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Scientific Note

Description of the female of *Clavinomia clavicornis* (Warncke, 1980) (Halictidae: Nomiinae), with the species' taxonomy and first record from the Arabian Peninsula

The Nomiinae represent the second largest subfamily within the Halictidae, comprising roughly 600 described species (Michener 2007, Ascher & Pickering 2016). These are fascinating bees with tremendous morphological diversity and a puzzling biogeographical distribution. Most species inhabit the Old World tropics and Australasia, but some morphologically distinct lineages occur in North America. In comparison to their halictine relatives, the nomiine bees are rather poorly studied. This holds true not only for our understanding of their biology and natural history, but also their taxonomy. The classification of *Clavinomia clavicornis* (Warncke, 1980) illustrates a prime example. Initially described as *Nomia clavicornis*, Warncke (1980) recognized the species' distinctive morphology and placed it into a newly described subgenus *Clavinomia* Warncke, 1980. This is emblematic of the traditional approach to Nomiinae classification: placing nearly every nomiine taxon in a single hyperdiverse genus *Nomia* Latreille, 1804, including distinct and well characterized groups such as today's genus *Pseudapis* Kirby, 1900. This approach may indeed retain a single monophyletic group; however, it is not justifiable in light of this diverse and speciose subfamily. Currently, the lower-level taxonomic groupings of the Nomiinae are delimited under two classifications. The one following Michener (2007) represents the more conservative framework. With the primary criterion of monophyletic genera, Michener (2007) delineated many of the distinct groups on a subgeneric level and lumped them into the genus *Lipotriches* Gerstaecker, 1858. He reasonably argued with the necessity of revisions and pointed to our fragmentary understanding of the Asian taxa, also mentioning that some of his placements might be arbitrary. In Michener's (2007) classification, *Clavinomia* is treated as a subgenus of *Lipotriches*.

In the course of a nearly completed worldwide revision of the Nomiinae (Pauly 1990, 1991, 1999, 2000, 2003, 2008, 2009a), the genus *Lipotriches* has become more narrowly defined, comprising carefully delineated taxa with a higher degree of similarity. Very different groups that deviate from the generic characteristics of *Lipotriches* sensu Pauly (2014a, 2014b), such as *Clavinomia*, are regarded as separate genera. The present study follows Pauly's classification.

Clavinomia clavicornis is a rare bee only reported from a single locality in Iran (see below). The original description was based on three male specimens. An additional female is known from the type locality, and this specimen matches the description of the female described in this article. Some specific characteristics of the female *C. clavicornis* are already mentioned in Michener (2007), and a female specimen is illustrated on the Atlas Hymenoptera webpage (Pauly 2009b). Though these notes exist, the female is formally undescribed.

During a survey of the nomiine bee taxa in the collection of the USDA Bee Biology and Systematics Laboratory in Logan, Utah, a female specimen collected in Dubai, United Arab Emirates (UAE), was discovered. The single specimen was collected using malaise trapping and represents the first record of the species from the Arabian

Peninsula. Based on this finding, the female of *C. clavicornis* is described below. For the description, a number of abbreviations are used: Tergite (T), sternite (S) and flagellum segment (FL). Photographs were taken using a Canon EOS 6D camera and a Macropod Pro mounting system. Stacking was performed with a Stackshot 3X Cognisys device and processed using Zerene focus stacking software.

Clavinomia clavicornis (Warncke, 1980)

Nomia (Clavinomia) clavicornis Warncke, 1980: 372–374

(Figures 1–8)

Holotype. IRAN: Kashan, Wanderdünen, 25 May 1976, 1000 m, 1 ♂, leg. Ressler/Holzschuh, deposited in coll. OÖL (Oberösterreichisches Landesmuseum, Linz).

Diagnosis. ♀: With 8.6 mm total body length, the female is slightly smaller than the male. The basitibial plate is complete and pointed (Fig. 6). The head is greatly enlarged with a strongly developed genal area. The genal area is wider than the compound eye in lateral view (Fig. 5). The mandibles are unidentate. The integument of the mesosoma is dark brown to black, while all tergites are red-orange and covered with thick, white tomentum.

Description. ♀: Head conspicuously enlarged in contrast to the rest of the body, clearly broader (3.21 mm) than the mesosoma (distance between pronotal lobes 2.57 mm). Head shorter than broad (2.67–3.21 mm) (Fig. 4). Integument generally dark brown, turning reddish-brown on the clypeus, supraclypeal area and below the preoccipital ridge. Entire head excluding clypeus and supraclypeal area densely covered with short, plumose and thick setae, superficially resembling scales. Setae less dense on clypeus and supraclypeal area, very dense on the genal area. Clypeus much broader than long (1.83–0.72 mm), flat, shiny, punctation sparse and shallow in the center, increasingly dense and fine on the lateral part. Lower margin of the clypeus with a thin, distinct line of yellow colored integument. Supraclypeal area shiny, with punctation deeper and denser than on clypeus. Frontal line forming a visible groove. Mandibles mostly reddish, with darkened integument on tips, 1.34 mm long, unidentate. Head with distinct hypostomal carina. Galea with sparse unbranched yellow setae. Gena well developed, broader than the compound eye in lateral view (0.78 mm vs. 0.72 mm) (Fig. 5). Genal surface shiny with dense and quite fine punctation, barely visible because of the dense setae. Malar distance very short, not measureable. Antennal foramen almost in the center of the face, just slightly below the horizontal midline. Scape long (1.15 mm) and slender, dark. Pedicel slightly longer than broad (0.18–0.16 mm), with slightly less darkish brown integument. FL1 (0.14–0.19 mm) and FL2 (0.14–0.21 mm) shorter than broad, FL3 to FL10 more or less as long as broad. FL11 longer than broad (0.28–0.21 mm). FL1–11 with darkish-orange integument. Ocular ocellar line 0.83 mm long, diameter of outer ocellus 0.15 mm, of median ocellus 0.25 mm.

Mesosoma. Integument mainly dark, reddish-brown on the propodeum and metepisternum. Borders of scutum covered with thick, short, creamy off-white setae, most dense along the pronotum and pronotal lobe and extending onto the entire mesepisternum. Entire postscutellum covered with a thick band of tomentum. Basal area of the propodeum entirely hairless, but with sparse erect setae on the posterior surface. Anterior border of pronotum slightly lamellate, to a lesser extent along the midline of the pronotum. Scutum with scattered, fine punctation (Fig. 6). Center of scutum shiny, very smooth, distance between punctation often more than 10× the diameter of the punctures. Punctation more dense along the parapsidal lines and the region adjacent to the scutellum. Scutellum more densely punctate than scutum but



Figures 1–6. The female of *Clavinomia clavicornis* (Warncke, 1980). 1. Habitus, dorsal view. 2. Habitus, lateral view. 3. Metasomal terga. 4. Head, frontal view. 5. Head, lateral view. 6. Head and scutum, dorsal view. All scale bars indicate 1 mm.

still with distinct shiny interspaces. Basal surface of the propodeum less shiny, with shallow striae covering approximately two thirds of the surface. Border between basal area and posterior area of the propodeum fairly rounded, minutely lamellate, almost indiscernible (Fig. 3). Intertegular distance 1.94 mm. Tegulae weakly pigmented, dark yellow, slightly transparent. Wings weakly pigmented as well, clear, venation dark yellow to light brown. Forewing with three submarginal cells, stigma small, yellow. First and third submarginal cells roughly equal in size, second cell distinctly smaller.

First recurrent vein intersecting at the second submarginal cell. Basal vein arcuate. Hind wings each with 14 hamuli. All legs largely reddish-brown, forelegs slightly darker than mid- and hind legs. Tips of the tarsal claws dark brown. Setae creamy whitish, most dense on hind legs. Scopal hairs delicately branched, corresponding to the type ‘scirpoïde’ (Pauly 2014a). Penicellus on basitarsus orange. Two fairly inconspicuous hind tibial spurs, both short, light-colored, slender, unmodified, without bulbs or modifications. Basitibial plate complete, pointed, ear-shaped, the center of the plate covered with thick, short setae (Fig. 7).

Metasoma. Integument of all tergites orange-red, in clear contrast to mesosoma. Depressions and basal areas of T2–T5 densely covered with bands of thick white tomentum. Tomentum continues laterally on T2–T5, connecting the bands on the depressions and the basal areas (Fig. 3). Band on depression of T1 medially interrupted. Discs of T1–T2 shiny, finely but not very densely punctuated, much denser on depressions. Disc of T3 more densely punctate than T1 and T2. T4–T5 covered with tomentum, punctation barely visible. T6 covered with tomentum, however the setae are longer and more reddish than on other tergites. T6 with a well-developed pygidial plate, the shape resembling a traditional anchor (Fig. 8). Sterna orange, S6 with round patch of dark integument.

Specimen Examined. United Arab Emirates (UAE). Dubai, Nakhalai, 15/18 April 1984, 1 ♀, leg. E. Sugden, malaise trap. Nakhalai is located at N25.103, E55.573 at approximately 100 m above sea level.

Remarks. Until now, the species was only known from Iran, with all records reported from Kashan in today’s province Isfahan. A total of four specimens were known previously: IRAN: Kashan, Wanderdünen, 25 May 1976, 1000 m, 1 ♂, leg. Ressler/Holzschuh, Paratype. Kashan, Abuzed-abad, 25–27 May 1976, 1 ♀, leg. Ressler/Holzschuh. The specimens are located in the collection of the OÖL. Warncke (1980) reported two additional males from the same locality, one deposited in Warncke’s collection (now part of the collection of the OÖL) and the other one in the collection P. A. W. Ebmer. These specimens were examined by A. Pauly and are illustrated on the Atlas Hymenoptera webpage, including details of male genitalia and antenna modifications (Pauly 2009b).



Figures 7–8. Morphological details of *Clavinomia clavicornis* (Warncke, 1980). 7. Basitibial plate. 8. Tergum 6. The scale bars indicate 0.1 mm.

The genus *Lipotriches* sensu Pauly (2014a, 2014b) is characterized by three main distinguishing characteristics: (1) The basitibial plate on the hind tibia of females is incomplete and reduced to a narrow carina, (2) the anterior border of the pronotum is sharp-edged lamellate in both sexes, and (3) the inner hind tibial spur of females possesses a lamellate hump. As described above, the basitibial plate of *C. clavicornis* is complete and pointed (Fig. 7), and both hind-tibial spurs are fairly short without modifications and comparable humps. Both sexes possess a slightly elevated anterior pronotal border, thereby forming a shallow lamella. However, this lamella is less strongly developed and prominent than in *Lipotriches* s. str. and broadly interrupted medially. The female of *C. clavicornis* has a conspicuously enlarged head (Fig. 6) and well-developed genal areas which exceed the width of the compound eyes. In contrast to all other species of *Lipotriches* sensu Pauly (2014a, 2014b), the mandibles are unidentate. The sum of these characteristics clearly delineates *C. clavicornis* from *Lipotriches* in the stricter sense. The shape of the basitibial plate actually indicates a closer relationship to *Austronomia* Michener, 1965. However, this particular group urgently needs revision. Originally described from Australia (Michener 1965), additional species from other parts of the Old World were assigned to this group, rendering *Austronomia* a very loosely defined and potentially paraphyletic genus. Only a few descriptive morphological characters can be applied, and nearly all show at least some degree of inconsistency. Given our very fragmentary phylogenetic knowledge of the Nomiinae in general and the basically unstudied relationship of *Clavinomia* to other nomiine bees, it seems best to first develop a comprehensive phylogenetic framework before further hypothesizing about intergeneric relationships.

The reported record of *C. clavicornis* presents the first evidence of the species outside the type locality in Iran. The collection locality in the UAE on the Arabian Peninsula is approximately 950 km away and shows that the species is more widely distributed than previously thought. The lack of records further indicates that the species is not very common on the Arabian Peninsula. There is no record of the species in the recently published inventory of the UAE bee fauna (Dathe 2009) nor in the checklist from adjacent Saudi Arabia (Engel et al. 2013). Correspondingly, our knowledge of the species' biology is very limited, and we have no information about host-plant preferences, nesting biology or potential cleptoparasites. However, the record from the UAE has great potential to facilitate future work on this species, as we now have the first precise collection locality.

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