Scanning Electron Microscope Study of *Mirophthirus liae* (Anoplura: Mirophthiridae) and Confirmation of the Family Status of the Mirophthiridae (Phthiraptera: Anoplura)

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ABSTRACT The family Mirophthiridae was erected in 1980 to accommodate the monotypic sucking louse *Mirophthirus liae* Chin, an ectoparasite of the Chinese pygmy dormouse, *Typhlomys cinereus*. Some systematists did not accept this taxonomic designation and instead placed *M. liae* in the family Polyplacidae. The scanning electron microscope study described here provides further diagnosis of *M. liae* and, based on the unique morphological characteristics of this louse, it is returned to the monotypic family Mirophthiridae. A diagnosis of the family Mirophthiridae is provided.

KEY WORDS *Mirophthirus liae*, Mirophthiridae, taxonomy, morphology, scanning electron microscopy

THE MORPHOLOGICALLY UNIQUE sucking louse *Mirophthirus liae* Chin was described from specimens recocvered from the Chinese pygmy dormouse, *Typhlomys cinereus* Milne-Edwards, from Guizhou Province in southwestern China (Chin 1980). Since the original description, *M. liae* also has been recovered from this host in Sichuan Province, China (unpublished data). Morphologically, this louse is so specialized that Chin (1980) placed it in a new genus *Mirophthirus* and a new family Mirophthiridae.

Unfortunately, in the original description, some unique structures were not illustrated and the published figures were very small. Kim and Ludwig (1982) did not accept the new family and instead assigned the genus *Mirophthirus* to the family Polyplacidae. In their world catalog of sucking lice, Durden and Musser (1994) also placed *Mirophthirus* in the Polyplacidae.

In 1986, with the kind help of Richard G. Robbins and the late Robert Traub, scanning electron micrographs of *M. liae* were prepared at the Smithsonian Institution's Museum Support Center in Suitland, MD. Standard methods for scanning electron microscopy (SEM) were followed for preparing and examining specimens (Corwin et al. 1979). The following diagnoses for *M. liae* and for the family Mirophthiridae are based on this SEM study.

Mirophthirus liae Chin, 1980
(Fig. 1A)

Diagnosis. *Head* (Fig. 1 B and C) heavily sclerotized, about twice as broad as long, extending laterally beyond tips of antennae. Eyes absent. Clypeofrontal suture reduced, situated transversely in middle of head with 1 minute seta on each side. Hind margin of occiput sinuous with 6 setae including an elongate seta on each posterolateral angle. Median longitudinal furrow extending from haustellum close to hind margin of occiput (Figs. 1 B and E). Haustellum scaly, lacking hooks or toothlike structures, but with minute stublike structures ventrolaterally (Fig. 1F). Antennae (Fig. 1D) 5-segmented with huge basal segment and large 2nd segment with posterior margin of latter extended into robust, hook-like spur in both sexes; remaining 3 antennal segments filiform, directed upward and much smaller than other segments. Sensillum present on last 2 antennal segments, and 11 peg organs present distally on 5th segment.

Thorax (Fig. 1 B and C) heavily sclerotized, broader than long. Dorsally (Fig. 1B), arched suture divides thorax into 2 sections representing mesothorax and metathorax, respectively; suture terminates at anterolateral thoracic angles. Approximately 6 small setae inserted along suture margin. Spiracles situated laterally on anterior section of thorax; notal pit situated centrally just posterior to thoracic suture. Ventrally (Fig. 1C), thorax almost covered by very large boat-shaped thoracic sternal plate with concave anterior and posterolateral margins and protruding anterolateral extensions. Forelegs (Fig. 1C) greatly reduced, with coxae closely appressed medially and tibiae directed ventrally; forelegs concealed by head dorsally and inserted near anterior margin of thoracic sternal plate. Midlegs and hindlegs (Fig. 1A) much larger and more robust than forelegs and directed outward. Midlegs are largest with span equal to entire abdominal length. Mid and hind legs: coxae located marginally and far apart in each pair; trochanters and femora elongate and robust; tibiae and tarsi attenuated, not fused. Tibio-tarsal claws very small, especially on forelegs.

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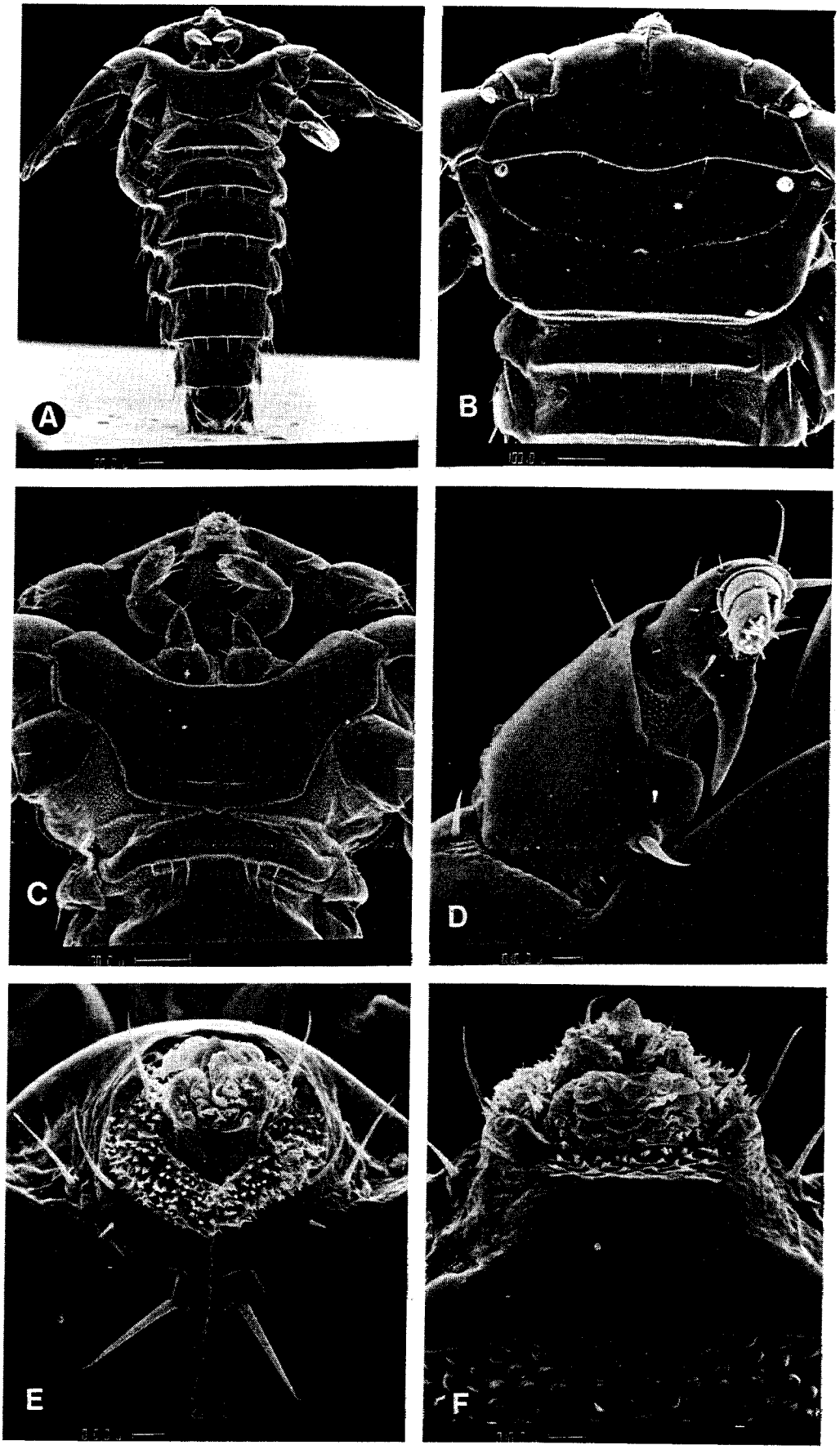

Fig. 1. Scanning electron micrographs of *Mirophthirus liae*. (A) Female, ventral aspect (scale bar = 100 μ). (B) Dorsal aspect of head and thorax (scale bar = 100 μ). (C) Ventral aspect of head and thorax (scale bar = 100 μ). (D) Antenna (scale bar = 10 μ). (E) Dorsal aspect of mouthparts including haustellum and dorsal longitudinal head furrow (scale bar = 10 μ). (F) Ventral aspect of mouthparts showing lateral stubs and slightly protruded stylets (scale bar = 10 μ).

Abdomen (Fig. 1A) with tergites, sternites, and paratergal plates minutely fringed along posterior margins. In addition to having long apical setae, paratergal plates with spiracles also have a pair of minute posterolateral spiracular setae. Spiracles subglobular, heavily sclerotized and with circular openings.

Comment. The shape of the body and thorax of *M. liae* is striking. The median longitudinal head furrow, the stublike structures at the base of the haustellum, and the transverse thoracic suture all are unique and recorded for the 1st time in sucking lice. Other adaptive structures such as the toothless haustellum, the reduced clypeofrontal suture, and the highly modified legs and antennae, also are evident. Leg morphology suggests that *M. liae* is more adept at walking than in tightly grasping host hairs. Together, these unique and unusual morphological traits indicate that *M. liae* is not closely related to any other described sucking lice and that it should be placed in its own family, the Mirophthiridae. Moreover, because *M. liae* has a notal pit, it should not be placed in the family Polyplacidae.

Family Mirophthiridae Chin, 1980 (Phthiraptera: Anoplura)

Diagnosis. Head and thorax both heavily sclerotized and broader than long. Head extended laterally. Mouthparts with pair of minute stubs at base of haustellum. Eyes absent. Antennae with 1st and 2nd segments massive, and 2nd segment armed with strong hooklike spur in both sexes; last 3 antennal segments small and filiform. Mesothorax and metathorax delineated by arched mesothoracic transverse suture in middle of thorax. Notal pit present. First pair of legs very small and concealed dorsally by head; 2nd and 3rd legs with enlarged trochanter and femor, slender tibia, and small claw. Abdominal spiracles subglobular and heavily sclerotized posteriorly.

Hosts. Platacanthomyine rodents.

Type Species. *Mirophthirus liae* Chin, 1980.

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