

## A Study of Chinese *Cirrospilus* Westwood (Hymenoptera: Eulophidae)

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**Chao-Dong Zhu, John LaSalle and Da-Wei Huang (2002)** A study of Chinese *Cirrospilus* Westwood (Hymenoptera: Eulophidae). *Zoological Studies* 41(1): 23-46. This paper treats Chinese species of *Cirrospilus* Westwood. Twenty valid species are recognized, and a key to species is provided. Six species were previously known from China: *C. ambiguus* Hansson and LaSalle, *C. ingenuus* Gahan, *C. jiangxiensis* Sheng and Wang, *C. phyllocnistis* (Ishii), *C. pictus* (Nees), and *C. tricuspis* Sheng. Four species are newly recorded from China: *C. diallus* Walker, *C. elegantissimus* Westwood, *C. variegatus* (Masi), and *C. vittatus* Walker. Ten new species are described and compared with related species: *C. brevis*, *C. centralis*, *C. dispersus*, *C. divergens*, *C. insculptus*, *C. nigrifemur*, *C. perticus*, *C. striatus*, *C. submedialis*, and *C. transrugosus*. Two new synonyms, *C. huangyaensis* Sheng and *C. nigriscutellaris* Sheng and Wang have been proposed under *C. pictus* (Nees). New hosts and distributional records are provided. <http://www.sinica.edu.tw/zool/zoolstud/41.1/23.pdf>

**Key words:** Hymenoptera, Eulophidae, *Cirrospilus*, New species, New records.

*Cirrospilus* Westwood is a large and widespread genus of Eulophinae, with over 130 species worldwide (Noyes 1998). The genus was divided into several species groups (Bouček 1988), but as yet there are no revisions or keys to species of *Cirrospilus* other than the fauna of Europe (Bouček 1959) and Britain (Askew 1968). In China, Liao et al. (1987), Sheng (1994), and Sheng and Wang (1992 1993) provided new records or described undecided species of *Cirrospilus*, and Sheng (1994) published a key to 8 species of *Cirrospilus* collected in Hubei, Jiangxi, and Zhejiang Provinces. Recent investigations of Chinese Chalcidoidea (Zhu et al. 1999 2000a b, Xiao and Huang 2001a b, Zhu and Huang 2001) reveal new records and new species of *Cirrospilus*. Now, twenty valid species are recognized (Table 1). Prof. Sheng of Jiangxi Agricultural Univ. kindly let the senior author examine the types of all species described by him and his colleagues. These species include *C. huangyaensis*

Sheng, *C. jiangxiensis* Sheng and Wang, *C. nigriscutellaris* Sheng and Wang, and *C. tricuspis* Sheng. With his kind favor, the senior author also examined specimens determined as '*C. lynxus*' (see *C. brevis* sp. nov.) and *C. quadristriatus* in his collection.

The purposes of this paper are to: 1) review Chinese species of *Cirrospilus*; 2) provide a key to species; 3) describe new species found in China; 4) provide new hosts and distributional records for some species.

Morphological terminology follows that of Gibson (1997). Absolute measurements, in millimeters (mm) are used for the body and forewing length. For all other dimensions, relative measurements are used. Unless indicated otherwise, all examined specimens are deposited at the Institute of Zoology, Chinese Academy of Sciences (IOZ). Other examined specimens are deposited at and distributed to the following collections: the Natural History Museum, London,

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England (BMNH), United States National Museum, Washington, D.C., USA (USNM), Department of Plant Protection, Jiangxi Agricultural Univ. (JXAU), and Insect Collection, Taiwan Agricultural Research Institute (TARI).

### Genus *Cirrospilus* Westwood

- Cirrospilus* Westwood, 1832: 128. Type species: *Gyrolasella elegantissimus* Westwood; by monotypy.
- Atoposoma* Masi, 1907: 276. Type species: *Atoposoma variegatus* Masi; by monotypy. Synonymized by Bouček, 1959: 172.
- Atoposomoidea* Howard, 1910: 9. Type species: *Atoposomoidea ogimae* Howard; by monotypy. Synonymized by Peck, 1951: 458.
- Winnemana* Crawford, 1911: 620. Type species: *Winnemana argei* Crawford; by original designation. Synonymized by Graham, 1975: 281.
- Gyrolasella* Girault, 1913a: 166. Type species: *Cirrospilomella fasciatus* Girault; by original designation. Synonymized by Bouček, 1988: 612.
- Achrysocharellioidea* Girault, 1913a: 178. Type species: *Gyrolasella pax* Girault; by monotypy. Synonymized by Bouček, 1988: 612.
- Cirrospilomella* Girault, 1913a: 265. Type species:

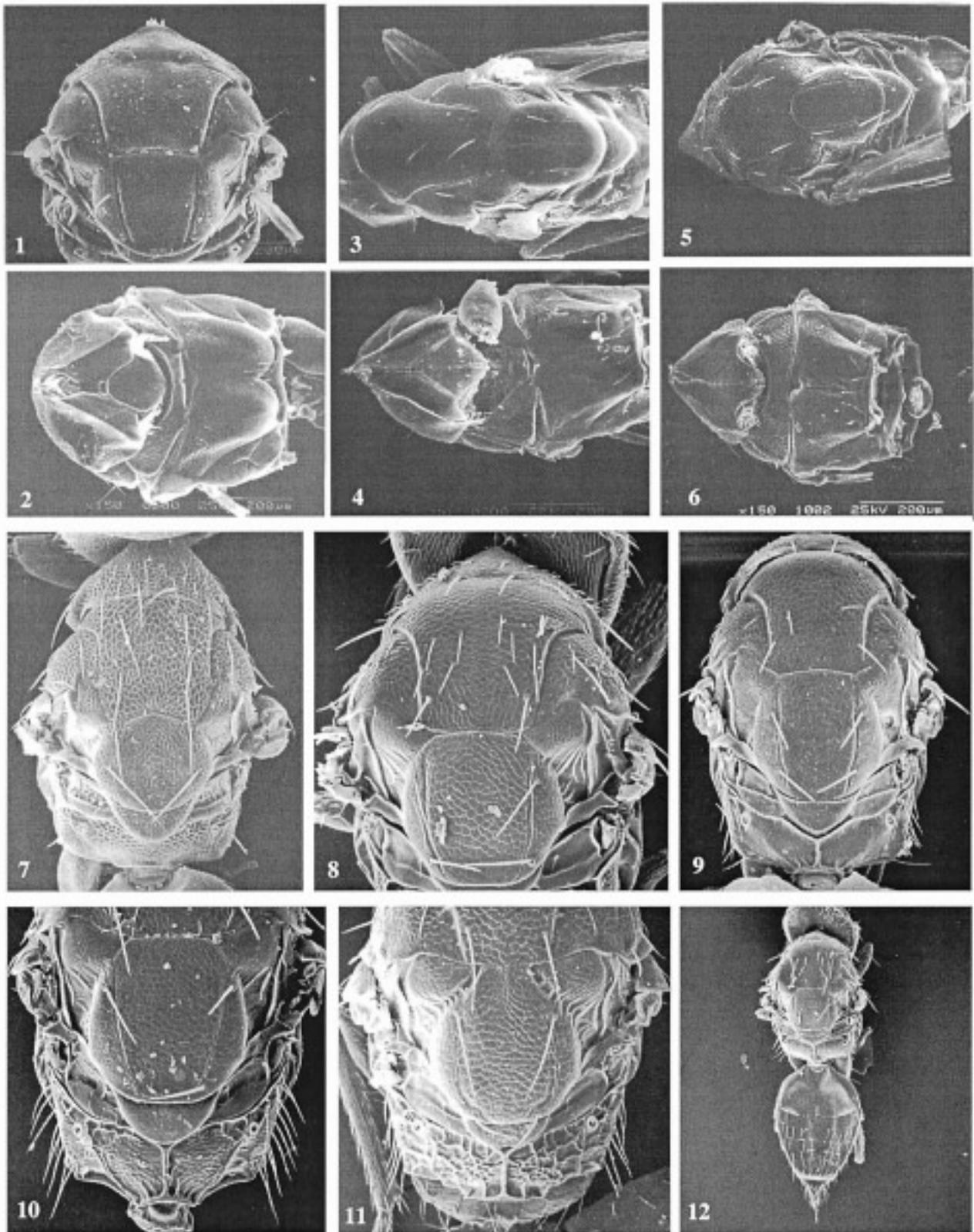
- Cirrospilomella fasciatus* Girault; by monotypy. Synonymized by Bouček, 1988: 612.
- Pseudiglyphomyia* Girault, 1913a: 267. Type species: *Pseudiglyphomyia biguttatus* Girault; by original designation. Synonymized by Girault, 1916: 222.
- Gyrolasella* Girault, 1913b: 105. Type species: *Gyrolasella consobrinus* Girault; by original designation. Synonymized by Bouček, 1988: 611.
- Cirrospilopsis* Girault, 1915: 263. Type species: *Pseudiglyphomyia nigrivariegatus* Girault; by monotypy. Synonymized by Bouček, 1988: 612.
- Parzagrammosoma* Girault, 1916: 222. Type species: *Zagrammosoma pulchra* Girault; by original designation. Synonymized by Bouček, 1988: 612.
- Giraultia* Gahan and Fagan, 1923: 66. Replacement name for *Cirrospilopsis* Girault, 1915 [*nec.* Brèthes, 1913]. Synonymized by Bouček, 1988: 612.
- Austrolynx* Girault, 1929: 325. Type species: *Austrolynx flavitibia* Girault; by monotypy. Synonymized by Bouček, 1988: 612.
- Ootetrastichoides* li, 1936: 221. Type species: *Ootetrastichoides habachi* li; by monotypy. Synonymized with *Winnemana* by Domenichini, 1964: 15; synonymized with *Cirrospilus* by Graham, 1975: 281.
- Plesiospilus* Ferrière, 1953: 398. Type species: *Eulophus unistriatus* Förster; by original designation. Synonymized by Delucchi, 1958: 253.

**Table 1.** Checklist of Chinese *Cirrospilus* Westwood

Species	New record	Synonymy	sp. nov.
<i>C. ambiguus</i> Hansson and LaSalle			
<i>C. brevis</i> sp. nov.			x
<i>C. centralis</i> sp. nov.			x
<i>C. diallus</i> Walker	*		
<i>C. dispersus</i> sp. nov.			x
<i>C. divergens</i> sp. nov.			x
<i>C. elegantissimus</i> Westwood	*		
<i>C. huangyaensis</i> Sheng (see <i>C. pictus</i> )		under <i>C. pictus</i>	
<i>C. ingenuus</i> Gahan			
<i>C. insculptus</i> sp. nov.			x
<i>C. jiangxiensis</i> Sheng and Wang			
<i>C. lynxus</i> Walker (see <i>C. brevis</i> sp. nov.)			
<i>C. nigrifemur</i> sp. nov.			x
<i>C. nigriscutellaris</i> Sheng and Wang (see <i>C. pictus</i> )		under <i>C. pictus</i>	
<i>C. perticus</i> sp. nov.			x
<i>C. phyllocnistis</i> (Ishii)			
<i>C. pictus</i> (Nees)			
<i>C. striatus</i> sp. nov.			x
<i>C. submedialis</i> sp. nov.			x
<i>C. transrugosus</i> sp. nov.			x
<i>C. tricuspidatus</i> Sheng			
<i>C. variegatus</i> (Masi)	*		
<i>C. vittatus</i> Walker	*		
Total	20	4	2
			10

\*: a new record for China for previously described species.

x: a new species.



**Figs. 1-2.** *Cirrospilus divergens* sp. nov.: 1. dorsal view of thorax; 2. ventral view of thorax. **Figs. 3-4.** *Diaulinopsis* sp.: 3. dorsal view of thorax; 4. ventral view of thorax. **Figs. 5-6.** *Diglyphus bimaculatus* Zhu et al.: 5. dorsal view of thorax; 6. ventral view of thorax. **Fig. 7.** *Cirrospilus ambiguus* Hansson and LaSalle: dorsal view of thorax. **Fig. 8.** *Cirrospilus brevis* sp. nov.: dorsal view of mesosoma. **Fig. 9.** *Cirrospilus pictus* (Nees): dorsal view of thorax. **Fig. 10.** *Cirrospilus diallus* Walker: dorsal view of thorax. **Fig. 11.** *Cirrospilus ingenuus* Gahan: dorsal view of thorax. **Fig. 12.** *Cirrospilus brevis* sp. nov.: dorsal view of body.

**Diagnosis:** Funicle 2 segmented in both sexes. Notaulus usually complete, straight, ending at or near junction of anterior margin of scutellum and axilla. Scutellum usually with longitudinal submedian grooves (Figs. 1, 5, 7-10, 12), although sometimes indistinct (Fig. 11) or even absent except for coloration. Postmarginal vein at most 1.5 times longer than stigmal vein, often equal to or shorter in length. Petiole very short.

Bouček (1988) placed *Cirrospilus* in the tribe Ophelimiini, which included other genera such as *Ophelimus* Haliday, *Diglyphus* Walker, *Zagrammosoma* Ashmead, and several Australian genera. This does seem to represent a natural group of genera, although *Ophelimus* does not belong with other genera that were included in the Ophelimiini. Genera related to *Cirrospilus* generally have 2 funicular segments (3 in *Aulogymnus* Förster and *Dichatomus* Förster), the propleura separated posteriorly (Figs. 2, 4, 6), and (usually) sub-parallel longitudinal grooves present on the scutellum (Figs. 1, 3, 5). Palaeartic genera included in this group are *Aulogymnus*, *Cirrospilus*, *Danuviella*, *Diaulinopsis* (Figs. 3, 4), *Dichatomus*, *Diglyphus* (Figs. 5, 6), and *Zagrammosoma*, of which *Danuviella*, *Dichatomus*, and *Zagrammosoma* are not yet known from China. Most species are parasitoids of leaf-miners in various orders, however *Aulogymnus*, *Dichatomus*, and a few species of *Cirrospilus* are associated with galls (Gauthier et al. 2000, Zhu et al. 2000b).

Zhu et al. (2000b) presented a key to the Chinese genera related to *Cirrospilus* and *Diglyphus*, and support for this grouping of genera is offered by Gauthier et al. (2000). *Cirrospilus* can be told apart from other eulophids by the presence of the following characters: two funicular segments; notaulus complete and distinct, straight or nearly so, mostly extending to the scutoscuteellar suture (Figs. 1, 8-12), rarely curving to meet the apex of axilla (Fig. 7); submarginal vein with 3 or more strong setae on dorsal surface; submedian grooves present on scutellum and usually distinct; postmarginal vein barely longer than stigmal vein; vertex usually not vaulted above the level of compound eye; posterior pair of scutellar setae close to hind margin of scutellum. Bouček (1988) mentioned that species of *Cirrospilus* have the mid lobe of the mesoscutum with raised reticulations, and this character helps distinguish them from both *Diaulinopsis* and Tetrastichinae. Although this character usually works, examination of Chinese *Cirrospilus* shows that there are some species, such as *C. pictus* and *C. insculptus*, with engraved reticulations on the mid lobe of the

mesoscutum. There are also examples of variation between engraved and raised sculpturing types in some other eulophine genera such as *Sympiesis* Förster.

Bouček (1988), Peck et al. (1964), and Schauff et al. (1997) provided keys to genera of Eulophidae. Keys to species of *Cirrospilus* have been provided by Askew (1968) for the fauna of Britain, and by Bouček (1959) for that of Europe. Sheng (1994) gave a key to Chinese species of *Cirrospilus*.

**Biology:** Parasitoids, or hyperparasitoids of leaf-miners, or other small sheltered larvae or pupae. Some species are egg parasitoids.

**Distribution:** Worldwide.

#### Key to species

1. Notaulus curved, not reaching posterior margin of mesoscutum, extending to anterior margin of axilla (Fig. 7).....  
.....*C. ambiguus* Hansson and LaSalle
- Notaulus straight or nearly so, complete to scutoscuteellar suture (Figs. 1, 8-12).....2
2. Cubital vein distinctly curved anteriorly at base; setae in area just distad of basal vein generally short, lightly colored and dense; speculum usually absent or small and narrow (Fig. 82).....3
- Cubital vein relatively straight, or reduced or absent (Figs. 78-81); setae in area just distad of basal vein stronger, usually black, sparser; speculum variable, but usually present and distinct.....5
3. Body mainly yellow, with longitudinal green to black stripes of varying widths (Fig. 74). Reticulations on mesoscutum and scutellum raised.....*C. vittatus* Walker
- Meso- and metasoma completely dark green or black. Reticulations on mesoscutum and scutellum engraved.....4
4. Meso- and metasoma completely dark green; head yellow with dark patches; legs yellow except coxae dark green. (Note: this species is unknown in China. It is included in the key for comparative purposes.).....  
.....*C. curvineurus* Askew
- Meso- and metasoma completely black; head completely black; legs with femora mostly dark.....  
.....*C. nigrifemur* sp. nov.
5. Dorsellum large, triangular, longer than propodeum medially (Figs. 66, 70); forewing with dark markings on stigma and parastigma (Figs. 71, 80, 81); pronotum long, more than 1/2 as long as mesoscutum.....  
.....*C. variegatus* Walker
- Dorsellum shorter than, or at most as long as, propodeum medially (Figs. 9-12); forewing hyaline, except for occasionally with (sometimes large) diffuse markings on disk; pronotum usually less than 1/2 length of mesoscutum.....6
6. Propodeum smooth (Fig. 9) or lightly and regularly sculptured, at most evenly reticulate or with 1 or 2 short carina extending from posterior margin; plicae and rugae absent, although median carina usually present.....7
- Propodeum with distinct and strong sculpturing, and/or distinct plicae (Figs. 10, 11) sculpturing usually much stronger than that on scutellum; plicae present or absent;

- distinct rugae often present, median carina present or absent.....14
7. Anterior pair of scutellar setae distinctly shorter (about 1/2 length) than posterior pair; mesosoma with broad longitudinal dark stripe; longitudinal grooves on scutellum indistinct or absent (Fig. 32).....*C. elegantissimus* Westwood
- Anterior pair of scutellar setae only slightly shorter (at least 0.75 length) than posterior pair; coloration variable; longitudinal lines on scutellum usually distinct.....8
8. Speculum large, extending anteriorly to about 1/2 length of marginal vein, although setae may be present in this area on underside of wing (Fig. 79); forewing may have infumated spot(s) on disc; males often with black spot on otherwise yellow middle tibia; this spot sometimes also presents in females; color variable.....9
- Speculum small to moderate, not extending past 1/3 length of marginal vein (Fig. 78); forewing hyaline; males without a black spot on otherwise yellow middle tibia.....10
9. Sculpturing on scutellum raised; propodeum with several small rugae or carinae extending forward from posterior margin. From spider eggs.....*C. tricuspoidatus* Sheng
- Sculpturing on scutellum incised; propodeum without rugae or carinae. Host range wide and variable.....*C. pictus* Nees
10. Mid lobe of the mesoscutum with only 1 strong pair of setae placed posteriorly near hind margin, anterior setae small, not paired, scattered, light colored (Fig. 8).....11
- Mid lobe of the mesoscutum with at least 2 pairs of large, strong setae, 1 posteriorly and 1 anteriorly (Fig. 9), although an additional anterior pair or additional smaller setae anteriorly may be present.....13
11. Scutellum with 1 central brown spot (Fig. 17).....*C. centralis* sp. nov.
- Scutellum completely brown.....12
12. Gaster short, only about as long as head plus mesosoma (Figs. 12, 15).....*C. brevis* sp. nov. (= *lynxus*, sensu Sheng and Wang)
- Gaster distinctly longer (at least 1.2 times) than mesosoma (Fig. 13). (Note: this species is unknown in China. It is included in the key for comparative purposes.).....*C. lynxus* Walker
13. Propodeal median carina widely expanded posteriorly from base (Fig. 28); gaster mostly dark brown, with yellow base and apex.....*C. divergens* sp. nov.
- Propodeal median carina linear from base to near end, and T-shaped posteriorly (Fig. 57); gaster with 4 dark, transverse bands.....*C. submedialis* sp. nov.
14. Propodeum with distinct, strongly raised and step like plicae and distinct median carina; area between plicae generally reticulate, although additional rugae may be present, but at least always with sculpturing weaker and more regular than plicae (Fig. 10).....15
- Propodeum with raised reticulations or rugae; plicae present or absent, but never complete and defining a raised area between them, or rugae in median area of propodeum subequal in strength to plicae; median carina present or absent (Fig. 11).....16
15. Mid lobe of the mesoscutum with 1 strong pair of setae posteriorly, and many small scattered setae anteriorly (Fig. 27).....*C. dispersus* sp. nov.
- Mid lobe of the mesoscutum with 2 strong pairs of setae (rarely a 3rd pair may be present).....*C. diallus* Walker
16. Torulus placed high on head, distinctly nearer to median ocellus than to mouth margin, and well above lower eye margin. Scape extending distinctly above vertex (Fig. 47).....*C. perticus* sp. nov.
- Torulus not so high on head, about midway between median ocellus and mouth margin, usually at or near lower eye margin. Scape generally not extending above vertex, sometimes slightly so.....17
17. Mid lobe of the mesoscutum with many scattered setae anteriorly (in addition to paired setae); scapular flange with many setae in addition to paired setae.....18
- Mid lobe of the mesoscutum with only paired setae (3-4 pairs); scapular flange with or without scattered setae.....19
18. Mesosoma with longitudinal dark stripes on mid lobe of the mesoscutum, notaulus; propodeum rugose (Fig. 53).....*C. striatus* sp. nov.
- Mesosoma completely yellow; propodeum with transverse rugae (Fig. 61).....*C. transrugosus* sp. nov.
19. Sculpturing on mesoscutum engraved; thorax with broad longitudinal metallic stripe (Fig. 39).....*C. insculptus* sp. nov.
- Sculpturing on mesoscutum raised; thorax without metallic coloration, with or without median stripe.....20
20. Mesosoma with dark median stripe, or at least with dark median spots on mesoscutum and scutellum.....*C. phyllocnistis* (Ishii)
- Mesosoma yellowish orange, without dark markings dorsally (Fig. 37).....21
21. Propodeum completely yellow; gaster with 3 to 5 complete transverse dark stripes (Fig. 20).....*C. ingenuus* Gahan
- Propodeum almost completely black; gaster narrowly yellow at base, on sides, near and at apex, with a large dark brown patch medially.....*C. jiangxiensis* Sheng

### ***Cirrospilus ambiguus* Hansson and LaSalle (Fig. 7)**

*Cirrospilus ambiguus* Hansson and LaSalle, 1996: 194-196.

**Diagnosis:** Notaulus curved, not reaching or coming close to posterior margin of mesoscutum, extending to anterior margin of axilla. Body metallic green, with some yellow markings, especially on gaster and face. Anterior pair of scutellar setae placed very close to posterior margin of mesoscutum, as is more typical of *Diglyphus* (Fig. 5) than other *Cirrospilus* (Figs. 1, 8-11).

**Materials examined:** 6 ♂♂, 7 ♀♀, Taiwan, 25 Dec. 1993, ex. *Liriomyza trifolii* (Burgess) (CC Chien). Other specimens examined: 5 ♀♀, VIETNAM: Hung Yen Prov., My Van Dist., Tan Quong Village, 22 Aug. 1998, HY3.

**Host range:** Parasitoids of *Liriomyza trifolii*, *Calycomyza lantanae* (Frick) (Agromyzidae).

**Distribution:** China: Taiwan; Afrotropical and Oriental regions.

**Comments:** This species is not typical of *Cirrospilus* due to the curved notauli which do not extend to the scutoscuteellar suture. Problems with

the placement of this species in *Cirrospilus*, and possible relationships with other genera were discussed by Hansson and LaSalle (1996).

***Cirrospilus brevis* sp. nov.**

(Figs. 12, 15, 16, 78)

*Cirrospilus* sp. nr. *lyncus*: Ujiye et al., 1996: 93; Schauff et al., 1998: 1010.

*Cirrospilus* sp. D: Schauff et al., 1998: 1012.

[*Cirrospilus lyncus* Walker: Sheng and Wang, 1992: 37. Misidentification].

**Diagnosis:** Propodeum smooth to lightly sculptured, with distinct median carina. Mid lobe of the mesoscutum with a strong pair of posterior setae, and several smaller, scattered setae anteriorly. Scutellum almost entirely brown. Gaster nearly equal in length to mesosoma.

**Female:** Body length 2.9-3.5 mm, forewing length 2.4-3.0 mm.

Body yellow with the following dark areas. Ocellar triangle, pronotum medially, anterior 1/3 of mid lobe of the mesoscutum, apex of axilla, scutellum except sometimes anterior margin, dorsellum, propodeum, and gaster except basal yellow patch and apex. Dark patches on thorax tend to be black, elsewhere brown. Antennae brown with distal 1/2 yellow. Legs completely yellow, or with partly to mostly brown hind coxa.

Head wider than high. Vertex not vaulted. Piles on eyes sparse. Torulus placed slightly above lower eye margin. Scape slightly flattened. Flagellar segments subequal in width. Clava longer than each funicular segment. Relative measurements: head width 41, head length 17, head height 35, POL 9, OOL 4, eye 19/15, interorbital distance 25, malar space 12, mouth opening 10, torulus to median ocellus 20, torulus to mouth margin 11, scape 13, pedicel 9, F<sub>1</sub> 9, F<sub>2</sub> 7, clava 15.

Pronotum usually less than 1/2 length of mesoscutum. Notaulus complete to scutoscuteellar suture, parallel posteriorly, ending at inner margin of axilla. Mid lobe of the mesoscutum with only 1 strong pair of setae placed posteriorly near hind margin, with anterior setae smaller, scattered, light colored. Mesosoma distinctly raised reticulate in dark patch. Axilla with apex anterior to scutoscuteellar suture. Scutellum as long as mesoscutum, with imbricate to engraved reticulations, with straight submedian grooves. Anterior pair of setae as long as posterior pair. Dorsellum with engraved reticulations, with rounded posterior margin. Propodeum shorter than scutellum, medially nearly as long as dorsellum, with isodiametric, superfi-

cial reticulations. Median carina strong. Callus with 5-6 setae. Plicae absent. Relative measurements: mesosoma length 38, mesosoma width 22, pronotum 5, mesoscutum 10, scutellum 13, dorsellum 3.5, propodeum 3.5.

Forewing hyaline, or with a broad, faint infumation behind marginal vein. Costal cell with a complete line of setae on lower surface, with those on upper surface present on distal 1/2. Submarginal vein with 5-6 setae on dorsal surface. Cubital vein straight. Basal cell with several setae below submarginal vein. Speculum absent or very small, not extending past 1/3 length of marginal vein, closed below. Hind wing subacute apically. Relative measurements: submarginal vein 28, costal cell 36, parastigma 9, marginal vein 30, postmarginal vein 6, stigmal vein 7.

Gaster subovate, slightly broader than thorax. Apex of gaster acute. Apex of ovipositor sheath visible. Relative measurements: gaster length 42, head plus mesosoma 41, gaster width 22.

**Male:** Similar to female. Body length 1.6-2.3 mm.

**Materials examined:** Holotype: ♀, SPAIN: lab culture (orig. Spain) 1998, ex. *Phyllocnistis citrella* (R Vercher A) (BMNH). Paratypes: 41 ♀♀, 24 ♂♂, same data as holotype (BMNH, IOZ, USNM). Other specimens examined: 2 ♂♂, CHINA: Zhejiang, Linghai 1996, ex. *Phyllocnistis citrella* Stainton (ZX Yang) (JXAU).

Compared with 2 ♀♀ determined by Z Bouček as *C. lyncus* Walker: 1 ♀, ITALY: Superga, near Torine, 16 Sept. 1969 (Z Bouček) (BMNH); 1 ♀, ENGLAND: Burnham Beeches, Bucks, 13 June 1976 (Z Bouček) (BMNH).

**Host range:** Known from citrus leaf-miner, *Phyllocnistis citrella* Stainton (Gracillariidae).

**Distribution:** Throughout the warmer regions of the Palaearctic, from Spain to Japan

**Comments:** This species has been repeatedly reared in Europe and Asia as a parasitoid of citrus leaf-miners. It has generally been treated in the literature as *Cirrospilus lyncus*, or *C. nr. lyncus* (see Schauff et al., 1998, as *C. nr. lyncus* and *Cirrospilus* sp. D). It is indeed very close to *C. lyncus*, but the main difference is that the gaster in *C. brevis* is shorter (about equal in length to the thorax), while the gaster in *C. lyncus* is at least 1.2 times as long as the thorax.

We could not find the specimens from Nanchang, Jiangxi which were reported as *C. lyncus* by Sheng (1992). But the senior author found 2 males in Sheng's collection of this genus labelled as '*Cirrospilus lyncus*'. We have also

seen *C. brevis* reared from citrus leaf-miners in Japan, and 2 ♂♂ examined fit well with *C. brevis*, so we suspect that *C. brevis* occurs throughout the Holarctic region, and the specimens of *C. lyncus* recorded from Nanchang, Jiangxi could be this species. Both *C. brevis* and *C. lyncus* are illustrated here for comparison.

**Etymology:** The species name is derived from the Latin *brev* (= short) for it has a shorter gaster than that of *C. lyncus*.

***Cirrospilus centralis* sp. nov.**

(Figs. 17, 18, 19)

**Diagnosis:** Scutellum with 1 brown central spot. Mid lobe of the mesoscutum with 1 pair of strong setae posteriorly, and smaller, scattered setae anteriorly. Speculum very small. Forewing hyaline. Anterior pair of scutellar setae only slightly shorter than posterior pair; longitudinal grooves on scutellum distinct. Propodeum superficially reticulate medially, with distinct median carina, without plicae. Dorsellum shorter than propodeum medially. Forewing hyaline, with at least 1 complete row of admarginal setae. Pronotum usually less than 1/2 length of mesoscutum. Cubital vein relatively straight; setae in basal cell strong, black, and sparse. Notaulus complete to scutoscutellar suture.

This species resembles *C. lyncus* and *C. brevis* in having scattered setae on mid lobe of the mesoscutum along with only 1 pair of longer setae. It differs from the latter species in having only 1 central dark spot on scutellum, while *C. lyncus* and *C. brevis* have the entire scutellum dark.

**Female:** Body length 1.05-1.5 mm, forewing length 1.25-1.45 mm.

Body yellow with the following brown areas. Ocellar triangle, a patch on occiput, most of propodeum except sides (1 specimen from Guangxi with propodeum mainly yellow), middle part of or transverse stripes on gaster. Antennae yellowish brown, except scape yellow with brown dorsal surface, pedicel with brown basal 1/2, remainder yellow, and anelli yellow. Pronotum yellow with black anterior area. Dorsellum yellow with black, median longitudinal stripe. Legs yellow.

Head wider than high. Vertex not vaulted. Piles on eyes sparse. Torulus placed above lower eye margin. Scape cylindrical. Flagellar segments subequal in width. Clava longer than each funicular segment. Relative measurements: head width 49, head length 20, head height 30, POL 10, OOL 7, eye 20/15, interorbital distance 27, malar space 12, mouth opening 10, torulus to median

ocellus 15, torulus to mouth margin 13, scape 17, pedicel 9, F<sub>1</sub> 10, F<sub>2</sub> 10, clava 10.

Notaulus curved, turning outwards anteriorly, parallel posteriorly, ending at inner margin of axilla. Mid lobe of the mesoscutum with only 1 pair of strong setae posteriorly, with smaller, scattered setae anteriorly, smooth. Scattered setae on mesoscutum covering entire dorsal surface including median part. Axilla with smooth apex anterior to scutoscutellar suture. Scutellum as long as mesoscutum, smooth, with straight submedian grooves. Anterior pair of setae as long as posterior pair. Dorsellum smooth, with rounded posterior margin. Propodeum shorter than scutellum, medially distinctly longer than dorsellum, with isodiametric, superficial reticulations medially, smooth or vaguely sculptured laterally. Median carina present. Callus with 8 setae. Plicae absent. Relative measurements: thorax length 17, thorax width 17, pronotum 4, mesoscutum 8.5, scutellum 7.5, dorsellum 1.5, propodeum 2.

Forewing hyaline. Costal cell with a complete line of setae on lower surface, with those on upper surface present on distal 1/2. Submarginal vein with 5 setae on dorsal surface. Cubital vein straight. Basal cell with several setae below submarginal vein. Speculum present under parastigma and near basal vein, closed posteriorly. Hind wing subacute apically. Relative measurements: submarginal vein 30, costal cell 48, parastigma 12, marginal vein 45, postmarginal vein 9, stigmal vein 11.

Gaster subrotund, as broad as thorax. Apex of gaster acute. Apex of ovipositor sheath visible. Relative measurements: gaster length 23, head plus thorax 24, gaster width 14.

**Materials examined:** 5 ♀♀. Holotype: ♀, Jiangsu, Nanjing, 10 Sept. 1997, (CD Zhu). Paratypes: 1 ♀, Fujian, Fuzhou City, June 1983 (MS Chen); Guangxi, Fangcheng City, Fulong, 20 Apr. 1998 (CD Zhu); Guangxi, Daxing Co., Xialei, 31 Mar. 1998 (CD Zhu).

**Distribution:** China: Fujian, Jiangsu, Guangxi.

**Etymology:** This species name is derived from the Latin *centr* (= central) for it is distinct in having only 1 central dark spot on scutellum.

***Cirrospilus diallus* Walker**

(Figs. 10, 20, 21, 22, 23, 24, 25)

*Cirrospilus diallus* Walker, 1838: 312.

*Eulophus quadrimaculatus* Förster, 1841: 41. Synonymized by Bouček, 1959: 176.

*Eulophus flavomaculatus* Ratzeburg, 1844: 164. Synonymized by Bouček, 1959: 176.

*Entedon flavomaculatus* (Ratzeburg): Ratzeburg, 1848: 163.

*Cirrospilus walkeri* Stephens, 1846: 10. Synonymized by Graham, 1963: 174.

*Entedon punctatus* Ratzeburg, 1848: 208. Synonymized by Bouček, 1959: 176.

[*Cirrospilus elegantissimus* Westwood: Thomson, 1878: 201. misidentification]

*Atoposomoidea diallus* (Walker): Delucchi, 1958: 247.

*Cirrospilus* (*Atoposomoidea*) *diallus* Walker: Bouček, 1959: 176.

*Cirrospilus diallus* Walker: Graham, 1959: 177; Kamijo, 1979: 253; Ujije, 1980: 138; Kamijo, 1987: 47.

**Diagnosis:** Mesosoma color variable: at least with a broad, median dorsal metallic green stripe, sometimes wholly metallic green; may have (sometimes extensive) yellow markings including sides of pronotum, scapula, axilla, and most of pleural area. Mid lobe of the mesoscutum, with 2 pairs of strong setae. Propodeum with distinct raised plicae and median carina; area between plicae generally reticulate, although additional rugae may be present, but at least always with sculpturing weaker and more regular than plicae; median carina distinct (plicae may be indistinct or absent from males). Sculpturing on propodeum stronger than that on scutellum. Dorsellum shorter than, or at most as long as, propodeum medially; forewing hyaline, with at least 1 complete row of admarginal setae. Pronotum usually less than 1/2 length of mesoscutum. Cubital vein relatively straight; setae in basal cell stronger, usually black, sparser; speculum small. Mid lobe of the mesoscutum and scutellum with engraved reticulations. Scutellum with distinct submedian grooves. Notaulus complete to scutoscutellar suture.

**Materials examined:** 3 ♂♂, 15 ♀♀. 1 ♀, Hunan, Sangzhi Co., 14 Aug. 1988, 1450 m (LL Yang); 1 ♀, Fujian, Huanggang Shan, June 1980 (NQ Lin); 1 ♀, Fujian, Huanggang Shan, June 1982 (JF XU); 1 ♀, Guangxi, Napo Co., Baidu, Xiaobaihe, 1100 m (CD Zhu); 1 ♂, 1 ♀, Guangxi, Napo Co., Defu Reserve, 4 Apr. 1998 (CD Zhu); 2 ♀♀, Taiwan, Nantou Co., Meifeng, 7-9 May 1991, 2150 m (KS Lin, SC Lin) (TARI); 1 ♂, 1 ♀, Taiwan, Nantou Co., Meifeng, 2-4 May 1981, 2150 m (LY Chou and CC Chen) (TARI); 1 ♀, Taiwan, Nantou Co., Meifeng, 5-9 Oct. 1980 (CC Chen, CC Chien) (TARI); 1 ♂, 1 ♀, Hainan, Wuzhi Mts., 26 Apr. 1984, 1867 m (CF Li); 1 ♀, Yunnan, Deqen Zangzu Zizhizhou, Zhongdian, 31 July 1984, 3200 m (CF Li); 1 ♀, Yunnan, Lijiang Diqu, Longshan, 20 May 1974, 2960-3150 m (DX Liao); 3 ♀♀, Yunnan, Lijiang Diqu, Ludian, Aug. 1984, 3200 m (CF Li).

**Host range:** Ectoparasitoid or hyperparasitoid of a variety of small Lepidoptera, and more rarely Coleoptera or even Hymenoptera: Cynipidae

(Noyes 1998). Hansson (1987) stated that this species also attacks *Agromyza demejerei* [Agromyzidae] (Diptera).

**Distribution:** China: Fujian, Hunan, Guangxi, Hainan, Yunnan (new records); Taiwan, widespread throughout the Palaearctic region.

**Comments:** *C. diallus* is quite variable in color. Two ♂♂ from Hainan and Guangxi have a dark marking sub-apically on the middle tibia, yellow scapula and axilla, but 1 ♂ from Taiwan has the middle tibiae completely yellow, and scapular flange and axilla completely metallic green. In Europe, the species reared from citrus leaf-miner differs from normal *C. diallus* because males have prominent dark marking apically on the middle tibia. Although we strongly suspect that this represents a distinct species, we could find no differences in features of females.

The following key shows the color variation in *C. diallus* in China.

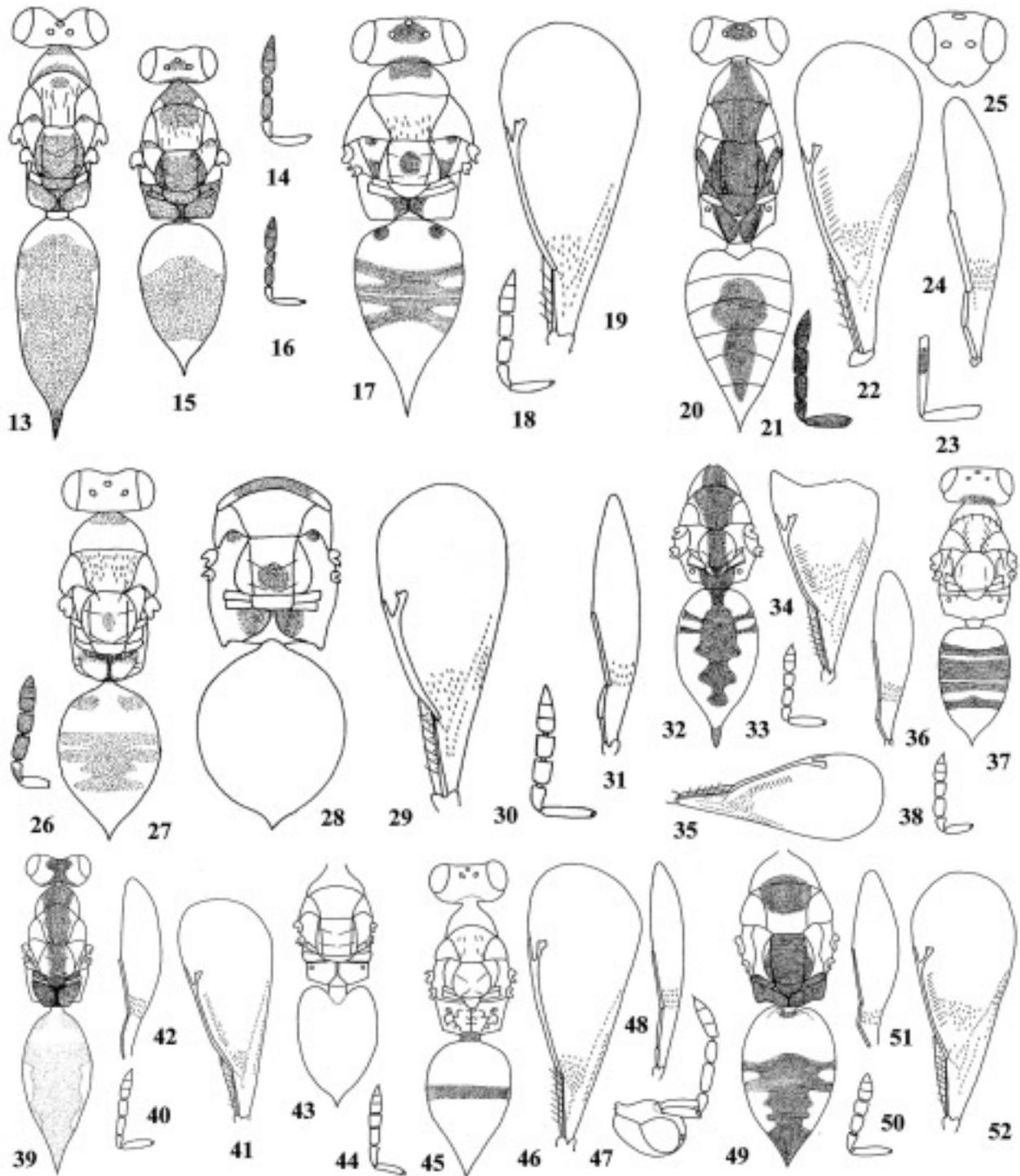
1. Hind coxae yellow; gaster brown medially or mostly; occiput mostly brown or with a brown stripe along foramen magnum .....2
  - Hind coxae partly or completely dark; gaster completely metallic green; occiput mostly metallic green .....3
2. Gaster mostly brown; pronotum, pleuron, and axilla completely metallic green or blue; ocellar triangle brown .....
  - specimens from Hunan and Fujian
  - Gaster brown medially; pronotum metallic green medially; ocellar triangle metallic green; axilla and pleuron yellow .....
    - specimens from Guangxi
3. Pronotum completely metallic green; mid coxae metallic green; antennal scrobe brown; scapular flange with anterior dark part not visible dorsally; axilla completely metallic green; pleuron yellow .....
  - specimens from Yunnan and 1 specimen from Taiwan
  - Pronotum metallic green dorsally; mid coxae yellow; antennal scrobe yellow; scapular flange with anterior dark part visible dorsally; axilla yellow with a metallic spot anteriorly; pleuron metallic green except acropleuron or prepectus yellow .....most specimens from Taiwan

The key above shows regional differences between specimens. Examination of additional specimens will be necessary to assess if such color variation in females reflects specific differences or not.

### *Cirrospilus dispersus* sp. nov.

(Figs. 26, 27)

**Diagnosis:** Mid lobe of the mesoscutum with 1 pair of longer setae posteriorly, and many shorter setae scattered anteriorly. Propodeum with distinct, strong reticulations, with distinct, strong raised and step-like plicae and median carina; area



**Figs. 13-14.** *Cirrospilus lynceus* Walker: 13. dorsal view of body; 14. antenna. **Figs. 15-16.** *Cirrospilus brevis* sp. nov.: 15. dorsal view of body; 16. antenna. **Figs. 17-19.** *Cirrospilus centralis* sp. nov.: 17. dorsal view of body; 18. antenna; 19. forewing. **Figs. 20-25.** *Cirrospilus diallus* Walker: 20. dorsal view of body; 21. antenna; 22. forewing; 23. hind femur and tibia; 24. hind wing; 25. front view of head. **Figs. 26-27.** *Cirrospilus dispersus* sp. nov.: 26. antenna; 27. dorsal view of body. **Figs. 28-31.** *Cirrospilus divergens* sp. nov.: 28. dorsal view of body; 29. forewing; 30. antenna; 31. hind wing. **Figs. 32-34.** *Cirrospilus elegantissimus* Westwood: 32. dorsal view of body; 33. antenna; 34. forewing. **Figs. 35-38.** *Cirrospilus ingenuus* Gahan: 35. forewing; 36. hind wing; 37. dorsal view of body; 38. antenna. **Figs. 39-42.** *Cirrospilus insculptus* sp. nov.: 39. dorsal view of body; 40. antenna; 41. forewing; 42. forewing. **Figs. 43-44.** *Cirrospilus nigrifemur* sp. nov.: 43. dorsal view of body; 44. antenna. **Figs. 45-48.** *Cirrospilus perticus* sp. nov.: 45. dorsal view of body; 46. forewing; 47. lateral view of head; 48. hind wing. **Figs. 49-52.** *Cirrospilus pictus* (Nees): 49. dorsal view of body; 50. antenna; 51. hind wing; 52. forewing.

between plicae generally reticulate, although additional rugae sometimes present, but at least always with sculpturing weaker and more regular than plicae. Dorsellum shorter than propodeum medially. Pronotum less than 1/2 length of mid lobe of the mesoscutum. Forewing hyaline. Cubital vein relatively straight; setae in basal cell dark, sparse. Notaulus complete to scutoscuteellar suture.

This species resembles *C. diallus* in having distinct plicae on the propodeum. But it is quite distinct in having many scattered setae and only 1 pair of stronger setae on mid lobe of the mesoscutum, while *C. diallus* has no scattered but 2 paired setae.

**Female:** Body length 1.9 mm, forewing length 1.7 mm.

Body yellow with dark patches, anterior part of pronotum, central spot of scutellum, anterior and median part of propodeum, and transverse median part of gaster. Eye reddish. Antennae dark except scape and pedicel. Setae yellow.

Head wider than high, smooth. Vertex not vaulted. Eye with sparse piles. Torulus placed above lower eye margin. Scape flattened. Flagellar segments subequal in width. Clava longer than each funicular segment. Relative measurements: head width 57, head length 24, head height 35, POL 11, OOL 8, eye length 22, eye width 14, interorbital distance 33, malar space 12, torulus distance from median ocellus 15, torulus distance from mouth margin 15, scape 20, pedicel 9, F<sub>1</sub> 14, F<sub>2</sub> 11, clava 21.

Mid lobe of the mesoscutum with 1 pair of longer setae, with shorter setae scattered anteriorly over most of dorsal surface, with isodiametric, superficial reticulations. Notaulus straight, converging, ending at inner margin of axilla. Axilla with apex anterior to scutoscuteellar suture, reticulate. Scutellum with 2 pairs of setae, as long as mesoscutum, with submedian grooves, with isodiametric, superficial reticulations. Anterior pair of setae as long as posterior pair. Dorsellum reticulate, with rounded posterior margin. Propodeum shorter than scutellum, medially distinctly longer than dorsellum, with median carina and distinct step-like plicae. Area between median carina and plicae distinctly reticulate. Callus with 10 setae. Relative measurements: pronotum 6, mesoscutum 9, scutellum 9, area between submedian grooves 7/9, dorsellum 2, propodeum 4.

Forewing hyaline. Costal cell with 2 lines of setae on lower surface and those on upper surface present on distal 1/2. Submarginal vein with 5 setae on dorsal surface. Cubital vein straight at base. Basal cell with several setae below submar-

ginal vein. Speculum very small. Hind wing subacute apically. Relative measurements: submarginal vein 40, costal cell 50, parastigma 10, marginal vein 51, postmarginal vein 28, stigmal vein 12.

Gaster oblong-ovate, as broad as thorax. Apex of gaster acute. Apex of ovipositor sheath visible. Relative measurements: gaster length 24, head plus thorax 25, gaster width 19.

**Materials examined:** 5 ♀♀. Holotype: ♀, Hainan, Jianfeng Mts., 17 May 1983 (Z Bouček) (BMNH). Paratypes: 4 ♀♀, Hainan, Jianfeng Mts., 17 May 1983 (Z Bouček) (BMNH).

**Distribution:** China: Hainan.

**Etymology:** This species name is derived from the Latin *dispers* (= scattered) for it is quite distinct in having many scattered setae and only 1 pair of stronger setae on the mid lobe of the mesoscutum.

### ***Cirrospilus divergens* sp. nov.**

(Figs. 1, 2, 28, 29, 30, 31)

**Diagnosis:** Propodeum with median carina widely expanding posteriorly from base (Fig. 28). Mid lobe of the mesoscutum with at least 2 pairs of setae, one posteriorly and another anteriorly, although an additional pair or additional smaller setae may be present anteriorly. Speculum not extending past 1/3 length of marginal vein. Anterior pair of scutellar setae only slightly shorter than posterior pair; longitudinal grooves on scutellum distinct. Propodeum engraved reticulate medially, with distinct median carina, without plicae. Dorsellum shorter than propodeum medially. Forewing hyaline, with at least 1 complete row of admarginal setae. Pronotum usually less than 1/2 length of mesoscutum. Cubital vein relatively straight; setae in basal cell strong, black, and sparse. Notaulus complete to scutoscuteellar suture. Body yellow with brown patches on pronotum, and on posterior 2/3 of area between submedian grooves on scutellum.

This species resembles *C. submedialis* in having mid lobe of the mesoscutum with at least 2 pairs of large, strong setae, one posteriorly and one anteriorly, although an additional pair or additional smaller setae anteriorly may be present. This species is unique in having the median carina of propodeum expanded to form a triangular plate, while the carina of other species is linear.

**Female:** Body length 1.1-1.2 mm, forewing length 1.2-1.3 mm.

Body yellow with the following brown areas. Occiput except area near vertex, median part of

pronotum, lower mesepisternum, most of mesopleuron, posterior 2/3 of area between submedian grooves on scutellum, anterolateral part of axilla, median part of propodeum, and gaster except T1 and last tergum. Antennae brown except scape yellow, pedicel with basal 1/2 brown, the rest yellow. Legs yellow, except hind coxae yellowish brown at apex.

Head as wide as high. Vertex not vaulted. Piles on eyes sparse. Torulus placed below lower eye margin. Scape cylindrical. Flagellar segments subequal in width. Clava longer than each funicular segment. Relative measurements: head width 41, head length 13, head height 35, POL 9, OOL 5, eye 22/8, interorbital distance 20, malar space 10, mouth opening 13, torulus to median ocellus 13, torulus to mouth margin 10, scape 15, pedicel 7, F<sub>1</sub> 10, F<sub>2</sub> 9, clava 16.

Notaulus curved, turning outwards anteriorly, parallel posteriorly, ending at inner margin of axilla. Mid lobe of the mesoscutum with 2-3 pairs of setae, occasionally with scattered setae, with diametric, superficial reticulations. Axilla with apex anterior to scutoscutellar suture, vaguely reticulate anteriorly, remainder smooth. Scutellum longer than mesoscutum, with elongate, superficial reticulations distinct on median stripe, vaguely reticulate laterally, with submedian grooves not straight. Anterior pair of setae as long as posterior pair. Dorsellum smooth, with rounded posterior margin. Propodeum shorter than scutellum, medially distinctly longer than dorsellum, with isodiametric, engraved reticulations. Median carina present. Callus with 6 setae. Plicae absent. Relative measurements: thorax 14/14, pronotum 4, mesoscutum 5, scutellum 7, dorsellum 1.5, propodeum 2.

Forewing hyaline. Costal cell with a complete line of setae on lower surface, with setae on upper surface only present apically. Submarginal vein with 4 setae on dorsal surface. Cubital vein straight. Basal cell with several setae below submarginal vein. Speculum present under parastigma and near basal vein, closed posteriorly. Hind wing subacute apically. Relative measurements: submarginal vein 28, costal cell 40, parastigma 10, marginal vein 31, postmarginal vein 10, stigmal vein 11.

Gaster subrotund, broader than thorax. Apex of gaster acute. Apex of ovipositor sheath visible. Relative measurements: gaster 18, head plus thorax 18, gaster width 14.

**Materials examined:** 11 ♀♀. Holotype: ♀, Beijing, Daniwan, 24 June 1955, (DX Zhang). Paratypes: 3 ♀♀, Beijing, Daniwan, 24 June 1955 (DX Zhang); 7 ♀♀, Beijing, Zhaodonglou, 3 July 1955 (DX Zhang).

**Distribution:** China: Beijing.

**Etymology:** This species name is derived from the Latin *diverg* (= expanding) for its unique median carina of propodeum expanded to form a triangular plate, while the carina of other species is linear.

### ***Cirrospilus elegantissimus* Westwood**

(Figs. 32, 33, 34)

*Cirrospilus elegantissimus* Westwood, 1832: 128.

*Eulophus unistriatus* Förster, 1841: 41. Synonymized by Delucchi, 1958: 253.

*Plesiospilus unistriatus* (Förster): Ferrière, 1954: 398.

*Cirrospilus elegantissimus* Westwood: Delucchi, 1958: 253; Bouček, 1959: 176; Bouček and Askew, 1968: 38.

**Diagnosis:** Anterior pair of setae on scutellum much shorter than posterior ones (less than 1/2 length of latter). Scutellum with or without faint submedian grooves. Thorax dorsally with a broad median metallic green or black stripe. Propodeum smooth or lightly and regularly sculptured, at most evenly reticulate or with 1 or 2 short carina extending from posterior margin; plicae and rugae absent. Dorsellum shorter than propodeum medially. Forewing hyaline, with at least 1 complete row of admarginal setae. Pronotum usually less than 1/2 length of mesoscutum. Cubital vein relatively straight; setae in basal cell stronger, usually black, sparser. Reticulations on mesoscutum and scutellum engraved. Notaulus complete to scutoscutellar suture.

**Material examined:** 1 ♀. Hebei, Yongning, 11 June 1978, ex. *Lyonetia* sp. [Lyonetiidae].

**Host range:** Ectoparasitoids of Gracillariidae (Lepidoptera), and rarely of Curculionidae (Coleoptera). New host record: ectoparasitoids of larvae of *Lyonetia* sp. [Lyonetiidae] (Lepidoptera).

**Distribution:** China: Hebei (new record); Central and Southern Europe.

**Comments:** Kamijo (1987) described *C. ringoniellae* from Japan, and stated it was close to *elegantissimus*, and this species also has black rather than metallic markings on the thorax. *C. ringoniellae* differs from *elegantissimus* in having the propodeum irregularly rugose with plicae.

### ***Cirrospilus ingenuus* Gahan**

(Figs. 11, 35, 36, 37, 38)

*Cirrospilus ingenuus* Gahan, 1932: 753.

*Scotolinx quadristriata* Subba Rao and Ramamani, 1966: 412. Synonymized by Ujiye and Adachi, 1995: 96.

*Cirrospilus quadristriatus* (Subba Rao and Ramamani): Batra and Sandhu, 1981; Bouček, 1988; Sheng and Wang, 1993.

*Cirrospilus ingenuus* Gahan: Heppner, 1993: 56; Ujiye and Adachi, 1995: 96; Schauff et al., 1998: 1010.

**Diagnosis:** Thorax yellowish orange, without dark or metallic markings dorsally (Fig. 37), with raised reticulations. Mid lobe of the mesoscutum with only paired setae (3-4 pairs). Torulus not very high on head, usually at or near lower eye margin. Scape generally not extending above vertex. Propodeum with rugose sculpturing stronger than that on scutellum; plicae or median carina absent. Dorsellum shorter than propodeum medially. Forewing hyaline, with at least 1 complete row of admarginal setae. Pronotum usually less than 1/2 length of mesoscutum. Cubital vein relatively straight; setae in basal cell stronger, usually black, sparser. Scutellum with faint submedian grooves. Notaulus complete to scutocutellar suture.

**Materials examined:** 35 ♀♀. 3 ♀♀, Zhejiang, Linhai, May-Sept. 1995, ex. *Phyllocnistis citrella* Stainton (ZX Yang) (JXAU); 1 ♀ determined by Prof. Sheng (1993) as *Cirrospilus quadristriatus* (Subba Rao and Ramamani), Jiangxi, Xin'gan, 14 Apr. 1982, ex. *Phyllocnistis citrella* Stainton (BL Shen) (JXAU); 1 ♀, Jiangxi, 17 Aug. 1987, ex. Pupae of *Phyllocnistis citrella* Stainton (ZQ Yang) (JXAU); 1 ♀, Jiangxi, 20 Aug. 1987, ex. Larvae of *Phyllocnistis citrella* Stainton (ZQ Yang) (JXAU); 1 ♀, Jiangxi, Kangnan 1983 (JXAU); 1 ♀, Fujian 1993, ex. *Phyllocnistis citrella* Stainton (LD Wang); 3 ♀♀, Fujian, Fuzhou, July 1983 (MS Chen); 1 ♀, Fujian, Putian Co., 26 Sept. 1979 (BK Huang); 2 ♀♀, Fujian, Yanzhou, 12 Sept. 1983 (YQ Tang); 2 ♀♀, Guangzhou, Baiyun Shan, 23 Apr. 1981, ex. leaf-miner (Lyonetiidae) on citrus (pupae) (DX Liao); 2 ♀♀, Guangzhou, Baiyun Mts., 13 May 1981, ex. leaf-miner (Lyonetiidae) on citrus (pupae) (DX Liao); 4 ♀♀, Guangzhou, Baiyun Shan, 2 June 1981, ex. leaf-miner (Lyonetiidae) on citrus (pupae) (DX Liao); 3 ♀♀, Guangdong, Institute of Entomology, 1 Sept. 1981, ex. larvae of leaf-miner (Lyonetiidae) (DX Liao); 3 ♀♀, Guangdong, Institute of Entomology, 3 Aug. 1981, ex. larvae of leaf-miner (Lyonetiidae) (DX Liao); 2 ♀♀, Guangzhou, Shahe, 10 Sept. 1979, ex. leaf-roller of Lepidoptera on citrus (NC Qiu); 3 ♀♀, Guangxi, Guilin, Mar. 1983, ex. *Phyllocnistis citrella* Stainton (YS Lu); 1 ♀, Guangxi, Guilin, Feb. 1986, ex. *Phyllocnistis citrella* Stainton (YS Lu); 1 ♀, Guangxi, Guilin, 16 June 1987, Guangxi, Guilin, Mar. 1983, ex. *Phyllocnistis citrella* Stainton (ML Dai); 3 ♀♀, Guangxi, Guilin, 22 June 1987, Guangxi, Guilin, Mar. 1983, ex. *Phyllocnistis citrella* Stainton (ML Dai); 1 ♀, Guangxi, Guilin, 23 June 1986, Guangxi, Guilin, Mar. 1983, ex. *Phyllocnistis*

*citrella* Stainton (ML Dai).

**Host range:** Ectoparasitoids of Gracillariidae. New host record: ectoparasitoid of Lyonetiidae.

**Distribution:** China: Zhejiang, Jiangxi, Fujian, Guangdong, Guangxi.

**Comments:** Most specimens examined have 4-5 brown, transverse stripes on gaster, but anterior or posterior stripes may be somewhat faded. One specimen from Putian, Fujian has posterior and lateral parts continuously dark brown.

### ***Cirrospilus insculptus* sp. nov.**

(Figs. 39, 40, 41, 42)

**Diagnosis:** Sculpturing on mid lobe of the mesoscutum engraved. Thorax with broad longitudinal metallic stripe (Fig. 39). Mid lobe of the mesoscutum with 3 pairs of setae. Torulus not high on head, usually at or near lower eye margin. Scape generally not extending above vertex. Propodeum with distinct median carina, plicae, and rugae. Sculpturing on propodeum much stronger than that on scutellum. Dorsellum shorter than propodeum medially. Forewing hyaline, with at least 1 complete row of admarginal setae. Pronotum usually less than 1/2 length of mesoscutum. Cubital vein relatively straight; setae in basal cell strong, black, and sparse. Notaulus complete to scutocutellar suture.

This species resembles *C. phyllocnistis* and *C. ingenuus* in having mid lobe of the mesoscutum with only paired setae, but it differs from both latter species in having engraved reticulations on thorax.

**Female:** Body length 3.0-3.1 mm, forewing length 2.3-2.4 mm.

Body yellow with the following areas metallic green, ocellar triangle, median stripe on pronotum, midlobe of mesoscutum and scutellum, and median panel of dorsellum; the following areas brown or black: upper 1/2 of occiput behind ocellar triangle and postgena, lower part of mesepisternum, lower parts of upper and lower mesepimeron, metepimeron, propodeum, lateral depressions on dorsellum, median part of gaster. Antennae brown except scape yellow with dorsal surface brown, and yellowish brown apically, pedicel metallic. Legs yellow, except fore coxae with 1 brown patch anterodorsally, hind coxae yellow with brown patch basally. Fore coxae color contrasting with mesosoma. Mid and hind coxae same color as mesosoma.

Head wider than high. Vertex not vaulted. Piles on eyes sparse. Torulus placed above lower eye margin. Scape slightly flattened. Flagellar segments subequal in width. Clava longer than

each funicular segment. Relative measurements: head width 64, head length 29, head height 47, POL 14, OOL 10, eye length 26, eye width 15, interorbital distance 34, malar space 19, mouth opening 22, torulus to median ocellus 22, torulus to mouth margin 14, scape 26, pedicel 12, F<sub>1</sub> 20, F<sub>2</sub> 15, clava 27.

Notaulus straight, parallel posteriorly, ending at inner margin of axilla. Mid lobe of the mesoscutum with 3 pairs of setae, without scattered setae. Reticulations on mesoscutum isodiametric, raised anteriorly, engraved posteriorly. Axilla with anterior margin in line with scutoscuteellar sutures, with indistinct reticulations. Scutellum shorter than mesoscutum, with distinct, isodiametric, engraved reticulations on median stripe, vaguely reticulate laterally on remaining parts, with oblique submedian grooves. Anterior pair of setae shorter than posterior one.

Dorsellum with isodiametric, engraved reticulations, with rounded posterior margin. Propodeum shorter than scutellum, medially distinctly longer than dorsellum, rugose. Median carina present. Callus with 13 setae. Plicae present. Relative measurements: thorax length 29, thorax width 20, pronotum 8, mesoscutum 13, scutellum 11.5, dorsellum 3, propodeum 7.5.

Forewing hyaline. Costal cell with setae on lower surface present as a complete line, with those on upper surface present on distal 1/2. Submarginal vein with 9 setae on dorsal surface. Cubital vein straight. Basal cell bare below submarginal vein. Speculum very small. Hind-wing nearly truncate apically. Relative measurements: submarginal vein 48, costal cell 75, parastigma 18, marginal vein 77, postmarginal vein 18, stigmal vein 18.

Gaster elongate, as broad as thorax. Apex of gaster acute. Longer setae longer than remaining setae. Apex of ovipositor sheath visible. Relative measurements: gaster 50, head plus thorax 37, gaster width 20.

*Materials examined:* 3 ♀♀. Holotype: ♀, Tibet, Bomi Co., Tangmai, 11 July 1997 (CD Zhu). Paratypes: 1 ♀, Tibet, Bomi Co., Tangmai, 11 July 1997 (CD Zhu); 1 ♀, Tibet, Bomi Co., Tangmai, 12 July 1997 (CD Zhu).

*Distribution:* China: Tibet.

*Etymology:* This species name is derived from the Latin *insculpt* (= engraved) for it has engraved reticulations on mesosoma.

### ***Cirrospilus jiangxiensis* Sheng and Wang**

*Cirrospilus jiangxiensis* Sheng and Wang, 1992: 35-36, 39. Holotype female, China, Jiangxi [examined].

*Diagnosis:* This species is very close to *C. ingenuus* Gahan. It is distinct in having the propodeum almost completely black except callus and gaster with dark patches on each tergite, while *C. ingenuus* has a nearly completely yellow thorax and 3 to 5 transverse dark stripes on middle of gaster.

Sheng and Wang (1992) stated that this species is very similar to *C. diallus*, from which it differs by being mainly yellow, and having black markings on the thorax restricted to small black spots on the anterior part of the notaulus and the anterior part of the axilla, and the side of the scutellum and propodeum. Sheng (1994) also distinguished this species from *C. ingenuus* in having both median carina and plicae. Thus he placed it in the same couplet as *C. tricuspoidatus*. After re-examination of the holotype, we found that this species differs from *C. diallus* in the absence of distinct or complete plicae and the presence of strong rugae on the propodeum. Also, it does not fall within the color range of the latter species. Examination of all specimens of *C. ingenuus* which have been reared out from the same host in the same locality, or swept in the field elsewhere, has shown that the propodeal and gastral dark pattern of *C. jiangxiensis* does not fall into the range of *C. ingenuus*.

*Material examined:* Holotype: ♀, Jiangxi, Nanchang, Meiling 19 Oct. 1989, ex. *Phyllocnistis citrella* Stainton (ZX Yang) (JXAU).

### ***Cirrospilus nigrifemur* sp. nov.**

(Figs. 43, 44)

*Diagnosis:* Body completely dark. Femur with dark marks dorsally. Reticulations on thorax engraved. Cubital vein distinctly curved anteriorly at base; setae in basal cell generally short, lightly colored, and dense; speculum usually absent or small and narrow. Notaulus complete to scutoscuteellar suture.

This species resembles *C. curvineurus* in having engraved reticulations on mesoscutum and scutellum, but it differs from the latter in having a completely black body; legs with mostly dark femora, while *C. curvineurus* has a completely dark green meso- and metasoma; yellow head with dark patches; yellow legs except dark green coxae.

*Female:* Body length 1.2-1.3 mm, forewing length 1.2-1.6 mm.

Body black. Antennae yellow except scape black, pedicel mostly black, with yellow apex, yellowish brown anelli. Legs yellow, except fore and mid-coxae brown, fore femur brown on basal 1/2,

yellow on apical 1/2, mid- and hind-femur brown with yellow apical part, tarsus 4 yellowish brown.

Head wider than high. Vertex not vaulted. Piles on eyes sparse. Torulus placed at lower margin of eye. Scape cylindrical. Flagellum becoming wider apically. Clava longer than each funicular segment. Relative measurements: head width 48, head length 22, head height 40, POL 12, OOL 7, eye length 24, eye width 16, interorbital distance 24, malar space 14, mouth opening 18, torulus to median ocellus 26, torulus to mouth margin 9, scape 23, pedicel 11, F<sub>1</sub> 7, F<sub>2</sub> 7, clava 19.

Notaulus straight, converging, ending at inner margin of axilla. Mid lobe of the mesoscutum with 3 pairs of setae, with isodiametric, superficial reticulations. Axilla with apex anterior to scutoscuteellar suture, reticulate. Scutellum as long as mesoscutum, with distinct and straight submedian grooves, and elongate, engraved reticulations. Anterior pair of setae as long as posterior pair. Dorsellum smooth, with rounded posterior margin. Propodeum shorter than scutellum, medially distinctly longer than dorsellum, with isodiametric, engraved reticulations. Median carina present, inverted Y-shaped posteriorly. Plicae absent. Relative measurements: thorax length 15, thorax width 14, pronotum 4, mesoscutum 6, scutellum 7.5, dorsellum 1.5, propodeum 4.5. Callus with 11 setae.

Forewing hyaline. Costal cell with setae on lower surface and upper surface present on distal 1/2. Submarginal vein with 4 setae on dorsal surface. Cubital vein sinuate, curving anteriorly at base. Basal cell bare below submarginal vein. Speculum very small. Hind-wing subacute apically. Relative measurements: submarginal vein 29, costal cell 49, parastigma 19, marginal vein 34, postmarginal vein 13, stigmal vein 13.

Gaster subrotund, broader than thorax. Apex of gaster acute. Relative measurements: gaster 20, head plus thorax 20, gaster width 15.5.

*Materials examined:* 2 ♀♀. Holotype: ♀, Hebei, Xinglong Co., 24 July 1985, 2116 m (HF Mi). Paratype: 1 ♀, Jilin, Changbai Mts., 3 Aug. 1996, 1150 m (DW Huang).

*Distribution:* China: Hebei, Jilin.

*Etymology:* This species name is derived from the Latin *nigr* (= dark) and *femur* (= femora) for it differs from *C. curvineurus* in having mostly dark femora.

***Cirrospilus perticus* sp. nov.**

(Figs. 45, 46, 47, 48)

*Diagnosis:* Torulus placed high on head, dis-

tinctly nearer to median ocellus than to mouth margin (Fig. 47). Scape extending distinctly above vertex. Body yellow. Submedian grooves on scutellum faint. Propodeum with very vague, isodiametric, superficial reticulations; plicae present. Dorsellum shorter than propodeum medially. Forewing hyaline, with at least 1 complete row of admarginal setae. Pronotum usually less than 1/2 length of mesoscutum. Cubital vein relatively straight; setae in basal cell strong, black, and sparse. Notaulus complete to scutoscuteellar suture.

This species is unique in this genus in having the torulus placed high on the head, distinctly nearer to the median ocellus than to mouth margin, and well above the lower eye margin, so that the scape extends distinctly above the vertex

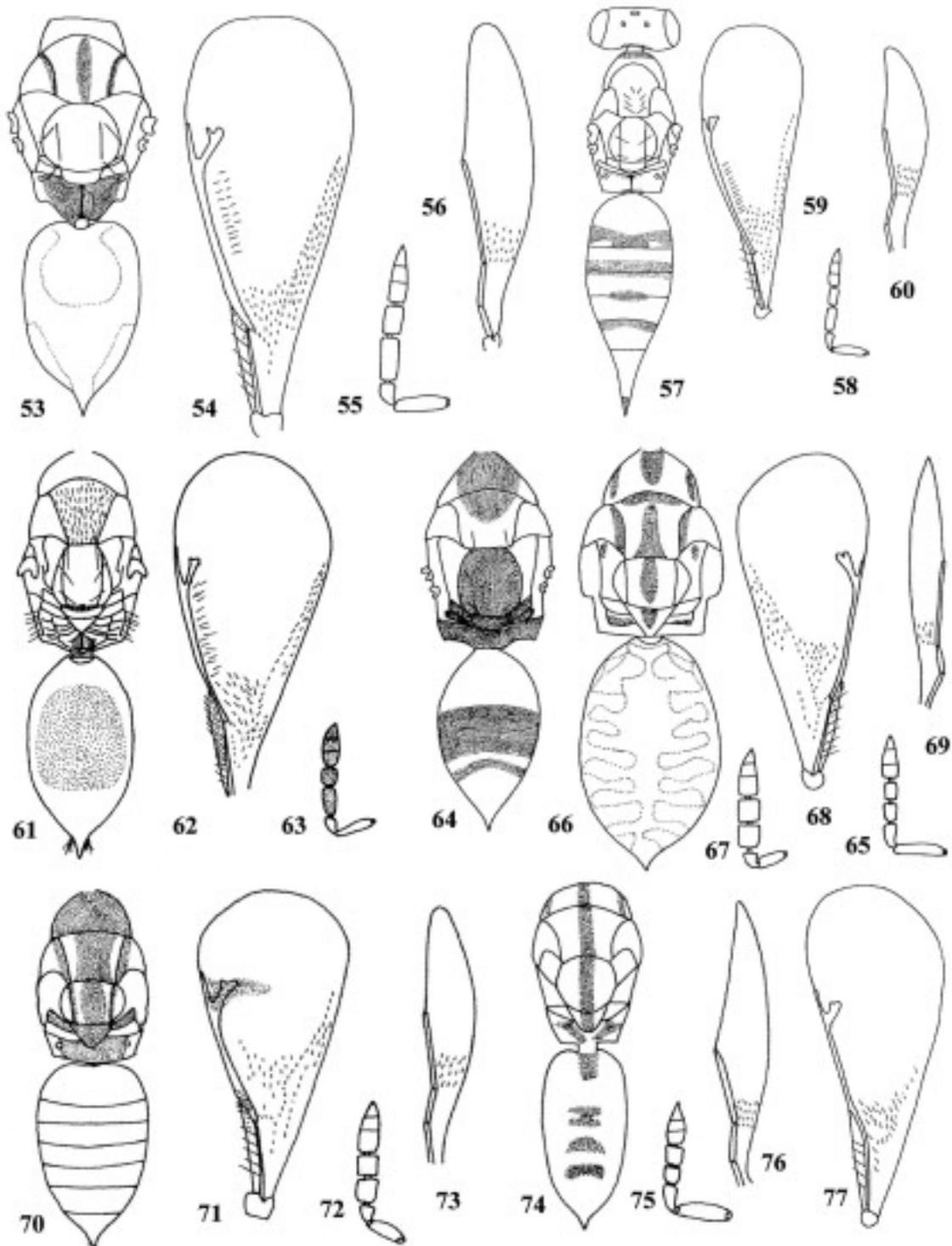
*Female:* Body length 1.75 mm, forewing length 1.55 mm.

Body yellow. Antennae yellow except pedicel yellowish brown basally.

Head wider than high, smooth. Vertex not vaulted. Piles on eyes sparse. Torulus placed above lower eye margin. Scape slightly flattened. Flagellar segments subequal in width. Clava longer than each funicular segment. Relative measurements: head width 46, head length 19, head height 34. POL 9, OOL 6, eye length 19, eye width 10, interorbital distance 25, malar space 13, torulus distance from median ocellus 11, torulus distance from mouth margin 15, mouth opening 14, scape 18, pedicel 8, F<sub>1</sub> 14, F<sub>2</sub> 11, clava 23.

Mid lobe of the mesoscutum with 4 pairs of setae, with isodiametric, engraved reticulations. Notaulus straight, turning outwards anteriorly, parallel posteriorly, ending at inner angles of axilla. Axilla with anterior margin in line with scutoscuteellar sutures, reticulate. Scutellum as long as mesoscutum, with 2 pairs of setae, with isodiametric, engraved reticulations. Anterior pair of setae as long as posterior pair. Dorsellum smooth, with rounded posterior margin. Propodeum shorter than scutellum, medially distinctly longer than dorsellum, with very vague, isodiametric, superficial reticulations. Callus with 12 setae. Median carina present, inverted T-shaped posteriorly. Plicae present. Relative measurements: thorax length 21, width 13, pronotum 4, mesoscutum 8, scutellum 7.5, dorsellum 1, propodeum 6.

Forewing hyaline. Costal cell with a line of setae on lower surface and upper surface present on distal 1/2. Submarginal vein with 6 setae on dorsal surface. Cubital vein straight at base. Basal cell with 1 setal line parallel to submarginal vein. Speculum very small. Hind-wing subacute



**Figs. 53-56.** *Cirrospilus striatus* sp. nov.: 53. dorsal view of body; 54. forewing; 55. antenna; 56. hind wing. **Figs. 57-60.** *Cirrospilus submedialis* sp. nov.: 57. dorsal view of body; 58. antenna; 59. forewing; 60. hind wing. **Figs. 61-63.** *Cirrospilus transrugosus* sp. nov.: 61. dorsal view of body; 62. forewing; 63. antenna. **Figs. 64-65.** *Cirrospilus tricuspis* Sheng: 64. dorsal view of body; 65. antenna. **Figs. 66-69.** *Cirrospilus variegatus* (Masi) from Guangxi: 66. dorsal view of body; 67. antenna; 68. forewing; 69. hind-wing. **Figs. 70-73.** *Cirrospilus variegatus* (Masi) from Hubei: 70. dorsal view of body; 71. forewing; 72. antenna; 73. hind-wing. **Figs. 74-77.** *Cirrospilus vittatus* Walker: 74. dorsal view of body; 75. antenna; 76. hind-wing; 77. forewing.

apically. Relative measurements: submarginal vein 36, costal cell 48, parastigma 15, marginal vein 55, postmarginal vein 19, stigmal vein 15.

Gaster subrotund, broader than thorax. Apex of gaster acute. Apex of ovipositor sheath visible. Relative measurements: gaster length 23, head plus meso- and metasoma 27, gaster width 16.

**Material examined:** 1 ♀. Holotype: ♀, Guangxi, Fangcheng, Fulong, 22 Apr. 1998 (CD Zhu).

**Distribution:** China: Guangxi.

**Etymology:** This species name is derived from the Latin for long shaft or long arm of something because the torulus is high on the head, distinctly nearer to the median ocellus than to the mouth margin, thus apex of the scape extends above the vertex.

### *Cirrospilus phyllocnistis* (Ishii)

*Scotolinx phyllocnistis* Ishii, 1953: 4.

*Cirrospilus phyllocnistis* (Ishii): Kamijo, 1987: 45; Sheng and Wang, 1992: 14; Schauff et al., 1998: 1010.

**Diagnosis:** Thorax yellowish orange, with a dark brown median stripe on mesoscutum and scutellum, or at least with a dark brown median spot on each, with raised reticulations. Mid lobe of the mesoscutum with paired setae, and with several scattered setae near the anterior margin. Torulus not very high on head, usually at or near lower eye margin. Scape generally not extending above vertex. Propodeum with distinct rugose reticulations stronger than those on scutellum; plicae or median carina absent. Dorsellum shorter than propodeum medially. Forewing hyaline, with at least 1 complete row of admarginal setae. Pronotum usually less than 1/2 length of mesoscutum. Cubital vein relatively straight; setae in basal cell stronger, usually black, sparser. Scutellum with submedian grooves. Notaulus complete to scutoscutellar suture.

**Discussion:** We were unable to confirm any Chinese materials belonging to this species. Sheng and Wang (1992) reported this species from China; however, we could find no determined materials in Prof. Sheng's collection. This species was described from Japan, and we have examined specimens from that country. It is likely that it does occur in China, so we include it in this paper.

*C. phyllocnistis* is extremely close to *C. ingenuus* and *C. jiangxiensis*. All 3 of these species have the propodeum with strong, rugose sculpturing (Fig. 11). Some synonymy may be required here, but it will require further study of

additional materials to resolve this problem.

### *Cirrospilus pictus* (Nees)

(Figs. 9, 49, 50, 51, 52, 79)

*Eulophus pictus* Nees, 1834: 165. Lectotype female, designated by Graham, 1988: 27.

*Cirrospilus thasus* Walker, 1838: 309. Synonymized by Bouček and Askew, 1968: 34.

*Eulophus arcuatus* Förster, 1841: 41. Synonymized by Bouček and Askew, 1968: 34.

[*Eulophus flavovarius* Nees: Walker, 1846: 72. Misidentification].

*Entedon arcuatus* (Förster): Ratzeburg, 1848: 163.

*Cirrospilus bifasciatus* Walker, 1872: 103. Synonymized by Bouček and Askew, 1968: 34.

*Cirrospilus pictus* (Nees): Thomson, 1878: 200; Bouček and Askew, 1968: 34; Noyes, 1988; Schauff et al., 1988: 1010; Kamijo, 1987: 47-48.

*Atoposomoidea ogimae* Howard, 1910: 9-11. Synonymized by Kamijo, 1987: 47.

*Atoposomoidea ogimae* Howard: Mercet, 1916: 79; Ishii, 1938: 104.

*Cirrospilus pictus* var. *alnicola* Erdős, 1956: 7. Synonymized by Bouček, 1959: 177.

*Cirrospilus* (*Atoposomoidea*) *pictus* (Nees): Bouček, 1959: 173.

*Cirrospilus ogimae* (Howard): Iwata and Tachikawa, 1966: 3.

*Cirrospilus nigriscutellaris* Sheng and Wang, 1992: 37. Holotype female, China, Jiangxi, Nanchang, Jiangxi Agricultural Univer. [examined]. **Syn. nov.**

*Cirrospilus huangyaensis* Sheng, 1994: 1-4. Holotype ♀, China, Jiangxi, Nanchang, Jiangxi Agricultural Univer. [examined]. **Syn. nov.**

**Diagnosis:** Reticulations on scutellum engraved. Propodeum smooth, without rugae or carinae. Host range wide and variable. Dark patch on pronotum and that on anterior part of mid lobe of the mesoscutum metallic, continuous, not restricted in middle. Speculum large, extending anteriorly to about 1/2 length of marginal vein. Males often with black spot on yellow mid-tibia; this spot may also be present in females, although it is usually not as dark. Anterior pair of scutellar setae only slightly shorter than posterior pair; longitudinal grooves on scutellum usually distinct. Dorsellum shorter than propodeum medially. Forewing hyaline, with at least 1 complete row of admarginal setae. Pronotum usually less than 1/2 length of mesoscutum. Cubital vein relatively straight; setae in basal cell stronger, usually black, sparser. Notaulus complete to scutoscutellar suture.

**Materials examined:** 39 ♂♂, 178 ♀♀. Holotype of *C. nigriscutellaris* Sheng 1992, ♀, Jiangxi, Nanchang, 17 Aug. 1987 (ZQ Yang) (JXAU); 5 ♀♀, newly designated by senior author as paratypes of *C. nigriscutellaris* Sheng 1992, Zhejiang, Linghai 1996, ex. *Phyllocnistis citrella*

Stainton (ZX Yang) (JXAU); holotype and 1 paratype of *C. huangyaensis* Sheng and Wang 1994, 2 ♀♀, Zhejiang, Huangyan 1992, ex. *Phyllocnistis citrella* Stainton (YS Ren) (JXAU); 8 ♀♀, Beijing, 5 June 1948; 1 ♀, Beijing, 9 June 1948; 5 ♀♀, Beijing, 25 June 1948; 1 ♀, Beijing, 30 Aug. 1977 (SF Wang); 1 ♀, Beijing, 1 July 1957 (JL Mao); 4 ♀♀, Hebei, Changli Co., 21 July 1951 (DX Liao); 2 ♀♀, Shanxi Academy of Sciences, Apr. 1980 (DM Guo); 1 ♂, 3 ♀♀, Shanxi, Qinyuan Co., June 1993-1994 (Y Liu); 2 ♀♀, Inner Mongolia, Baotou City, 4 Aug. 1989, ex. Lyonetiidae (ZR Liu); 1 ♀, Inner Mongolia, Baotou City, 29 July 1981 (ZR Liu); 3 ♀♀, Inner Mongolia, Baotou City, 18 Aug. 1979, ex. Notodontidae (QH Shao); 1 ♀, Inner Mongolia, Xi Ujimqin Qi, 11 Aug. 1982 (QH Shao); 1 ♀, Liaoning, Liaoyang, 31 July 1980, ex. Notodontidae (CK Zhao); 4 ♀♀, Liaoning, Shenyang City, 12 July 1978, ex. Tenthredinidae, *Cirrospilus pictus* (Nees), Bouček det. 1983 (GT Xu); 2 ♀♀, Liaoning, Shenyang City, Beiling, 5 Sept. 1978, ex. *Ivela auripes* (Butler) (GT XU); 1 ♂, 3 ♀♀, Liaoning, Zaomeng, 10 Aug. 1978, ex. *Malacosoma* sp. (GW Wang); 2 ♀♀, Liaoning, Zaomeng 1978; 25 ♂♂, 1 ♀, Jilin, Dongliao, June 1988 (YH Yuan); 8 ♂♂, Jilin, Dongliao, 9 June 1988 (YH Yuan); 11 ♀♀, Jilin, Dongliao, 10 June 1988 (YH Yuan); 8 ♂♂, 7 ♀♀, Jilin, Changchun Institute of Forestry, July 1980 (YY Qiu); 1 ♂, 2 ♀♀, Jilin, Dunhua Co., 16 June 1989 (ZM Wang); 3 ♀♀, Jilin, Panshi, 20 May 1987 (L Sun); 1 ♀, Jilin, Taipingchuan, 20 July 1985, ex. *Cerura menciiana* Moore (FC Zhou); 3 ♀♀, Jiangsu, Nanjing Institute of Forestry, June 1982 (QX Peng); 2 ♀♀, Jiangsu, Xuzhou City, Aug. 1953, ex. *Apanteles chirensis* (ZL Zou); 4 ♀♀, Hunan, Changsha City, Oct. 1982, ex. Braconidae (XW Tong); 2 ♂♂, 3 ♀♀, Hunan, Changsha City, 23 July 1979, ex. larvae of *Gracilaria* (XW Tong); 3 ♀♀, Jiangxi, Liangjiadu, Apr. 1992, ex. *Apanteles* sp. (GX Zhang); 4 ♀♀, Zhejiang, Linhai, May-Sept. 1995, ex. *Phyllocnistis citrella* Stainton (ZX Yang); 1 ♀, Shandong, Nov. 1989, ex. *Apanteles* sp. (D Fan); 1 ♀, Shandong, Qufu Co., 15 Oct. 1962 (DX Liao); 1 ♀, Sichuan, Pengshui Co., 10 Oct. 1981, 850 m (DW Huang); 1 ♀, Ningxia, Yongning Co., 24 June 1978; 4 ♀♀, Xinjiang, Altay, Beitun, July 1979 (JW Xia); 2 ♀♀, Xinjiang, Qinghe, July 1978 (WL Ma).

**Host range:** Parasitoids of Gracillariidae, Lyonetiidae, Tischeriidae, Tortricidae (Lepidoptera), and Curculionidae (Coleoptera). Hyperparasites of Braconidae, Ichneumonidae, and Tenthredinidae

(Hymenoptera). Hosts newly recorded: Lyonetiidae, *Ivela auripes* sp. [Lymantriidae], *Malacosoma* sp. [Lasiocampidae], and *Cerura menciiana* [Notodontidae] (Lepidoptera).

**Distribution:** China: Beijing, Hebei, Shanxi, Inner Mongolia, Liaoning, Jilin, Hunan, Jiangxi, Jiangsu, Zhejiang, Shandong, Sichuan, Ningxia, Xinjiang; Nearctic and Palearctic regions.

**Comments:** *C. pictus* varies greatly in size and coloration. In general, *C. pictus* has a fairly large speculum, and usually the dark color on the thorax has (at least) some metallic shine. All males have 1 large transverse brown stripe on the gaster. Females from different regions show some varieties in coloration of the ocellar triangle, occiput, pronotum, axilla, hind coxae, and gaster.

Sheng (1992) stated that *C. nigriscutellaris* differs from *C. pictus* in having a non-metallic dark patch which is restricted to the pronotum and mid lobe of the mesoscutum. Sheng (1994) also stated that *C. huangyaensis* is closely related to *C. pictus*, but differs in having subquadrate propodeum, yellowishbrown, without metallic green shine, with subparallel anterior and posterior margins, and carinate lateral margins; dark brown patch not continuous between the pronotum and the mesoscutum; mesoscutum brown only anteriorly; dark patch on gaster very small. In his key to 6 species of *Cirrospilus* found in Zhejiang, Jiangxi, and Hubei (Sheng 1994), he indicated that *C. pictus* differs from both *C. nigriscutellaris* and *C. huangyaensis* in having the dark patch between pronotum and mid lobe of the mesoscutum dark metallic, often extending to the rear beyond middle of mesoscutum, gaster with dark patch extending to apex.

Examination of *C. pictus* in our collection, and types of both *C. nigriscutellaris* and *C. huangyaensis*, shows that the dark pattern of both latter species falls within variation seen in *C. pictus*. Thus, we propose both species as new synonyms of *C. pictus*.

### ***Cirrospilus striatus* sp. nov.**

(Figs. 53, 54, 55, 56)

**Diagnosis:** Body yellow, with 3 longitudinal black stripes on thorax, one medially on mid lobe of the mesoscutum, other 2 on the notauli. Propodeum black, rugose. Mid lobe of the mesoscutum with many scattered setae anteriorly (in addition to paired setae); scapular flange with many setae in addition to paired setae. Torulus not high on head, usually at or near lower eye margin. Scape generally not extending above ver-

tex. Propodeum with distinct median carina, plicae, and rugae. Dorsellum shorter than propodeum medially. Forewing hyaline, with at least 1 complete row of admarginal setae. Pronotum usually less than 1/2 length of mesoscutum. Cubital vein relatively straight; setae in basal cell strong, black, and sparse. Notaulus complete to scutoscuteellar suture.

This species resembles *C. transrugosus* in having the mid lobe of the mesoscutum with many scattered setae anteriorly (in addition to paired setae); scapular flange with many setae in addition to paired setae, but it greatly differs from the latter in having the thorax with longitudinal dark stripes on the mid lobe of the mesoscutum, and notaulus; propodeum rugose.

*Female*: Body length 1.85 mm, forewing length 1.55 mm.

Body yellow with the following black patches. Median area of occiput, anterior margin of mesoscutum, middle longitudinal stripes on mesoscutum and scutellum, notaulus, anterolateral corner of axilla, propodeum. Antennae dark brown except scape yellow with dorsal surface brown. Gaster brown with 1 yellow sub-basal patch and yellow posterolateral margins.

Head wider than high. Vertex not vaulted. Piles on eyes sparse. Torulus placed above lower eye margin. Scape cylindrical. Flagellar segments subequal in width. Clava longer than each funicular segment. Relative measurements: head width 46, head length 10, head height 41, POL 10, OOL 4, eye 19/16, interorbital distance 16, malar space 18, mouth opening 13, torulus to median ocellus 17, torulus to mouth margin 16, scape 20, pedicel 7,  $F_1$  17,  $F_2$  12, clava 22.

Notaulus curved, converging, ending at inner angle of axilla. Mid lobe of the mesoscutum with 2 pairs of setae, with additional scattered setae on anterior part, with transverse, raised reticulations anteriorly, smooth posteriorly. Axilla with anterior margin in line with scutoscuteellar sutures, reticulate. Scutellum as long as mesoscutum, with submedian grooves not straight, with isodiametric, engraved reticulations. Anterior pair of setae as long as posterior pair. Dorsellum smooth, with rectangular posterior margin. Propodeum shorter than scutellum, medially distinctly longer than dorsellum, rugose. Median carina present. Callus with 12 setae. Plicae absent. Relative measurements: thorax length 23, thorax width 17, pronotum 3, mesoscutum 9, scutellum 9, dorsellum 2, propodeum 6.

Forewing hyaline. Costal cell with 1 incomplete line of setae on lower surface, with those on

upper surface present on distal 1/2. Submarginal vein with 5 setae on dorsal surface. Cubital vein straight. Basal cell bare below submarginal vein. Speculum very small. Hind-wing subacute apically. Relative measurements: submarginal vein 37, costal cell 53, parastigma 18, marginal vein 55, postmarginal vein 20, stigmal vein 19.

Gaster oblong-ovate, narrower than thorax. Apex of gaster acute. Longer setae less than twice length of others. Apex of ovipositor sheath visible. Relative measurements: gaster length 25, head plus thorax 29, gaster width 14.

*Material examined*: 1 ♀, Holotype: Tibet, Zayü 19 July 1997 (CD Zhu).

*Distribution*: China: Tibet.

*Etymology*: This species name is derived from the Latin *stri* or *striat* (= striped or grooved) for it is unique in having longitudinal dark stripes on the mid lobe of the mesoscutum and notaulus.

#### ***Cirrospilus submedialis* sp. nov.**

(Figs. 57, 58, 59, 60)

*Diagnosis*: Median carina on propodeum linear from base to near end, and T-shaped posteriorly. Mid lobe of the mesoscutum with at least 2 pairs of setae, one posteriorly and another anteriorly, although an additional anterior pair or additional smaller setae may be present anteriorly. Speculum not extending past 1/3 length of marginal vein. Anterior pair of scutellar setae only slightly shorter than posterior pair; longitudinal grooves on scutellum distinct. Propodeum engraved reticulate medially, with distinct median carina, without plicae. Dorsellum shorter than propodeum medially. Forewing hyaline, with at least 1 complete row of admarginal setae. Pronotum usually less than 1/2 length of mesoscutum. Cubital vein relatively straight; setae in basal cell strong, black, and sparse. Notaulus complete to scutoscuteellar suture. Body yellow with brown patches on pronotum, anterior margin of propodeum, and the attachment of propodeum to gaster.

This species resembles *C. divergens*. Differences between both species are shown in the key. It also resembles *C. perticus* by having the body almost entirely yellow, and the torulus placed high above the lower eye margin, but differs by having distinct submedian grooves on scutellum.

*Female*: Body length 1.85 mm, forewing length 1.55 mm.

Body yellow, except area around foramen magnum, inner areas of each ocellus, anterior

margins of pronotum and propodeum black. Propodeum black at anterior margin and attachment to gaster. Gaster with 4 dark, transverse bands present between tergites.

Head wider than high, smooth. Vertex not vaulted. Eye with sparse piles. Torulus placed above lower eye margin. Scape slightly flattened. Flagellar segments subequal in width. Clava longer than each funicular segment. Relative measurements: head width 48, head length 18, head height 35, POL 10.5, OOL 6.5, eye length 19, eye width 11, interorbital distance 30, malar space 15, torulus distance from median ocellus 16, torulus distance from mouth margin 12, mouth opening 11, scape 20, pedicel 10,  $F_1$  12,  $F_2$  10.5, clava 20.

Mid lobe of the mesoscutum with 4 pairs of setae, with isodiametric, superficial reticulations. Notaulus straight, parallel posteriorly, ending at inner margin of axilla. Axilla with apex anterior to scutoscuteellar suture, reticulate. Scutellum with 2 pairs of setae, as long as mesoscutum, with submedian grooves, and isodiametric, superficial reticulations. Anterior pair of setae as long as posterior pair. Dorsellum smooth, with rounded posterior margin. Propodeum shorter than scutellum, medially distinctly longer than dorsellum, with isodiametric, superficial reticulations. Callus with 7 setae. Median carina present, inverted T-shaped posteriorly. Plicae absent. Relative measurements: thorax length 22, thorax width 14, pronotum 4, mesoscutum 8.5, scutellum 8, dorsellum 2, propodeum 3.5.

Forewing hyaline. Costal cell with a line of setae on lower surface and those on upper surface present on distal 1/2. Submarginal vein with 6 setae on dorsal surface. Cubital vein straight at base. Basal cell with several setae below submarginal vein. Speculum very small. Hind-wing subacute apically. Relative measurements: submarginal vein 34, costal cell 48, parastigma 15, marginal vein 50, postmarginal vein 7, stigmal vein 11.

Gaster oblong-ovate, broader than thorax. Apex of gaster acute. Apex of ovipositor sheath visible. Relative measurements: gaster length 30, head plus thorax 30, gaster width 16.

*Material examined:* 1 ♀. Holotype: ♀, Guangxi, Daxing Co., Xialei, 31 Mar. 1998 (CD Zhu).

*Distribution:* China: Guangxi.

*Etymology:* This species name is derived from the Latin *sub* (= nearly) and *med* (= median) for it differs from *C. perticus* in having distinct submedian grooves on the scutellum.

### *Cirrospilus transrugosus* sp. nov.

(Figs. 61, 62, 63)

*Diagnosis:* Thorax completely yellow. Propodeum with transverse rugae. Mid lobe of the mesoscutum with many scattered setae anteriorly (in addition to paired setae); scapular flange with many setae in addition to paired setae. Torulus slightly above lower eye margin. Scape generally not extending above vertex. Propodeum with distinct median carina, plicae, and rugae. Dorsellum shorter than propodeum medially. Forewing hyaline, with at least 1 complete row of admarginal setae. Pronotum usually less than 1/2 length of mesoscutum. Cubital vein relatively straight; setae in basal cell strong, black, and sparse. Notaulus complete to scutoscuteellar suture.

This species is unique in having transverse rugae on propodeum.

*Female:* Body length 1.6 mm, forewing length 1.38 mm.

Body yellow. Eyes reddish. Antennae dark except scape and pedicel yellow. Setae dark except those on callus. Gaster narrowly yellow at base, on sides, near and at apex, with a large, dark brown patch medially.

Head wider than high, smooth. Vertex not vaulted. Eye with sparse piles. Torulus placed slightly above lower eye margin. Scape slightly flattened. Flagellum slightly broadening apically. Clava longer than each funicular segment. Relative measurements: head width 42, head length 16, head height 39, POL 8, OOL 4, eye length 21, eye width 13, interorbital distance 18, malar space 12, torulus distance from median ocellus 15, torulus distance from mouth margin 15, mouth opening 10, scape 13, pedicel 8,  $F_1$  11,  $F_2$  7, clava 17.

Mid lobe of the mesoscutum with 1 pair of longer setae, with shorter setae scattered all over the dorsal surface, with isodiametric, engraved reticulations. Notaulus straight, converging, ending at inner margin of axilla. Axilla with apex anterior to scutoscuteellar suture, reticulate, with several transverse rugae posteriorly. Scutellum with 2 pairs of setae, as long as mesoscutum, with submedian grooves, with isodiametric, superficial reticulations. Anterior pair of setae as long as posterior pair. Dorsellum smooth, with rounded posterior margin. Propodeum shorter than scutellum, medially distinctly longer than dorsellum, with several sub-parallel transverse rugae. Callus with 8 setae. Median carina present, inverted T-shaped posteriorly. Plicae present. Relative mea-

surements: pronotum 3, mesoscutum 8.5, scutellum 7, dorsellum 1, propodeum 3.

Forewing hyaline. Costal cell with setae scattered all over the lower surface, with those on upper surface present on distal 1/2. Submarginal vein with 8 setae on dorsal surface. Cubital vein straight at base. Basal cell with several setae below submarginal vein. Speculum very small. Hind-wing subacute apically. Relative measurements: submarginal vein 32, costal cell 44, parastigma 13, marginal vein 42, postmarginal vein 15, stigmal vein 13.

Gaster oblong-ovate, as broad as thorax. Apex of gaster acute. Apex of ovipositor sheath visible. Relative measurements: gaster length 24, head plus thorax 25, gaster width 14.

*Materials examined:* 2 ♀♀. Holotype: Hainan, Jianfeng Mts., 17 May 1983 (Z Bouček) (BMNH). Paratype: Guangzhou, Xijiao Mts., 29 May 1983 (Z Bouček) (BMNH).

*Distribution:* China: Guangzhou, Hainan.

*Etymology:* This species name is derived from the Latin *trans* (= transverse) and *rug* (= wrinkle) for it is unique in having transverse rugae on propodeum.

### ***Cirrospilus tricuspидatus* Sheng**

(Figs. 64, 65)

*Cirrospilus tricuspидatus* Sheng, 1994: 1. Holotype, female, China, Hubei, Wuhan [examined].

*Diagnosis:* This species closely resembles *C. pictus* but differs in having the reticulations on the scutellum raised (as opposed to incised) and the propodeum with several small rugae extending forward from the posterior margin which are absent in *C. pictus*.

Sheng (1994) stated that this species differs from *C. pictus* in having propodeal plicae,  $F_1$  as long as  $F_2$ , submarginal vein with 4 dorsal setae, and dark patches with very slight metallic shine. Examinations of *C. pictus* and type material of *C. tricuspидatus* indicate that most of the characters used by Sheng are too variable to effectively distinguish these species. However, all specimens of *C. tricuspидatus* have distinctly raised reticulations on the scutellum, while *C. pictus* has engraved reticulations on the scutellum. Also, *C. tricuspидatus* has several small rugae on the propodeum, which are seldom found in *Cirrospilus* and are absent in *C. pictus*. The hosts of *C. tricuspидatus* seem to be restricted to spider eggs; *C. pictus* is known as a primary or secondary parasitoid of a

wide range of insect hosts, but is not known to attack spiders.

*Materials examined:* Holotype: ♀, Hubei, Wuhan, Sept.-Oct. 1983, ex. eggs of *Misumenops tricuspидatus* (Fabricius) (spider) (JZ Zhao) (JXAU). Paratypes: 48 ♀♀, Hubei, Wuhan, Sept.-Oct. 1983, ex. eggs of *Misumenops tricuspидatus* (spiders) (JZ Zhao) (JXAU); Hubei, 3 ♀♀, Hubei, Wuchang, Sept. 1978, ex. eggs of *Misumenops tricuspидatus* (spiders); 54 ♀♀, Hubei, Wuhan, 10-20 Sept. 1983, ex. eggs of *Misumenops tricuspидatus* (J Chen).

*Host range:* *Misumenops tricuspидatus* (Araneae: Thomisidae).

*Distribution:* China: Hubei.

### ***Cirrospilus variegatus* (Masi)**

(Figs. 66, 67, 68, 69, 70, 71, 72, 73, 80, 81)

*Atoposoma variegatum* Masi, 1907: 276.

*Zagrammosoma variegatum* (Masi): Ferrière, 1952: 32; Yefremova, 1995: 48.

*Cirrospilus (Zagrammosoma) variegatus* (Masi): Bouček, 1959: 185; Bouček and Askew, 1968: 39.

*Cirrospilus variegatus* (Masi): Bouček, 1988: 616; Schauff et al., 1998: 1010.

*Diagnosis:* Dorsellum large, triangular, longer than propodeum medially. Forewing with dark markings at stigma and parastigma. Pronotum long, more than 1/2 as long as mesoscutum (Figs. 66, 70). Cubital vein relatively straight; setae in basal cell stronger, usually black, sparse. Scutellum with distinct submedian grooves. Funicles all transverse. Body with longitudinal black stripes; stripe at lateral margin of pronotum covering a longitudinal groove. Notaulus complete to scutoscutellar suture.

*Materials examined:* 7 ♀♀. 1 ♀, Hubei, Hefeng, 30 July 1989, 1200 m (DW Huang); 5 ♀♀, Shandong, Huang Co., 2 May 1955 (DX Zhang); 1 ♀, Guangxi, Daxing Co., 29 Mar. 1998 (CD Zhu); Hainan, Tienfong Mts. 19 May 1983 (Z Bouček) (BMNH); 2 ♀♀, Guangdong, Ding-hu Mts., 60 Km W. Of Guangzhou, 4 June 1983 (Z Bouček) (BMNH); 1 ♀, Guangdong, Ding-hu Mts., 60 km W Of Guangzhou, 4 June 1983 (Z Bouček) (BMNH); 2 ♀♀, Great Wall, 60 km NW of Beijing, 12 June 1983 (Z Bouček) (BMNH). Determined specimens examined: 1 ♀, ITALY: Sarre (Aosta), 13 Sept. 1969 (Z Bouček) (BMNH); 1 ♀, SPAIN: Madrid, Cercedilla, 8 July 1974 (Z Bouček) (BMNH).

*Host range:* Ectoparasitoids of larvae of Heliozelidae, Leucopteridae, Lithocolletidae,

Lyonetiidae, Stigmellidae, Gracillariidae (Lepidoptera), and Trypetidae (Diptera).

**Distribution:** China: Hubei, Shandong, Guangxi (new record); all regions.

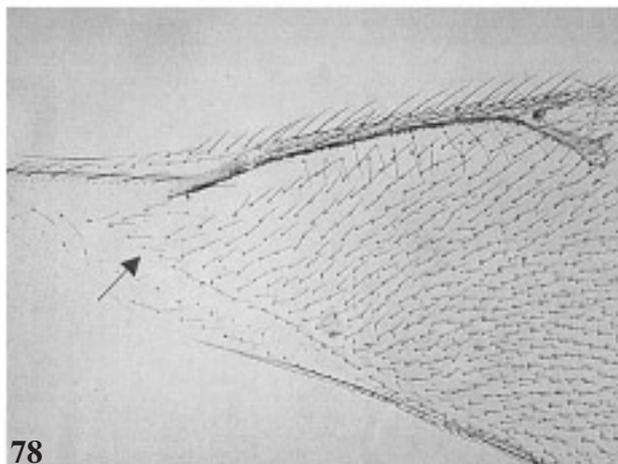
**Comments:** Although we are treating this Chinese sample as *C. variegatus*, it is not clear that it may represent another distinct species. European specimens of *C. variegatus* have 1-2 rows of very small admarginal setae on the underside of the wing (Fig. 80), whereas these setae are absent from Chinese specimens (Fig. 81). Additionally, European specimens have 2 bare areas distal to the stigmal vein (Fig. 80), which are more uniformly setose in Chinese specimens (Fig. 81).

*C. isonoi* Kamijo 1987, from Japan is also clearly closely related to *variegatus*, but is described as having metallic coloration on the thorax (Kamijo 1987). Other characters given by Kamijo to distinguish *isonoi* from *variegatus* are: body squat, F<sub>1</sub> much longer than pedicel, eye bare, forewing with basal cell parallel-sided and color patterns on head

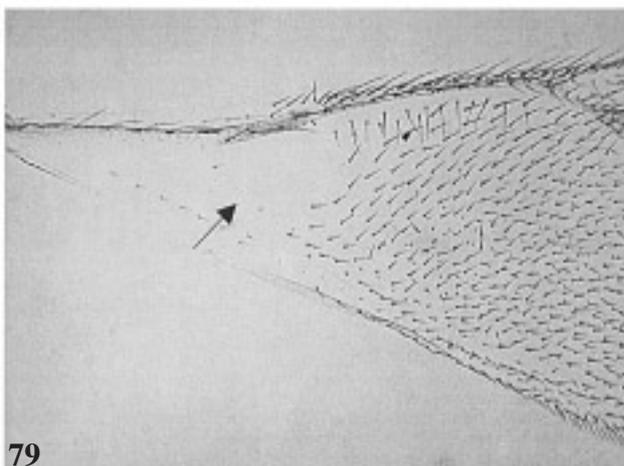
and gaster. We have not yet found specimens that could be assigned to this species in China.

***Cirrospilus vittatus* Walker**

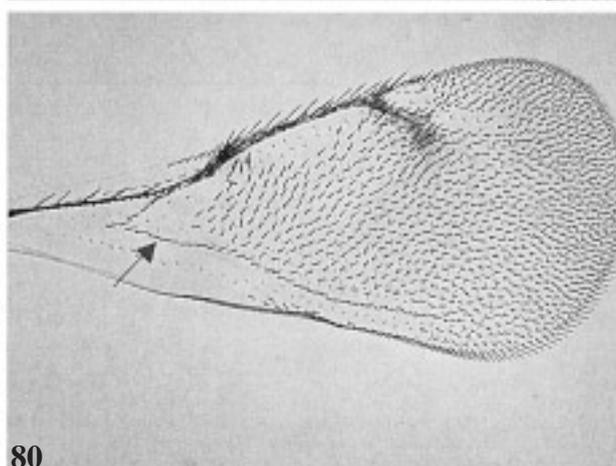
(Figs. 74, 75, 76, 77, 82)



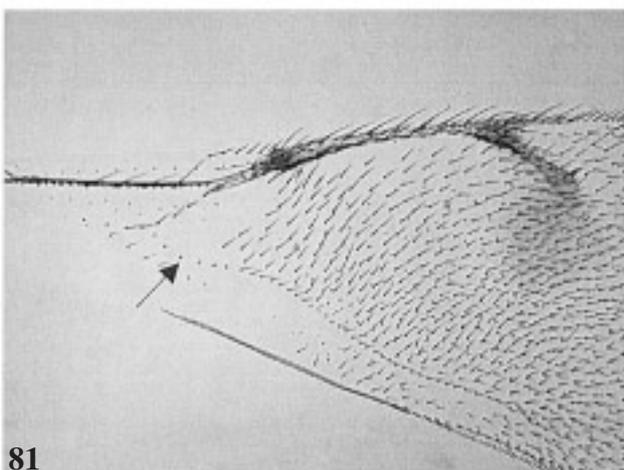
78



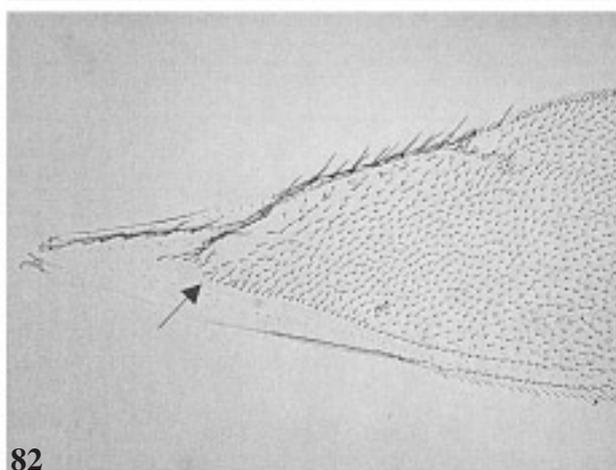
79



80



81



82

**Fig. 78.** *Cirrospilus brevis* sp. nov. **Fig. 79.** *Cirrospilus pictus* (Nees). **Fig. 80.** *Cirrospilus variegatus* (Masi) from Europe. **Fig. 81.** *Cirrospilus variegatus* (Masi) from China. **Fig. 82.** *Cirrospilus vittatus* Walker.

- Cirrospilus vittatus* Walker, 1838: 308. Lectotype designated by Graham, 1991: 8.
- Eulophus lineatus* Förster, 1841: 41. Synonymized with *C. vittatus* by Bouček and Askew, 1968: 37.
- Entedon lineatus* (Förster): Ratzeburg, 1852: 209.
- Zagrammosoma nigrolineata* Crawford, 1913: 257. Synonymized with *C. vittatus* by Bouček, 1988: 616.
- Gyrolasella nigrilineata* (Crawford): Girault, 1916: 125.
- Zagrammosoma sanguinea* Girault, 1916: 133. Synonymized with *Z. nigrolineatum* Crawford by Gordh, 1978: 356. Synonymized with *C. vittatus* by Bouček 1988: 616.
- Atoposomoidea pulcherrima* Mercet, 1916: 77. Lectotype designated by Bouček, 1994: 117. Synonymized with *C. vittatus* by Askew, 1984: 63.
- Cirrospilus donatellae* Mariani, 1942: 12. Indicated as a possible synonym of *C. vittatus* by Bouček 1959: 183. Synonymized with *C. vittatus* by Askew, 1984: 63.
- Atoposoma hytomyzae* Ishii, 1953: 3-4. Synonymized with *C. vittatus* by Kamijo, 1987: 48.
- Cirrospilus vittatus* var. *novickyi* Bakkendorf, 1955: 149. Synonymized with *C. vittatus* by Bouček and Askew, 1968: 149.
- Cirrospilus* (*Atoposomoidea*) *pulcherrimus* (Mercet): Bouček, 1959: 184; Bouček and Askew, 1968: 35.
- Cirrospilus* (*Atoposomoidea*) *vittatus* Walker: Bouček, 1959: 183; Bouček and Askew, 1968: 37.
- Zagrammosoma nigrolineatum* Crawford: Peck, 1963: 190; Gordh, 1978: 356; Burks, 1979: 985.
- Cirrospilus hytomyzae* (Ishii): Bouček and Askew, 1968: 38.
- Cirrospilus vittatus* Walker: Ujiye, 1980: 136; Askew, 1984: 63-67; Kamijo, 1987: 48.

**Diagnosis:** Body mainly yellow, with dark, metallic or black stripes on head and thorax. Reticulations on thorax raised and minute. Cubital line strongly curved anteriorly at base. Dorsellum as long as propodeum medially. Forewing immaculate. Notaulus complete to scutoscuteellar suture.

**Materials examined:** 11 ♀♀. 1 ♀, Beijing Academy of Agriculture, 28 June 1984, ex. *Phytomyza atricornis* Meigen [Agromyzidae] (DW Huang); 1 ♀, Beijing, 5 Apr. 1985, ex. *Phytomyza* sp. (DH Zhao); 3 ♀♀, Shanxi, Qinyuan Co., June 1993-1994, ex. larvae or pupae of *Coleophora* sp. [Lepidoptera] (Y Liu); 1 ♀, Shaanxi, Wugong Co., 8 June 1979 (ST Huo); 3 ♀♀, Jilin, Changchun City, Institute of Forestry, June 1980 (YY Qiu); 1 ♀, Qinghai, Huangyuan, 9 June 1997 (CD Zhu); 1 ♀, Qinghai, Xining City, 5 June 1997 (CD Zhu).

**Host range:** Parasitoid of Cosmopterigidae, Elachistidae, Gracillariidae, Heliozelidae, Lyonetiidae, Phyllocnistidae, Stigmellidae (Lepidoptera); Curculionidae (Coleoptera); sometimes a secondary parasite; Agromyzidae (Diptera); Cimbicidae, and Tenthredinidae (Hymenoptera).

**Distribution:** China: Beijing, Jilin, Shanxi, Shaanxi, Qinghai (new record); Palaearctic region.

**Comments:** Askew (1984) discussed the variation in this species. In cooler and wetter regions,

this species is extensively dark, while in warmer and drier regions, it is more brightly colored with reduced darkened markings. Collections here clearly support his statement.

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### Excluded species

*Cirrospilus* (*Zagrammosoma*) *lutelineatus* Liao, 1987: 115

This species was transferred to *Trichospilus* Ferrière by Zhu et al. 2000.

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## 中國 *Cirrospilus* 屬研究

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本論文研究了中國 *Cirrospilus* 屬。文中確認了該屬20個物種，並提供了一個物種檢索表。其中，*C. ambiguus* Hansson and LaSalle, *C. ingenuus* Gahan, *C. jiangxiensis* Sheng and Wang, *C. phyllocnistis* (Ishii), *C. pictus* (Nees), 和 *C. tricuspis* Sheng 等 6 種為中國原有記錄種，*C. diallus* Walker, *C. elegantissimus* Westwood, *C. variegatus* (Masi), 和 *C. vittatus* Walker 等 4 種為中國首次報導，*C. brevis*, *C. centralis*, *C. dispersus*, *C. divergens*, *C. insculptus*, *C. nigrifemur*, *C. perticus*, *C. striatus*, *C. submedialis*, 和 *C. transrugosus* 等 10 種被描記為新種，並與近似種進行了比較。同時，文中提出了 *C. huangyaensis* Sheng 和 *C. nigriscutellaris* Sheng and Wang 等兩種為 *C. pictus* (Nees) 的異名。同時，文中還提供了該屬物種的新寄主和分布記錄。

**關鍵詞：**膜翅目，姬小蜂，*Cirrospilus*，新種，新記錄。

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