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The Immature Stages of Japanese Species of the Genus *Episteira* Warren (Lepidoptera, Geometridae)

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Abstract The immature stages of two Japanese species of the genus *Episteira* Warren, *E. eupena* (Prout) and *E. nigrilinearia nigrilinearia* (Leech), are described, figured and keyed. Some biological notes are also given.

Key words : *Episteira eupena, nigrilinearia*, larva, pupa, Geometridae.

Episteira Warren, 1899, an Oriental-Australian genus, belongs to the tribe Trichopterygini of the subfamily Larentiinae of the family Geometridae. The genus comprises only six species and is closely related to the genera *Sauris* Guenée, 1857, and *Tympanota* Warren, 1895. Two Japanese representatives were originally described under the genus *Sauris*, and were transferred to *Episteira* by Dugdale (1980). Although Nakamura (1981) presented brief descriptions of the mature larvae of Japanese species under the genus *Sauris*, there are some differences between his description and my observation. The present paper provides detailed descriptions of the mature larvae and pupae of two Japanese species : *Episteira eupena* (Prout) and *E. nigrilinearia nigrilinearia* (Leech).

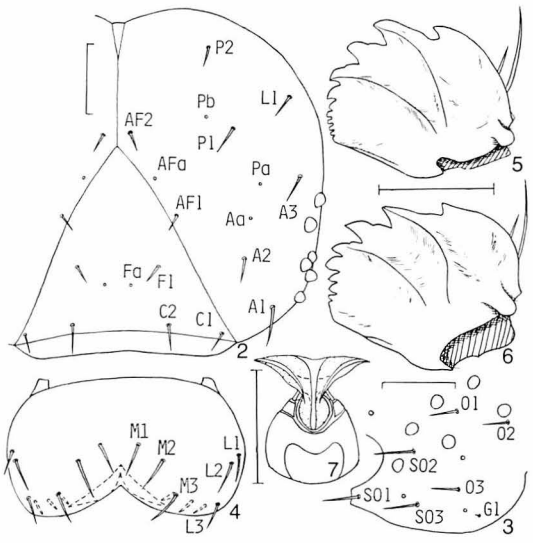
The terminology used here for the setae is based on Hinton's (1946) system ; the names of the setae on the anal proleg and on the anal shield follow Dugdale (1961) and McGuffin (1958), respectively. An extra seta of the lateral group, found in the larvae of Geometridae on 1st to 7th abdominal segments, is peculiar to the family ; Dugdale's term L4 is used for this seta.

Fig. 1. Last instar larva of *Episteira nigrilinearia nigrilinearia*.

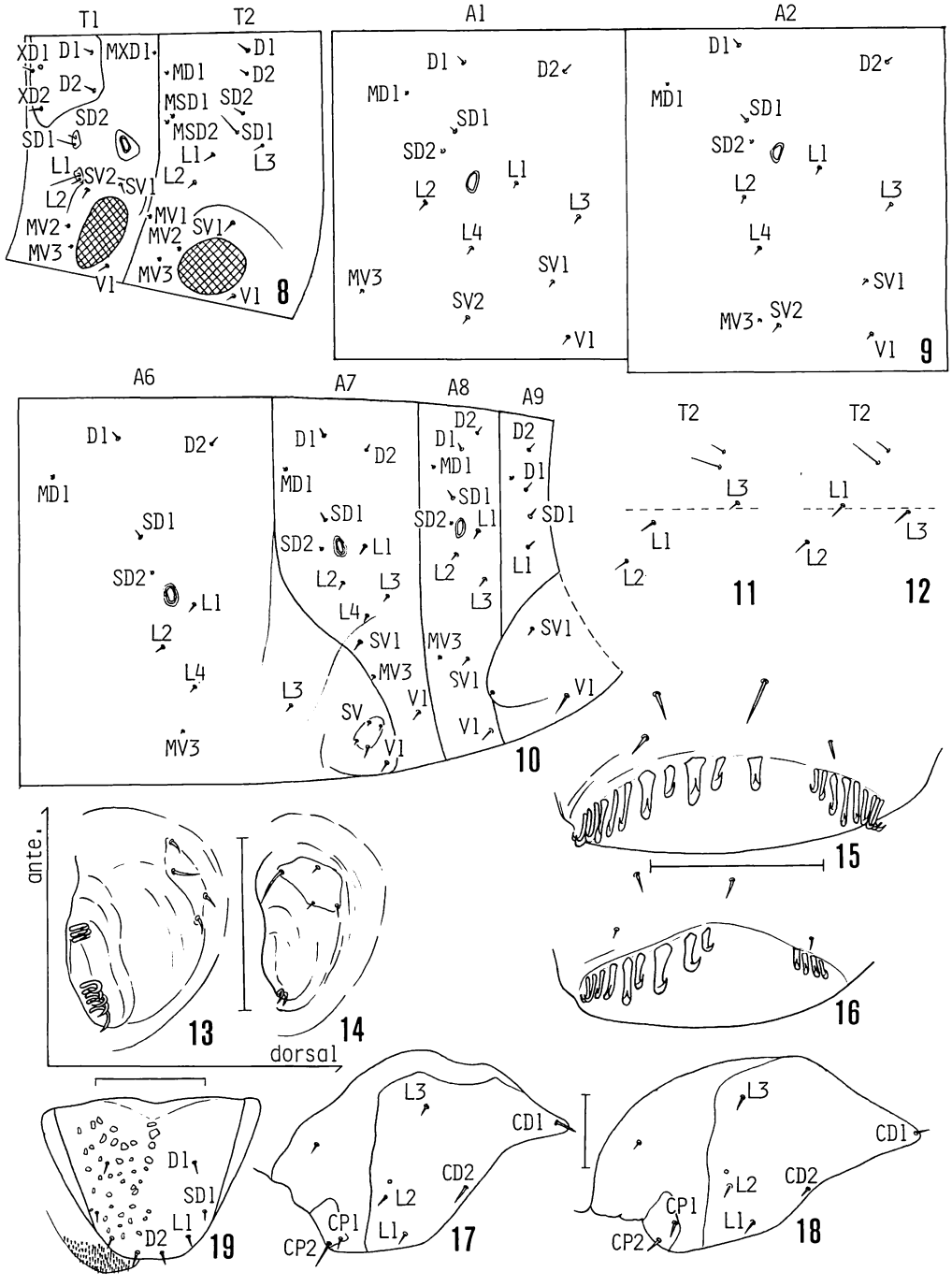
Genus *Episteira* Warren

Episteira Warren, 1899, Novit. Zool., 6 : 36. Type-species : *Episteira colligata* Warren, 1899, by original designation.

Last instar larva. Head yellowish green, wider than long ; cuticle almost smooth ; nerve attachments of individual ocelli black ; labrum and mandible concolorous with head ; teeth of mandible fuscous ; adfrontal suture lacking ; mandible (Figs. 5 and 6) with 5 distinct teeth and several

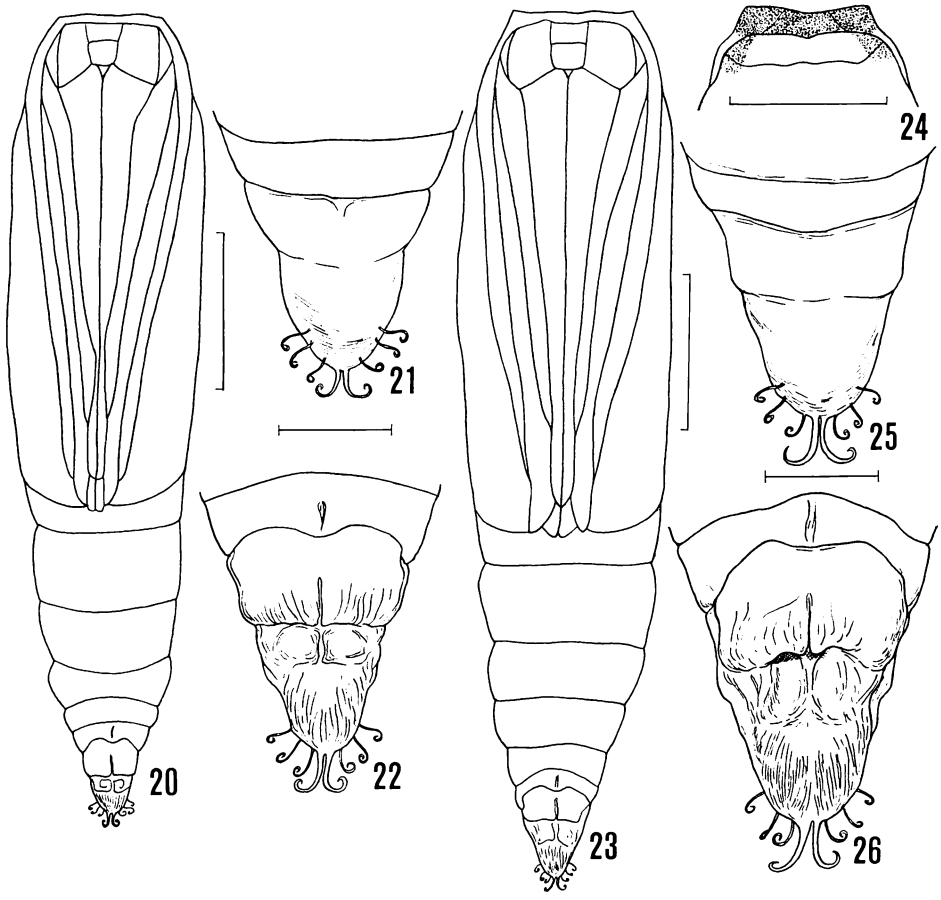


Figs. 2-7. Cranial area of last instar larva. *Episteira eupena* : 2, head ; 3, ocellar area ; 4, labrum ; 5, mandible ; 7, spinneret. *Episteira nigrilinearia nigrilinearia* : 6, mandible. (Scale : 0.25 mm).



Figs. 8-19. Thorax and abdomen. *Episteira eupena* : 8, setal map of pro- and mesothoraces ; 9, setal map of 1st and 2nd abdominal segments ; 10, setal map of 5th to 9th abdominal segments ; 11, L setal group of mesothorax ; 13, ventral proleg ; 15, crochets of anal proleg ; 17, anal proleg ; 19, anal shield. *Episteira nigrilinearia nigrilinearia* : 12, L setal group of mesothorax ; 14, ventral proleg ; 16, crochets of anal proleg ; 18, anal proleg. (Scale : 0.25 mm for Figs. 15 and 16 ; 0.5 mm for Figs. 13, 14 and 17-19).

indistinct distal teeth graded to small ; depth of labral notch (Fig. 4) about 1/4 of width of labrum ; spinneret (Fig. 7) with wide apex, longer than labial palpi. Body whitish green to yellowish green, slender, cylindrical ; cuticle almost smooth ; thoracic legs pale green to yellowish green ; peritreme of spiracles pale grey ; abdominal setae extremely short ; chrochets (Figs. 13 and 14) of ventral proleg reduced in number ; paraproct (posterodorsal protrusion of anal proleg) of anal proleg (Figs. 17 and 18) well-developed ; crochets of anal proleg interrupted in middle, arranged in irregular biordinal mesoseries, reduced in number ; 10th abdominal segment with two pairs of protrusions surrounding anal opening ; those protrusions bearing many minute spines ; cuticle of anal shield rough. Chaetotaxy : Head (Fig. 2) with Pb puncture nearer to P1 than P2 ; seta P1 slightly above level of AF2 ; A3 above level of AF1, anterior to a line drawn between setae L1 and A2 ; O3 (Fig. 3) slightly posterior to a line joining setae O2 and SO3. SD setal group of prothorax (Fig. 8) bisetose, on same pinaculum ; meso- and metathoraces with D1 dorsal to D2 ; seta SD1 longer than SD2, anteroventral to SD2 on thorax. Seta D1 (Figs. 9 and 10) anteroventral to D2 on 1st to 7th abdominal segments, posterodorsal on 8th and 9th abdominal segments ; L3 above level of L4 on 1st to 5th, and 7th abdominal segments, below on 6th abdominal segments ; SV



Figs. 20-26. Pupa. *Episteira eupena* : 20, whole aspect, ventral view ; 21, cremaster, dorsal view ; 22, cremaster, ventral view. *Episteira nigrilinearia nigrilinearia* : 23, whole aspect, ventral view ; 24, vertex, dorsal view ; 25, cremaster, dorsal view ; 26, cremaster, ventral view. (Scale : 0.5 mm for Figs. 21, 22 and 24-26 ; 2.0 mm for Figs. 20 and 23).

setal group bisetose on 1st to 5th abdominal segments, quadrosetose on ventral proleg, unisetose on 7th to 9th abdominal segments ; on anal proleg L2 dorsal to a line joining setae CP1 and CD2 ; CP1 and CP2 of anal proleg on same pinaculum ; on anal shield (Fig. 19) D1 anterior to a line drawn between SD1s.

Pupa. Yellowish green ; cremaster brown. Body (Figs. 20 and 23) slender ; both sides of vertex angulate ; clypeo-labral suture distinct ; antenna reaching before tip of forewing ; labial palpus exposed, small ; maxilla reaching before tip of forewing ; forefemur not exposed ; foreleg ending at about 4/5 the distance between apex of head and wing tip ; tip of hind leg exposed. Cremaster (Figs. 21, 22, 25 and 26) with 4 pairs of hook-like setae ; terminal one sclerotized, longer than others ; the other three very slender.

Remarks. The genus has not adfrontal suture on the head and has seta D1 anterior to a line drawn between SD1s on the anal shield. The former character is peculiar to the genus, and the later is common within the tribe. *Episteira* is closely related to the genera *Sauris* and *Tympanota* in the adult characters. The larval description of *Sauris* was given by Singh (1953, 1956) for the Indian species, but any information on the larvae of *Tympanota* has not been given. *Episteira* differs from *Sauris* in the following points : the depth of labral notch is about 1/4 of width of the labrum in *Episteira*, but about 1/3 in *Sauris* ; the wide apex of the spinneret is not fringed in *Episteira*, but fringed in *Sauris* ; SD setal group on the prothorax is unisetose in *Episteira*, but bisetose in *Sauris* ; in *Episteira* the seta L1 of the 9th abdominal segment is not migrated to the 8th abdominal segment, while in *Sauris* migrated ; the larvae of *Episteira* feed on the leaves of *Podocarpus macrophyllus* (Thunb.) Lanb. (Podocarpaceae), whereas Indian species of *Sauris* feeds on *Sapindus* sp. (Sapindaceae) and Japanese species, *Sauris marginepunctata* (Warren), feeds on *Prunus zippenliana* Miq. (Rosaceae).

Key to Japanese species based on larval and pupal characters

1 . Mature larva glossy green ; L3 seta of meso- and metathoraces posterodorsal to L1 ; crochets of ventral proleg interrupted, 6-11 in number ; crochets of anal proleg interrupted imcompletely, 15-20 in number. Pupa with vertex slightly angulate at both sides ; vertex without brown line along its dorsal margin ..... *Episteira eupena* (Prout)

Mature larva whitish green ; L3 seta of meso- and metathoraces posteroventral to L1 ; crochets of ventral proleg reduced, 1-2 in number ; crochets of anal proleg interrupted, 11-15 in number. Pupa with vertex strongly angulate at both sides ; vertex with brown to fuscous line along its dorsal margin ..... *Episteira nigrilinearia nigrilinearia* (Leech)

Episteira eupena (Prout)

Sauris eupena Prout, 1937, in Seitz, Macrolep. World, 4, Suppl. : 93, pl. 9e.

First instar larva. Body length about 1.5 mm (just after hatching). Head pale yellow ; body, thoracic legs, ventral proleg and anal proleg yellow.

Last instar larva (Figs. 2-5, 7, 8-11, 13, 15, 17 and 19). Body length 18-20 mm ; head width 1.24-1.36 mm. Mandible (Fig. 5) with 5 distinct teeth and about 6 indistinct teeth graded to small. Body green, with or without reddish purple dorsal stripe ; thoracic legs yellowish green ; ventral proleg (Fig. 13) with 6-11 crochets, arranged in uniordinal interrupted mesoseries ; crochets of anal proleg (Fig. 15) interrupted imperfectly, irregular biordinal mesoseries, 15-20 in number. Chaetotaxy : Cranial setae as shown in Figs. 2 and 3. On meso- and metathoraces seta L1 (Figs. 8 and 11) anteroventral to L3 ; on anal proleg CP1 and CP2 (Fig. 17) almost at ventral margin of pinaculum ; CP1 of anal proleg on a line joining setae CD2 and CP2.

Pupa (Figs. 20-22). Length about 10.5 mm ; width about 2.7 mm. Body yellowish green ; cremaster brown ; both sides of vertex slightly angulate ; tip of hindleg exposed, oblong.

Materials examined. Eight last instar larvae and 5 pupae reared from eggs and various stages of larvae taken at Mt. Makio, Osaka Pref., on 19. Ⅷ. 1982 (S. Hashimoto).

Biological notes. Food plant : *Podocarpus macrophyllus* (Thunb.) Lamb. The larvae reached maturity in about 15 days. Pupation takes place in a rough shelter formed by joining young leaves of the food plant with silk.

Remarks. *E. eupena* is distinguished from the

next species by the characters given in the key.

***Episteira nigrilinearia nigrilinearia* (Leech)**

Sauris nigrilinearia Leech, 1897. Ann. Mag. nat. Hist. (6) 20 : 76.

First instar larva. Body length about 2.0 mm (just after hatching). Head dark yellow ; body, thoracic legs, ventral proleg and anal proleg yellow.

Last instar larva (Figs. 1, 6, 12, 14, 16 and 18). Body length 20-22 mm ; head width 1.29-1.40 mm. Mandible (Fig. 6) with 5 distinct teeth and about 5 indistinct teeth graded to small. Body whitish green, with or without reddish purple dorsal stripe ; supraspiracle and lateral stripes indistinct and whitish ; thoracic legs, ventral and anal proleg pale green ; ventral proleg (Fig. 14) reduced, with 1-2 crochets ; on anal proleg crochets (Fig. 16) interrupted, irregular biordinal mesoseries, 11-15 in number. Chaetotaxy : Cranial setae same as those of *E. eupena*. On meso- and metathoraces seta L1 (Fig. 12) anterodorsal to L3 ; on anal proleg CP1 dorsal to a line drawn between CD2 and CP2.

Pupa (Figs. 23-26). Length about 11.5 mm ; width about 2.8 mm. Body yellowish green ; cremaster brown ; vertex with brown to fuscous marking along its dorsal margin ; both sides of vertex strongly angulate ; tip of hindleg exposed, trapezoidal.

Materials examined. Twelve last instar larvae and 2 pupae reared from various stages of larvae taken at Sakai, Osaka Pref., on 17. IX. 1981 (S. Hashimoto).

Biological notes. Food plant : *Podocarpus macrophyllus* (Thunb.) Lamb. The larvae reached maturity in about 30 days. The mature larva cuts off the tips of young leaves of the food plant and forms a rough shelter, in which the larva pupates, by joining these leaves with silk. The coloration of the cut ends of leaves is similar to that of vertex of the pupa.

Remarks. The ventral proleg of this species is extremely posterior to the 6th abdominal segment in appearance. For this condition Nakamura (1981) made a mistake in describing the setae. He presented that V1 seta of 1st and 9th abdominal segments and SV1 and V1 setae of 7th and 8th abdominal segments are absent. However, these setae are clearly present on my observation.

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References

Dugdale, J. S. 1961. Larval characters of taxonomic significance of New Zealand ennomines (Lepidoptera : Geometridae). Trans. R. Soc. N. Z. (Zool.) 1 : 215-233.

Dugdale, J. S. 1980. Australian Trichopterygini (Lepidoptera : Geometridae) with description of eight new taxa. Aust. J. Zool. 28 : 301-340.

Hinton, H. E. 1946. On the homology and nomenclature of the setae of lepidopterous larvae, with some notes on the phylogeny of the Lepidoptera. Trans. R. ent. Soc. Lond. 97 : 1-37.

McGuffin, W. C. 1958. Larvae of the Nearctic Larentiinae (Lepidoptera : Geometridae). Can. Ent. Suppl. 8. 104pp.

Nakamura, M. 1981. Brief notes on some Japanese inch-worms. Yugato 83 : 1-7. (In Japanese)

Singh, B. 1953. Immature stages of Indian Lepidoptera. No. 8 Geometridae. Ind. For. Rec. (Ent.) 8 (7) : 67-158.

Singh, B. 1956. Some more Indian geometrid larvae with a note on the identity of components of various groups of setae. Ind. For. Rec. (Ent.) 9 : 131-163.

Warren, W. 1895. New species and genera of Geometridae in the Tring Museum. Novit. Zool. 2 : 82-159.

Warren, W. 1899. New species and genera of the families Drepanidae, Thyrididae, Uranidae, Epiplemidae, and Geometridae from the old-world regions. Novit. Zool. 6 : 1-66.

日本産 *Episteira* 属（鱗翅目，シャクガ科）2種の幼生期の記載

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Episteira 属は，シャクガ科ナミシャク亜科のコバネナミシャク族に属し，日本からはこれまでマダラ

ヒゲブトナミシャク(*E. eupena*), ウスミドリナミシャク（*E. nigrilinearia nigrilinearia*）の2種が知られている．本論文では，これら2種の幼生期（終令幼虫と蛹）の形態を記載し，あわせて2種への検索表を作成した．本属の幼虫は，頭部の副前額縫線を欠くこと，第6腹節の腹脚が退化し，鉤爪の数が著しく減少することにより，他の属から区別される．特に副前額縫線の欠如は，本属の特異な形質である．マダラヒゲブトナミシャクの幼虫はウスミドリナミシャクの幼虫に似ているが，中胸および後胸のL1刺毛がL3刺毛より腹方に位置すること，第6腹節腹脚の鉤爪の数が6から11であることにより区別される．本属の幼虫は，共にイヌマキを食する．