



***Tingupa tlingitorum*, n. sp., a new milliped from Haines, Alaska, USA, with notes on the generic distribution and a revised key to species (Chordeumatida: Tingupidae)**

WILLIAM A. SHEAR¹ & ROWLAND M. SHELLEY²

¹Department of Biology, Hampden-Sydney College, Hampden-Sydney, Virginia, 23901 USA; email: wshear@mail.hsc.edu

²Research Lab., North Carolina State Museum of Natural History, 4301 Reedy Creek Rd., Raleigh, North Carolina 27607 USA; email: rowland.shelley@ncmail.net

Abstract

Tingupa tlingitorum n. sp. (Diplopoda: Chordeumatida: Tingupidae) is proposed for male and female millipeds from Haines, Alaska, USA. It constitutes the first Alaskan record of the family and third of the order, and represents generic and familial range extensions of ca. 1,050 mi (1,680 km) from the previous northern limit in Oregon. *Tingupa* sp. is also reported from Idaho, the first generic and familial records from this state, and the Queen Charlotte Islands, the first records for both Canada and British Columbia. A revised key to species and a new familial distribution map are presented.

Key words: Tingupidae, *Tingupa*, *T. tlingitorum*, *T. intergerina*, Alaska, British Columbia, Idaho

Introduction

Less is known about the millipeds occurring in Alaska than those of any other American state. Even the Hawaiian fauna, comprising exclusively introduced forms except for the 13 endemic species of *Nannolene* Bollman, 1887 (Spirostreptida: Cambalidae), has been addressed in a number of publications (e. g. Silvestri 1904; Shelley 1998a, b, c, d; Shelley & Swift 1998; Shelley *et al.* 1998; Shelley & Golovatch 2000; Nishida 2002), but the only work that even partly considers Alaska is that of Shelley (1990), which focuses primarily on western Canadian diplopods. Otherwise, the only published mentions of Alaskan millipeds are generalized statements, locality records, and/or symbols on maps of taxa occurring to the south and east in Canada and the "lower 48 states" (Cook 1904; Chamberlin 1911; Buckett & Gardner 1968; Causey 1974; Kevan 1983; Hoffman 1999; Shelley 1993a, b, 2002).

Before 2006 only around 20 milliped samples had been taken in Alaska, all incidentally by researchers pursuing other organisms; however, in August 2006 the second author (RMS) collected in the southern coastal region, the warmest and wettest part of the state, on an expedition sponsored by the National Geographic Society. The area sampled extended from the Matanuska Valley, around Wasilla and Palmer, and the Kenai Peninsula to the Panhandle and Wrangell Island in the Alexander Archipelago. Panhandle forests, most of which comprise the Tongass National Forest and are true temperate rainforests, were the most productive environments, and several publications are anticipated. While searching for introduced, synanthropic millipeds in Haines, on the mainland some 31.5 mi (50.4 km) south of the northwestern corner of British Columbia (BC), RMS investigated a ditch in Tlingit Park, in the center of the town, and discovered two minute, yellowish-white millipeds that appeared to be polydesmids because of the visible paranota, the only anatomical feature discernible to the unaided eye. Microscopic examination subsequently showed them to be an adult male

and female of the genus *Tingupa* (Chordeumatida: Tingupidae) and the new species described herein. They constitute not only the northernmost records of the genus and family and the first for Alaska but also astonishing generic and familial range extensions from the previously established northern limit, the Columbia River in northwestern Oregon around 1,050 mi (1,680 km) to the south in the "lower 48" (Shear 1981, Hoffman 1999). These millipeds represent only the third ordinal record and the second chordeumatidan family reported from Alaska, the other being Caseyidae (Shelley 1990, 1993b; Hoffman 1999; Shelley *et al.*, in submission). We also add here a geographically intermediate record from the Queen Charlotte Islands (QCI), BC, Canada. Repository acronyms are NCSM, North Carolina State Museum of Natural Sciences, Raleigh, NC, USA; NMNH, National Museum of Natural History, Smithsonian Institution, Washington, DC, USA; and RBCM, Royal British Columbia Museum, Victoria, BC, Canada.

Taxonomy

Family Tingupidae Loomis, 1966

Tingupidae Loomis, 1966:227. Shear, 1969:140; 1972:264; 1981:5-6. Loomis & Schmitt, 1971:128. Peck & Lewis, 1977:49. Hoffman, 1980:135; 1999:253. Kevan, 1983:2967. Gardner, 1986:34. Shear & Hubbard, 1998:86-88. Shelley *et al.*, 2000:79.

Diagnosis. Chordeumatida with two pairs of setose angiocoxites on the gonopods; 9th legs reduced to one, two, or three podomeres, coxae without prominent coxites; 10th and 11th legs with coxal glands.

Components. *Tingupa* Chamberlin, 1910; *Buotus* Chamberlin, 1940; *Blancosoma* Shear & Hubbard, 1998.

Distribution. The Alaskan Panhandle; the Queen Charlotte Islands (QCI), BC, Canada; coastal Oregon; the Sierra Nevada of central California; northern Idaho and western Montana; northwestern Colorado; northern, southwestern, and southeastern Utah; southeastern Arizona; southwestern Illinois to northern Arkansas; and eastern West Virginia to northcentral North Carolina (Fig. 4) (Chamberlin 1910, 1925, 1928, 1940; Chamberlin & Hoffman 1958; Loomis & Schmitt 1971; Shear 1972, 1981, map 1; Shear & Hubbard 1998; Hoffman 1999). Southeastern Utah is based on the obscure record of two females from Devil's Canyon, San Juan County (Chamberlin 1928) that has been missed by previous authors; its generic and specific identities are unknown.

Remarks. Tingupidae, an endemic North American milliped family, was revised by Shear (1981). He and Hoffman (1980) recognized two genera, *Tingupa* and *Buotus*, the latter being monotypic and transferred into the family by Shelley (1976) after being misplaced in the order Polyzoziida, family Polyzoziidae (Chamberlin 1940; Chamberlin & Hoffman 1958). Shear and Hubbard (1998) added a second monotypic genus, *Blancosoma*, and provided a key to the three component genera. Tingupidae is closely related to the monotypic family, Niponiosomatidae Verhoeff, 1941, in Japan, and the two belong to the superfamily Brannerioidea Cook, 1896, suborder Craspedosomatidea Brolemann, 1935, along with eight other families (Shear 2000; Shelley 2003). Shear (1988) maintained both Tingupidae and Niponiosomatidae primarily because of somatic apomorphies of *Tingupa* (paranota and tergal microsculpture), even though the gonopod structure of *Niponiosoma* Verhoeff, 1941, is closer to that of *Tingupa* than those of either *Buotus* or *Blancosoma*. However, *Blancosoma* does not possess these somatic features and thus resembles *Niponiosoma*. Niponiosomatidae holds taxonomic priority over the more widespread and utilized Tingupidae, so synonymization would have the undesirable consequence of submerging this continental North American taxon under the geographically restricted and little-used Japanese name.

Genus *Tingupa* Chamberlin, 1910

Tingupa Chamberlin, 1910:238. Chamberlin & Hoffman, 1958:106. Buckett, 1964:14. Shear, 1969:141; 1972:265; 1981:6-7. Jeekel, 1971:82. Hoffman, 1980:135; 1999:254-255. Kevan, 1983:2967. Shelley *et al.*, 2000:79.

Type-species. *T. utahensis* Chamberlin, 1910, by original designation.

Diagnosis. Tingupidae with prominent, rounded paranota, metaterga with microsculpture of low tubercles interspersed among short, sharp ridges (see Shear 1981, figs. 1–2).

Distribution. Same as that of the family but excluding Colorado, West Virginia, Virginia, and North Carolina (Fig. 4). Idaho and the Queen Charlotte Islands are based on the following samples of females that are unidentifiable to species; the latter site is some 450 mi (720 km) south-southwest of Haines.

USA: IDAHO, *Valley Co.*, 4 mi (6.4 km) NE McCall, ♀, 18 October 1944, W. Ivie (NMNH). **New State Record.**

CANADA: BRITISH COLUMBIA: QUEEN CHARLOTTE ISLANDS, *Graham I.*, Queen Charlotte City, 3♀, 9 October 1948, G. J. Spencer (RBCM). **New Country and Provincial Record.**

Remarks. *Tingupa* comprises ten species, plus the new one described herein, but only nine are keyed in Shear (1981) and cited by Hoffman (1999), who both missed *T. intergerina* Loomis & Schmitt, 1971, in western Montana. Six species inhabit the northwestern Pacific Coast in the "lower 48" from east-central California to northwestern Oregon; one species occurs in western Montana; the type-species, ostensibly with two subspecies, occupies the Wasatch Mountains and Parowan Valley of Utah; another nominal species, probably a synonym of *T. utahensis*, inhabits the Santa Catalina, Pinaleno, and Chiricahua Mountains of southeastern Arizona; and a troglobitic species occupies limestone caves in southwestern Illinois, Missouri, and northern Arkansas (Chamberlin 1910, 1925, 1928; Chamberlin & Hoffman 1958; Loomis & Schmitt 1971; Shear 1972, 1981; Hoffman 1999).

Revised key to species based on adult males

- 1a. With 30 segments..... 2
- 1b. With 28 segments..... 3
- 2a. Darkly pigmented, epigeal; Montana..... *intergerina* Loomis & Schmitt
- 2b. Depigmented, troglobitic; Illinois, Missouri, and Arkansas..... *pallida* Loomis
- 3a. Uniformly white or pale yellowish..... 4
- 3b. Body with some brown, tan, or purplish pigment 7
- 4a. Less than 2.5 mm long, 7 or 8 ocelli on each side; Oregon..... *sinuosa* Shear
- 4b. More than 3.0 mm long 5
- 5a. Mesal angiocoxites of gonopods with 3 small terminal spines; Oregon..... *tillamook* Shear
- 5b. Mesal angiocoxites of gonopods with long, curved, terminal spines 6
- 6a. 4.5 mm long, 4-6 ocelli; Oregon..... *clatskani* Shear
- 6b. 5 mm long, 3 ocelli; Alaska..... *tlingitorum* n. sp.
- 7a. Ocelli 5 or fewer, 3.0 mm long; Oregon..... *causeyae* Shear
- 7b. Ocelli 10 or more, more than 3.5 mm long..... 8
- 8a. Lateral angiocoxite of gonopod much the largest, with lateral flange and single apicolateral spine; Oregon
..... *benedictae* Shear
- 8b. Not as above 9
- 9a. Telopodal prefemora of legpair 9 three times as long as terminal articles; Oregon *auricula* Shear
- 9b. Telopodal prefemora of legpair 9 about twice as long as terminal articles 10
- 10a. About 3.5 mm long; California *eldorado* Shear
- 10b. More than 6.0 mm long; Utah and Arizona *utahensis* Chamberlin and *arizonica* Loomis¹

Tingupa tlingitorum, n. sp.

Figs. 1–3

Type specimens. ♂ holotype and ♀ paratype (NCSM) collected by R. M. Shelley, 21 August 2006, in Tlingit Park, Haines, Haines Borough, Alaska; coordinates are N59°13'55.4", W135°26'38.1".

Diagnosis: A small depigmented species with three depigmented ocelli arranged in single row; mesal angiocoxites of gonopods with three long, attenuated, sigmoidally curved, immobile macrosetae apically, lateral angiocoxites with both long and short, hooklike immobile macrosetae distad (Fig. 1).



FIGURES 2–4. *Tingupa tlingitorum*. 1, gonopods, anterior view. 2, colpocoxite branches, posterior view. 3, right leg 9, anterior view.

Holotype. Length 5.0 mm, width ca. 0.35 mm. Segments with small paranota; segmental setae clavate, longer anteriorly and posteriorly, becoming less clavate and more acuminate posteriorly. Antennae with 5th article inflated. Gonopods (Figs. 1,2) of typical structure; lateral angiocoxites (*la*) basally swollen, setose, with three or four long, attenuated, immobile macrosetae anterodistad and three strong, decurved, hooklike, immobile macrosetae on posterior surfaces of apices; mesal angiocoxites (*ma*) narrow, projecting anteriorly, closely appressed and basally fused, bases bulbous, shafts setose with long, attenuated, gently curved, immobile macrosetae arising from anterior surfaces at about 2/3 lengths, apices with three attenuated, sigmoidally curved, immobile macrosetae each. Anterior division of colpocoxite divided into three processes (Fig. 3, *a*, *b*, *c*), posterior division poorly sclerotized, bulbous and constricted in midline, lower part with fine, apparently unsocketed hairs. Ninth legs (Fig. 3) with broad, short coxae bearing anterior cuticular fimbriae and short, medially toothed processes; prefemora about twice as long as distal articles, latter pyriform.

1. According to Shear (1981), these two nominal species are likely synonyms.

Female paratype: Length 5.2 mm, width ca. 0.40 mm, nonsexual characters as in male.

Habitat. The type specimens were discovered in Tlingit Park under logs and debris on damp, "mucky" substrate in a shallow ditch that appears to carry overflow water periodically. The ditch runs down a slope into a small wooded area but is bordered on each side by a row of cottonwood trees (*Populus balsamifera*) along the stretch where RMS discovered the specimens.

Distribution. Known only from the type locality.

Etymology. The species epithet is an adjective referring to the Tlingit tribe of native Alaskans.



FIGURE 4. Distribution of the Tingupidae. A, range of *Buotus*; B/star, locality of *Blancosoma*; dots and unlabeled shaded areas, distribution of *Tingupa*; square (denoted by arrow), *T. tlingitorum*.

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