

# *Acrotrichis thoracica* (Waltl) and *Acrotrichis grandicollis* (Mannerheim) (Coleoptera: Ptiliidae) New to Korea

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## 한국산 미기록종 *Acrotrichis thoracica* (Waltl)와 *Acrotrichis grandicollis* (Mannerheim) (딱정벌레목: 깨알벌레과)에 대한 보고

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**ABSTRACT:** The family Ptiliidae (Insecta: Coleoptera) has approximately 1,000 valid species in 100 recognized genera. Ptiliid beetles are readily collected from various habitats. They can be distinguished by feather-like hindwings and small body sizes. The genus *Acrotrichis* is the largest ptiliid genus. It contains almost a quarter of all ptiliids. In Korea, a single species of *Acrotrichis lewisii* (Matthews, 1884b) was recently reported in 2020. In this paper, we report two additional species, *A. thoracica* (Waltl, 1838) and *A. grandicollis* (Mannerheim, 1844) from the Korean Peninsula, collected during an assessment of biological variation in agricultural land of Jeju Island. Illustrations of habitus and diagnostic characters, distribution map and a key to Korean *Acrotrichis* species are provided.

**Key words:** *Acrotrichis*, Jeju Island, Farmland, New records, Taxonomy

**조 록:** 깨알벌레과는 전세계적으로 약 100속, 1,000여 종이 알려져 있다. 깨알벌레들은 다양한 서식처에서 채집되며, 깃털 모양의 날개와 작은 크기로 쉽게 구분된다. 이 중 *Acrotrichis*속은 깨알벌레과의 약 4분의 1을 차지하나, 국내에서는 *Acrotrichis lewisii* (Matthews, 1884b)만이 2020년에 처음으로 기록되었다. 본 연구에서는 전국 농경지 생물상 변동조사 중 제주에서 채집된 *A. thoracica* (Waltl, 1838)와 *A. grandicollis* (Mannerheim, 1844)를 국내에 처음으로 보고한다. 이 두 종의 외형과 세부 사진, 분포도 그리고 한국산 *Acrotrichis*속의 분류키를 함께 제공한다.

**검색어:** 깨알벌레속, 제주도, 농경지, 미기록종, 분류학

The family Ptiliidae Erichson, 1845 (Coleoptera: Staphylinoidea) is usually collected from leaf litter, fungi, mammal nest, dung piles, and rotten wood. The best diagnostic character of ptiliids is their feather-like hindwings. They can also be distinguished from other coleopteran families by their small body sizes (generally 0.40 - 1.20 mm, very few tropical species reaching near 4.00 mm), large and triangular scutellum, and 10- or

11-segmented, long, hairy, and loosely clavate antenna. They are parthenogenetic in some species (Hall, 2000, 2005; Hangay and Zborowski, 2010; Jang and Park, 2021, 2022). Presently, the family Ptiliidae has approximately 100 recognized genera with ~1,000 valid ptiliid species (Sörensson and Delgado, 2019; Bánki et al., 2022).

The genus *Acrotrichis* originally belonged to subfamily Acrotrichinae until Sörensson and Delgado (2019) moved it into subfamily Ptiliinae. The genus *Acrotrichis* Motschulsky, 1848 is the largest ptiliid genus. It contains approximately a

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Received October 10 2022; Revised November 9 2022

Accepted November 20 2022

quarter of all ptiliids (Johnson, 1969; Bánki et al., 2022).

Four subgenera, *Acrotrichis* Motschulsky, 1848, *Ctenopteryx* Flach, 1889, *Capotrichis* Johnson, 1969, and *Flachiana* Sundt, 1969, are currently recognized in the genus *Acrotrichis*. In adjacent countries of Korea, especially Japan and the Russian Far East, 27 *Acrotrichis* species have been recorded (Sörensson, 2015; Suzuki, 2022). Sawada et al. (2020) recently reported a single species, *A. (Flachiana) lewisii* (Matthews, 1884b), from Jeju Island in Korea (National Institute of Biological Resources, 2022).

In this paper, we report two *Acrotrichis* species, *A. (s. str.) thoracica* (Waltl, 1838) and *A. (Ctenopteryx) grandicollis* (Mannerheim, 1844) from the Korean Peninsula for the first time. Illustrations of habitus, diagnostic characters, distribution map and a key to Korean *Acrotrichis* species are also provided.

## Material and Methods

A total of 21 *Acrotrichis* specimens were examined. During an assessment of biological variation in agricultural land of Jeju Island, Republic of Korea (ROK), 18 specimens were collected, among which, five permanent microscopic slides were prepared based on Hanley and Ashe (2003). They were deposited in Chungbuk National University Insect Collection (CBNUIC), Cheongju, ROK. Additional three specimens were collected from the Democratic People's Republic of Korea (DPRK), which were loaned from National Institute of Biological Resources (NIBR), Incheon, ROK. Images were generated using a Sony ILCE-7RM3 mirrorless camera with a 20X Mitutoyo Plan Apo Objective. They were stacked with a Zerene stacker 1.04. The map of Korean Peninsula was obtained from an image in SimpleMappr (Shorthouse, 2010) and marked to indicate the collection locality.

## Systematic Accounts

### Family Ptiliidae Erichson, 1845

### Subfamily Ptiliinae Erichson, 1845

### Tribe Acrotrichini Reitter, 1909

Reitter, 1909: 272, Sörensson and Delgado, 2019: 793

### Genus *Acrotrichis* Motschulsky, 1848 깨알벌레속(신칭)

*Acrotrichis* Motschulsky, 1848: 569.

Type species *Latridius fascicularis* Herbst, 1793: 8 [subsequent designation by Johnson, 1969: 229].

= *Acratrichis* Motschoulsky, 1850: 207.

= *Acrotripteryx* Brèthes, 1915: 15.

= *Cleopterium* Gistel, 1856: 360.

= *Cleopteryx* Gistel, 1857: 1024.

= *Macdonaldium* Abdullah and Abdullah, 1967: 78.

= *Ptilopterium* Gistel, 1848: X.

= *Trichopteryx* Kirby, in Kirby and Spence, 1826: 41 [junior homonymized of *Trichopteryx* Hübner, 1825 (Lepidoptera) by Reitter, 1909: 265].

## Key to the Korean *Acrotrichis* species

1. Protibia with 6 bristles on inner margin (Fig. 3F). Pronotum widest around middle (Fig. 3B). Pronotum with one, elytra with two distinct long setae (Figs. 1C - D, 3B, D). ..... ***A. (Ctenopteryx) grandicollis* (Mannerheim, 1844)**
- 1'. Protibia with 3 bristles on inner margin (Fig. 2F). Pronotum widest around posterior (Fig. 2B). Pronotum and elytra without distinct long setae (Figs. 1A - B, 2B, D). ..... 2
2. Size slightly smaller (under 1.0 mm) (Figs. 1A - B). Male abdominal sternite VI with 7 - 14 basal bristles (Fig. 2J). Aedeagus narrowed basally; apical flattened (Fig. 2L). ..... ***A. (s. str.) thoracica* (Waltl, 1838)**
- 2'. Size slightly larger (over 1.0 mm). Male abdominal sternite VI without basal bristles; Aedeagus basal wide and round; narrowed and expended apically. .... ***A. (Flachiana) lewisii* (Matthews, 1884b)**

### Subgenus *Acrotrichis* s. str. 깨알벌레아속(신칭)

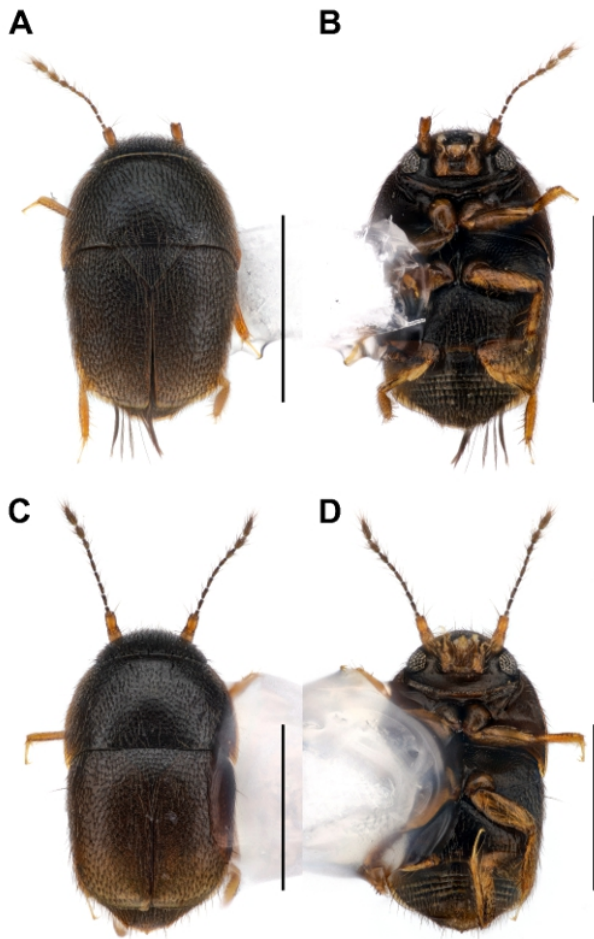
***Acrotrichis (s. str.) thoracica* (Waltl, 1838)** 큰가슴깨알벌레 (신칭)

(Figs. 1A - B, 2, 4 circle)

*Ptilium thoracicum* Waltl, 1838: 272.

*Trichopteryx thoracica* Gillmeister, 1845: 48; Wankowicz, 1869: 414.

*Acrotrichis thoracica* Reitter, 1909: 274; Portevin, 1929:



**Fig. 1.** Habitus of *Acrotrichis* (s. str.) *thoracica* (Waltl, 1838) and *A. (Ctenopteryx) grandicollis* (Mannerheim, 1844) from Jeju-do. A - B: *A. thoracica*; C - D: *A. grandicollis*; A, C: dorsal habitus; B, D: ventral habitus. <scale bar: 0.5 mm>.

576; Rosskothén, 1934: 114; Sundt, 1958: 273; Sundt, 1971 in Besuchet and Sundt, 1971: 337; Sörensson and Merkl, 1999: 183; Polilov, 2008: 173.

*Acrotrichis (sericans-group) grandicollis* Sawada and Hirowatari, 2002: 90.

*Acrotrichis* (s. str.) *thoracica* Csiki, 1911: 52; Młynarski, 1984: 359; Sörensson, 2015: 175; Bánki et al., 2022.

= *alpina* Allibert, 1844: 52 (*Trichopteryx*); 1847: 195 (*Trichopteryx*).

= *anthracina* Matthews, 1865: 35 (*Trichopteryx*); 1868: 11 (*Trichopteryx*).

= *attenuata* Gillmeister, 1845: 49 (*Trichopteryx*).

= *brevicornis* Motschulsky, 1869: 174 (*Acratrachis*).

= *caucasica* Kolenati, 1846: 56 (*Ptilium causicum*).

= *convexiuscula* Motschulsky, 1851: 250 (*Acratrachis*); Csiki,

1911: 44.

= *thoracica* Gillmeister (*Trichopteryx*) in Redtenbacher, 1847: 149; Fairmaire and Laboulbène, 1855: 331; Thomson, 1855: 336; Flach, 1889: 518.

= *pubescens* Rey, 1889: 4 (*Trychopteryx*).

= *punctatissima* Motschulsky, 1869: 178 (*Acratrachis*).

= *quadrata* Motschulsky, 1845: 530 (*Ptilium quadratum*).

= *rufipennis* Motschulsky, 1869: 179 (*Acratrachis*); Csiki, 1911: 44.

= *subaenea* Motschulsky, 1869: 179 (*Acratrachis*).

**Diagnosis.** This species can be distinguished from other Korean *Acrotrichis* species by the following combination of characters: abdominal sternite VI hind margin of male with 7 - 14 basal bristles; apical flattened aedeagus.

**Description.** Body length 0.75 - 0.80 mm; oval, convex; dark brownish black with pale brown pubescence. Antennae, mentum and legs yellowish brown (Figs. 1A - B).

*Head.* Broad, round; distance between eyes in ventral view 0.20 mm. Antennomeres I - XI 0.40 mm; I - II large, thick, stout than other; III shortest; IV - VII long cylindrical; V - VII slightly longer than IV and VIII; VIII cylindrical, distal concaved; IX - XI weakly clavate; XI 1.43 times longer than IX, 1.25 times than X (Figs. 1A - B, 2A).

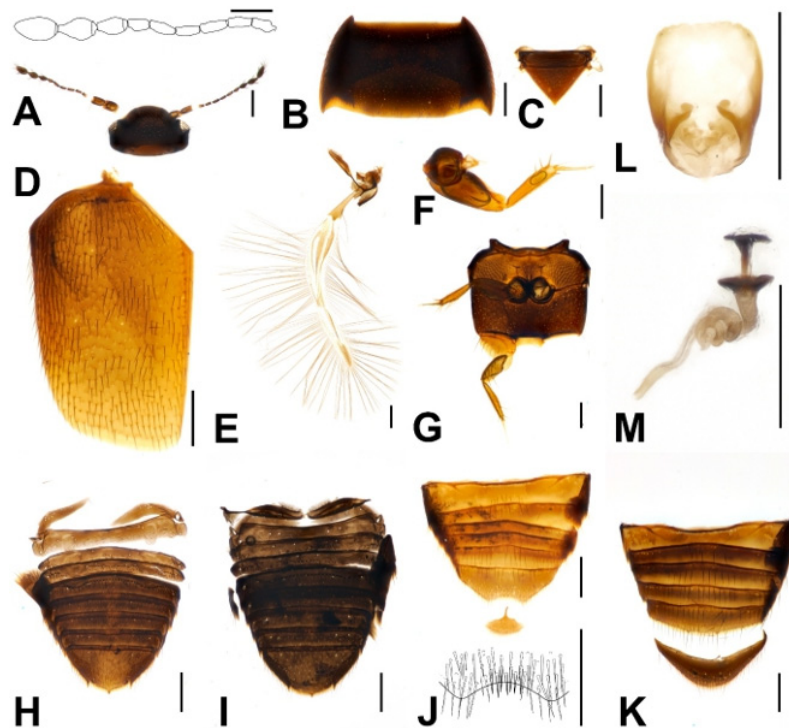
*Thorax.* Pronotum length 0.26 mm, width 0.51 mm; rather broad and convex; little wider than elytra; widest slightly in front of posterior margin; side margin gently curved; posterior margin wider than anterior, sinuate. Scutellum large (Figs. 2B - C).

*Wing.* Elytra length 0.43 mm, width 0.48 mm; little longer than broad; widest at humeral part; humeri weakly angulate; lateral slightly narrowed posterior; hind margin truncate (Fig. 2D).

*Meso-, Metaventricle.* Mesocoxal sutures straight; almost horizontal. Metaventral side slightly narrowed posterior. Metacoxal cavities separated as 1/1.29 of cavity width (Fig. 2G).

*Abdomen.* Pygidium large, subtriangular; posterior margin tridentate, with a pair of long setae. Male abdominal sternite VI hind margin emarginate, with 7 - 14 basal bristle; VII fan shaped, apodeme protracted anterior (Figs. 2H - K).

*Legs.* Femur and tibia stout. Protibia with three bristles on inner margin distal one thirds (Figs. 2F - G).



**Fig. 2.** *Acrotrichis* (s. str.) *thoracica* (Waltl, 1838). A: head with antennae; B: pronotum; C: scutellum; D: elytra; E: hindwing; F: foreleg; G: meso- and metaventre with mid- and hindleg; H - I: abdominal tergites; J - K: abdominal sternites; L: aedeagus; M: spermatheca; A - H, J, L: male; I, K, M: female. <scale bar: 0.1 mm>.

**Male genitalia.** Aedeagus oblong, apex truncate; narrowed basally; apical margin straight in ventral aspect (Fig. 2L).

**Female genitalia.** Spermatheca. Mushroom-shape part slender. Extension of the collar narrowed basally. Spermathecal chord rather stout (Fig. 2M).

**Materials examined** (n=13, 6♂7♀ CBNUIC). 6♂7♀ (4♂6♀ dried; 2♂1♀ slide), ROK: Jeju Prov. 325, Susan-ri, Aewol-eup, Jeju-si, 18.VII.2021, 33°27'46.5"N 126°23'38.8"E, 96 m, sifting soil and corn stem debris, J.-W. Kang, J.-I. Shin leg.

**Distribution.** ROK: Jeju Prov. (Fig. 4 circle), East Asia (including China, Japan, Russian East Siberia, and Far East), Middle East, Europe, Nearctic Region, North Africa.

Subgenus *Ctenopteryx* Flach, 1889 긴털개알벌레아속 (신칭)

*Ctenopteryx* Flach, 1889: 517; Johnson, 1969: 226.

Type species *Trichopteryx grandicollis* Mannerheim, 1844:

181 [subsequent designation by Johnson, 1969: 227].

***Acrotrichis (Ctenopteryx) grandicollis* (Mannerheim, 1844)**

긴털개알벌레(신칭)

(Figs. 1C - D, 3, 4 triangle)

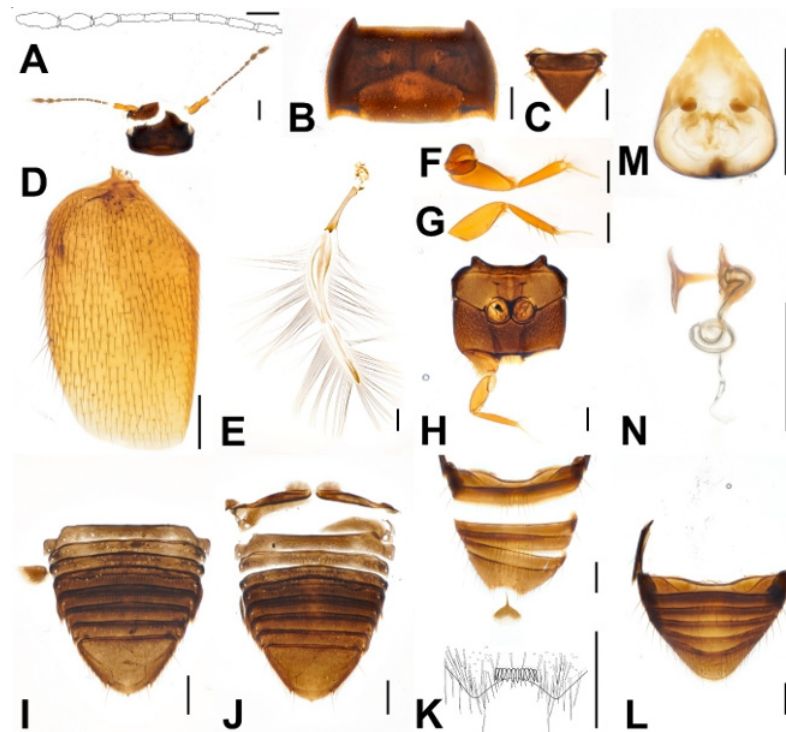
*Trichopteryx grandicollis* Mannerheim, 1844: 181 (attrib. Märkel); Ericson, 1845: 20; Allibert, 1847: 195; Haliday, 1855: 123; Thomson, 1855: 336; Wankowicz, 1869: 414; Matthews, 1884a: 134; 1884b: 80.

*Trichopteryx (Ctenopteryx) grandicollis* Flach, 1889: 517; Ganglbauer, 1899: 325.

*Acrotrichis grandicollis* Reitter, 1909: 274; Portevin, 1929: 576; Rosskothén, 1934: 114; Kubota, 1943: 4; Hisamatsu, 1985: 239; Sörensson and Merkl, 1999: 182; Polilov and Bibin, 2004: 152; Polilov, 2008: 171.

*Acrotrichis (grandicollis-group) grandicollis* Sawada and Hirowatari, 2002: 82.

*Acrotrichis (Ctenopteryx) grandicollis* Csiki, 1911: 38; Sundt, 1958: 259; Besuchet and Sundt, 1971: 336; Młynarski, 1984: 334; Sörensson, 2015: 175; Sörensson and Delgado, 2019:



**Fig. 3.** *Acrotrichis (Ctenopteryx) grandicollis* (Mannerheim, 1844). A: head with antennae; B: pronotum; C: scutellum; D: elytra; E: hindwing; F: foreleg; G: midleg; H: meso- and metaventrite with hindleg; I - J: abdominal tergites; K - L: abdominal sternites; M: aedeagus; N: spermatheca; A - I, K, M: male; J, L, N: female. <scale bar: 0.1 mm>

799; Bánki et al., 2022.

= *fascicularis* Gillmeister, 1845: 43 (*Trichopteryx fascicularis* Gillmeister, 1845: 43, not *Latri dius fascicularis* Herbst, 1793: 8); Redtenbacher, 1847: 148; Haliday, 1855: 123.

= *grandicollis* Märkel, in Mannerheim, 1844: 181 (*Trichopteryx*); Flach, 1889: 517 (*Trichopteryx*).

= *grandicollis* Mannerheim (*Ctenopteryx*), in Yazaki, 1925: 26.

= *grandicollis* Ericson (*Trichopteryx*) in Haliday, 1855: 123; Fairmaire and Laboulbène, 1855: 332.

= *lata* Motschulsky, 1845: 528 (*Ptilium latum*), Matthews, 1865: 174 (*Trichopteryx*), Csiki, 1911: 47 (*Acrotrichis*).

= *plumigera* L'Hermina, 1791: 206 (*Ips plumigerus*).

= *plumigera* L'Hermina, 1792: 46 (*Opatrum plumigerum*).

**Diagnosis.** This species can be distinguished from other Korean *Acrotrichis* species by the following combination of characters: three pairs of distinct long, stout setae on pronotum and elytra lateral margin; six long, thick bristles on inner margin of protibia; hind margin of male abdominal sternite VI with  $\pm 10$  thick basal bristles; subtriangular aedeagus; short

spermathecal collar extension.

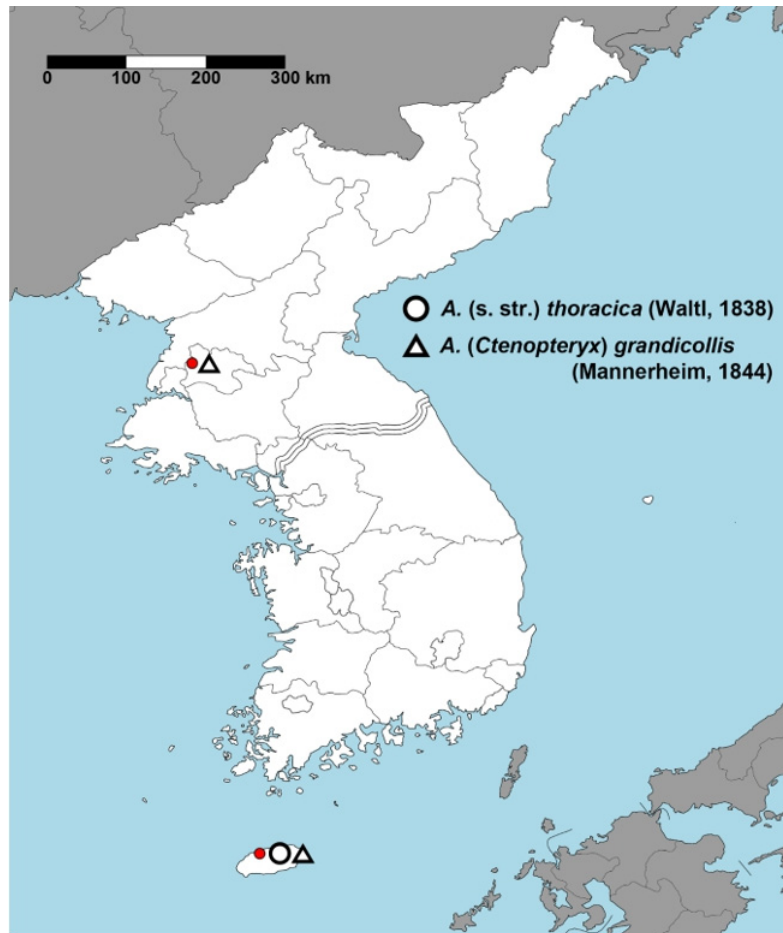
**Description.** Body length 0.90 - 0.95 mm; oval, rather convex; with pale brown pubescence. Head and pronotum dark brownish black, elytra slightly lighter. Antennomeres I - II light yellowish brown, III - XI dark brown (Figs. 1C - D).

**Head.** Broad, round; distance between eyes in ventral view 0.22 mm. Antennomeres I - XI 0.48 mm; I - II large, thick, stout than other; III shortest; IV - VIII long cylindrical, similar in length; IX - XI weakly clavate; XI 1.79 times longer than IX, 1.28 times than X (Figs. 1C - D, 3A).

**Thorax.** Pronotum length 0.30 mm, width 0.54 mm, rather broad; little wider than elytra; posterior one third widest, with distinct long setae; side margin curved; posterior margin wider than anterior, weakly sinuate. Scutellum large (Figs. 3B - C).

**Wing.** Elytra length 0.48 mm, width 0.50 mm; length almost equals width; widest at middle; side margin with two distinct long setae; hind margin truncate (Fig. 3D).

**Meso-, Metaventrite** lateral margin straight; almost horizontal. Metaventral side slightly narrowed posterior. Metacoxae



**Fig. 4.** Collection localities of *Acrotrichis* (s. str.) *thoracica* (Waltl, 1838) and *A. (Ctenopteryx) grandicollis* (Mannerheim, 1844). circle: *A. thoracica*; triangle: *A. grandicollis*.

separate 1/1.29 of coxal cavity width (Fig. 3H).

**Abdomen.** Pygidium large, subtriangular; with pair of long setae on little behind middle; posterior margin tridentate, with pair of long setae. Male abdominal sternite VI hind margin emarginate with  $\pm 10$  thick bristles; VII subtriangular, apodeme protracted anterior (Figs. 3I - L).

**Legs.** Femur rather stout, tibia slender. Protibia with six long, thick bristles on inner margin distal half (Figs. 3F - H).

**Male genitalia.** Aedeagus subtriangular, basal margin broadly round in ventral aspect (Fig. 3M).

**Female genitalia.** Spermatheca. Mushroom-shape part wide as collar, scape slender and long. Extension of the collar short. Spermathecal chord rather slender (Fig. 3N).

**Materials examined** (n=8, 2♂ 1♀ NIBR; 3♂ 2♀ CBNUIC). 1♀ (NIBR, dried), NIBRIN0000573256; DPRK: around Mt.

RyongAk-san near Suna-river, Pyongyang-si, 17. V. 2012, C.-D. Han leg.; 2♂ (NIBR, dried), NIBRIN0000573254; NIBRIN 0000573255: same locality and collector, 6 - 9.VI.2012; 3♂ 2♀ (CBNUIC, 2♂ 1♀ dried; 1♂ 1♀ slide), ROK: Jeju Prov. 325, Susan-ri, Aewol-eup, Jeju-si, 18.VII.2021, 33°27'46.5"N 126°23'38.8"E, 96 m, sifting soil and corn stem debris, J.-W. Kang, J.-I. Shin leg.

**Distribution.** ROK: Jeju Prov., DPRK: Pyongyang-si (Fig. 4 triangle), Asia (including China, Japan, Russian East Siberia, and Far East), Australian Region, Europe, Nearctic Region, and North Africa.

## Acknowledgments

We thank to Dr. J. Hur and Dr. M.-J. Jeon (NIBR) for loan

specimens of *Acrotrichis grandicollis*. This study was carried out with the support of the Research Program for Agricultural Science & Technology Development (Project No. PJ01606 2072022) funded by the Rural Development Administration in the Republic of Korea in 2022.

## Statements for Authorship Position & Contribution

Jang, T.: Chungbuk National University, Ph.D student; examined specimens, wrote the manuscript.

Park, K.: National Institute of Agricultural Sciences, Researcher: Designed the research, review the manuscript.

Park, J.-S.: Chungbuk National University, Professor, Ph.D; Designed the research, examined specimens, wrote the manuscript, review the manuscript.

All authors have read and approved the manuscript.

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