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Taxonomic review of the genus *Thecobathra* (Lepidoptera, Yponomeutidae) from Taiwan

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ABSTRACT

The Taiwanese species of *Thecobathra* are reviewed. Four new species of *Thecobathra*: *T. heppneri* n. sp., *T. minuta* n. sp., *T. pauciguttata* n. sp., and *T. taiwanensis* n. sp. are described. The female genitalia of *T. basilobata* are described for the first time. Keys to all the Taiwanese species of *Thecobathra* are provided.

Thecobathra is one of the only two genera belonging to an yponomeutine tribe Niphonymphini (Niphonymphina sensu Moriuti 1977). This genus was once confused to *Niphonympha* Meyrick but distinguished from the latter by two characters in the male genitalia: the presence of a large, elongate saccus on the vinculum and the presence of one or two rows of teeth on the phallus; and two characters in the female genitalia: the presence of the stouter ductus bursae, and the shape of signum (Moriuti 1977).

The *Thecobathra* comprises 28 species, the majority of which have been described from China (Lewis and Sohn 2015). It is known that at least four species of *Thecobathra*: *basilobata* Fan, Jin & Li, *kappa* Moriuti, *lambda* Moriuti, and *partinuda* Fan, Jin & Li, occur in Taiwan (Fan et al. 2008).

The aims of this paper are to review the Taiwanese species of *Thecobathra* and to describe four new congeners. The imaginal and genital features of the new species described in the present paper are illustrated for available sexes.

Material and methods

Dried specimens were obtained from two institutions: Bavarian State Zoological Collection, Munich, Germany (BSZC) and Florida Museum of Natural History, Gainsville, Florida, USA (FMNH).

Slide specimens of genitalia were prepared following Clarke (1941), except that chlorazol black was used for staining and Euparal resin for permanent mounting. Only the new species are fully described, while specimen data and partial description, if necessary, are provided for the previously known species. Terms for genitalia follow Klots (1970). The verbatim label data are provided for primary types: the mark "|" indicating a line break. The abbreviation 'GSN' in the collecting data stands for the genitalia slide number.

Systematic accounts

Family Yponomeutidae

Subfamily Yponomeutinae

Tribe Niphonymphini

***Thecobathra* Meyrick 1922**

Thecobathra Meyrick 1922: 553 [Type species: *Thecobathra acropercna* Meyrick 1922].

Pseudocalantica Friese 1960: 36 [Type species: *Niphonympha anas* Stringer, 1930].

The adult moths are white, sometimes mixed with pale brownish brown or ochraceous patches on the forewing. Most species of *Thecobathra* have similar forewing patterns including sparsely-scattered dark brown scales on the costal and medial areas and a dark brown, oblique dorsal streak. External appearance of the moths is very similar to one another so that reliable identification needs examination of their genitalia. The male genitalia include a pair of slender socii; the gnathos fused with the tuba analis; the ventral plate of the gnathos sclerotized (except in *T. anas*); and the phallus with a single or two rows of teeth (except in *T. pauciguttata*). The female genitalia include the strongly-sclerotized antrum; the entirely or partly sclerotized ductus bursae; and the signum with large flanges at either side.

Keys to the species of the Taiwanese *Thecobathra*, based on the male genitalia [after Moriuti 1963 for *T. lambda*; males of *T. taiwanensis* n. sp. and *T. heppneri* n. sp. unknown].

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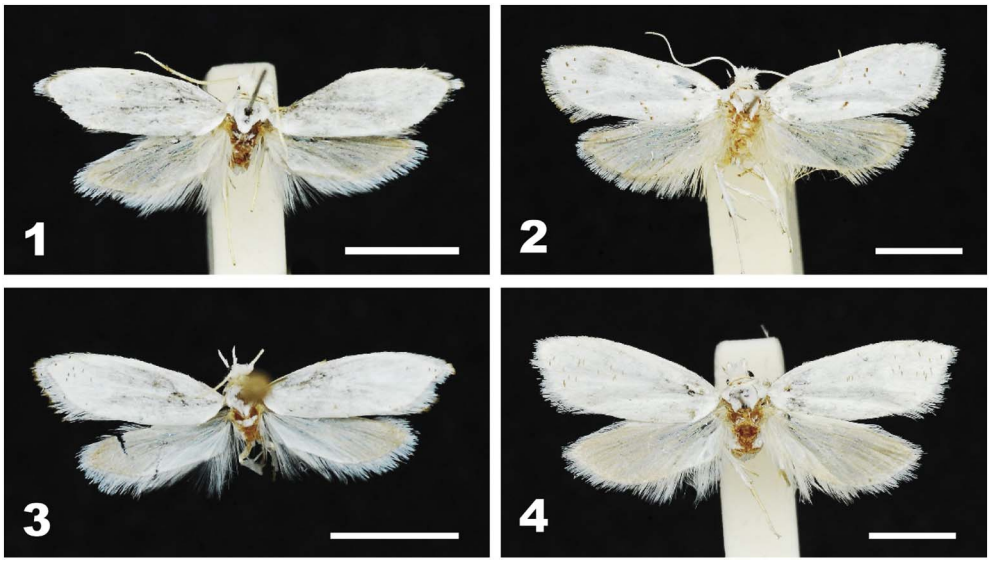

Figs. 1–4. Adults of *Thecobathra*. 1. *T. minuta* n. sp., holotype; 2. *T. pauciguttata* n. sp., holotype; 3. *T. taiwanensis* n. sp., holotype; 4. *T. heppneri* n. sp., holotype. Scale bars = 3 mm.

1.	A process at distal end of sacculus present	2
	A process at distal end of sacculus absent	3
2.	Distal saccular process quadrate; costal process present	*kappa* Moriuti
	Distal saccular process spiniform; costal process absent	*basilobata* Fan et al
3.	A serrate band in distal part of phallus present	4
	A serrate band in distal part of phallus absent	5
4.	Valva broad	*pauciguttata* n. sp.
	Valva narrow	*minuta* n. sp.
5.	Costal bulge present; phallus sinuous	*partinuda* Fan et al.
	Costal bulge absent; phallus nearly straight	*lambda* Moriuti

Keys to the species of the Taiwanese *Thecobathra*, based on the female genitalia [after Moriuti 1963 for *T. lambda*; female of *T. pauciguttata* unknown].

1.	A setose bulge on lamella postvaginalis present	2
	A setose bulge on lamella postvaginalis absent	5
2.	Antrum broader than ductus bursae	3
	Antrum as broad as ductus bursae	4
3.	Lateral process on signum digitiform	*heppneri* n. sp.
	Lateral process on signum spiniform	*taiwanensis* n. sp.
4.	A half ductus bursae sclerotized	*basilobata* Fan et al.
	Nearly entire ductus bursae sclerotized	*lambda* Moriuti
5.	Ductus bursae broadened at middle	*partinuda* Fan et al.
	Ductus bursae broadened near corpus bursae	6
6.	Ductus bursae 3× longer than signum	*kappa* Moriuti
	Ductus bursae 4× longer than signum	*minuta* n. sp.

***Thecobathra basilobata* Fan, Jin et Li, 2008** (Figs. 5, 6, 11, 20)

Thecobathra basilobata Fan, Jin et Li, 2008: 15 [Type locality: Taiwan, Taizhong, Mt. Baxian].

Diagnosis. This species is similar to *Thecobathra anas* (Stringer) in the male and female genitalia (Figs. 5, 6, 11), but differs from the latter in having the saccular process (a bulge in *T. anas*) and the narrower sclerotized part of the ductus bursae.

Description. Female genitalia (Fig. 20) – Papillae anales long, rectangular. Ostium bursae on bulge, surrounded by a pair of semicircular sclerotized zones; lamella antevaginalis as a small, long-setose bulge. Ductus bursae narrow, broadened to corpus bursae, weakly sclerotized in anterior 1/4, slightly tapered posteriorly, strongly sclerotized between anterior 1/4 and middle, of nearly even width. Corpus bursae ovobate, 1/2 as long as ductus bursae; signum cruciform, with stout lateral processes.

Material examined. **[Hualien Co.]** 1♂, 21 km east of Fuli (alt. 800 m), 27 viii 1983 (JB Heppner), FMNH; 3♂, Tienshien (alt. 435 m), 5–7 viii 1992 (JB Heppner), FMNH. **[Ilan Co.]** 8♂, Fushan Botanical Station (alt. 650 m), 20–24 vii 1996 (JB Heppner), FMNH. **[Kaohsiung Co.]** 1♂, Santimen Forest Station, 9 km southeast of Lukuei, 4–7 xi1984 (J Heppner & H Wang), FMNH. **[Nantou Co.]** 2♂, 15 km east of Puli (alt. 700 m), 6 v 1989 (J Heppner & H Wang), FMNH. **[Taichung Co.]** 6♂, 2♀, Chingshan (alt. 1100 m), 31 viii–4 ix 1988 (JB Heppner & H Wang), [GSN] FMNH-JCS-012 (♂), 013 (♀), FMNH; 2♂, ditto, 8–11 v 1989 (JB Heppner & H Wang), FMNH.

Literature localities. Taichung (Fan et al. 2008).

Distribution. Taiwan.

Remarks. The female of this species is known for the first time.

***Thecobathra heppneri* n. sp.** (Figs. 4, 23)

Diagnosis. This species is similar to *Thecobathra albana* Liu and *T. basilobata* Fan, Jin et Li in the female genitalia, but differs from *T. albana* in having the signum with stouter lateral processes and from *T. basilobata* in having the nearly entirely-sclerotized ductus bursae (the sclerotized part half length of the ductus bursae in *T. basilobata*).

Description (Fig. 4). Wingspan 17.8 mm. Head – Vertex and frons white. Antenna 1/2 as long as forewing; scape white; flagellomeres pale yellowish brown. Labial palpus upcurved, white, tinted with pale yellowish gray ventrally; 1st segment 1/5 as long as 2nd segment; 3rd segment as long as 2nd segment, acuminate apically. Thorax – Patagium, tegula, and mesonotum white. Fore- and midleg with coxa and femur white; tibia and tarsi pale orange. Hindleg with coxa and femur white; tibia white, pale brownish gray on laterodistal 1/8, with dark brown spot laterodistally; tarsi pale orange. Forewing length 8 mm, white; costa dark brown on basal 1/6; small, dark brown bars sparsely scattered on medial area; dorsal patch small, pale brownish gray; fringe white. Hindwing pale brownish gray, paler on basal and anal areas; fringe pale gray. Female genitalia (Fig. 23) – Papillae anales broadly round laterally, narrowed dorsally, setose. Lamella postvaginalis shallow-lobate, setose, with small, setose hump laterally. Ductus bursae 2.3× longer than corpus bursae; sclerotized on posterior 2/3,