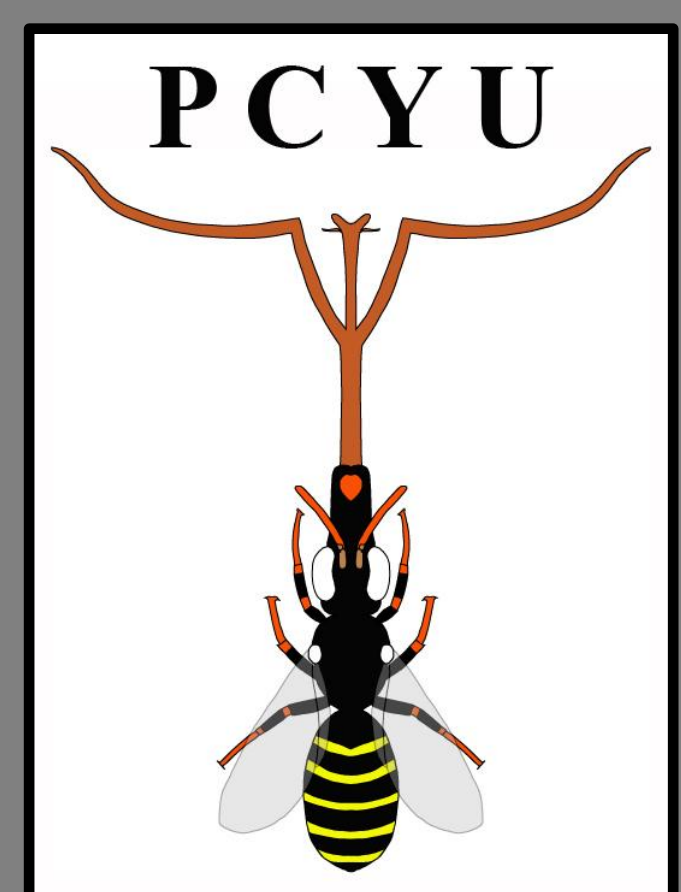


A Revision of the Cleptoparasitic Bee Genus *Coelioxys* (Hymenoptera: Megachilidae) in Canada

Nicholai de Silva & Laurence Packer
Department of Biology, York University, Toronto, ON



ABSTRACT

Bees of the genus *Coelioxys*, like many other cleptoparasitic bee groups, are poorly studied, particularly in terms of their species-level host associations and nest entering behaviour. In many cases uncertainties pertaining to species level classification still exist. These cleptoparasitics are represented by over 480 species worldwide. In North America, north of Mexico, there are about 44 species recorded, and until recently only 14 species have been recognized in Canada. Influential work by Mitchell (1973) and Baker (1975) on the subgeneric and species level classification of *Coelioxys* in the Western Hemisphere in general and Nearctic region in particular are in need of revision as many subgenera have been synonymised by Michener (2007), as have many species. Recent collecting events and the examination of specimens from multiple museum collections has contributed to over 1500 specimens being studied. Many of these specimens have been DNA barcoded, resulting in over 170 high quality sequences. The combined approach of using morphological and DNA barcode data has revealed a total of 16 species within 5 subgenera occurring in Canada, including 2 new species level records and some considerable extensions in species ranges.

RESULTS

- Over 1500 specimens studied
- 170+ barcodes (>350 bp) generated, including 14/16 Canadian species and more than half of the 46 North American (N. of Mexico) species.
- 2 new species records for Canada



Figure 2: Females of the subgenus *Boreocoelioxys* Mitchell found in Canada. The graduli on tergites 2 and 3 of the metasoma are visibly complete in all but *funeraria*.

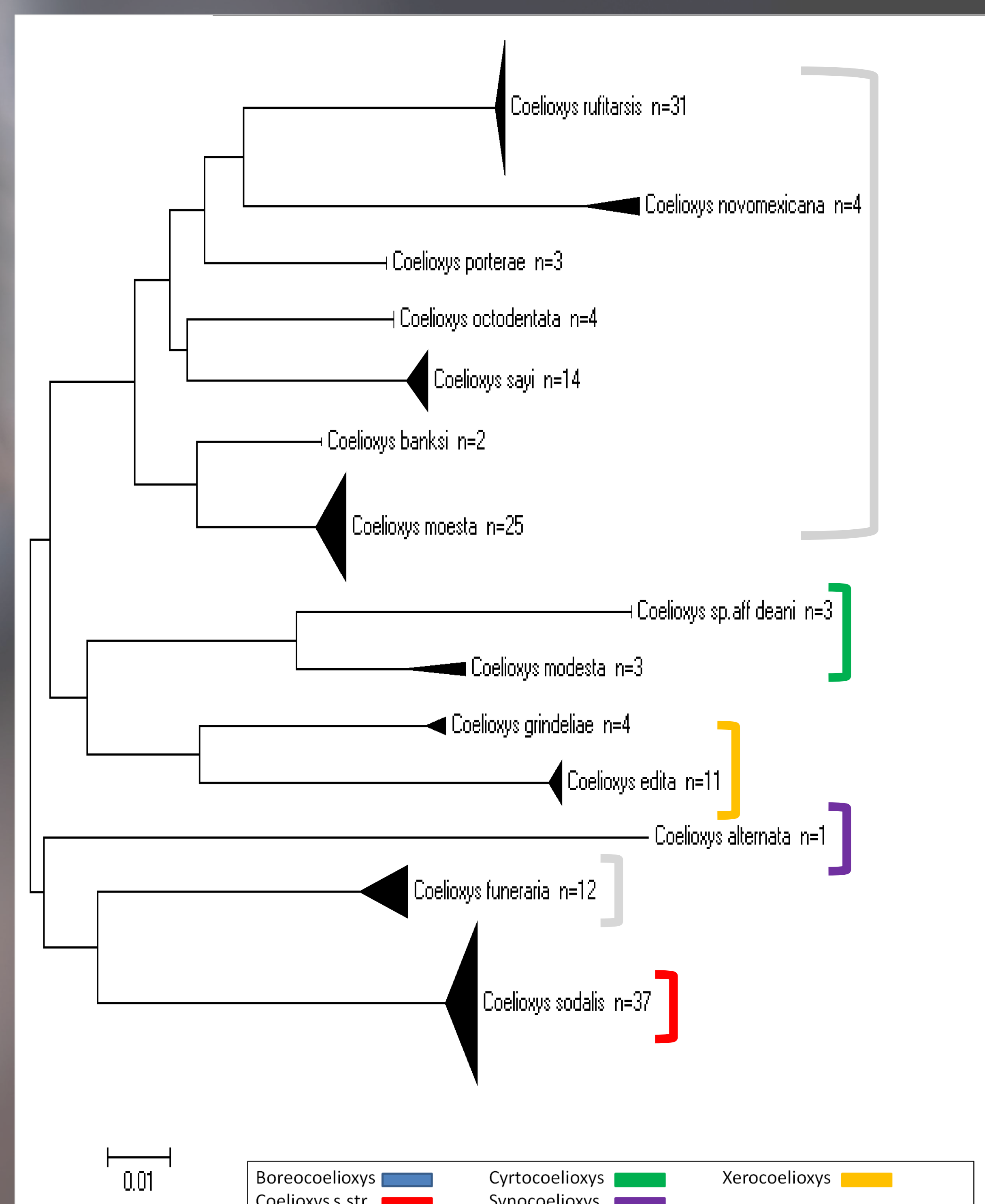


Figure 1: Neighbour joining tree based on Kimura-2-parameter of CO1 sequences, created using MEGA v5.0. The 5 subgeneric groupings present in Canada are colour coded. Note *Boreocoelioxys* appears twice in the tree.

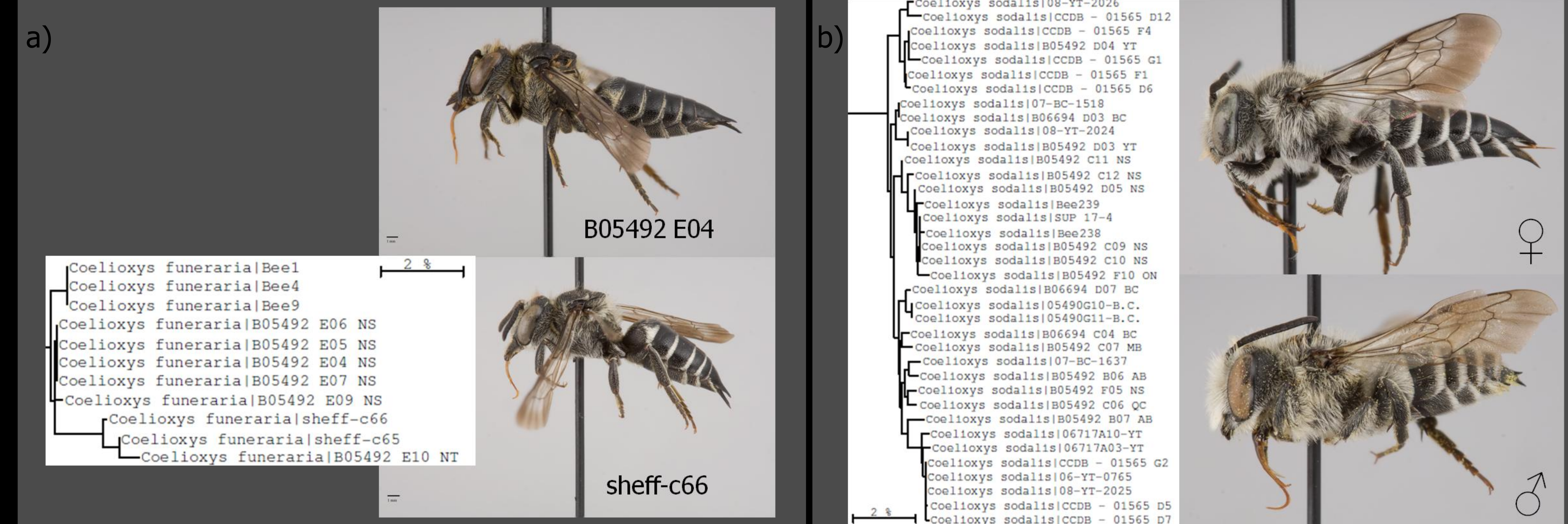


Figure 3: a) *Coelioxys funeraria* shows genetic diversity and also marked size differences but no morphologically separating characters within members of the same sex. Multiple hosts have been recorded for this species (Baker, 1975; Packer et al., 1995). b) *Coelioxys sodalis* does not show as distinct a size difference as *C. funeraria* however a large range and several host species may contribute to the genetic diversity illustrated by the barcode data.

DISCUSSION

Among the most common cleptoparasitic bees, the genus *Coelioxys* is easily differentiated from all others by the unique shape of the metasoma. It is also one of the few New World genera with ocular hairs. Unfortunately, species level identification of the North American *Coelioxys* is difficult and the genus is in need of revision. DNA barcode data and similarity analysis (Fig. 1) agree with preliminary phylogenetic analysis suggesting current subgeneric groupings be reassessed. The difference in *C. funeraria* from other females of the *Boreocoelioxys* is easily observed (Fig. 2) and has been incorporated into a morphological matrix for future phylogenetic work. Complicating species identification in *Coelioxys* is intraspecific size differences (Fig. 3a). Many of the host species differ in size, some may be cavity-nesting while others may be ground nesting, resulting in even greater variation among their cleptoparasites. Further phylogenetic analysis will be incorporated into my revisionary work in order to better understand the subgeneric groupings.

References

- Baker JR. 1975. Taxonomy of five nearctic subgenera of *Coelioxys* (Hymenoptera: Megachilidae). The University of Kansas Science Bulletin **50**(12):649-730.
 Michener CD. 2007. The Bees of the World. Baltimore: The Johns Hopkins University Press.
 Mitchell TB. 1973. A subgeneric revision of the bees of the genus *Coelioxys* of the Western Hemisphere (Hymenoptera: Megachilidae). Dept. of Entomology, North Carolina State University (Raleigh).
 Packer et al., 1995. Genetic Differentiation Between Two Host "Races" and Two Species of Cleptoparasitic Bees and Between Their Two Hosts. *Biochem. Gen.* **33** (3/4):97-109.