A taxonomic revision of the Kermesidae (Hemiptera: Coccoidea) in Israel, with a description of a new species

MALKIE SPODEK\textsuperscript{1,2} & YAIR BEN-DOV\textsuperscript{1}
\textsuperscript{1}Department of Entomology, Volcani Center, Agricultural Research Organization, POB 6, Bet Dagan 50250, Israel. 
E-mail: malkiespodek@gmail.com
\textsuperscript{2}Department of Entomology, Robert H. Smith Faculty of Agriculture, Food and Environment, The Hebrew University of Jerusalem, POB 12, Rehovot 76100, Israel

Magnolia Press
Auckland, New Zealand

MALKIE SPODEK & YAIR BEN-DOV
A taxonomic revision of the Kermesidae (Hemiptera: Coccoidea) in Israel, with a description of a new species
(Zootaxa 3781)
99 pp.; 30 cm.
25 Mar. 2014
ISBN 978-1-77557-360-9 (paperback)
ISBN 978-1-77557-361-6 (Online edition)

FIRST PUBLISHED IN 2014 BY
Magnolia Press
P.O. Box 41-383
Auckland 1346
New Zealand
e-mail: zootaxa@mapress.com
http://www.mapress.com/zootaxa/

© 2014 Magnolia Press
All rights reserved.
No part of this publication may be reproduced, stored, transmitted or disseminated, in any form, or by any means, without prior written permission from the publisher, to whom all requests to reproduce copyright material should be directed in writing.
This authorization does not extend to any other kind of copying, by any means, in any form, and for any purpose other than private research use.

ISSN 1175-5326 (Print edition)
ISSN 1175-5334 (Online edition)
Table of contents

Abstract .................................................................................................................................................. 3
Introduction .......................................................................................................................................... 3
Material and methods .......................................................................................................................... 5
Key to instars and adults of Kermesidae species of Israel ................................................................ 7
Key to the adult females of Kermesidae species of Israel .................................................................. 7
Key to the third-instar females of Kermesidae species of Israel ............................................................. 7
Key to the second-instar females of Kermesidae species of Israel ......................................................... 8
Key to the first-instar nymphs of Kermesidae species of Israel ............................................................... 8
Key to the post-reproductive females of Kermesidae species of Israel ................................................ 8
Key to the adult males of Kermesidae species in Israel ...................................................................... 8
Key to the second-instar males of Kermesidae in Israel ..................................................................... 9
Kermesidae Signoret, 1875 .................................................................................................................. 9
Kermes Boitard, 1828 .......................................................................................................................... 9
Israel species ......................................................................................................................................... 9
   Kermes echinatus Balachowsky ........................................................................................................ 9
   Kermes greeni Bodenheimer ........................................................................................................... 24
   Kermes hermonensis Spodek & Ben-Dov ......................................................................................... 36
   Kermes nahalali Bodenheimer ......................................................................................................... 51
   Kermes spatulatus Bodenheimer ..................................................................................................... 65
   Nidularia Targioni Tozzetti, 1868 .................................................................................................... 79
   Nidularia balachowskii Bodenheimer .............................................................................................. 79
Discussion ........................................................................................................................................... 93
Acknowledgements .............................................................................................................................. 96
References ............................................................................................................................................ 96

Abstract

A taxonomic revision is presented of the six Kermesidae species from Israel, namely, Kermes echinatus Balachowsky, K. greeni Bodenheimer, K. nahalali Bodenheimer, K. spatulatus Balachowsky, Nidularia balachowskii Bodenheimer, and K. hermonensis Spodek & Ben-Dov. K. bytinskii Sternlicht, syn. n. is established as a junior synonym of K. nahalali Bodenheimer and a lectotype for K. nahalali is designated. This study includes descriptions, redescriptions and illustrations of the adult female, adult male and all developmental stages for these six species. Keys are provided to distinguish instars, adult females, adult males and immature stages for all species.

Key words: Israel, Kermesidae, oaks, Quercus sp., scale insects

Introduction

Species of the scale insect family Kermesidae (Hemiptera: Coccoidea) are distributed in the Nearctic, Oriental and Palearctic regions of the world (Ben-Dov et al., 2013). The family contains about one hundred valid species in ten genera. All species are known to develop exclusively on Fagaceae, with the exception of species that belong to the genus Eriokermes, associated with Cupressaceae (Miller & Miller, 1993). Oak (Quercus) is the main host although a few Asiatic Kermes have been collected off fagaceous trees that belong to other genera such as Castanea, Castanopsis, Lithocarpus and Pasania, and some North American species have been collected off Chrysolepis (Ben-Dov et al., 2013). Most females and males develop on twigs and branches and in bark crevices, although some species develop on leaves (Sternlicht, 1969; Bullington & Kosztarab, 1985; Hu, 1986; Podsiadlo, 2005).

For the most part Kermesidae species are not known to cause any visible damage to their host trees although there are a few reports of branch dieback, flagging, reduced growth rates and occasionally tree death, mainly in urban areas (Kozár, 1974; Hamon, 1977; Solomon et al., 1980; Viggiani, 1991; Pellizzari et al., 2012; Podsiadlo, 2012). Some species of Kermes are known for their importance as a natural source of crimson dye for the textile industry (Amar et al., 2005; Cardon, 2007).

Most species of Kermesidae appear to be univoltine (Balachowsky, 1950, 1953; McConnell & Davidson, 1959; Sternlicht, 1969; Hamon et al., 1976; Koteja, 1980; Bullington & Kosztarab, 1985; Hu, 1986; Kosztarab & Kozár, 1988; Viggiani, 1991; Liu et al., 1997; Marotta et al., 1999). However, Podsiadlo (2011, 2013) showed that...
antennae. The study of adult female *Kermes* species in all regions remains incomplete, particularly because the majority of descriptions were based on post-reproductive females or first-instar nymphs. Much more taxonomic work on Kermesidae is required to fully understand the relationship between the species in Israel and Kermesidae species of other regions.

Conclusions

This study presents a taxonomic revision of the Kermesidae species of Israel. Prior to this study, nine species of Kermesidae belonging to two genera, *Kermes* and *Nidularia* were reported from the country. We studied the type-series of all species, as well as freshly-collected material and conclude that there are only six species in Israel: *K. echinatus*, *K. greeni*, *K. hermonensis*, *K. nahalali*, *K. spatulatus* and *N. balachowskii*. Although *K. biblicus* and *N. pulvinata* have been reported from Israel, we did not collect them, nor did we find material in any of the entomological collections at ICVI, BMNH, MNHN or TAU. We have, therefore, concluded that these species do not occur in Israel. *Kermes bytinskii* is here synonymized with *K. nahalali*. *Kermes palestiniensis* was synonymized with *K. greeni* in an earlier study (Spodek et al., 2012a).

The Kermesidae is comprised of about 100 species belonging to ten genera. The present work is a comprehensive taxonomic contribution to the knowledge of this family in Israel and the Palaearctic region. Further similar studies on this group of scale insects in other regions would greatly enhance our understanding of this family.

Acknowledgements

This study was funded to the senior author by Keren Kayemeth LeIsrael/ The Jewish National Fund (Project # 131-1621-11) and the Israel Taxonomy Initiative. This paper comprises part of the PhD dissertation of M. Spodek at The Hebrew University of Jerusalem. We thank the following people who helped us obtain specimens and slide-mounted material for this study: Imre Foldi and Daniele Matile-Ferrero (MNHN, France), Mehmet Bora Kaydan (Imamoglu Vocational School, Çukurova University, Adana, Turkey), Jon Martin (BMNH, England), Dug Miller and Debra Creel (Systematic Entomology Laboratory, USDA, MD, USA), Francesco Porcelli (Department of Entomology, University of Bari, Italy) and Elżbieta Podsiadlo (Department of Zoology, Agricultural University of Warsaw, Poland). We are grateful to Chris Hodgson (Department of Biodiversity and Biological Systematics, The National Museum of Wales, Cardiff, United Kingdom) for his constructive comments that improved the final presentation of this manuscript. We thank M.B. Kaydan for his helpful comments to the manuscript. We would also like to thank Zvi Mendel and Murad Ghanim (Department of Entomology, Volcani Center, Bet Dagan, Israel) for their encouragement and support throughout this project. Special gratitude is expressed to Alex Protasov (Department of Entomology, Volcani Center, Bet Dagan, Israel) for his outstanding photographic skills and general technical support. Collection permits at Nature Reserves in Israel, were kindly provided by the Israel Nature and Parks Authority.

References


Ferris, G.F. (1920) Scale insects of the Santa Cruz Peninsula. Stanford University Press. Biological Sciences, Palo Alto 1, 1


http://dx.doi.org/10.2478/v10200-012-0031-x


http://dx.doi.org/10.3897/zookeys.246.3766


http://dx.doi.org/10.3897/zookeys.254.3959


