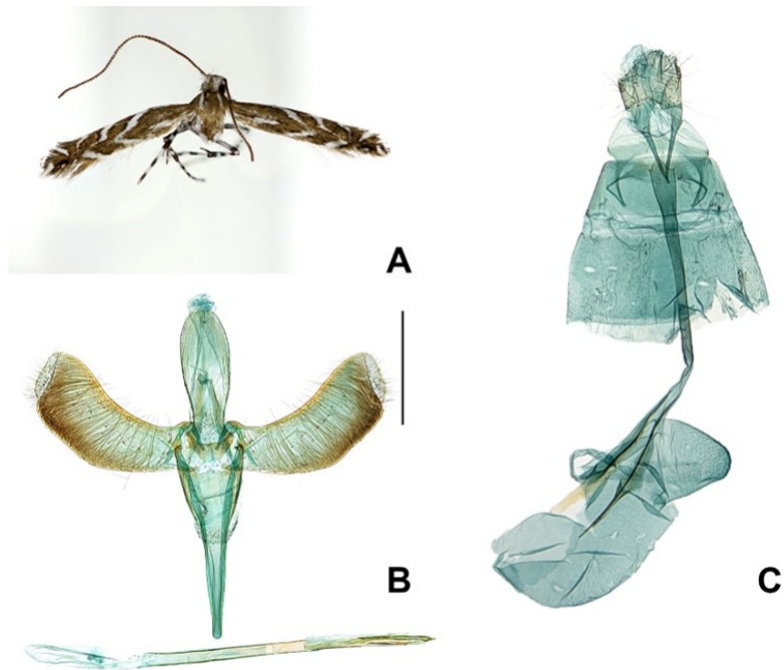


Fig. 1. *Aristaea bathracma*. A, Adult; B, male genitalia; C, female genitalia. <scale bars: 0.5 mm>.

forewing, short and stout, and extend to wing fold; second dorsal fascia at 3/4 to base and somewhat rectangular; short striae on apex with a small white dorsal spot.

Male genitalia (Fig. 1B). Tegumen narrow and clavate. Valva slightly rectangular and muscle-shaped, narrowed at base, apical margin rather straight, basal dorsum slightly curved to inner side and base to a half of ventral margin straight; long and slender scales along apical margin to ventral margin. Vinculum narrow, extremely elongated as long as 2 times longer than tegumen and apical round. Juxta sclerotized and broad. Aedeagus 2 times longer than vinculum, slender, bar-shaped with acute apical, apical bifurcated with two long spines and many of minute spinules on spines.

Female genitalia (Fig. 1C). Papillae anales moderate with scales; base of apophyses posteriores broad and almost 2 times longer than anteriores. Ostium bursae with a sclerotized flap soaring to caudally. Ductus bursae sclerotized except for the rest 1/3 part near corpus bursae and straight to membranous part. Corpus bursae somewhat large, elongated and membranous with two long signa; signa begin at just below ductus bursae, extend to 2/3 of corpus bursae, flap at lateral side and

narrowed apically.

Material examined. [JN] 1♂, Mt. Aengmu, Suncheon-si, 10 vii 2019 (leg. BK Byun), gen. slide no. HNUSEL-5670-coll. HNUSEL; 1♀, Hwaheung-ri, Is. Wan-do, 31 v 2015 (leg. BS Park, SM Na, DJ Lee), gen. slide no. HNUSEL-5362-coll. HNUSEL.

Distribution. Korea (new record), China, Japan, Russia, Thailand, Madagascar, Mozambique, Réunion, South Africa, Uganda.

Host plants. *Aster ageratoides* Turcz. var. *ovatus* Nakai [Compositae] in Japan (Kumata, 1977; De Prins and Prins, 2006-2022).

Aristaea pavoniella (Zeller, 1847) 국화가는나방 (신칭) (Fig. 2A, 2B, 2C)

Gracillaria (Euspilopteryx) pavoniella Zeller, 1847: 362-363. TL: Vienna, Austria. TD: Unknown.

Euspilapteryx pavoniella: Herrich-Schäffer, 1855: 293.

Gracilaria pavoniella: Stainton, 1864: 184.

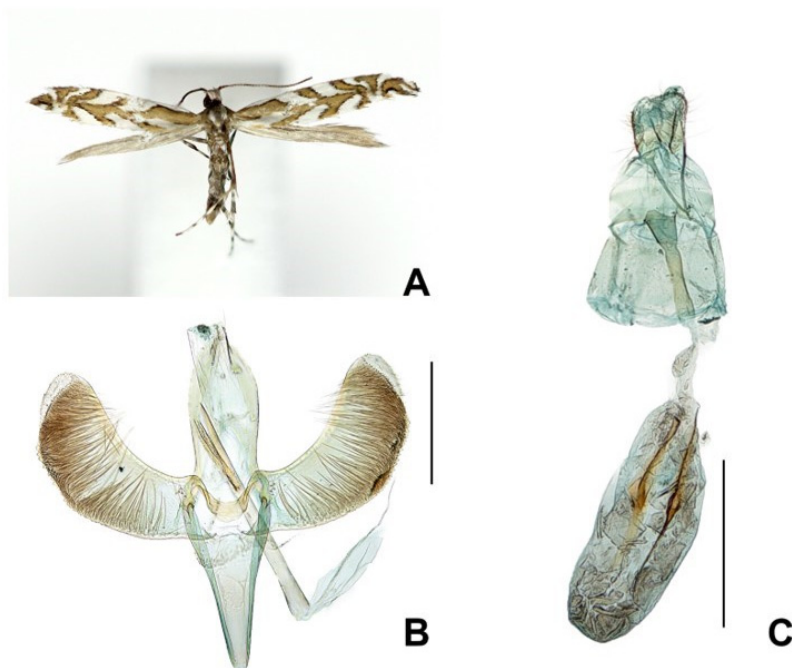


Fig. 2. *Aristaea pavoniella*. A, Adult; B, male genitalia; C, female genitalia. <scale bars: 0.5 mm>.

Micrurapteryx pavoniella: Spuler, 1910: 409.

Parectopa pavoniella: Meyrick, 1912: 20.

Parectopa latisecta Meyrick, 1922: 564.

Aristaea pavoniella Kumata, 1977: 13-20.

Redescription. Adult (Fig. 2A). Wingspan 8.0-10mm. Head white tinged with light ochreous and smooth; frons and face shiny white; maxillary palpus dark brown mixed with white scales and rough; labial palpus white dorsally with a tuft of brown and white scales ventrally; antenna and scape fuscous. Thorax ochreous with two thick striae; legs white and dark brown; fore coxa white only on median with apical and basal brown band; fore femur and tibia brown; fore tarsus white with four fuscous bands almost at same intervals.

Forewing ground color orange ochreous with distinctive white fasciae and streak with black edges; a basal streak near wing fold extending 1/3 to base and slightly upcurved apically; first costal fascia begins at wing base, extends along costal margin at 1/4 to base, oblique to outward and narrowed apically; second costal fascia just next to first one, basal somewhat rectangular and curved to outward smoothly; two of dorsal fasciae more blunt than costal one; a small 'u' shaped white marking at 3/4 to base, occupying a half of forewing,

meet two costal fasciae at middle and costal fasciae oblique opposite each other; a small white dorsal spot with a blackish edge only on upper side; small white striae on apical margin. Hindwing lanceolate and light silver.

Male genitalia (Fig. 2B). Tegumen as long as vinculum and ovate. Valva upcurved and apical margin round; long and slender scales along apical margin to ventral margin except for basal part, some minute saw-like setae along apical margin. Vinculum narrow, elongated and apex blunt. Juxta slightly sclerotized and 'u' shaped. Aedeagus bifurcated on apex with fine and long spines, tubular, narrow and slender without cornuti.

Female genitalia (Fig. 2C). Papillae anales long with scales; apophyses posteriores 2 times longer than anteriores. Ostium bursae 1/2 of papillae anales in width; antrum sclerotized and elongated as long as 1/2 of apophyses posteriores. Ductus bursae sclerotized at half caudally; a small cervix bursae just above neck of corpus bursae. Corpus bursae ellipsoidal form and membranous with two long signa; signa occupying almost entire bursae, begin near the end of ductus bursae, long and slender and lie parallel each other.

Material examined. [IC] 1♂, Mt. Horyonggloksan, Muido, 26 v 2011 (leg. SY Park & JS Lim), gen. slide no. HNUSEL-5364-coll. KNAE; [GG] 1♀, Lake Yuklim, Gwangneung, 11 v 2016 (leg. Park, Choi, Kim, Nam, Shin, Bae), gen. slide no. HNUSEL-5367-coll. KNAE; [GW] 1♂, Jiam-ri, Chwuncheon, 9 v 1999, gen. slide no. HNUSEL-5365-coll. HNUSEL.

Distribution. Korea (new record), China, Japan, Russia, Austria, Czech Republic, Germany, Hungary, Italy, Poland, Slovakia, Switzerland.

Host plants. *Aster ageratoides* Turcz. var. *ovatus* Nakai, *A. glehni* Fr. Schm., *A. scaber* Thunb. [Asteraceae] in Japan (Kuroko, 1958; Kumata, 1977; De Prins and De Prins, 2006-2022). *A. ageratoides* Turcz., *A. amellus* L., *A. bellidiastrum* (L.) Scop., *A. glehni* Fr. Schm., *A. scaber* Thunb., *A. sp.* [Asteraceae] in Russia (Kuznetzov, 1981; Dubatolov and Kosterin, 2000; De Prins and De Prins, 2006-2022). *A. amellus* L., *A. bellidiastrum* (L.) Scop., [Asteraceae] in Austria (Klimesch 1951; Kusdas and Reichl 1990; De Prins and De Prins, 2006-2022). *A. amellus* L. [Asteraceae] in Czech Republic (Laštuvka et al., 1992; De Prins and De Prins, 2006-2022). *A. sp.* [Asteraceae] in Germany (Eckstein, 1933; De Prins and De Prins, 2006-2022). *A. amellus* L. [Asteraceae] in Hungary (Szabóky, 2013; De Prins and De Prins, 2006-2022). *A. amellus* L. [Asteraceae] in Italy (Hartig, 1939; De Prins and De Prins, 2006-2022). *A. alpinus* L. [Asteraceae] in Poland (Baran, 1996; De Prins and De Prins, 2006-2022). *A. amellus* L., *A. bellidiastrum* (L.) Scop. [Asteraceae] in Switzerland (Frey, 1855; De Prins and De Prins, 2006-2022).

Acknowledgements

We thanks to Prof. Kyu-Tek Park (The Korean Academy of Science and Technology) for his preliminary work on the Korean Gracillariidae. We are also grateful to Dr. Bong-Woo Lee (Korea National Arboretum) for providing specimens with access to examine specimens. Also, we would like to express our deep thanks to Mr. Jae-In Oh, Systematic Entomology Lab., Hannam University, for her help in preparing the manuscript and illustration of the adults and genitalic structures. This work was supported by the National Research Foundation

of Korea (NRF) (grant number: NRF-2021R111A2059745) funded by the Government of Korea.

Statements for Authorship Position & Contribution

Kim, D.-S.: Basic Science Division, National Science Museum of Korea, Researcher; Experiment, Sample Identification, Conducted the experiments and wrote the manuscript

Byun, B.-K.: Department of Biological Science and Biotechnology, Hannam University, Professor; Designed the research and Conducted the writing manuscript.

All authors read and approved the manuscript.

Literature Cited

- Baran, T., 1996. *Aristaea pavoniella* (Zeller) (Lepidoptera: Gracillariidae) in Poland. Pol. pis. entomol. 65, 257-258.
- Byun, B.K., Park, K.T., Bae, Y.S., Lee, B.W., 2009. A checklist of the microlepidoptera in Korea (Lepidoptera). Korea National Arboretum, Pocheon.
- De Prins, J., De Prins, W., 2006-2022. Global Taxonomic database of Gracillariidae (Lepidoptera). World Wide Web electronic publication <http://www.gracillariidae.net> (accessed 5 February, 2022).
- Dubatolov, V.V., Kosterina, O.E., 2000. Nemoral species of Lepidoptera (Insecta) in Siberia: a novel view on their history and the timing of their range disjunctions. Entomol. Fenn. 11, 141-166.
- Eckstein, K., 1933. Die Schmetterlinge Deutschlands mit besonderer Berücksichtigung ihrer Biologie und wirtschaftlichen Bedeutung 5. Band Die Kleinschmetterlinge Deutschlands, p. 223.
- Frey, H., 1855. Ueber die in der Schweiz beobachteten arten des genus *Lithocolletis* Zell. NGZH. 3, 600-635.
- Hartig, F., 1939. Sulla minefauna della Venezia Tridentina. Archivio per l'Alto Adige 34, 1-70.
- Herrich-Schäffer, G.A.W., 1855. Systematische Bearbeitung der Schmetterlinge von Europa zugleich als Text, Revision und Supplement zu Jakob Hübner's Sammlung europäischer Schmetterlinge. 5. Die Schaben und Federmotten, Regensburg, pp. 1-394.
- Holloway, J.D., Bradley, J.D., Carger, D.J., 1987. CIE guides to insects of importance to man 1. Lepidoptera. CAB International, London. p. 262.
- Kim, D.S., Byun, B.K., 2016. First discovery of winter-emerging leaf-miner: *Phyllonorycter styracis* (Kumata, 1963) (Lepidoptera:

- Gracillariidae) from Korea with DNA barcode. *J. Asia-Pac. Biodivers* 9, 477-480.
- Kim, D.S., Byun, B.K., 2017. Taxonomic review of the genus *Phylolonyx* Hübner (Lepidoptera: Gracillariidae) in Korea. *J. Asia-Pac. Entomol.* 20, 1377-1386.
- Kim, D.S., Byun, B.K., 2019. An annotated catalogue of the two genera *Liocrobyla* and *Spulerina* of the family Gracillariidae (Lepidoptera) from Korea with new records. *J. Asia-Pac. Biodivers* 12, 444-447.
- Kim, D.S., Byun, B.K., 2022a. Genus *Eteoryctis* Kumata & Kuroko, 1988 (Lepidoptera: Gracillariidae) in Korea with description of a new species. *Zootaxa* 5120, 402-408.
- Kim, D.S., Byun, B.K., 2022b. Genus *Telamoptilia* Kumata & Kuroko, 1988 (Lepidoptera: Gracillariidae) new to Korea. *ASED.* 38, 162-166.
- Kim, D.S., Ahn, N.H., Byun, B.K., 2022a. The Genus *Cameraria* Chapman, 1902 (Lepidoptera: Gracillariidae: Lithocolletinae), New to Korea. *Korean J. Appl. Entomol.* 61, 313-318.
- Kim, D.S., Lee, J.Y., Byun, B.K., 2022b. Korean species of *Gracillaria* Haworth, 1828 (Lepidoptera: Gracillariidae). *J. Asia-Pac. Biodivers* 15, 408-413.
- Kim, D.S., Oh, J.I., Byun, B.K., 2022c. Five Species of the Subfamily Acrocercopinae (Lepidoptera: Gracillariidae) New to Korea. *ASED.* 38, 113-121.
- Kim, D.S., Oh, J.I., Byun, B.K., 2022d. Taxonomic review of the genus *Spulerina* Vári, 1961 (Lepidoptera: Gracillariidae) in Korea. *Orient. Insects*, doi: 10.1080/00305316.2022.2117246.
- Klimesch, J., 1951. Über Microlepidopteren des Traunsteingebietes in Oberösterreich. *Zeitschrift der Wiener Entomologischen Gesellschaft.* 36, 101-117.
- Kumata, T., 1977. On the Japanese species of the genera *Macrostola*, *Aristaeta* and *Systoloneura*, with descriptions of three new species (Lepidoptera: Gracillariidae). *Insecta Matsumurana* 9, 1-51.
- Kuroko, H., 1958. Notes on *Parectopa pavoniella* Zeller (Gracillariidae) from Japan. *LSJ.* 9, 58-60.
- Kusdas, K., Reichl, E.R., 1990. Die Schmetterlinge Oberösterreichs. Teil 6: Microlepidoptera (Kleinschmetterlinge), Oberösterreichischen Landesregierung, Linz.
- Kuznetsov, V. I., 1981. Fam. Gracillariidae (Lithocolletidae) - leaf blotch miners, Nauka, Leningrad.
- Laštuvka, Z., Laštuvka, A., Liška, J., Marek, J., Skyva, J., Vávra, J., 1992. Faunistic records from Czechoslovakia Lepidoptera. *Acta Entomologica Bohemoslovaca* 89, 466-472.
- Lee, G.E, Jeun, Y.C., 2022. Eighteen species of microlepidoptera (Lepidoptera) new to Korea. *J. Asia-Pac. Biodivers* 15, 241-253.
- Lee, S.H., Kim, D.S., Kim, I.K., Choi, C.W., Hwang, R.Y., Ku, D.S., Byun, B.K., 2017. Indigenous parasitoids as effective natural enemies of *Phyllocnistis citrella* (Lepidoptera: Gracillariidae) in Korea. *JFR.* 28, 183-187.
- Linnaeus, C, 1758. *Systema naturae per regna tria naturae, secundum classes, ordines, genera, species, cum characteribus, differentiis, synonymis, locis.* Vol. 1. 10th ed. Laurentius Salvius, Stockholm. pp. 1-824.
- Meyrick, E., 1907. Descriptions of Indian Micro-Lepidoptera. *JBNHS.* 17, 976-993.
- Meyrick, E., 1912. *Exotic microlepidoptera.* Printed by Taylor and Francis, London.
- Meyrick, E., 1922. *Exotic microlepidoptera v.2,* Taylor and Francis, London.
- Park, J.K., Lee, J.E., 2021. Check list of insects from Korea. Korean Society of Applied Entomology & The Entomological Society of Korea. Paper and Pencil, Daegu.
- Park, K.T., 1983. Microlepidoptera of Korea. *Insecta Koreana* 3, 1-189.
- Shin, Y.M., Lee, B.W., Byun, B.K., 2015. Taxonomic review of the Genus *Caloptilia* Hübner (Lepidoptera: Gracillariidae) in Korea. *J. Asia-Pac. Entomol.* 18, 83-92.
- Spuler, A., 1910. *Die Schmetterlinge Europas.* E. Schweizerbart, Stuttgart, pp. 1-523.
- Stainton, H.T., 1854. Lepidoptera: Tineina, in: Stainton, H.T. (Ed.), *Insecta Britannicavol.* 3. Lovell Reeve, London, pp. 1-313.
- Stainton, H.T., 1864. *He natural history of the Tineina.* Volume VIII. Containing Gracillaria. Part I. and Ornix Part I. John Van Voorst, London, pp. 1-315.
- Szabóky, C., 2013. New data to the Microlepidoptera fauna of Hungary, part XV (Lepidoptera: Coleophoridae, Depressariidae, Gracillariidae, Oecophoridae, Tineidae). *Folia Entomologica Hungarica Rovartani Közlemények* 74, 123-130.
- Zeller, P.C., 1847. *Die Gracillarien.* *Linnaea Entomologica* 2, 303-383.