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Descriptions of two new species of the genus *Parastenolechia* from Japan and Taiwan, with a new definition of the genus (Lepidoptera: Gelechiidae)

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日本及び台湾産 *Parastenolechia* 属キバガの2新種の記載と属の分類学的整理（鱗翅目：キバガ科）

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抄録：台湾からの1新種（*Parastenolechia formosana*）と日本からの1新種（*P. gracilis*）を記載した．同時に，北ベトナム産の1種を含む *Tutor* 属を *Parastenolechia* 属の同物異名として扱い，*Parastenolechia* 属の分類学的整理を行った．6種の *Parastenolechia* 属キバガの内，材料の入手できた4種について分岐学的系統解析を行い，3種に見られる交尾器の非対称性の起源に言及した．

Abstract: Two new species, *Parastenolechia formosana* from Taiwan and *P. gracilis* from Japan are described. The genus *Tutor* OMELKO, 1988 is synonymized with the genus *Parastenolechia* KANAZAWA, 1985. The genus *Parastenolechia* is newly defined on the basis of three additional species. Taking phylogenetic relationships among four available species into consideration, the origins of asymmetrical genitalia in the three species of the genus are also commented.

Key words: *Parastenolechia*; *Tutor*; Gelechioidea; taxonomy; phylogeny; asymmetry in genitalia.

Introduction

The genus *Parastenolechia* KANAZAWA, 1985 was established and defined with three East Asian species, *P. asymmetrica* from Taiwan, *P. issikiella* from Japan, and *P. argobathra* from China and Korea. In August of 1983 I collected several small gelechiid moths in Taiwan, which were assigned to a new species and had asymmetrical male or female genitalia. Further detailed study made it clear that the new species from Taiwan and another new species from Kyushu of Japan were congeneric with *P. asymmetrica* and *P. issikiella*. I knew the fact that the new Taiwanese species shares asymmetry in male and female genitalia with *P. asymmetrica* equally from Taiwan and reported the origins of asymmetry in genitalia at the 47th annual meeting of the Entomological Society of Japan (KANAZAWA, 1987).

Recently I noticed a paper treating two new genera of the Gelechiidae from North Vietnam

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(OMELKO, 1988). One of them, the genus *Tutor* OMELKO, 1988 was created and its type species, *Tutor acclivis* OMELKO, 1988 was simultaneously described basing on only one male specimen. *T. acclivis* seems to be closely related to the new Taiwanese species judging especially from the male genitalia. Then I concluded that the genus *Tutor* is a junior synonym of *Parastenolechia*.

In this paper I will describe two new species and redefine the genus *Parastenolechia*. Moreover, I comment on asymmetrical features of the male genitalia, considering about the phylogenetic relationships between species of the genus. All the types are deposited in the collection of the Osaka Museum of Natural History (OMNH), Osaka, Japan.

Before going further I wish to express my hearty thanks to Mr. Y. MIYATAKE of the Osaka Museum of Natural History and Dr. Y. YOSHIYASU of the Kyoto Prefectural University for their kindness in critical reading through the manuscript. My cordial thanks are due to Dr. F. KOMAI of the Osaka University of Arts for his helpful suggestions and assistance in literatures. I am much indebted to Dr. R. SATO and Mr. A. SEINO of Niigata Prefecture for their cooperation in collecting the materials.

Genus *Parastenolechia* KANAZAWA, 1985

Parastenolechia KANAZAWA, 1985, Bull. Osaka Mus. Nat. Hist. (38): 6-9. Type species: *Parastenolechia asymmetrica* KANAZAWA, 1985. [Three described species.]

Tutor OMELKO, 1988, Tr. Zool. Inst. SSSR (Leningrad) 176: 131. Type species: *Tutor acclivis* OMELKO, 1988. [Monotypic.] **syn. nov.**

Diagnosis: *Parastenolechia* is recognized by the following supposed synapomorphies: 1) Forewing with veins M_2 and M_3 approximated; 2)in male genitalia, posterior end of tegumen protruded and region of fenestrula concave at center; 3)pedunculus of tegumen very slender; 4)vinculum absent excepting saccus; 5)anterior end of saccus fused with subzonal sheath of aedeagus; 6)basal part of valva with a clavate process bearing several stiff setae apically; 7) costal process of valva greatly developed, extremely slender and elongate, with a bulbous base; 8)in female genitalia, ductus bursae bearing a sclerotized thick plate at junction of ductus seminalis; 9)ductus bursae thick; 10)ductus seminalis conspicuously slender, and bulla seminalis small and indistinct.

Of these characters, autapomorphies of this genus are 1), 3), 7), 8).

External characters: Head whitish, smoothly scaled, with a series of slender dark scales along posterior margin of eye. Ocellus absent. Proboscis well developed, squamose basally. Antenna almost filiform but slightly serrate distally, about 3/5 length of forewing, without pecten, in male rather shorter and thicker than in female; scape elongate, with a dark band before apex on anterior surface; basal 2 flagellar segments almost black, base of each flagellar segment fuscous on anterodorsal surface. Labial palpus white; 2nd segment suffused with dark brown on basal 1/2 of outer surface as well as on outer surface of basal segment, with an incomplete yellow ring near apex; 3rd segment with 2 fulvous or black rings near

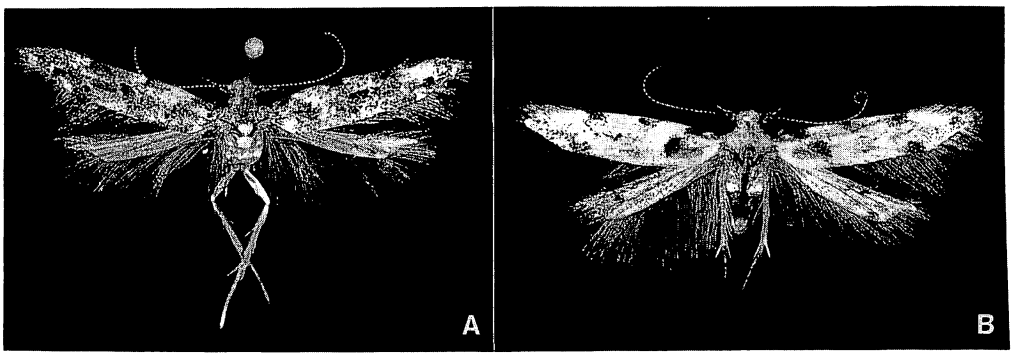

Fig. 1. A, *Parastenolechia formosana* sp. nov., paratype, ♀. B, *Parastenolechia gracilis* sp. nov., holotype, ♂.

base and before apex.

Thorax whitish; tegula whitish as well, with yellowish or fulvous base. Abdomen grayish. Foreleg whitish ochreous; coxa, femur and tibia each with a large fuscous suffusion; 1st and 2nd tarsomeres with a median wide fuscous band and some apical white scales on anterior surface; 3rd and 4th ones entirely fuscous; apical one whitish ochreous. Midleg whitish ochreous; femur with 2 groups of fuscous scales, each near base and before apex on anterior surface; tibia with a wide fuscous band at basal 1/3 and a narrow one at apical 1/4 on anterior surface, bearing 2 tufts of slightly raised scales at basal 1/2 and apex, respectively: tarsus almost fuscous or black on base of 1st to 3rd tarsomeres, other portion whitish ochreous. Hindleg almost whitish ochreous; tibia densely clothed with long and slender specialized hairs above, 1st to 3rd tarsomeres with fuscous spots on posterior surface.

Forewing with veins R_{4+5} and M_1 approximated; Cu1a absent; Cu1b almost vestigial. Hindwing with short section of R_1 which connects Rs with Sc clearly or sometimes indistinctly; $Sc+R_1$ ending at 4/7 of costa; Rs to costa near apex; M_1 absent.

Forewing whitish in ground color, with black markings which are mostly overlaid with raised scales, tinged with fulvous; cilia whitish. Hindwing grayish, almost long trapezoidal, apex acute, termen rather undulate; cilia well developed.

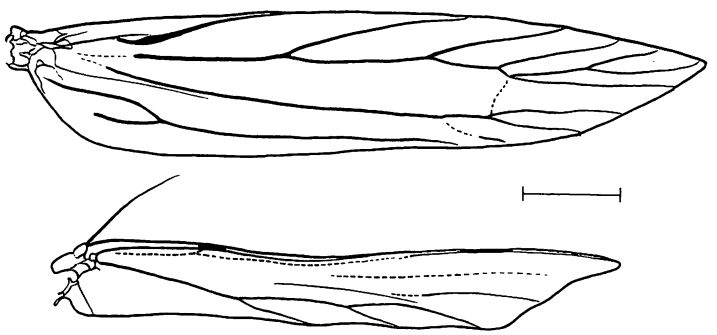

Fig. 2. Wing venation of *Parastenolechia formosana* sp. nov. (Scale: 0.5mm)

*Male genitalia**: Eighth tergum considerably reduced. Eighth sternum well developed, but not covering uncus in normal situation; anterior margin with or without a pair of invaginated apophyses; posterior margin with a central dent in various degrees. A sclerite in intersegmental membrane between 8th and 9th sterna absent. No coremata in intersegmental membrane. Inner pocket absent.

Genitalia rather slender, symmetrical or asymmetrical. Tegumen slender, slightly bending downwards, without tufts and membranous spots seen in *Stenolechia bathrodyas*; pedunculus considerably slender, without lapel. Region of fenestrula concave at center, with a pair of lateral sclerites which are articulated with tegumen and uncus. Uncus various in size and shape; posterior margin densely haired. Gnathos almost as long as uncus, represented by a pair of rather slender lateral sclerites and a ventral sclerite. Minute cuticular process rather developed but restricted on a ventral narrow membranous zone posterior to gnathos. Vinculum absent excepting saccus. Saccus boat-formed, long, weakly tapering towards rather wide anterior end which is characteristically united with ventroproximal portion of subzonal sheath of aedeagus. Valva very specialized, with basal part being a rather broad oblique sclerite which is articulated to pedunuculus in anterodorsal corner and has a clavate process bearing several stiff setae at its apex; an extremely long, slender process of costa arising from dorsal portion of valva, having a bulbous base anteriorly projected; a short process of sacculus arising from ventral corner of valva, tightly connected with saccus at base, bearing several hairs. Aedeagus relatively long, slightly shorter than tegumen; subzonal sheath moderately long; suprazonal sheath slightly tapering apically, curved ventrally, with a subapical dorsal area membranous; cornutus indistinct, seemingly composed of numerous minute spinules.

Female genitalia: Seventh abdominal segment rather enlarged. Ostium situated on intersegmental membrane posterior to 7th sternum. Ductus bursae thick, about 0.9 the length of apophysis posterioris, bearing a sclerotized thick plate at junction of ductus seminalis. Corpus bursae almost fusiform, about 0.7 as long as ductus bursae. Signum situated in basal portion of corpus bursae, represented by a subtriangular basal plate with a pair of short flattened processes or a ring with several teeth. Ductus seminalis originating from near ostium, conspicuously slender, almost as long as ductus bursae; bulla seminalis small and indistinct. Eighth segment slender; tergum medially membranous, divided into two lateral sclerites each with several hairs at posterior margin; apophysis anterioris very long, evenly tapering anteriorly and slightly curved dorsally; sternum almost membranous medially. Apophysis posterioris elongate, 2-2.6 times as long as apophysis anterioris.

Species groups: The genus *Parastenolechia* contains the 6 following nominal species from East Asia: *P. asymmetrica* KANAZAWA, 1985 from Taiwan, *P. issikiella* (OKADA, 1961) from Japan, *P. argobathra* (MEYRICK, 1935) from China and South Korea, *P. acclivis* (OMELKO, 1988) comb. nov. from North Vietnam, *P. formosana* sp. nov. from Taiwan, and *P. gracilis* sp. nov. from Japan. The genus is subdivided into the following two species groups, *P. asymmetrica* group and *P. formosana* group.

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* The terminology was mainly referred to Shirôzu (1960).

The *P. asymmetrica* group. This group consists of *P. asymmetrica*, *P. issikiella*, and *P. argobathra*. The group is characterized as follows: Medium-sized moths with forewings of 3.6-7.1mm length; abdominal 8th sternum in male not specialized and without a pair of invaginated apophyses in anterolateral margin and a median incision in posterior margin; male genitalia not so slender, pedunculus of tegumen not so abruptly twisted outwardly, aedeagus moderately thick, subzonal sheath not erected and not directed dorsally. There seem to be the features characterizing this group in the female genitalia such as 7th abdominal segment with a pair of deep invaginations on posterior 1/2 of lateral membranous regions, the sclerite on ductus bursae being near ostium, and signum with a pair of inner processes.

The *P. formosana* group. This group, to which *P. formosana* sp. nov., *P. acclivis*, and *P. gracilis* are belonging, is characterized as follows: Small-sized moths with forewings of 3.8-4.6mm length; 8th abdominal sternum in male specialized and with a pair of invaginated apophyses in anterolateral margin and a median deep incision in posterior margin; male genitalia rather slender, pedunculus of tegumen abruptly twisted to outwards, aedeagus entirely slender and curved ventrally, subzonal sheath erected and directed dorsally. Since a female genitalia is known in the only one species *P. formosana* of three species of the *P. formosana* group, I cannot comment on female genitalia of this group in detail.

Asymmetrical genitalia: In the male genitalia of *P. formosana*, the left pedunculus of the tegumen is long and its anterior apex is projected beyond the anterior apex of succus of vinculum, while the right pedunculus elongate in the male genitalia of *P. acclivis*. Furthermore, *P. asymmetrica* has asymmetrical male and female genitalia. The genus *Parastenolechia* can be characteristic of the phenomenon that many species have asymmetrical genitalia. At this occasion I would like to comment on the phenomenon in the respect of the phylogeny of the group.

P. issikiella is possible to be a junior subjective synonym of *P. argobathra* (KANAZAWA, 1985). *P. formosana* is closely related to *P. acclivis* with a possibity of being synonymous as mentioned later. Based on the materials of 4 species, *P. asymmetrica*, *P. issikiella*, *P. formosana*, and *P. gracilis*, the phylogenetic relationships are reconstructed by a cladistic analysis. *P. asymmetrica* and *P. issikiella* are thought to form a monophyletic group and are shared with synapomorphies as never seen in the other genus, *i. e.*, the large base of the costal process in the male genitalia, the 7th female abdominal segment with a pair of lateral emarginations, the plate of signum with a pair of inner processes in the female genitalia. On the same way *P. formosana* and *P. gracilis* are thought to form a monophyletic group which is characterized by synapomorphies, for example the 8th male abdominal sternum with a pair of anterolateral invaginated apophyses and a median deep incision in posterior margin.

Each of these two group contains one species with the asymmetrical genitalia and another species with the symmetrical genitalia. So far as I know, a small number species of Noctuidae, Pyralidae, Geometridae, Gracillariidae, and Gelechiidae have the asymmetrical genitalia. It is apparent that most of the species with the asymmetrical genitalia were derived from ancestor species with symmetrical genitalia. In the case of the genus *Para-*

stenolechia, *P. asymmetrica* and *P. formosana* are thought to have been speciated from an ancestor species like as *P. issikiella* and *P. gracilis*, respectively. As a result it is suggested that this asymmetry phenomenon is a very interesting sample of parallel evolution. Additional cases are needed for this conclusion.

Parastenolechia formosana sp. nov.

(Figs. 1A, 2, 3, 4)

Head whitish ochreous, speckled with fuscous, as most of dorsolateral scales marked with a fuscous apical band. Antenna whitish ochreous in ground color; scape with an obscure fuscous band near apex. Labial palpus whitish ochreous in ground color.

Thorax whitish ochreous and scattered with many fuscous scales; tegula whitish ochreous. Abdomen gray above with whitish scales apically, below almost whitish ochreous. Legs whitish ochreous.

Forewing 3.7-4.1mm, whitish ochreous, speckled with fuscous and fulvous, and having following dark fuscous markings: 3 blackish spots on costa, which are accompanied by fulvous scales, each a small dot near base, 2 comparatively large ones at 1/3 and 3/5; 4 groups of raised scales on fold, each near base (black), at 1/3 (black and white), at 2/3 (only white), at distal end (black and white); 3 black spots on discal area, 2 medium-sized ones at 2/3 and distal end, a small one at 4/5; 3 obscure black spots near distal end; cilia ochreous with 2 rows of dark fuscous speckles. Hindwing whitish gray.

Male genitalia: Eighth tergum very short, about 1/17 as long as 8th sternum. Eighth sternum with a pair of slender invaginated apophyses anterolaterally and a incision at center of posterior margin; apophysis rather slender, with a bluntly pointed apex, about 0.35 as long as entire sternum; posteromedial incision not so large as in *P. gracilis*.

Genitalia asymmetrical except for uncus and gnathos as seen in *P. asymmetrica*, extremely flattened. Tegumen not slender, subtriangular in dorsal view, not strongly projecting posteriorly and not tapering to a bluntly pointed posterodorsal apex as in the other species; pedunculus conspicuously elongate, twisted slightly, left one longer than right. Uncus subtriangular in dorsal view, tapering to a bluntly pointed and slightly ventrally curved apex. Saccus subtriangular in ventral view, twisted slightly. Basal part of valva slender, with a nipple-like process near posterior end. Costal process conspicuously elongate; left process longer than right, extending laterally to opposite side, strongly curved at basal 1/4, slightly curved posteriorly at middle, extending laterally in distal 1/4, and ending at a sharply pointed apex; right process directed posteriorly, curved outwards at basal 1/3, winding under uncus, and ending at a sharply pointed apex which is directed to anteriorly. Sacculus almost as long as saccus; process bearing a ventrally bending hook, with a lateral membranous lobe laterally which has several short hairs. Aedeagus moderately long, slightly twisted leftwards; subzonal sheath extending dorsally, opening of ductus ejaculatorius leaning to left; suprazonal sheath strongly curved ventrally, with peri-vesical area small and leaning to left.

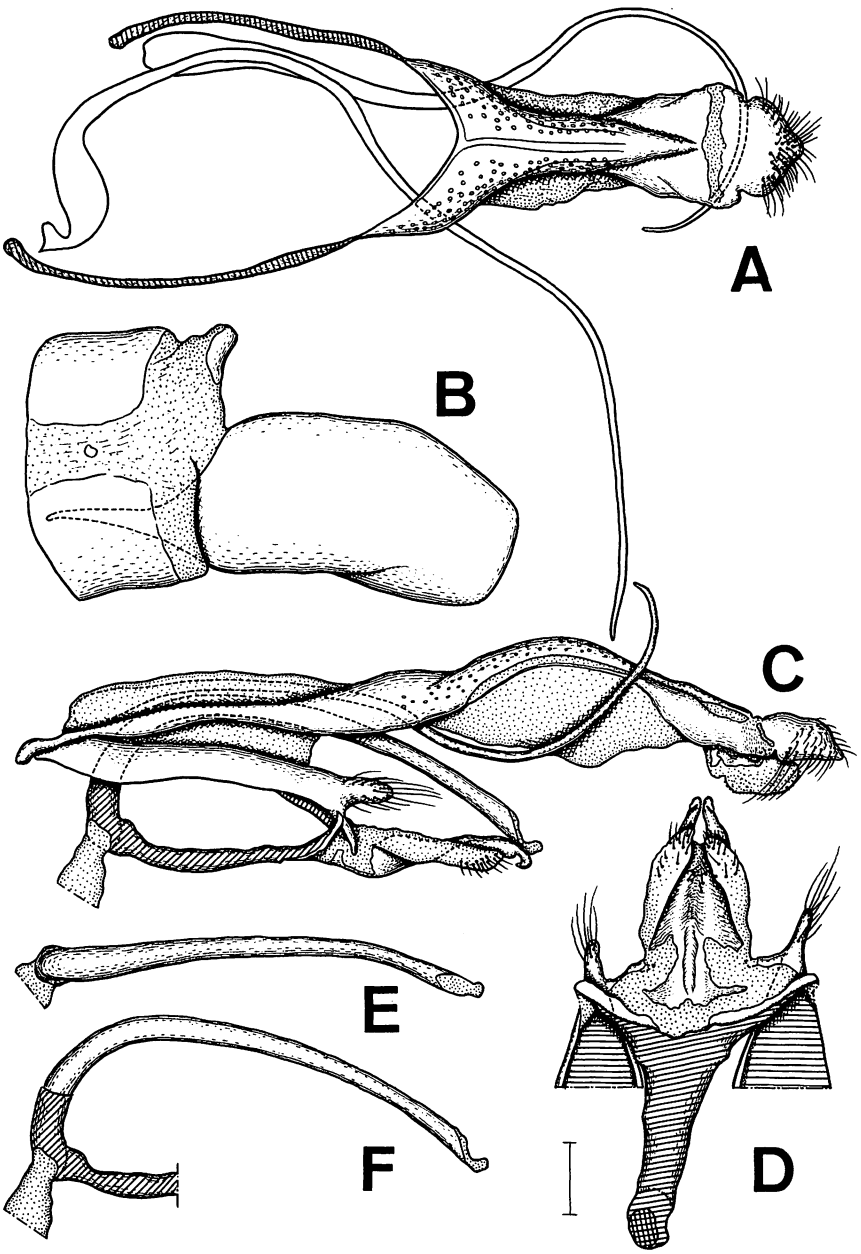

Fig. 3. Male genitalia of *Parastenolechia formosana* sp. nov. A, Dorsum in dorsal view. B, Pregenital segments in lateral view. C, Genitalia in lateral view. D, Saccus and sacculus in ventral view. E, Phallus in dorsal view. F, Ditto in lateral view. (Scale: 0.1mm)

Female genitalia: Ductus bursae bearing a long whirling thickening which is tapering anteriorly. Signum formed to be a ring-like sclerite with several teeth. Eighth segment with some short hairs in posterior margin. Apophysis posterioris about 2.5 times as long as apophysis anterioris.

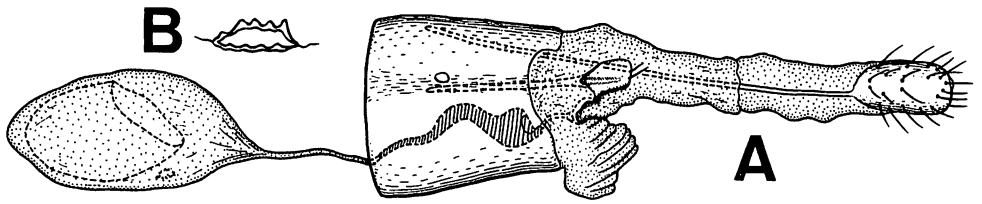

Fig. 4. Female genitalia of *Parastenolechia formosana* sp. nov. A, Ditto in lateral view. B, Signum.

Distribution: Taiwan.

Holotype: ♂ (OMNH TI 33), Lushan-wenchuan, Nantou Hsien, Taiwan, 15-16. viii. 1983 (I. KANAZAWA), forewing 3.7mm in length.

Paratypes: [TAIWAN] 1♂1♀, same data as for the holotype excepting size of forewing.

Remarks: This species is closely related to *P. acclivis* comb. nov., but is easily distinguished from it by the following respects: In the male genitalia of *P. formosana*, the left pedunculus of the tegumen is longer than the right one, the right costal process is strongly curved under the uncus, and the base of the costal process is larger than in *P. acclivis*. While, the left pedunculus is shorter than the right one, and the left costal process is strongly curved under the uncus, the base of which is smaller in *P. acclivis*.

***Parastenolechia gracilis* sp. nov.**

(Figs. 1B, 5)

Head almost white. Scape of antenna and labial palpus light yellowish white in ground color.

Thorax ochreous white above; mesoscutum with fulvous scales on posterior margin; tegula concolorous with thorax but fulvous base. Abdomen gray, scattered with white scales in posterior portion.

Forewing 4.6mm, whitish ochreous with following dark markings: a medium-sized black spot at base of costa, 2 small black spots surrounded by fulvous scales at 1/3 and 2/3 on costa; 3 black spots containing black raised scales on fold, large ones at 1/3 and distal end, and a very small dot at 1/3; 2 small black dots on discal area at 2/3 and distal end; fulvous scales and fuscous ones scattered in distal 1/3; cilia whitish ochreous, with a rather clear row of fuscous speckles. Hindwing whitish gray.

Male genitalia: Eighth tergum small, about 0.1 the length of 8th sternum. Eighth sternum with a pair of invaginated apophyses anterolaterally and a median incision in posterior margin as in *P. formosana*; apophysis very thick and almost subtriangular, about 0.3 as long as 8th sternum, rather longer than incision.

Genitalia symmetrical and extremely slender. Tegumen almost rocket-form and widest at basal 3/4 in dorsal view; pedunculus rather thick strongly twisted outwards, slightly swelling to thick anterior portion. Uncus column-form and widest at middle, bearing some long hairs

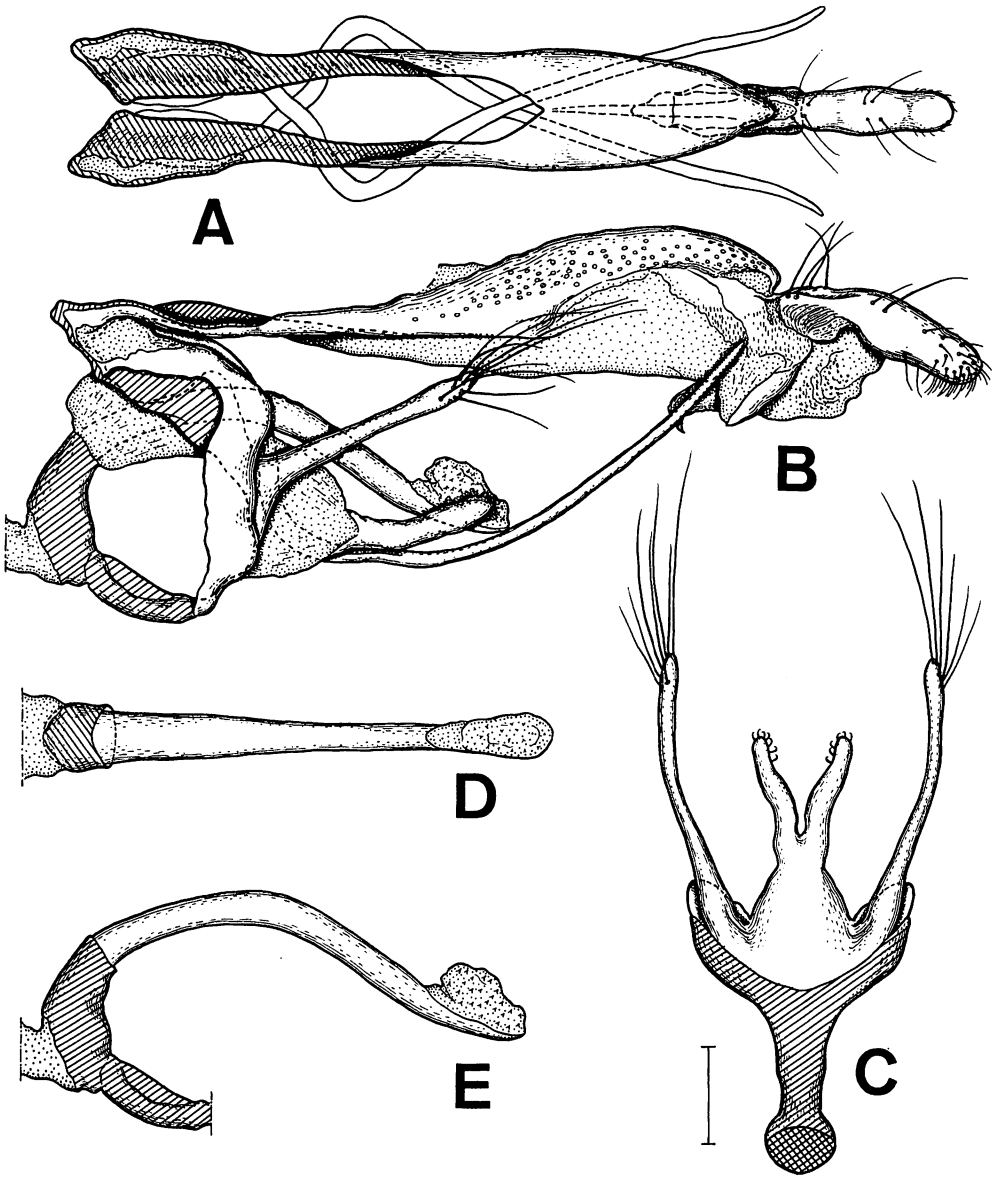

Fig. 5. Male genitalia of *Parastenolechia gracilis* sp. nov. A, Dorsum in dorsal view. B, Genitalia in lateral view. C, Saccus and sacculus in ventral view. D, Phallus in dorsal view. E, Ditto in lateral view. (Scale: 0.1mm)

anterodorsally and short dense hairs posteroventrally. Basal part of valva rather narrow, with a clavate process which is almost straight, long, and directed posterodorsally. Costal process firstly extending innerventrally, crossed over each other at basal 1/4, then curved dorsolaterally at 2/5, characteristically recrossed over each other at 1/2, slightly tapering to a pointed and dorsolaterally directed apex, basal portion longer than wide. Sacculus about 1/3 as long as tegumen; saccular process almost finger-form and slightly dorsolaterally.

Aedeagus almost cylindrical; subzonal sheath thick, erected and slightly curved ventrally; suprazonal sheath gradually tapered, rather strongly curved ventrally at basal 1/2, with peri-vesical area on apical 1/5. Cornutus composed of numerous minute spinules.

Female: Unknown.

Distribution: Japan (Kyushu).

Holotype: ♂ (OMNH TI 34), Mt. Hiko-san, Fukuoka Pref., Kyushu, Japan, 22. vi. 1979 (I. KANAZAWA), forewing 4.6mm in length.

Remarks: This new species resembles *P. issikiella* in appearance, but is easily distinguished from the latter in the slenderer uncus, the costal processes of the valvae which are crossed over each other twice, the very long clavate process of the basal portion of the valva, and the erected subzonal sheath in the male genitalia.

Parastenolechia acclivis (OMELKO, 1988) comb. nov.

Tutor acclivis OMELKO, 1988, Tr. Zool. Inst. SSSR (Leningrad) 176: 131-133.

Remarks: I have never examined any specimens of *P. acclivis*. This species, which was described basing on the only one male specimens from North Vietnam, is very similar to *P. formosana* sp. nov. judging especially from the figure of the male genitalia in OMELKO (1988). Although both species have asymmetrical male genitalia, structures of these genitalia are reverse to each other. I could not find out any conspicuous difference between these two species excepting the respects noted in "Remarks" in the description of *P. formosana*. There are two possibilities of understanding this situation. One is that the figure of the genitalia in *P. acclivis* is misdrawing and both are perfectly same species. The other is that the population of North Vietnam of *P. acclivis* is closely related to the population of *P. formosana* in Taiwan as these two species have been recently speciated from a common ancestor species. It is also necessary to examine the possibility of coexistence of both types of asymmetrical genitalia in the same population. However, I cannot interpret this situation as the latter case in any other way at present time.

In this paper, I describe *P. formosana* as a new species in detail in order to resolve the above-mentioned problem by detailed comparison between the two species based on additional materials. Consequently, this species is transferred to *Parastenolechia*.

Literature Cited

KANAZAWA, I. 1985. Description of a new genus and a new species of Gelechiidae from East Asia (Lepidoptera: Gelechioidea). Bulletin of the Osaka Museum of Natural History (38): 5-16.

KANAZAWA, I. 1987. Asymmetrical genitalia seen in two species of the *Stenolechia* group (Lepidoptera: Gelechiidae). Abstracts of the 47th annual meeting of the Entomological Society of Japan: 52. (in Japanese)

OMELKO, M. M. 1988. Two new genera and new species of moths from the subfamily Gelechiinae (Lepidoptera, Gelechiidae) from Vietnam. Trudy Zoologicheskogo Instituda an SSSR (Leningrad) 176: 129-133. (in Russian with English summary)

SHIRÔZU, T. 1960. *Butterflies of Formosa in Colour*. Hoiku-sha, Osaka, 481p, 76 pl. (in Japanese)