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BRIEF COMMUNICATION

On the classification of North American *Chelostoma* (Hymenoptera: Megachilidae)

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Abstract. A new subgenus of *Chelostoma* Latreille is established for the New World group historically placed in *Foveosmia* Warncke. These species, placed herein in *Neochelostoma* Engel & Griswold, new subgenus, are differentiated from the Palearctic *Foveosmia* and a modified key is provided to the subgenera of *Chelostoma*.

INTRODUCTION

The bee genus *Chelostoma* Latreille (Megachilinae: Osmiini) encompasses 56 species of slender bees distributed across the Holarctic region including the northern margins of Africa, but extending southward into the mountainous areas of tropical Asia (Michener, 2007). Species nest in pre-existing cavities in wood or stems, where females construct brood cells enclosed by mud or sand. With few exceptions, species are generally oligolectic, many in the Old World fauna on Campanulaceae or Ranunculaceae, while those of the New World are largely on Boraginaceae (*sensu* APG, 2016). Michener (2007) recognized six subgenera, two of which were considered to occur in North America: *Prochelostoma* Robertson, a monotypic subgenus endemic to eastern North America, and *Foveosmia* Warncke, a Holarctic group diverse in both western North America and the western Palearctic. Despite this arrangement, the New World *Foveosmia* are morphologically, behaviorally, and geographically distinct.

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Indeed, phylogenetic work on *Chelostoma* has further demonstrated that the North American species of *Foveosmia* were ill-placed within this otherwise Palearctic clade, and in fact a more basal branch within the overall group, thereby properly restricting the subgenus to the Old World species visiting Campanulaceae (Sedivy *et al.*, 2008). Herein the group of New World species previously placed in *Foveosmia* are diagnosed and modified couplets provided to aid in their identification and distinction from the Old World fauna. Morphological terminology follows that used by Michener (2007).

SYSTEMATICS

Genus *Chelostoma* Latreille

Neochelostoma Engel & Griswold, new subgenus

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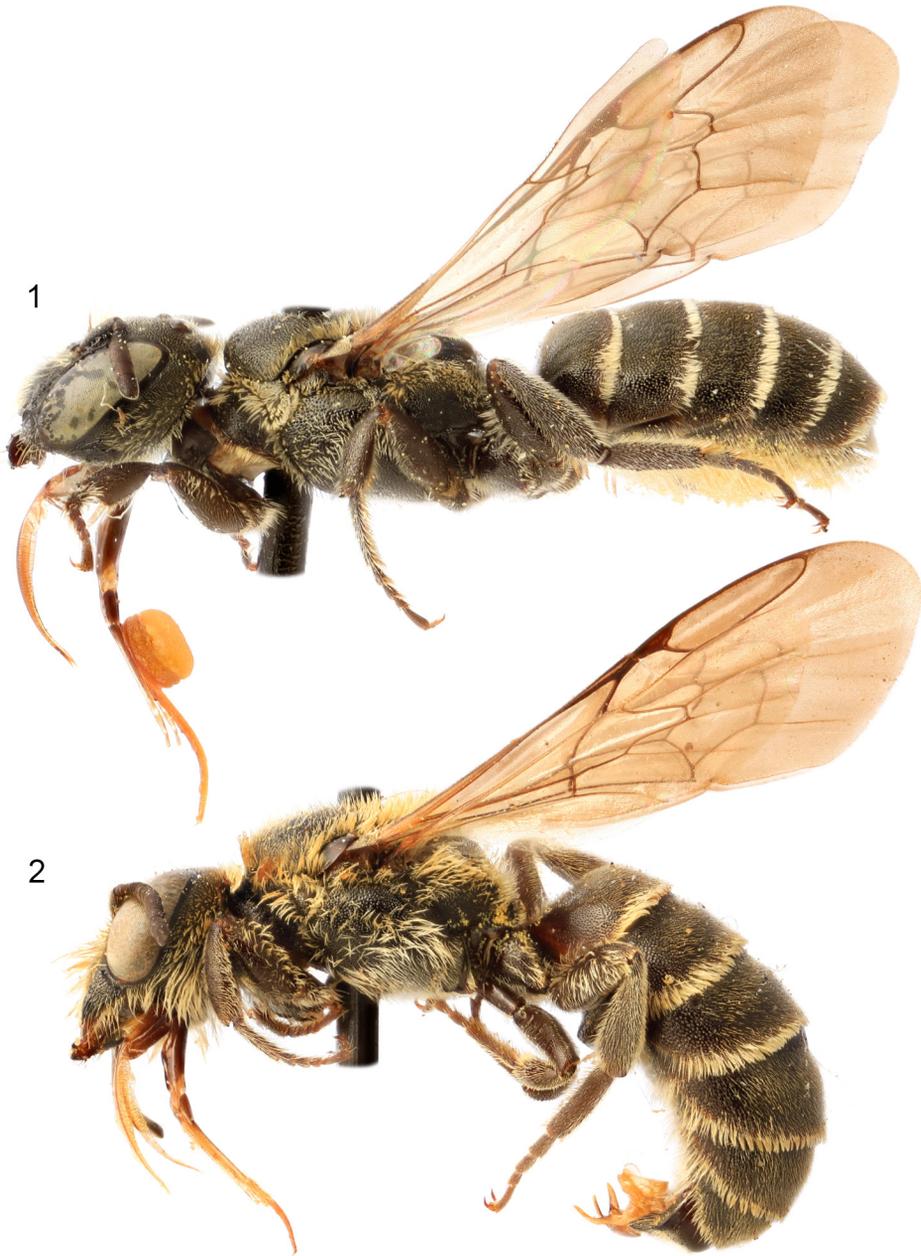
TYPE SPECIES: *Chelostoma californicum* Cresson, 1878 (Figs. 1, 2).

DIAGNOSIS: The subgenus can be most readily distinguished in males from *Foveosmia* proper by the presence of apicolateral processes on the seventh tergum (Fig. 5), in addition to the medial projections (sometimes joined apically to form a single projection; e.g., *C. incisulum* Michener), and in females by the simple setae on the outer surface of the probasitarsus (Fig. 3). In males of *Foveosmia* the lateral processes of the seventh tergum are lacking (Fig. 6), while in females the setae on the outer surface of the probasitarsus are pectinately branched to plumose (Fig. 4). Unlike species of *Foveosmia* which are oligoleges of Campanulaceae (Asterales), this clade of New World species includes primarily specialists of Hydrophyllloideae [Boraginales: Boraginaceae: note that the most recent familial classification demotes Hydrophyllaceae within Boraginaceae (APG, 2016), but see Luebert *et al.* (2016) for an alternative arrangement] (Hurd & Michener, 1955; Michener, 2007), although *C. tetramerum* Michener appears oligolectic on Amaryllidaceae (*Allium* Linnaeus) and *C. minutum* Crawford is polylectic with preference for *Phacelia* Juss. and *Allium* (Sedivy *et al.*, 2008). Female visitation by *C. minutum* supports this preference; of 152 specimens in the Pollinating Insects Research Unit collection with floral records, *Phacelia* accounts for 35% and *Allium* for 29%. Each of the 14 other genera account for <10%.

ETYMOLOGY: The new subgeneric name is a combination of the Greek *néos* (*νέος*), meaning, “new”, and the generic name *Chelostoma* [itself formed in Greek of *khēlē* (*χηλή*), meaning, “claw” and itself traditionally derived from *khēmē* (*χήμη*), meaning, “gape”, and *stōma* (*στόμα*, genitive *στόματος*), meaning, “mouth”]. The gender of the name is neuter.

COMMENTS: In recent history this group of species has been treated as New World members of the subgenus *Foveosmia* (Griswold & Michener, 1998; Michener, 2007), but is clearly distinct both morphologically and in terms of its floral associations, as well as phylogenetically (Sedivy *et al.*, 2008). The two Nearctic subgenera are allopatric; *Neochelostoma* is western, *Prochelostoma* eastern.

INCLUDED SPECIES: Aside from the type species (*C. californicum*), the following species are also included in *Neochelostoma*: *C. bernardinum* Michener, *C. cockerelli* Michener, *C. incisulum* Michener, *C. marginatum* Michener, *C. minutum*, *C. phaceliae* Michener, *C. tetramerum*. The keys of Michener (1938) and Hurd & Michener (1955) are sufficient to identify the described species of this subgenus.



Figures 1–2. Lateral habitus of female and male *Chelostoma (Neochelostoma) californicum* Cresson. 1. Female. 2. Male.

Key to Subgenera of *Chelostoma*
 (modified from Griswold & Michener, 1998; Michener, 2007)

- 1. Third labial palpomere flattened, its axis a continuation of that of second palpomere; seventh metasomal tergum of male with dorsal pit 2
- Third labial palpomere not flattened, its axis directed laterally as in most



Figures 3–4. Female characters of *Neochelostoma*, new subgenus, and *Foveosmia* Warncke. **3.** Probasitarsus of *Chelostoma* (*Neochelostoma*) *californicum* Cresson. **4.** Probasitarsus of *C.* (*Foveosmia*) *campanularum* (Kirby).

- megachilid bees; seventh metasomal tergum of male without dorsal pit (male unknown in *Ceraheriades* Tkalců) 5
- 2(1). Preoccipital carina present (sharply angled medially in *C. ventrale* Schletterer but not carinate); propodeum with sloping basal zone little more than one-half as long as metanotum; first metasomal tergum shallowly concave anteriorly [Palearctic] *Gyrodromella* Michener
- . Preoccipital carina absent; propodeum with horizontal basal zone at least two-thirds as long as metanotum; first metasomal tergum with anterior surface convex except for longitudinal groove 3
- 3(2). Parapsidal line half as long as tegula or more; second metasomal sternum of male without sloping platform, or, *if* present, then not carinate; labrum of female less than twice as long as broad (longer in *C. isabellinum* Warncke) 4



Figures 5–6. Male characters of *Neochelostoma*, new subgenus, and *Foveosmia* Warncke. 5. Seventh tergum of *Chelostoma* (*Neochelostoma*) *tetramerum* Michener, arrows indicate lateral projections. 6. Seventh tergum of *C.* (*Foveosmia*) *distinctum* (Stoeckhert).

- Parapsidal line less than half as long as tegula; second metasomal sternum of male with median prominence, its posterior surface a flat sloping platform margined by carina; labrum of female elongate, nearly 3× as long as broad or more (shorter in *C. nasutum* Pérez) [Palearctic, introduced into Nearctic] *Chelostoma* Latreille, *s.str.*
- 4(3). Male seventh metasomal tergum without lateral processes (Fig. 6); setae of outer surface of probasitarsus pectinately branched to plumose (Fig. 4) [Palearctic] *Foveosmia* Warncke
- Male seventh metasomal tergum with lateral processes (Fig. 5); setae of outer surface of probasitarsus simple (Fig. 3) [Nearctic] *Neochelostoma*, n. subgen.
- 5(1). Metacoxa not carinate [Nearctic] *Prochelostoma* Robertson
- Metacoxa with longitudinal carina along inner ventral margin 5
- 6(5). First metasomal tergum not concave on anterior surface; female mandible elongate, bidentate; labrum apically thickened [Central Asia] *Ceraheriades* Tkalců
- First metasomal tergum shallowly concave on anterior surface; female mandible not elongate, tridentate; labrum not apically thickened [Himalayas to Thailand] *Eochelostoma* Griswold

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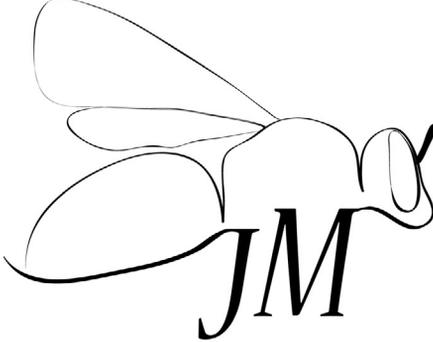
REFERENCES

APG [Angiosperm Phylogeny Group]. 2016. An update of the Angiosperm Phylogeny Group classification for the orders and families of flowering plants: APG IV. *Botanical Journal of the Linnean Society* 181(1): 1–20.

Cresson, E.T. 1878. Descriptions of new North American Hymenoptera in the collection of the American Entomological Society. *Transactions of the American Entomological Society* 7: 61–136.

- Griswold, T.L., & C.D. Michener. 1998. The classification of the Osmiini of the Eastern Hemisphere (Hymenoptera, Megachilidae). *Journal of the Kansas Entomological Society* 70(3): 207–253.
- Hurd, P.D., Jr., & C.D. Michener. 1955. The megachiline bees of California (Hymenoptera: Megachilidae). *Bulletin of the California Insect Survey* 3: 1–247.
- Luebert, F., L. Cecchi, M.W. Frohlich, M. Gottschling, C.M. Williams, K.E. Hasenstab-Lehman, H.H. Hilger, J.S. Miller, M. Mittelbach, M. Nazaire, M. Nepi, D. Nocentini, D. Ober, R.G. Olmstead, F. Selvi, M.G. Simpson, K. Sutorý, B. Valdés, G.K. Walden, & M. Weigend. 2016. Familial classification of the Boraginales. *Taxon* 65(3): 502–522.
- Michener, C.D. 1938. American bees of the genus *Chelostoma*. *Pan-Pacific Entomologist* 14(1): 36–45.
- Michener, C.D. 2007. *The Bees of the World* [2nd Edition]. Johns Hopkins University Press; Baltimore, MD; xvi+[i]+953 pp., +20 pls.
- Sedivy, C., C.J. Praz, A. Müller, A. Widmer, & S. Dorn. 2008. Patterns of host-plant choice in bees of the genus *Chelostoma*: The constraint hypothesis of host-range evolution in bees. *Evolution* 62(10): 2487–2507.

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