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# SYSTEMATIC NOTES ON THE GENUS *CLAASSENIA* WU (PLECOPTERA: PERLIDAE), WITH DESCRIPTION OF A NEW SPECIES

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## ABSTRACT

*Claassenia drukpa* sp. n. is described from Bhutan, a lectotype is designated for *C. manchuriana* (Banks) and it is placed as a synonym of *C. radiata* (Klapálek). *Claassenia semibrachyptera* Wu & Claassen is redescribed from the holotype and paratype specimens in the United States National Museum and the egg of *Claassenia sabulosa* (Banks) is redescribed from scanning electron micrographs. Four additional Asian species are described under informal designations.

**Keywords:** Plecoptera, *Claassenia,* new species, Asia

## INTRODUCTION

Genus *Claassenia* was proposed by Wu (1934) as a replacement name for *Adelungia* Klapálek (1914) when it was found to be pre-occupied. The genus has never been revised, but the group has continued to grow as more species have been added, most recently by Wu (1973). Currently, 12 species are recognized as valid (DeWalt et al. 2010; Sivec et al. 1988), but most species are poorly known, often from one life stage, making species determinations for Asian *Claassenia* difficult. Stark & Gaufin (1976) and Sivec et al. (1988) each provide an overview of the generic characters in all life stages. Presently the genus is known from several mainland Asian species and from a single species found in North America (Sivec et al. 1988; Stark & Gaufin 1976).

In this study we examine available types of *Claassenia* species and utilize what little unstudied and fresh material is available. This includes specimens from the British Museum of Natural Histoy, London (BMNH), the Institute of Zoology, Academia Sinica, Beijing (IZAS), the Museum of Comparative Zoology, Cambridge, Massachusetts (MCZ), the National Museum of Natural History, Prague (NMNH), the Slovenian Museum of Natural History, Ljubljana (PMSL), the Snow Entomological Collection, University of Kansas, Lawrence, Kansas (SEC), the Stark collection, Mississippi College, Clinton, Mississippi (BPS), the United States National Museum of Natural History, Washington (USNM), and the Zoological Institute, Russian Academy of Sciences, St. Petersburg, Russia (ZIRA). The results support recognition of one new species from Bhutan and allow placement of *C. manchuriana* (Banks) as a synonym. Four additional species are described under informal designations.

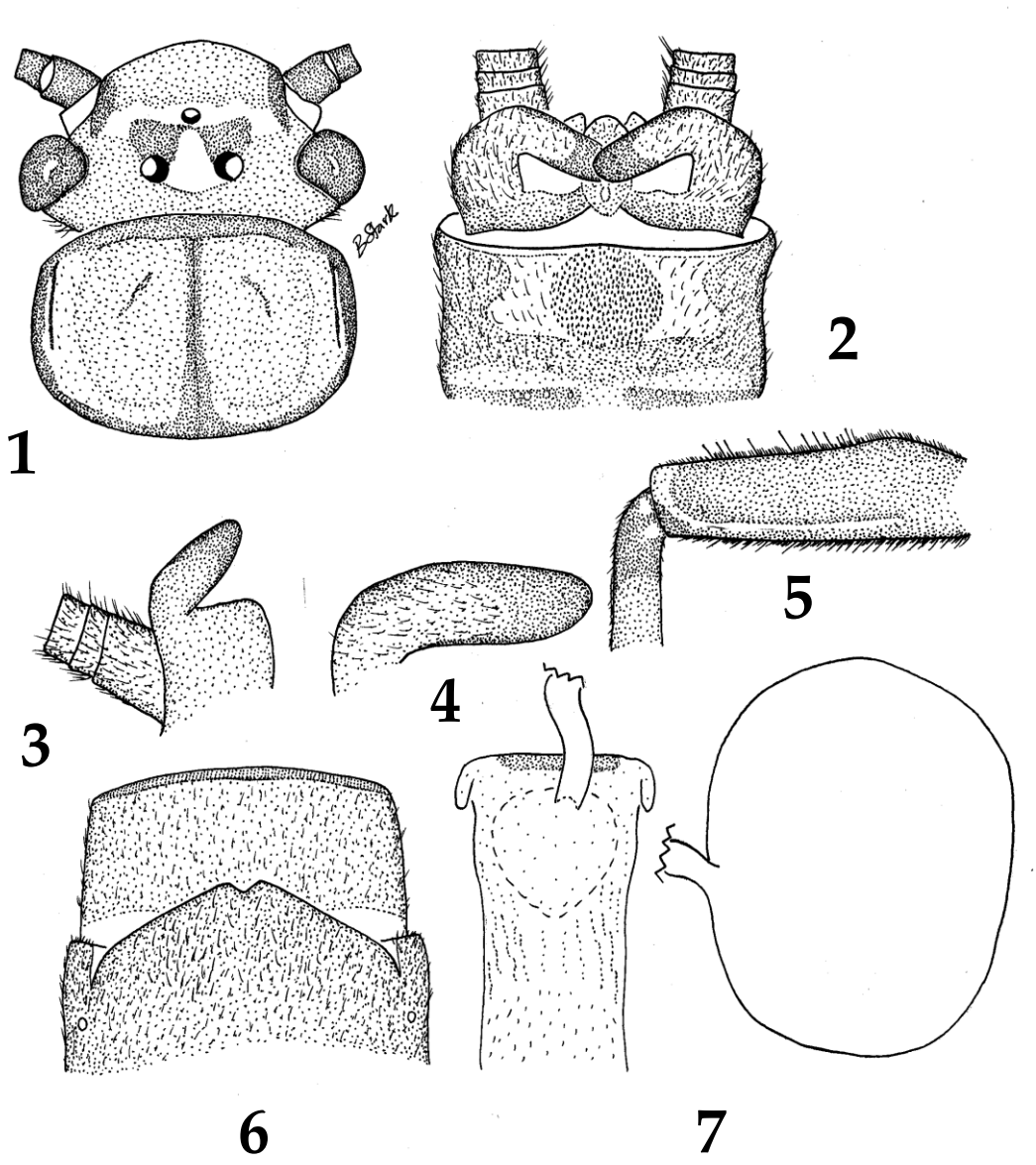
## RESULTS AND DISCUSSION

### *Claassenia drukpa* sp. n.

(Figs. 1-11)

**Material examined.** Holotype ♂ and 2♂, 1♀ paratypes from Bhutan, Punakha, Dungkhar Rongchhu, 27° 29′ N, 89° 46′ E, 1370 m, 24 April 2006, H. Malicky (PMSL).

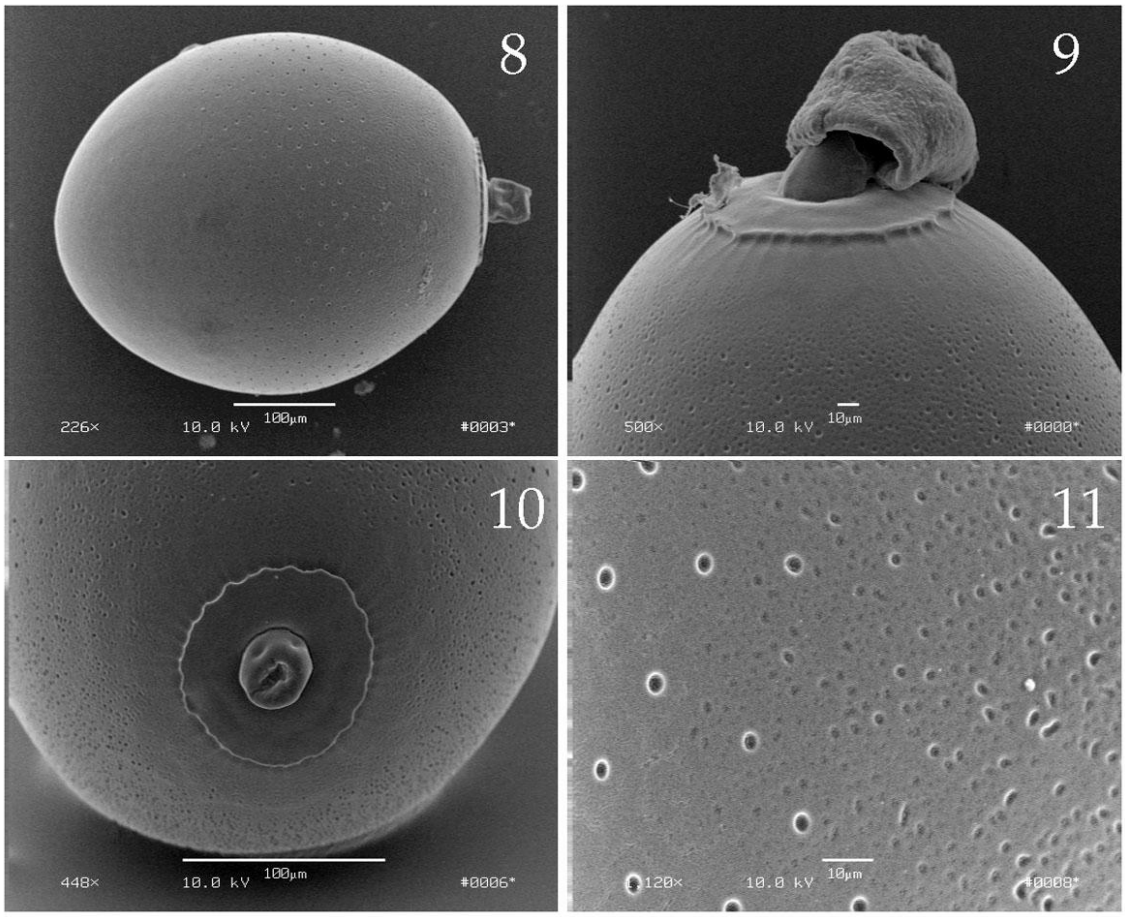
**Adult habitus.** General color tan patterned with darker brown. Head with dark pigment in ocellar




Figs. 1-7. *Claassenia drukpa* structures. 1. Head and pronotum. 2. Male genitalia, dorsal. 3. Male hemitergum and cercal base, lateral. 4. Male hemitergum, lateral. 5. Foreleg. 6. Female abdominal sterna 8-9. 7. Vagina and spermatheca.

triangle invaded by pale pigment (Fig. 1); lappets dark brown but most of head pale brown. Basal antennal segment brown, segments 2-3 dark brown and remainder of flagellum pale brown. Pronotum margined laterally, posteriorly, anteriorly and along median suture with dark brown pigment; disk pale brown. Femora mostly pale brown, tibiae dark at knee but pale brown over most of surface (Fig. 5). Wings with pale brown tint.

**Male.** Brachypterous, forewing length ca. 5 mm. Hemitergal lobes short, finger-like, projecting upward in lateral aspect and slightly forward of median in dorsal aspect (Figs. 2-4); apical third and dorsal margin of hemiterga dark brown. Tergum 9 bearing a median hump covered with a circular patch of small sensilla basiconica (Fig. 2).




Figs. 8-11. *Claassenia drukpa* egg. 8. Egg, lateral. 9. Collar end with anchor. 10. Collar end, apical aspect. 11. Chorionic detail.

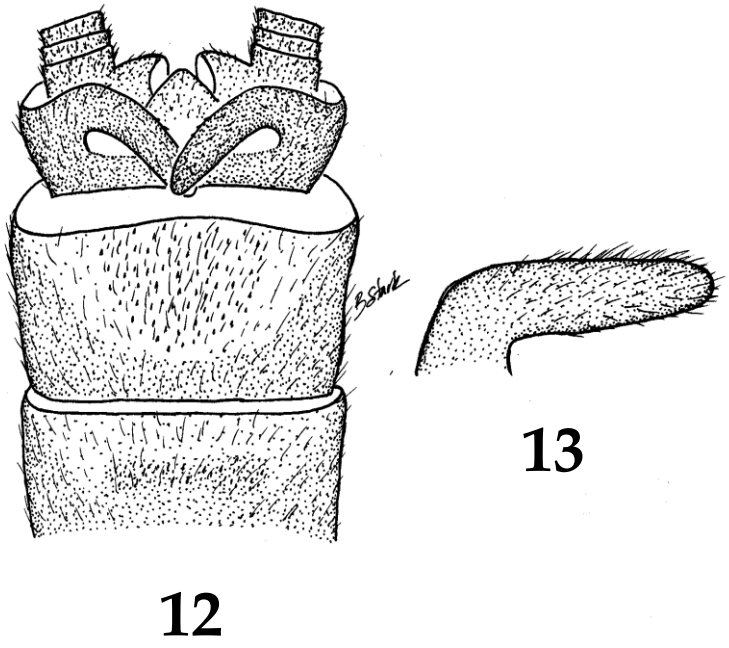
**Female.** Macropterous, forewing length ca. 26 mm. Subgenital plate projects over base of sternum 9 as a short triangular process with shallow median notch on posterior margin (Fig. 6). Vagina a membranous flattened bag with rectangular outline and short, partially fused accessory glands at anterior angles; anterior margin of vagina bearing a median sclerite and posterior half sparsely lined with fine setal spines (Fig. 7). Spermatheca swollen, balloon-like and attached to vagina by a short, slender stalk.

**Larva.** Unknown.

**Egg.** Outline oval, length ca. 420 µm, equatorial width ca. 354 µm (Fig. 8). Collar button-like, set on a raised, disc-like platform ca. 100 µm in diameter; margins irregularly crenulate and bearing short, obscure vertical struts (Figs. 8-10); anchor a relatively plain membranous bell-shaped structure with short cylindrical pedicel (Fig. 9). Chorionic surface punctate throughout, but mesal band including mixed larger, regularly spaced punctations and smaller irregularly spaced ones (Fig. 11); punctations on anterior pole shallow, fine and barely discernable at 500X. Micropylar row subequatorial, set ca. 135 µm from anterior end.

**Etymology.** The species name, used as a noun in apposition, is based on the Bhutanese word for dragon people, and honors the people and history of Bhutan.

**Diagnosis.** Males of this species are distinguished by the short, upwardly directed hemiterga and females




Figs. 12-13. *Claassenia radiata* holotype structures. 12. Male genitalia, dorsal. 13. Male hemitergum, lateral.

by the triangular, projecting and apically notched subgenital plate. This species is the only known *Claassenia* in which the egg form varies from the usual spindle shape.

### *Claassenia radiata* (Klapálek)

(Figs. 12-13)

*Adelungia radiata* Klapálek, 1916:78. Holotype ♂ (NMNH), Manchuria
*Claassenia radiata*: Wu, 1938:144.
*Acroneuria manchuriana* Banks, 1920:315. Lectotype ♂ (USNM), Yalu River, Manchuria/Korea. New synonymy

**Material examined.** China: Manchuria, 1♂ (*radiata* holotype, NMNH). Manchuria and Korea:Yalu River, 150-200 miles from mouth, May 1914, A. DeC. Sowerby, 1♂ (*manchuriana* lectotype, USNM). Same data, 1♂ (USNM).

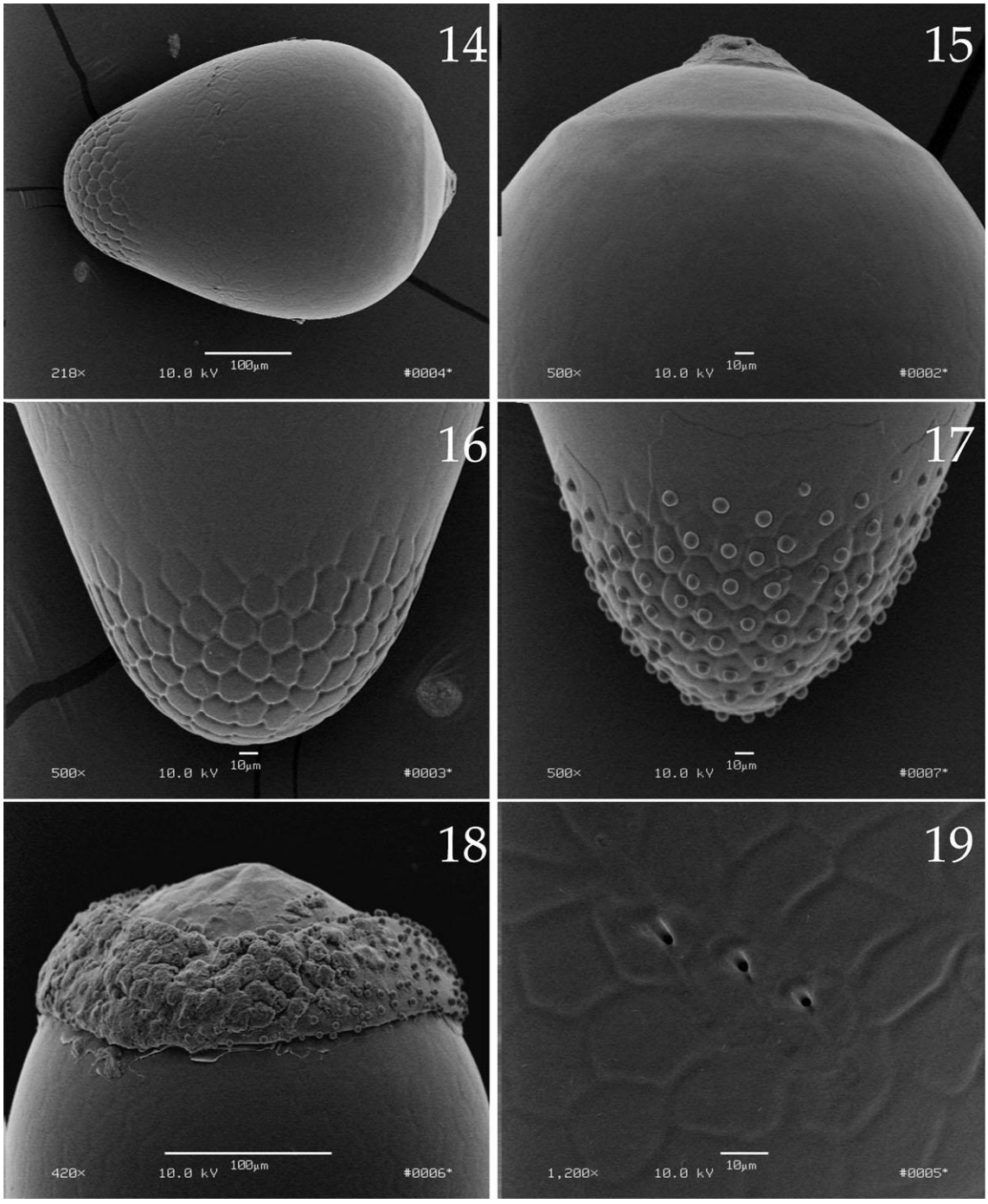
**Adult habitus.** Color pattern obscured by specimen condition. The following details are extracted from Banks (1920) description of *C. manchuriana*. Head mostly dull yellowish but ocellar area connected by a black V-mark. Abdomen dark above and yellow brown ventrally. Wings and veins brown.

**Male.** Macropterous, forewing length 22-25 mm. Hemitergal lobes slender, finger-like and more or less cylindrical for most of length in both dorsal (Fig. 12) and lateral (Fig. 13) aspect; dorsal margin bearing a few sensilla basiconica. Tergum 9 armed with a field of small sensilla basiconica scattered over mesal hump; a smaller patch of sensilla basiconica occurs on tergum 8. Aedeagus a slender, membranous cylinder armed mid-ventrally with a patch of microtrichia and armed dorsolaterally with a sparse field of fine setal spines beyond midlength.

**Female.** The following data are extracted from Banks (1920). Forewing length about 28 mm (wing expanse 60 mm). Subgenital plate slightly concave and projecting little beyond posterior margin of sternum 8.

**Larva.** Unknown.

**Comments.** The type series of *C. radiata* and *C. manchuriana* are from the same region and our study of the male types of both species indicate they are morphologically indistinguishable. Consequently, we place *C. manchuriana* as a junior synonym of *C.*




Figs. 14-19. *Claassenia sabulosa* egg. 14. Egg, lateral. 15. Collar end. 16. Anterior end. 17. Anterior end with intact extrachorionic membrane. 18. Anchor. 19. Micropyles.

*radiata*. The type series for *C. manchuriana* includes, according to Banks (1920) "six specimens" all from the same site, and at least one of these is a female. In 1974, one of us (BPS) studied a specimen bearing a type label which has been regarded as the holotype of *C. manchuriana*. Although apparently no other USNM specimen from this series bears such a label, we designate the male specimen from the USNM series bearing the "type" label as lectotype in order to provide stability for this name. We have seen only the lectotype and one additional male from the USNM; the female specimen may have been lost.

### *Claassenia sabulosa* (Banks)
(Figs. 14-19)

*Perla sabulosa* Banks, 1900:242. Holotype ♀ (MCZ), Washington, Yakima
*Adelungia arctica* Klapálek, 1916:78. Syntype ♂, ♀ (BMNH ?), Arctic America. Synonymy by Ricker (1952)
*Perla languida* Needham & Claassen, 1925:100. Holotype ♂ (Cornell University), Wyoming, Yellowstone River. Synonymy by Ricker (1952)

**Material examined.** Alberta: Bow River, ca. 1 mi S Cochrane, 3 September 1974, L. Dosdall, 1♂, 1♀ (BPS). California: Siskiyou Co., Klamath River, Sarah Totten Campground, 8 July 1979, B. Stark, K.W. Stewart, 1♂ (BPS). Colorado: Mesa Co., Colorado River, 2 mi SE DeBeque, 11 August 1973, B. Stark, R.W. Baumann, 2♂, 1♀ (BPS). Montana: Lincoln Co., Yaak River, Hwy 2, Yaak River Campground, 19 July 1979, B. Stark, K.W. Stewart, R.W. Baumann, 1♂, 1♀ (BPS). Park Co., Yellowstone River, Pray, 21-26 July 1989, B. Stark, J. Parham, T. Moore, D. Tanner, 20♂, 4♀ (BPS). Park Co., Yellowstone River, Hwy 89, Yankee Jim River Access, 19 August 2004, B. Stark, I. Sivec 2♂, 1♀ (BPS). Utah: Summit Co., Weber River, 1 mi W Peoa, 16 July 1974, B. Stark, 4♂ (BPS). Uintah Co., Green River, Dinosaur National Monument, 2 July 1974, B. Stark, 5♂ (BPS). Washington: Yakima, 1♀ (*sabulosa* holotype, MCZ).

Adults of this species are illustrated in Baumann et al. (1977), Stark (2004), Stark & Gaufin (1976) and Stewart & Stark (2008), larvae are described and illustrated by Stewart & Stark (2002), and SEM images of the eggs are available in Stark (2004) and Stark & Gaufin (1976). Additional images and comparative details are provided below for the egg.

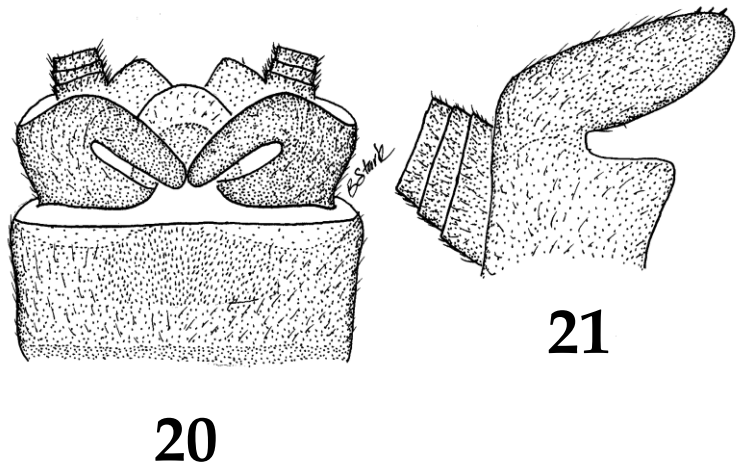
**Egg.** Spindle shaped with low button-like collar (Figs. 14-15). Total length ca. 440-450 µm, equatorial width ca. 314-320 µm. Anchor cap-shaped, margins studded with mushroom bodies, but crown bare (Fig. 18). Most of chorionic surface covered with obscure, hexagonal follicle cell impressions; anterior pole covered with more prominent follicle cell impressions for apical length of ca. 73-79 µm (Fig. 16); external membrane on anterior pole bearing a single mushroom body over each follicle cell impression (Fig. 17). Micropylar row subequatorial , located ca. 170-180 µm from anterior end (Fig. 19).

**Comments.** The holotype female of this species was studied by one of us (BPS) in 1974. Eggs obtained from that female were found to be consistent with those of other populations of *C. sabulosa* from throughout western North America. Ricker (1938) saw and illustrated the types of *C. arctica* and stated they were in the British Museum. Kimmins (1970) list does not include this species, consequently, we are uncertain where these types are presently located.

### *Claassenia semibrachyptera* Wu & Claassen
(Figs. 20-25)

*Claassenia semibrachyptera* Wu & Claassen, 1934:127. Holotype ♂ (USNM), Sichuan Province, between Yachow and Suifu, China
*Perlodes simplicior* Navas, 1934:4. Holotype ♂ (Rijksmuseum van Natuurlijke Historie, Leiden), Sichuan Province, China. Synonymy by Brinck (1954)
*Perlodes brevipennis* Navas, 1934:5. Holotype ♂ (Rijksmuseum van Natuurlijke Historie, Leiden), Sichuan Province, China. Synonymy by Brinck (1954)
*Perlodes debilior* Navas, 1934:6. Holotype ♂ (Rijksmuseum van Natuurlijke Historie, Leiden), Gansu Province, China. Synonymy by Brinck (1954)

**Material examined.** China: Sichuan Province, between Yachow and Suifu, 27 June-4 July 1930, D.C. Graham, 1♂ (Holotype, USNM). Same data, 1♀ (Paratype, USNM). Sichuan Province, between Suifu and Kiating, 1000-1200', 15 June 1929, 3♂ (Paratypes, USNM). Same location, 26 June-1 July 1930, 2♂, 2♀ (Paratypes) + 2♂ (pinned) (USNM). Sichuan Province, Chengtu to Kuanshien, 2-5 July 1924, D.C. Graham, 1♂ (Paratype, USNM). Sichuan Province, Suifu, 1000', 12 May 1928, D.C. Graham, 1♀ (Paratype, USNM). Sichuan Province, Shin Kaisi, Mt. Omei,




Figs. 20-21. *Claassenia semibrachyptera* structures. 20. Male genitalia, dorsal. 21. Male hemitergum and cercal base, lateral.

4400′, 1-30 July 1921, D.C. Graham, 1♂ (pinned, USNM).

**Adult habitus.** General color yellow brown, wings pale brown with darker veins. Pattern obscured due to specimen condition, but according to Wu (1938) the ocellar triangle is dark and the pronotum bears a median dark band.

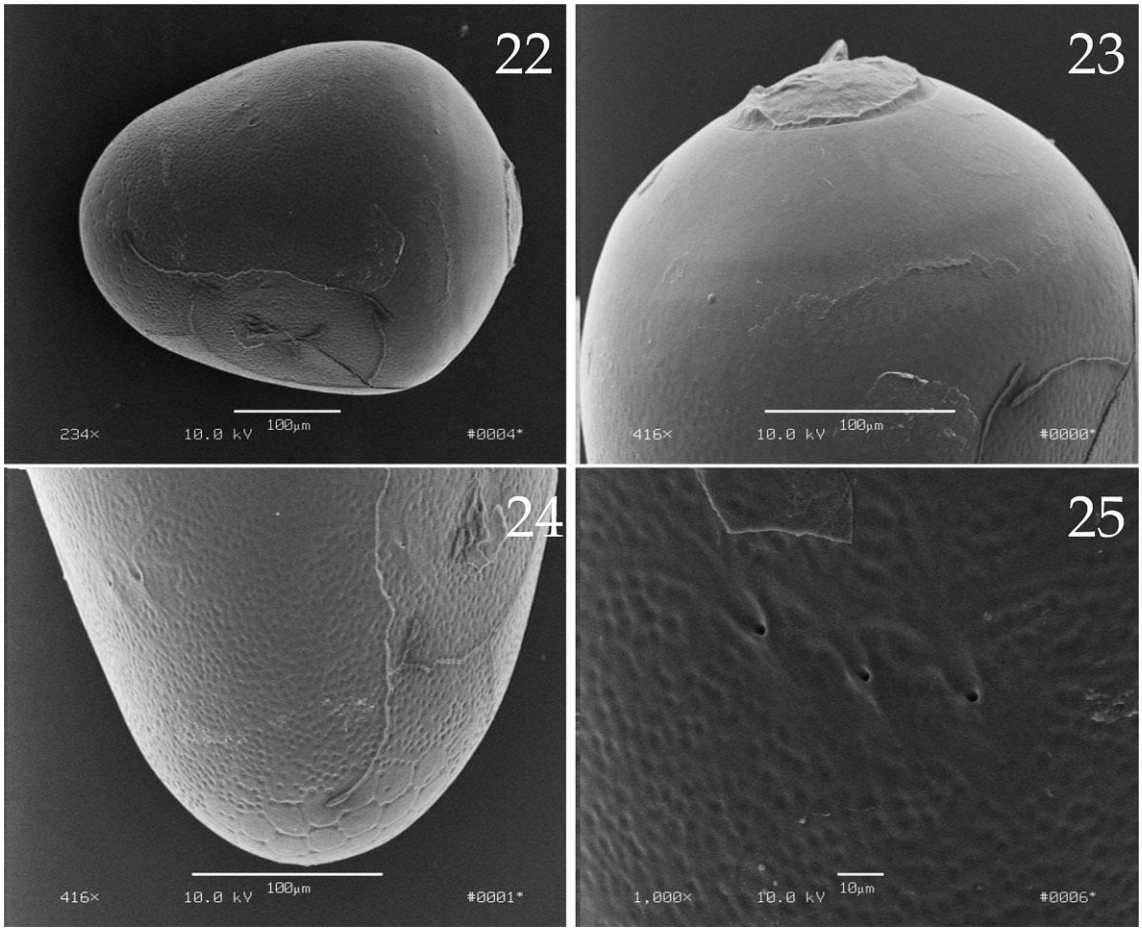
**Male.** Slightly brachypterous or macropterous forewing length 15-28 mm. Hemitergal lobes short, finger-like, straight in lateral aspect (Fig. 21), angled inward to anterior margin of tergum 10 in dorsal aspect (Fig. 20); hemiterga without conspicuous sensilla basiconica. Tergum 9 bearing a wide mesal field of sensilla basiconica set on a low hump. Aedeagus a membranous, cylindrical bag armed on dorsum with a subapical patch of microtrichia, and laterally with a scattered patch of fine setal spines.

**Female.** Macropterous, forewing length ca. 25 mm. Subgenital plate scarcely produced, extending only slightly beyond lateral margins of sternum 8, typical of genus. A patch of microtrichia extends almost completely across the intersegmental membrane of sterna 9 and 10.

**Larva.** Unknown.

**Egg.** Total length ca. 396-417 µm, equatorial width ca. 326-328 µm. Spindle shaped with low, wide button collar (Fig. 22). Chorion covered with shallow pits grouped in obscure follicle cell impressions over much of surface, but anterior end bearing a small area of follicle cell impressions (ca. 3 rows) without pits (Fig. 24) and area near collar smooth (Fig. 23). Micropylar row subequatorial, located ca. 166 µm from anterior end; orifices set in small cup-like depressions with long, smooth sperm guides extending from cup rims (Fig. 25).

**Comments.** Wu (1962) indicates for known species redescribed in his study, that redescriptions are based on "neotypes" because "…various collections in China {were} unfortunately destroyed during wars". On page 150 of the article *C. semibrachyptera* is redescribed and a new type series is listed, despite the fact that the holotype and much of the original paratype series had been placed in the USNM (Wu & Claassen 1934; Wu 1938), and is still intact. The neotype designation for this species (and for others in this same study) appear not to have met the conditions of the code and should, in our opinion, be considered invalid. Brink (1954) indicates the types of *P. simplicior*, *P. brevipennis* and *P. debilior* are in extremely poor condition and are unlikely to have retained distinctive morphological features. Their synonymy is based primarily on sharing a common distribution.




Figs. 22-25. *Claassenia semibrachyptera* egg. 22. Egg, lateral. 23. Collar end. 24. Anterior end. 25. Micropyles.

### *Claassenia* ChA
(Figs. 26-27)

*Claassenia* sp. A Stark & Gaufin, 1976:41.

**Material examined.** China: Sichuan Province, Kuanshien, 2800 ft, 28 July 1938, D.C. Graham, 3♂ (pinned, USNM).

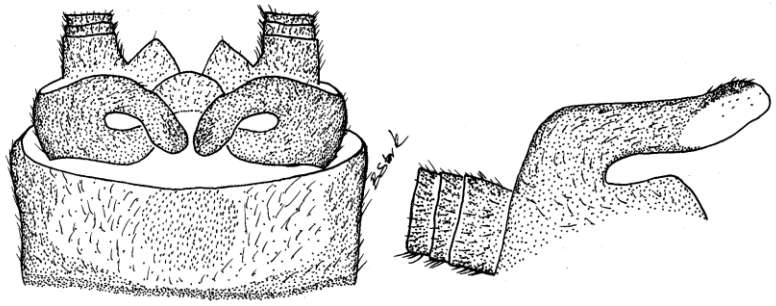
**Adult habitus.** General color yellow brown, pattern obscured by specimen condition. Wing membrane subhyaline, yellow brown, veins brown.

**Male.** Macropterous, forewing length 30-32 mm, body length 22-24 mm. Hemitergal lobes moderately long, curved inward in dorsal aspect with apex slightly swollen, bearing a small patch of mixed sensilla basiconica and fine hairs (Fig. 26); in lateral aspect, hemiterga bend upward near tips (Fig. 27), and are membranous and bare on ventroapical margin. Tergum 9 bears a circular mesal patch of sensilla basiconica.

**Female.** Unknown.

**Larva.** Unknown.

**Comments.** Several species have already been proposed from Sichuan Province [*C. brevipennis* (Navas); *C. caudata* (Klapálek); *C. debilior* (Navas); *C. gigas* (Klapálek); *C. longistyla* Wu; *C. semibrachyptera*; *C. simplicior* (Navas)]. Only *C. semibrachyptera* is sufficiently well known to eliminate as the probable identity of this species. The upturned hemitergal lobes for all three males in this sample suggest a possible distinctive character for species recognition.



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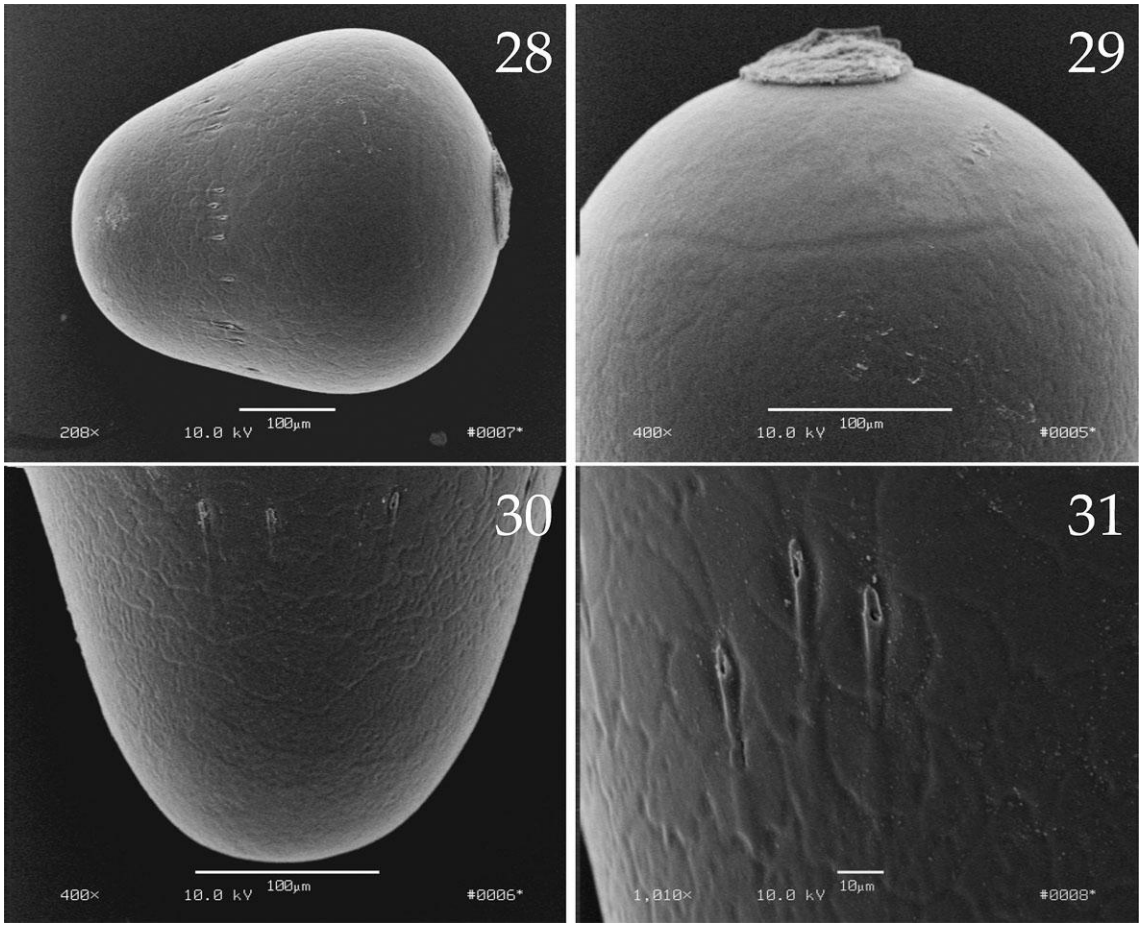
Figs. 26-27. *Claassenia* ChA structures. 26. Male genitalia, dorsal. 27. Male hemitergum and cercal base, lateral.

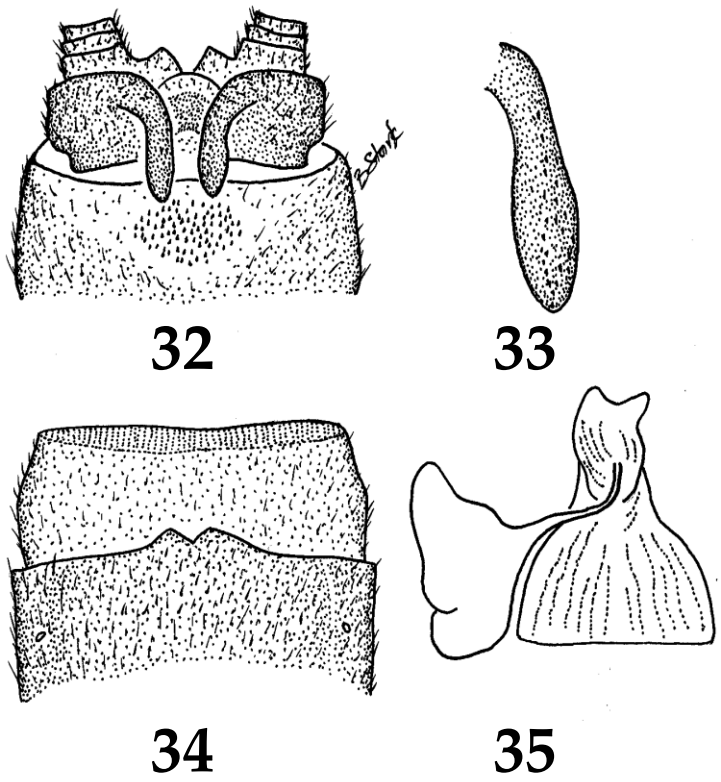



Figs. 28-31. *Claassenia* ChB egg. 28. Egg, lateral. 29. Collar end. 30. Anterior end. 31. Micropyles.

***Claassenia* ChB**
(Figs. 28-31)

Material. China: Fujian Province, Chongan, 1♀ (IZAS).

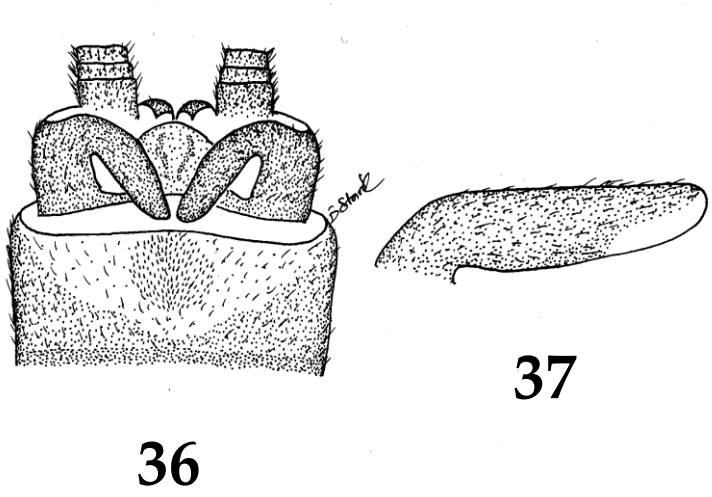
**Adult habitus.** Unknown, notes lost.
**Male.** Unknown.
**Female.** Unknown, notes lost.
**Larva.** Unknown.
**Egg.** Spindle shaped with low, button-like collar (Fig. 28). Total length ca. 446 µm, equatorial width ca. 360 µm. Much of chorion beyond shoulder covered with faint hexagonal follicle cell impressions bearing obscure pits in floors of follicle cell impressions (Fig.30); area surrounding collar without follicle cell impressions (Fig. 31). Micropylar row subequatorial, orifices almost linear, canals vertical (Fig. 31).
**Comments.** One of us (IS) examined a single female in the collection of the Institute of Zoology, Academia Sinica, Beijing and obtained the egg sample. Unfortunately notes and sketches made for this specimen were lost during travel. The egg of this species differs from those of *C. drukpa*, *C. semibrachyptera* and *C. sabulosa* (described above). Additional material is needed in order to determine the identity of this species.




Figs. 32-35. *Claassenia* ChC structures. 32. Male genitalia, dorsal. 33. Male hemitergum, dorsal. 34. Female abdominal sterna 8-9. 35. Vagina and spermatheca.

***Claassenia* ChC**
(Figs. 32-35)

**Material examined.** China: [Sichuan Province], 50 miles NW Chengtu [=Chengdu], 1910, W.N. Ferguson, 1♂, 1♀ (BMNH).
**Adult habitus.** General color brown, head yellowish but with triangular dark brown ocellar spot, pronotum uniformly brown without distinctive rugosities. Legs uniformly brown.



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Figs. 36-37. *Claassenia* MyA structures. 36. Male genitalia, dorsal. 37. Male hemitergum, lateral.

**Male.** Macropterous, forewing length 29 mm. Hemitergal lobes slender, finger-like, but slightly swollen near mid length and positioned parallel to one another for most of length (Fig. 32); inner margins of hemiterga in dorsal aspect bearing a prominent grouping of thick sensilla basiconica along most of length (Fig. 33).Tergum 9 armed with a prominent circular patch of sensilla basiconica, tergum 8 without obvious sensilla basiconica patch.
**Female.** Macropterous, forewing length 40 mm. Subgenital plate produced as a small triangular projection bearing an apical, triangular notch (Fig. 34). Intersegmental membrane between sterna 9-10 with a patch of microtrichia. Vagina broad near orifice and strongly narrowed in anterior third (Fig. 35); spermatheca a large membranous structure on a long slender pedicel.
**Egg.** Spindle shaped with low button-like collar. No specimens available for scanning electron microscopy.
**Larva.** Unknown.
**Comments.** This is another intriguing, and apparently distinctive, species from Sichuan Province. The female subgenital plate is similar to, but much smaller than that of the Bhutanese species, *C. drupka*, described above, and the parallel position and prominent sensilla basiconica of the male hemiterga also appear to be distinctive. Unfortunately, several of the types of *Claassenia* species known from Sichuan province are unavailable to us.

### *Claassenia* MyA
(Figs. 36-37)

*Claassenia* sp. B Stark & Gaufin, 1976:41

**Material examined.** Burma [Myanmar]: Myitkyina, 30 May 1945, L.C. Kuitert, 1♂ (pinned, SEC). Myanmar: 16 km E Putao, Kaung Mu Lon, 28-30 April 1998, S. Murzin, V. Siniaev, 1♂ (ZIRA).
**Adult habitus.** General color brown to dark brown. Head yellow brown with darker pigment over ocellar region. Pronotum brown, legs and wings dark brown.
**Male.** Macropterous, forewing length 29 mm. Hemitergal lobes short, finger-like, narrowed at tip and widest at mid length in dorsal aspect (Fig. 36); dorsal margin straight in lateral aspect, ventroapical margin bare (Fig. 37). Tergum 9 with a large circular patch of sensilla basiconica, tergum 8 with a smaller patch.
**Female.** Unknown.
**Larva.** Unknown.
**Comments.** Both specimens listed above are from the Irrawaddy River drainage of northern Myanmar. These specimens may represent an undescribed species but a larger sample, including gravid females is needed for confirmation.

**ACKNOWLEDGMENTS**

We thank the museums listed in the introduction for permitting access to holotype specimens and other material under their care. We also thank H. Malicky for the gift of specimens from Bhutan.

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