



Cyprus
University of
Technology

Faculty of Geotechnical
Sciences and
Environmental
Management

Master's Thesis

BARCODING OF THE WILD BEES IN CYPRUS

Vasiliki Michail

Limassol, June 2022

CYPRUS UNIVERSITY OF TECHNOLOGY
FACULTY OF GEOTECHNICAL SCIENCES AND
ENVIRONMENTAL MANAGEMENT
DEPARTMENT OF AGRICULTURAL SCIENCES, BIOTECHNOLOGY
AND FOOD SCIENCE

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Approval Form

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Presented by

Vasiliki Michail

Supervisor: Faculty of Geotechnical Sciences and Environmental Management,
Menelaos Stavrinides, Associate Professor

Signature _____

Supervisor: Faculty of Geotechnical Sciences and Environmental Management, Iakovos
Pantelides, Assistant Professor

Signature _____

Member of the committee: Faculty of Geotechnical Sciences and Environmental
Management, Nikolaos Nikoloudakis, Special Teaching Staff

Signature _____

Cyprus University of Technology

Limassol, June 2022

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The approval of the thesis by the Department of Agricultural Sciences, Biotechnology and Food Science does not imply necessarily the approval by the Department of the views of the writer.

First of all, I would like to pay my special regards to my thesis supervisors, Associate Professor Menelaos Stavrinos and Assistant Professor Iakovos Pantelides for sharing their knowledge with me, trusting me and spending their time to help me complete this study.

Furthermore, this work would not have been possible without the help of the two Ph.D. students Androulla Varnava and Elena Savva. I owe them a big thank you for their help, guidance, patience, support and time.

I would like to extend my deepest gratitude to my team IMED in CIBIO institute, in Porto and more specifically in Joana Abrantes, Tereza Almeida, Fabiana Neves and Soraia Barbosa. Their contribution was precious to me over the last few months not only for my emotional state but for part of my thesis results as well.

I would like to express my deepest thanks to the third member of my thesis committee, Professor Nikolaos Nikoloudakis.

Moreover, I am extremely grateful to my friends and especially my brother Manolis for their encouragement and emotional support all this time.

Last but not least, I would like to thank my parents Christos and Argyroula for their support, trust and endless faith in me and my capabilities from the beginning until the end of my studies.

ΠΕΡΙΛΗΨΗ

Οι μέλισσες έχουν αναγνωρισθεί από την επιστημονική κοινότητα ως είδη μεγάλης σημασίας για τις υπηρεσίες επικονίασης που προσφέρουν σε φυτά μεγάλης διατροφικής αξίας και στα οικοσυστήματα γενικότερα. Στην Ευρώπη έχουν καταγραφεί περίπου 2000 είδη μελισσοειδών εκ των οποίων το μεγαλύτερο ποσοστό ενδημικών ειδών εντοπίζεται στο νότιο τμήμα της ηπείρου. Στην Κύπρο έχουν καταγραφεί 369 είδη μελισσοειδών, 21 εκ των οποίων είναι ενδημικά. Με τον πληθυσμό των άγριων μελισσών να μειώνεται ραγδαία, η ταυτοποίηση των ειδών κρίνεται ύψιστης σημασίας για την προστασία των επικονιαστών και των ειδών χλωρίδας. Σκοπός της παρούσας διατριβής ήταν η χρήση DNA barcoding ως εργαλείου μοριακής ταυτοποίησης των άγριων μελισσών της Κύπρου. Χρησιμοποιώντας το γονίδιο COI ταυτοποιήθηκαν με σχετική ακρίβεια 25 είδη άγριων μελισσών. Βασικό πλεονέκτημα αποτέλεσε η διάκριση περισσότερων ειδών σε σχέση με τα μορφοείδη που είχαν αναγνωρισθεί κατά τη μορφολογική ταυτοποίηση. Ωστόσο δεν υπήρχε η δυνατότητα διάκρισης ειδών με μικρή διαφορά ομοιότητας από το COI barcode, όπως τα *Lasioglossum malachurum* και *L. subhirtum* και τα *Halictus quadricinctus* και *H. brunnescens*. Συνοψίζοντας, τα αποτελέσματα αποδεικνύουν ότι το DNA barcoding είναι ένα αξιόπιστο εργαλείο όπου σε συνδυασμό με τη μορφολογική ταυτοποίηση από ταξινομους θα μπορούσε να αποτελέσει την αρχή για μία μοριακή βάση δεδομένων των άγριων μελισσών της Κύπρου. Απαιτείται όμως περισσότερη δουλειά για τη σύνδεση του DNA barcode με τη μορφολογική ταξινόμηση για πολλά από τα είδη που υπάρχουν στο νησί.

Λέξεις- Κλειδιά: Apoidea; wild bees; molecular taxonomy; DNA barcoding; COI gene

ABSTRACT

Bees are considered to be one of the most significant taxa due to the pollination services they provide to key cultivated crops and natural ecosystems. There are approximately 2000 bee species in Europe, with southern Europe having the highest endemic species richness. In Cyprus 369 wild bee species have been recorded, 21 of which are endemic. With bee populations facing a global decline, bee identification plays a significant role in conservation efforts. The main objective of this study was to evaluate DNA barcoding as a molecular tool for the identification of the wild bees of Cyprus. Using the COI gene, 25 species have been identified with relatively high accuracy. The main advantage of the tool was the identification of more species compared to the morphospecies that were distinguished based on morphological identification. However, the barcode for some specimens resulted in high similarity to more than one species, such as *Lasioglossum malachurum* with *L. subhirtum* and *Halictus quadricinctus* with *H. brunnescens*, and therefore did not result in a complete identification. Overall, results suggest that DNA barcoding is a reliable tool for wild bee identification, and can form the basis for a Cyprus wild bee molecular identification database, in combination with reliable morphological identification of certain taxa. However, further work is needed to link species morphological identities to DNA barcodes.

Keywords: Apoidea; wild bees; molecular taxonomy; DNA barcoding; COI gene