

A new species of *Ditrigona* Moore (Lepidoptera: Drepanidae) in China, with a checklist to the *triangularia*-group

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Abstract: A new species, *D. tenuiata* in the *triangularia*-group of *Ditrigona* Moore, 1888 is described from Sichuan, China. The female genitalia of *D. uniuncusa* are described for the first time. Illustrations of external features and genitalia of this new species and related species are presented. A checklist to the *triangularia*-group is also provided.

Key words: Drepanoidea; Drepaninae; taxonomy

中国白钩蛾属三角白钩蛾种团名录并记一新种（鳞翅目：钩蛾科）

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摘要: 记述产自中国的白钩蛾属 *Ditrigona* 三角白钩蛾种团 1 新种: 纤白钩蛾 *D. tenuiata*, 首次描述单叉白钩蛾 *D. uniuncusa* 的雌性外生殖器。提供了新种及近似种的成虫和外生殖器图, 以及三角白钩蛾种团的物种名录。

关键词: 钩蛾总科; 钩蛾亚科; 分类

Introduction

Ditrigona was originally established by Moore (1888) with *Urapteryx triangularia* Moore, 1867 as type-species. In the taxonomic history of *Ditrigona*, the most famous research of *Ditrigona* was conducted by Wilkinson (1968), who provided a comprehensive revision of the genus, synonymized *Peridrepana* Butler, *Leucodrepana* Hampson and *Leucodrepanilla* Strand with *Ditrigona*, recorded 40 species and 12 subspecies including 23 new species and subspecies, summarized the generic features and the diagnoses of *Ditrigona*, and divided *Ditrigona* into four species-groups based on adult morphology. This revision established *Ditrigona* as a large genus in the Drepaninae, which contains more than 40 species centered in the Indo-Chinese subregion of the Oriental Region (Wilkinson 1968). Recently, Chu & Wang (1988, 1991) recorded 36 species of *Ditrigona* in China, including one new species *D.*

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uniuncusa, and Holloway (1998) named two new species from Borneo. Most recently, Li *et al.* (2015) described one new species *D. clavates* from China.

The *triangularia*-group contains nine species (Wilkinson 1968; Chu & Wang 1988), in which *D. triangularia*, *D. regularis* Warren and *D. uniuncusa* bear elongate posterior projections of the hind wings (tail process), which is absent in the other six species (*D. titana* Wilkinson, *D. pomenaria* (Oberthür), *D. typhodes* Wilkinson, *D. polyobotaria* (Oberthür), *D. sciara* Wilkinson, and *D. fasciata* (Hampson)). Through examination of recently collected specimens of *Ditrigona*, a new species bearing this tail process was discovered, and the female specimens of *D. uniuncusa* were also recognized. In this study, we describe a new species from China, provide diagnostic characters of this new species, present illustrations of adults and genitalia of the new species and related species, describe the female genitalia of *D. uniuncusa*, and provide the checklist of the *triangularia*-group.

Material and methods

Specimens of *Ditrigona* are mainly from the Institute of Zoology, Chinese Academy of Sciences, Beijing, China (IZCAS), and the Natural History Museum, London, United Kingdom (BMNH). Terminology for the genitalia is based on Wilkinson (1968). Photographs of the morphs were taken with digital cameras. Composite images were generated using Auto-Montage software version 5.03.0061 (Synoptics Ltd). The plates were compiled using Adobe Photoshop software.

Taxonomy

Ditrigona Moore, 1888

Ditrigona Moore, 1888: 258. Type species: *Urapteryx triangularia* Moore, 1868, by original designation and monotypy. India: Bengal.

Peridrepana Butler, 1889: 43. Type species: *Drepana hyaline* Moore, 1888, by monotypy. India: Dharmasala.

Leucodrepana Hampson, 1893: 333. Type species: *Leucodrepana idaeoides* Hampson, 1893, by original designation. India: Sikkim.

Leucodrepanilla Strand, 1911: 198. Type species: *Corycia sacra* Butler, 1878, by subsequent designation by Nagano, 1917. Japan: Yokohama.

Generic characters. Head. Antennae serrate, unipectinate, bipectinate or lamellate, male with pectinations longer than in female when unipectinate or bipectinate. Frons not protruding, color various, generally white, yellow or brown, sometimes upper half darker, especially between the bases of antennae. Proboscis well-developed. Labial palpus with length various, but always reaching frons. Vertex usually white, occasionally brown or pale brown.

Thorax. Usually white. Tegula white. Middle tibia with one pair of terminal spurs, and hind tibia with two pairs of spurs in both sexes. Wing pattern. Ground colour of both wings white, yellowish white or buff, sometimes semi-transparent or lustrous. Forewing with costa convex. Outer margin of forewing gently curved or straight; that of hind wing convex, slightly protruding on vein M_3 end, or straight with tail process on anal angle. Forewing with costa buff, brown or greyish brown. Transverse lines on both wings quite various, usually gray or

yellowish brown, straight or wavy, sometimes indiscernible. Underside. Fasciae usually absent but often with transverse lines on upperside discernible; sometimes forewing base decorated with greyish scales at tip per half. Discal spot absent. Fringes usually white, occasionally yellowish brown or greyish in some species of *triangularia* and *mytylata* species-groups. Venation. Forewing with areole present or absent; R_2 - R_4 stalked, or sometimes R_2 - R_5 stalked. Hind wing with $Sc+R_1$ approaching R_s or anastomosing with R_s .

Abdomen. Usually white. Eighth tergite and sternite usually well-modified, eighth sternite usually with a pair of processes. Male genitalia. Uncus single or bifurcate, usually short and thin. Socii well-developed, various, generally large and setose. Gnathos absent. Vinculum with developed sclerotization in *derocina*-group. Valva usually small but large in *mytylata*-group, shape various, sometimes with long posterior extensions. Anellus usually unmodified and occasionally slightly sclerotized. Juxta obvious, shape various, but indistinctly defined in *derocina* and *mytylata* species-groups. Saccus slender to very broad. Aedeagus straight or curved, usually short, but very long and slender in *derocina*-group; cornutus absent or present, usually as a process or a spinose patch when present. Female genitalia. Ovipositor lobes simple. Apophyses anteriores and posteriores usually absent, occasionally present. Ostium bursae often with ostial pocket, sometimes with developed ostial plate. Ductus bursae long and thin in *derocina*-group, and short or indiscernible in the other three species-groups (except *D. typhodes*). Corpus bursae medium-sized, with accessory sac present or not. Signum usually long and narrow, various in length.

Diagnosis. Wilkinson (1968) provided the characters for the genera *Argodrepana* Wilkinson, *Deroca* Walker, *Eudeilinia* Packard and *Teldenia* Moore, which are externally similar to the genus *Ditrigona*. The differentiations can be summarized as follows: *Ditrigona* can be differentiated from *Argodrepana* and *Teldenia* by hind tibia having two pairs of spurs, while the latter two genera only have one pair of spurs on hind tibia. In the male genitalia, *Ditrigona* can be distinguished from the other three genera by the absence of the gnathos. In addition, the developed uncus in *Ditrigona* is also different from those members of *Eudeilinia* and some species of *Deroca*, in which the uncus is reduced.

Distribution. China; Russia; Japan; Korea; India; Bhutan; Nepal; Myanmar; Sri Lanka; Malaysia; Indonesia.

The *triangularia*-group

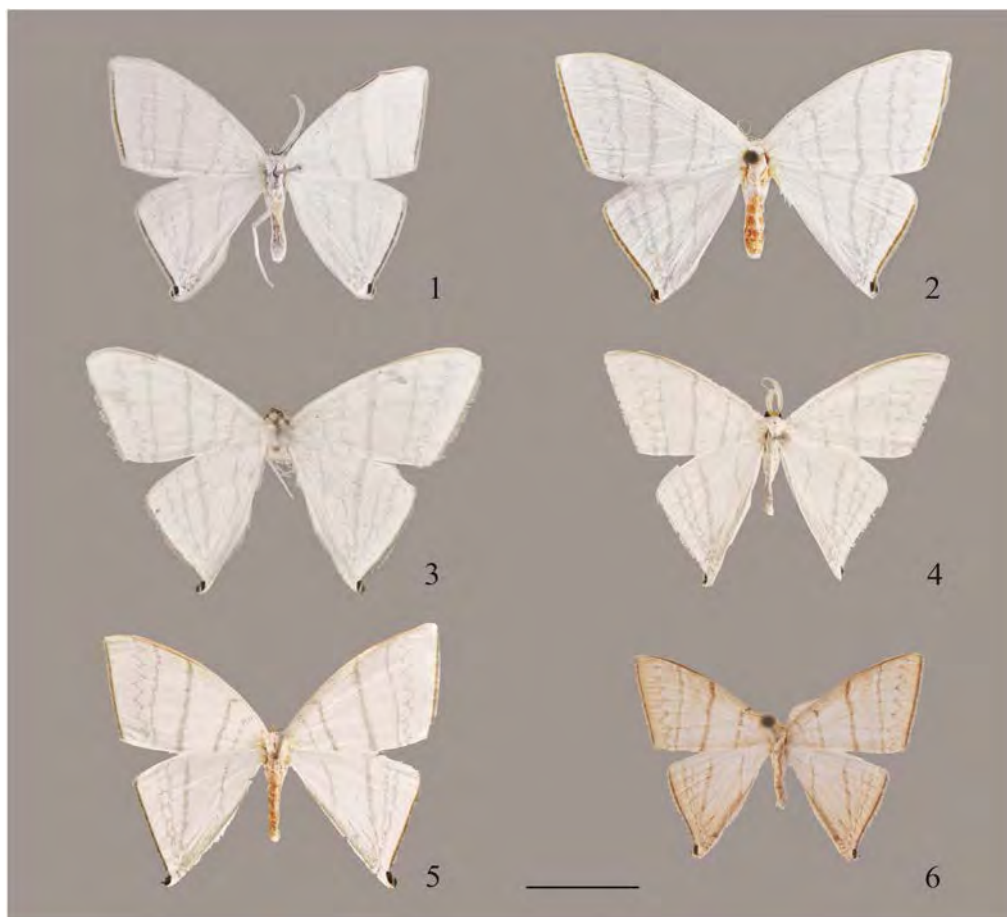
Redescription. Head. Antenna bipectinate or serrate in male, bipectinate or filiform in female, pectinations much longer in male and shorter in female when bipectinate. Frons white, with one narrow pale brown transverse band or all brown. Labial palpus extending beyond frons or not. Vertex white, sometimes with a brown band on upper margin.

Thorax. Dorsal and ventral sides white or with two pale brown lines. Wing pattern. In the type species *D. triangularia*, and the other three species, *D. regularis*, *D. uniuncusa* and *D. tenuiata*, vein 2A extending to a tail process on hind wing; the outer margin of both fore- and hind wings almost straight, forewing tornal angle and hind wing apex nearly a right-angle. Forewing with subbasal, antemedial and postmedial lines almost straight; submarginal line double, the outer one lunulate and the inner one straight or shallowly wavy. Hind wing with antemedial and postmedial lines mostly straight; postmedial line strongly dentate near anal angle; submarginal line double, gradually approaching to each other, and close to postmedial

line near anal angle, slightly wavy; a small black spot present at upper angle of tail. The species, *D. titana*, *D. fasciata*, *D. pomenaria*, *D. polyobotaria*, *D. typhodes* and *D. sciara* lack tail process, outer margin of forewing gently curved and that of hind wing rounded; transverse lines often appearing as narrow band.

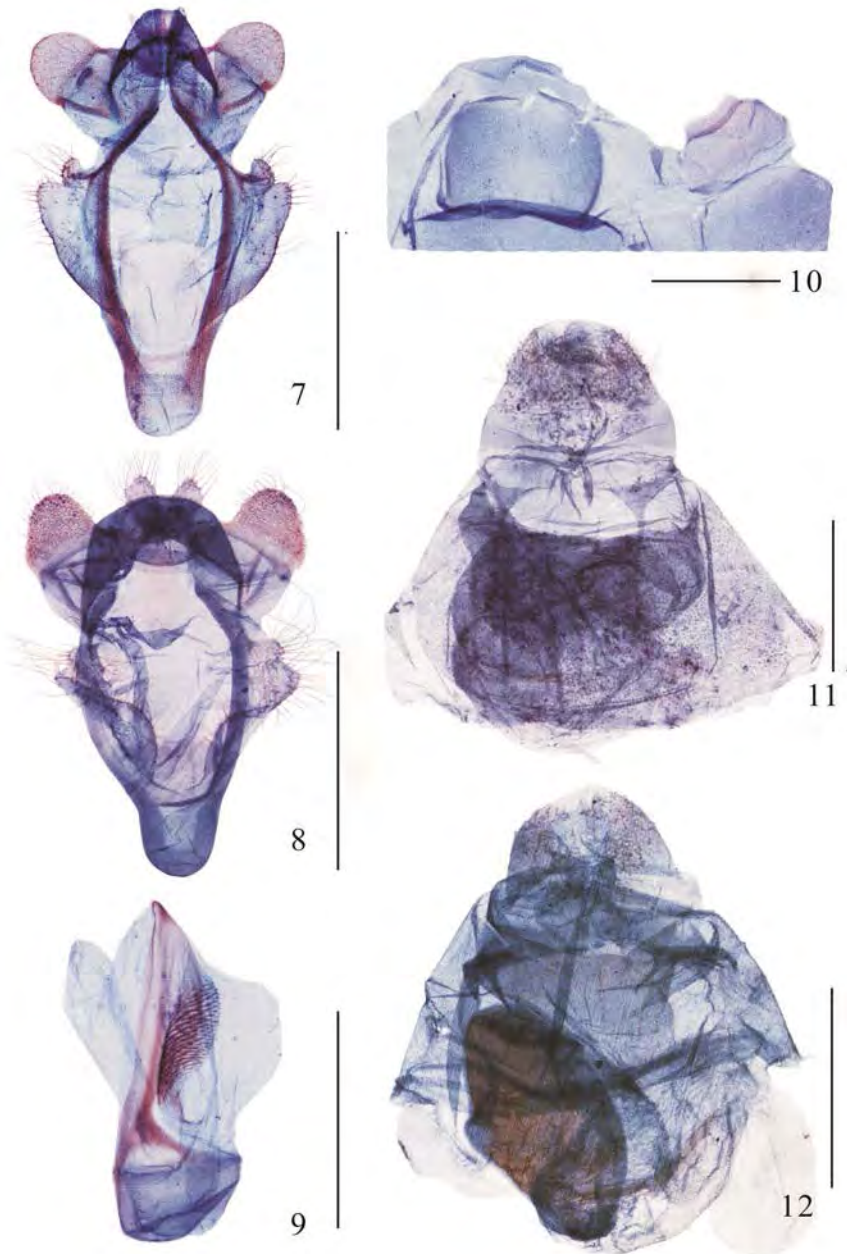
Abdomen. In the species with tail process, eighth tergite almost unmodified, eighth sternite small, shallowly concave or protruding. In the other species lacking tail process, eighth tergite and sternite often with one pair of lateral processes. Male genitalia. Uncus bifid, short, narrow or thick. Socii large, lobate or wing-like. Valva small, sometimes with posterior protrusion. Juxta large or small sclerite, or ring-like, indistinctly shaped. Saccus elongate, broad or narrow. Aedeagus stout or narrow, straight or bent, cornutus appearing as a large brush-like patch, or a simple process, or absent. Female genitalia. Apophyses anteriores present or not. Ostium bursae usually large. Ductus bursae often indiscernible but wide and obvious in *D. typhodes*. Corpus bursae with small accessory sac when present; signum long and thin, sometimes inconspicuous.

***Ditrigona tenuiata* Jiang & Han sp. nov.** (Figs. 1, 2, 7, 9, 10, 11)



Figures 1–6. Adults. 1, 2. *D. tenuiata*. 1. Male (holotype, Sichuan); 2. Female (paratype, Sichuan); 3. *Ditrigona triangularia*, male (lectotype, BMNH); 4, 5. *D. uniuuncusa*. 4. Male (Sangang, Fujian); 5. Female (Sangang, Fujian); 6. *D. regularis*, male (Yunnan). Scale bar = 1.0 cm.

Description. Head. Antenna bipectinate in both sexes, the longest ramus about six times diameter of antennal shaft in male, and about 1.5 times diameter of antennal shaft in female. Frons not protruding, white, upper half with a narrow pale yellowish brown transverse band. Labial palpus not extending beyond frons. Vertex white, with a broad yellowish brown transverse band at bases of antennae.



Figures 7–12. 7, 8. Male genitalia. 7. *D. tenuiata* (holotype, Sichuan); 8. *D. uniuncusa* (Sangang, Fujian). 9. Aedeagus, *D. tenuiata* (holotype); 10. Eighth segment, *D. tenuiata* (holotype); 11, 12. Female genitalia. 11. *D. tenuiata* (paratype, Sichuan); 12. *D. uniuncusa* (Sangang, Fujian). Scale bars = 1 mm.

Thorax. Dorsal and ventral sides of thorax white. Tegula white. Hind tibia with two pairs of spurs in both sexes. Wings. Forewing length: ♂♀16.5–17.5 mm. Both fore- and hind wings white, transverse lines grey. Forewing with costa brown. Subbasal and basal lines slightly bent inwards at middle and costa, the former narrower; postmedial line broad, straight; submarginal line double, the inner one slightly wavy and the outer one deeply wavy. Hind wing with antemedial line straight, merging into the elongate grey area along anal margin; postmedial line broad, slightly concave, forming large pointed teeth on CuA₂ and anal fold; submarginal line double with the outer one wavy, two lines gradually close towards anal margin; a small black patch present on tail process. Fringes with basal half dark brown and distal half pale brown.

Abdomen. Dorsal and ventral sides white. Eighth tergite quadrate, almost unmodified, eighth sternite sclerotised obviously, posterior margin slightly concave. Male genitalia. Uncus totally bifurcate, short and thin. Socii large, with terminal half semicircle, sclerotised. Valva small, bluntly triangular, ventral margin convex, small posterior protrusion rounded. Vinculum well sclerotised. Saccus short, anterior margin rounded. Juxta large, egg-shaped. Aedeagus stout, with shaft straight, terminal part tapering; cornutus a large oval brush-like patch. Female genitalia. Papillae analis short; apophyses anteriores long, broad basally; ostium bursae large; ductus bursae indiscernible; corpus bursae round, accessory sac small; signum long and thin.

Diagnosis. *D. tenuiata* is one of the four species in the *triangularia*-group. On the wing pattern, *D. tenuiata* is different from *D. triangularia* by the continuous forewing subbasal line and hind wing antemedial line, and by further distance between the antemedial and postmedial lines, from *D. uniuncusa* by the slightly wavy inner line of the submarginal line and less elongated anal margin, and from *D. regularis* by the paler wing colour. In addition, the double lines of the submarginal line are closer to each other in *D. tenuiata* than in other species. In the male genitalia, *D. tenuiata* can be easily recognized from *D. triangularia*, *D. uniuncusa* and *D. regularis* by the combination of the slender uncus, smooth socii and the broad saccus. In the corpus bursae of the female genitalia, *D. tenuiata* lacks the large oval sclerite that is present in *D. uniuncusa*, and lacks the sclerotized patch which is present in *D. regularis*.

Holotype. ♂, **China**, Sichuan (IZCAS), Kangding, Xikangyinxiang Hotel, 2582 m, 07–10-VIII-2016, coll. Le CUI, slide no. Drep. 947. **Paratype.** 1♀, **China**, Sichuan (IZCAS), Luding, Hailuoguo, 2569 m, 11-IX-2016, coll. Xinxin LI, slide no. Drep. 1090.

Distribution. China (Sichuan).

Etymology. The species epithet is derived from the Latin word “tenuis”, which refers to the slender uncus.

***Ditrigona triangularia* (Moore, 1867) (Fig. 3)**

Urapteryx triangularia Moore, 1867: 612. Lectotype ♂, India: Darjiling. (BMNH)

Ditrigona triangularia: Moore, 1888: 258.

Distribution. China (Fujian, Yunnan, Taiwan, Tibet); India; Myanmar.

Remarks. Wilkinson (1968) recorded a male specimen from Guadun, Wuyishan, Fujian Province. In the collection of IZCAS, there are two male and 31 female specimens belonging to *D. uniuncusa* that were collected from the Wuyishan area, including the holotype of *D. uniuncusa*; no *D. triangularia* were recognized from among these specimens. The distribution in Fujian is in doubt, and more material needs to be checked.

***Ditrigona uniuncusa* Chu & Wang, 1988** (Figs. 4, 5, 8, 12)

Ditrigona uniuncusa Chu & Wang, 1988, *Sinozoologia*, 6: 202. Holotype ♂, China: Fujian, Wuyishan (IZCAS).

Description. Female genitalia. Papillae anales short, slightly sclerotised. Apophyses anteriores short. Ostium bursae large; ductus bursae almost indiscernible; corpus bursae large, with large oval sclerite; accessory sac present. Signum long and thin.

Distribution. China (Fujian, Sichuan).

Remarks. *D. uniuncusa* was described on the basis of only one male specimen from Wuyishan, Fujian Province. It was described and figured as having the simple, not divided uncus, and the name also has the same meaning. But by careful examination of the holotype, and comparison with the male specimen collected from the same locality, we found that one branch of the uncus is broken, and appears as simple uncus. However, we confirm that *D. uniuncusa* is a valid species.

***Ditrigona regularis* Warren, 1922** (Fig. 6)

Ditrigona regularis Warren, 1922: 463. Lectotype ♂, Assam: Khasia. (BMNH).

Ditrigona regularis differentiata Bryk, 1943: 9.

Distribution. China (Guangxi, Sichuan, Yunnan, Tibet); India; Myanmar; Thailand.

***Ditrigona titana* Wilkinson, 1968**

Ditrigona titana Wilkinson, 1968: 453. Holotype ♂, China: Yunnan, Likiang (ZFMK).

Distribution. China (Yunnan).

***Ditrigona sciara* Wilkinson, 1968**

Ditrigona sciara Wilkinson, 1968: 458. Holotype ♂, China: Sichuan, Ta-t sien-lou (BMNH).

Distribution. China (Sichuan).

***Ditrigona pomenaria* (Oberthür, 1923)**

Corycia (Bapfa) pomenaria Oberthür, 1923: 238. Lectotype ♂, China: Sichuan, Moupin (ZFMK).

Ditrigona pomenaria Wilkinson, 1968: 454.

Distribution. China (Fujian, Sichuan).

***Ditrigona polybotaria* (Oberthür, 1923)**

Corycia polybotaria Oberthür, 1923: 237. Lectotype ♀, China: Sichuan, Siao-lou (ZFMK).

Ditrigona polybotaria Wilkinson, 1968: 458.

Distribution. China (Sichuan).

***Ditrigona typhodes* Wilkinson, 1968**

Ditrigona typhodes Wilkinson, 1968: 456. Holotype ♂, China: Yunnan, Likiang (ZFMK).

Distribution. China (Sichuan, Yunnan); Myanmar.

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References

- Bryk F. 1943. Entomological results from the Swedish Expedition 1934 to Myanmar and British India. Lepidoptera: Drepanidae. *Arkiv för Zoologi*, 34A(13): 1–30.
- Butler G. 1889. *Illustrations of Typical Specimens of Lepidoptera: Heterocera in the Collection of the British Museum*. 7. Trustees of the British Museum, London, 124 pp.
- Chu HF & Wang LY. 1988. On the Chinese species of the genus *Ditrigona* Moore (Lepidoptera: Drepanidae). *Sinozoologia*, 6: 199–208.
- Chu HF & Wang LY. 1991. *Fauna Sinica, Insecta, Vol. 3, Lepidoptera, Cyclidiidae, Drepanidae*. Science Press, Beijing, 269 pp.
- Hampson GF. 1893. *The Fauna of British India including Ceylon and Myanmar*. Moths 1. Taylor & Francis, London, 526 pp.
- Holloway JD. 1998. The moths of Borneo: families C astniidae, Callidulidae, Drepanidae and U raniidae. *Malayan Nature Journal*, 52: 20–22.
- Li Y, Xin D Y & Wang M. 2015. A new species of the genus *Ditrigona* Moore, 1888 (Lepidoptera: Drepanidae) in China. *Florida Entomological Society*, 98(2): 567–569.
- Moore F. 1867. On Bengalese Lepidoptera. *Proceedings of the Zoological Society of London*, 1867: 612–686.
- Moore F. 1888. Heterocera. In: Hewitson WC & Moore F (Eds.), *Descriptions of New Indian Lepidoptera in Atkinson Collection*. Asiatic Society of Bengal, Calcutta, pp. 199–299.
- Oberthür C. 1923. Révision iconographique des espèces de Phalénites (*Geometra* Linné) énumérées et décrites par Guenée dans le volume X du *Species général des Lépidoptères*, publié à Paris, chez l'éditeur Roret en 1857. *Études de Lépidoptérologie Comparée*, 20: 214–283.
- Strand E. 1911. Drepanidae. In: Seitz A (Ed.), *Die Gross-Schmetterlinge der Erde*. Alfred Kernen, Stuttgart, pp. 195–206.
- Warren W. 1922. Drepanulidae. In: Seitz A (Ed.), *Die Gross-Schmetterlinge der Erde*. Alfred Kernen, Stuttgart, pp. 443–490.
- Wilkinson C. 1968. A taxonomic revision of the genus *Ditrigona* (Lepidoptera: Drepanidae: Drepaninae). *Transactions of the Zoological Society of London*, 31: 403–517.