

**CONTRIBUTION TO THE KNOWLEDGE OF BARK BEETLES (COLEOPTERA:  
SCOLYTOIDEA) AND ASSOCIATED ORGANISMS IN ISRAEL\***

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**ABSTRACT**

Twenty-nine species of bark beetles are reported from Israel. Their hosts, zoogeographical distribution, economic importance and some associated organisms, are listed. Five additional species, previously recorded, but misidentified or not found in the present study, are also mentioned.

*KEY WORDS:* Scolytidae, bark beetles, Platypodidae, natural enemies, host plants, Israel.

**INTRODUCTION**

No systematic collections of bark beetles (Scolytoidea) have been made previously in Israel. The only list of species is included in *Prodromus Faunae Palaestinae* (Bodenheimer, 1937), where 11 species are registered.

During the last 25 years the first author collected bark beetles and their associates as part of an entomofaunistic survey of ornamental and forest trees and shrubs in Israel. The bark beetles and their associates were obtained by collecting stems and branches in man-made and natural forests as well as in gardens. The collection included also various woody material cut and left in the field for periods from 2 months up to 2 years. The material was kept in photo-electors (wooden boxes with external glass tubes and vials) for 1 or 2 additional years. The emerging insects (bark beetles, parasites, predators, etc.) were collected frequently from the vials; the inside of the boxes was checked monthly. Egg and larval galleries were sought in the wood from which bark beetles emerged.

Some of the bark beetles were identified by the late Prof. K. Schedl, and recorded in two papers (Schedl, 1969 and 1978), which include, *inter alia*, 13 species not previously known from Israel, of which *Carphoborus minimus* F., was understood as a collective-species, *Cisurgus maurus* Eggers was a misidentification, *Hypothenemus*

*simoni* Reitter is a synonym of *H. eruditus* Westwood (see Appendix to Part I), and *Thamnurgus orientalis* Schedl was described as new to science. More recent material was identified by the second author and includes nine species not listed by Bodenheimer (1937) and Schedl (1969, 1978), two of which are probably newly established introductions into Israel.

The data obtained during this survey are arranged in three parts:

I. *The bark beetles.* The beetles are set in alphabetical order under each family and subfamily. The data always include host plants in Israel, and usually also data on the material (place and date of collection and date(s) of emergence), from which the beetles were reared, except for the very common species and for collections already referred to by Schedl (1969, 1978). Bibliographical references are given to the main previous records in Israel.

Abbreviations indicating regions of Israel are as follows: CP, Central Coastal Plain; HV, Hula Valley; LG, Lower Galilee; NP, Northern Coastal Plain; UG, Upper Galilee.

Unless stated otherwise, identifications were done by the second author.

II. *Natural enemies and other associated organisms.* Insects, mites, etc. parasitizing, preying or associated in some other way with bark beetles (commensal, detrital or phoretic) are listed, with reference to the bark beetle species with which they were found to be associated.

III. *Index of host plants* genera (in alphabetical order) with their bark beetles in Israel. Rare beetle species are marked by an asterisk; strays, *i.e.*, species which do bore into the bark (or shoots), but were not found to reproduce there, are marked by two asterisks. Species previously misidentified or those not found in the present study (See Appendix to Part I) – are not included in this list.

Most of the listed insects upon which this study is based, are deposited at the Department of Entomology, ARO, Ilanot. Some, are deposited in the Department of Zoology, the Tel-Aviv University (Ramat Aviv); the Division of Plant Protection and Inspection, Ministry of Agriculture, Bet Dagan; the Naturhistorisches Museum, Wien; Forstliche Bundesversuchsanstalt Wien, and collection of C. Holzschuh, Wien.

## I. BARK BEETLES OF ISRAEL

### SCOLYTIDAE

#### SCOLYTINAE

##### 1. *Scolytus amygdali* Guérin

*Scolytus amygdali* Guérin: Bodenheimer (1937), Balachowsky (1949), Schedl (1969, 1978), Gurevitz (1965), Avidov and Harpaz (1969).

*Geographical distribution:* Circum-Mediterranean and Irano-Turanian.

*Hosts:* *Amygdalus communis* L., *Armeniaca vulgaris* Lamarck, *Cerasus vulgaris* Miller, *Persica vulgaris* Miller, *Prunus* spp.

MATERIAL EXAMINED: Many specimens bred from material collected in the northern and central parts of Israel.

## 2. *Scolytus mediterraneus* Eggers

*Scolytus mediterraneus* Eggers: Balachowsky (1949).

*S. rugulosus mediterraneus* Eggers: Schedl (1969, 1978).

*Geographical distribution*: France, Algeria, Morocco, Israel, Crimea, Caucasus.

*Hosts*: *Armeniaca vulgaris* Lamarck, *Cerasus vulgaris* Miller, *Crataegus* spp., *Cotoneaster* spp., *Malus silvestris* Miller, *Prunus* spp., *Pyracantha* spp.

MATERIAL EXAMINED: Many specimens bred from material collected in the northern and central parts of Israel.

## 3. *Scolytus kirschi* Skalitzky

*Scolytus kirschi* Skalitzky: Balachowsky (1949).

*Geographical distribution*: Circum-Mediterranean, Central Europe, Caucasus, Iraq.

*Host*: *Ulmus* spp.

MATERIAL EXAMINED: *Ulmus* sp.: Kefar Hittim (LG) 29.V.83; Kefar haNasi and Yesud haMa'ala (HV) 15.VI.83; Bet Qeshet (LG) 25.VII.83; Gadot (HV) 1.XI.84. *U. canescens* Melville, Ramat haShofet (Samaria) 13.III.84.

REMARK: Probably an introduced species, found for the first time in 1983 in Kefar Hittim, near Tiberias. At the end of 1984 it was already common in many localities up to 30 km to the north and 40 km to the west and southwest of Kefar Hittim, on natural and planted elm trees (Halperin, 1984).

## IPINAE

## 4. *Carphoborus henscheli* Reitter

*Carphoborus henscheli* Reitter: Balachowsky (1949), as a synonym of *C. minimus* F.; according to Pfeffer (1941) it has to be considered as a separate species.

*Carphoborus minimus* F.: Schedl (1969).

*Geographical distribution*: Turkey, Israel.

*Host*: *Pinus* spp.

MATERIAL EXAMINED: Many specimens bred from material collected in northern and central Israel.

## 5. *Carphoborus perrisi* Chapuis

*Estenoborus perrisi* Chapuis: Balachowsky (1949).

*Carphoborus perrisi* Chapuis: Schedl (1969).

*Geographical distribution*: Central and East Mediterranean, Crimea, Caucasus, Iran.

*Hosts*: *Pistacia* spp.

MATERIAL EXAMINED: *P. atlantica* Desfontaines: Hula Valley (HV) 3.XI.1958; Kefar haMaccabi (NC) 1.XI, 27.IX-8.XI.1979. *P. vera* L.: Mt. Hazon (LG) 26.V., 28.V-10.VI.82; Alumot (LG) 4.X.84; Bar'am (UG) 9.IX., 5.XI.84.

## 6. *Chaetoptelius vestitus* Mulsant et Rey

*Chaetoptelius vestitus* Mulsant et Rey: Balachowsky (1949), Schedl (1969).

*Geographical distribution*: Circum-Mediterranean, Crimea, Caucasus, Iran.

*Hosts*: *Pistacia* spp.

MATERIAL EXAMINED: *P. atlantica* Desf., Kefar haMaccabi (NC) 26.II, 4.V.80; *P. vera* L., Bar'am (UG) 4.VI.84.

## 7. *Coccotrypes dactyliperda* F.

*Coccotrypes dactyliperda* F.: Bodenheimer (1937), Balachowsky (1949), Schedl (1969), Avidov and Harpaz (1969), Kehat *et al.* (1976).

*Geographical distribution*: Tropical and subtropical.

*Host*: *Phoenix dactylifera* L. (fruits).

MATERIAL EXAMINED: Many specimens bred from collected dates. Reared also from buttons made from various Palmaceae fruits, such as *Phytelephas macrocarpa* Ruiz et Pavon.

REMARK: Probably introduced at the beginning of the 20th Century (Bytinski-Salz, 1966).

## 8. *Crypturgus cribrellus* Reitter

*Crypturgus cribrellus* Reitter: Balachowsky (1949).

*Geographical distribution*: Central and East Mediterranean, Crimea.

*Host*: *Pinus halepensis* Miller.

MATERIAL EXAMINED: *P. halepensis*, Mt. Carmel: 8.VIII, 15.VIII.66; 6.V., 14.IX.79.

## 9. *Crypturgus mediterraneus* Eichhoff

*Crypturgus mediterraneus* Eichhoff: Balachowsky (1949), Schedl (1969, 1978).

*Geographical distribution*: Circum-Mediterranean.

*Hosts*: *Pinus* spp. (common); *Callitris quadrivalvis* Ventenat (rare).

MATERIAL EXAMINED: Many specimens bred from material collected mostly in northern and central Israel. Collected also in flowers of *Pyrus syriaca* Boissier.

## 10. *Crypturgus numidicus* Ferrari

*Crypturgus numidicus* Ferrari: Balachowsky (1949).

*Geographical distribution*: West and East Mediterranean.

*Host*: *Pinus* spp.

**MATERIAL EXAMINED**: Specimens reared from material collected in northern and central Israel.

## 11. *Hylastes linearis* Erichson

*Hylastes linearis* Erichson: Balachowsky (1949).

*Geographical distribution*: Central and East Mediterranean, Central Europe, Western U.S.S.R.

*Hosts*: *Pinus* spp.

**MATERIAL EXAMINED**: *P. brutia* Tenore, Biriya (UG) 30.XII.78, 13.V.79; *P. halepensis* Mill. Kesalon (Judean Foothills) 25.II., 4.VI.80.

## 12. *Hylurgus micklitzii* Wachtl

*Hylurgus micklitzii* Wachtl: Balachowsky (1949), Schedl (1969, 1978).

*Geographical distribution*: Central and East Mediterranean.

*Hosts*: *Pinus* spp.

**MATERIAL EXAMINED**: Many specimens bred from material collected in northern and central Israel.

## 13. *Hypoborus ficus* Erichson

*Hypoborus ficus* Erichson: Bodenheimer (1937), Balachowsky (1949), Schedl (1969, 1978), Avidov and Harpaz (1969).

*Geographical distribution*: Circum-Mediterranean.

*Hosts*: *Ficus carica* L. (common); *Ailanthus altissima* Swingle, *Styrax officinalis* L. (rare).

**MATERIAL EXAMINED**: Many specimens bred from material collected almost everywhere in Israel where fig trees are abundant.

## 14. *Hypothenemus crudiae* Panzer

*Hypothenemus crudiae* Panzer: Wood (1977).

*Hypothenemus leprieuri* Perris: Schedl (1978).

*Geographical distribution*: Tropical and subtropical. Origin – probably from southern Asia (Wood, 1977).

*Hosts*: *Acacia* sp., *Bauhinia variegata* L., *Calycotome villosa* Link, *Celtis* spp., *Cotoneaster pannosus* Franchet, *Cupressus sempervirens* L., *Delonix regia* Refinesque-

Schmaltz, *Laurus nobilis* L., *Morus alba* L., *Persea americana* Miller, *Pinus* spp., *Pistacia* spp., *Rhamnus alaternus* L., *Thevetia peruviana* Schumacher, *Ulmus* spp.

MATERIAL EXAMINED: Many specimens bred from the above mentioned plants collected in various locations throughout Israel.

REMARK: *H. leprieuri* Perris (Schedl, 1978) belongs to this species.

### 15. *Hypothenemus eruditus* Westwood

*Hypothenemus eruditus* Westwood: Balachowsky (1949), Schedl (1962, 1969, 1978).

*Hypothenemus simoni* Reitter (Reitter 1913).

*Geographical distribution*: Tropical and subtropical.

*Hosts*: *Acacia albida* Delisle, *Brachychiton populneum* R. Brown, *Calotropis procera* R. Brown, *Celtis* spp., *Ceratonia siliqua* L., *Cercis siliquastrum* L., *Citrus sinensis* Osbeck, *Cotoneaster* spp., *Delonix regia* Raf., *Eriobotrya japonica* Lindley, *Ficus* spp., *Jasminum mesnyi* Hance, *Morus alba* L., *Pistacia* spp., *Pittosporum undulatum* Ventenat, *Platanus orientalis* L., *Populus* spp., *Rhamnus alaternus* L., *Schinus terebinthifolius* Raddi, *Thevetia peruviana* Schum., *Vitex agnus-castus* L., *Ulmus* spp., *Wisteria sinensis* Sweet. Found also in the inflorescence of pines and in galls of *Rhamnus alaternus*.

MATERIAL EXAMINED: Bred from material collected throughout Israel.

REMARK: Probably introduced around 1940-50 (Bytinski-Salz, 1966); today, the most polyphagous and one of the most common bark beetles in Israel.

### 16. *Hypothenemus leprieuri* Perris

*Hypothenemus leprieuri* Perris: Balachowsky (1949), Schedl (1969, 1978).

*Hypothenemus albipilis* Reitter: Reitter (1913), Schedl (1969).

*Geographical distribution*: Sardinia, Turkey, Israel, Algeria.

*Host*: Unknown.

MATERIAL EXAMINED: Bet Zera (Jordan Valley) 16.VI.71 (coll. Y. Palmoni); Ashqelon 22.IX.1 (coll. A. Freidberg); Mevasseret Ziyon (Judean Mountains), 30.IV.82 (coll. C. Besuchet and I. Loebi; deposited in the Museum of Geneva).

REMARK: Recorded by Reitter (1913), from Jerusalem and Jaffa, as *H. albipilis* Reitter. The specimens reported by Schedl (1978) as *H. leprieuri* were misidentified, and should be *H. crudiae* Panzer.

### 17. *Hypothenemus mateui* Schedl

*Stephanoderes mateui* Schedl: Schedl (1971).

*Geographical distribution*: Chad, Sudan, Israel.

*Host*: Probably *Acacia raddiana* Savi.

REMARK: Reported by Schedl (1971) from En Gedi (Dead Sea Area) 23.III.63 (coll. W. Wittmer, deposited in the Museum of Geneva), but not mentioned by Schedl in 1978.

### 18. *Liparthrum genistae* ssp. *georgi* Knotek

*Liparthrum genistae* Aubé: Balachowsky (1949), Schedl (1969).

*Liparthrum genistae* ssp. *georgi* Knotek: Pfeffer (1977).

*Geographical distribution*: East Mediterranean.

*Hosts*: *Calycotome villosa* Link, *Retama raetam* Webb.

MATERIAL EXAMINED: *R. raetam*, Sede Boqer (Central Negev) 29.XI.80 (coll. I. Noy-Meir and H. Levy); *C. villosa*, Ilanot (CP) 30.VI.82.

### 19. *Orthotomicus erosus* Wollaston

*Orthotomicus erosus* Wollaston: Bodenheimer (1937), Bodenheimer and Neumark (1955), Balachowsky (1949), Schedl (1969), Mendel and Halperin (1982).

*Geographical distribution*: Circum-Mediterranean, Central Europe, Caucasus and S. Africa.

*Hosts*: *Pinus* spp. (common); *Cupressus* spp. (rare).

MATERIAL EXAMINED: Many specimens bred from material collected almost everywhere in Israel where pines are cultivated.

### 20. *Phloeosinus armatus* Reitter

*Phloeosinus armatus* Reitter: Bodenheimer (1937), Balachowsky and Chararas (1961), Mendel (1984), Schedl (1969).

*Geographical distribution*: East Mediterranean.

*Hosts*: *Cupressus sempervirens* L. (common); *Thuja orientalis* L. (rare).

MATERIAL EXAMINED: Many specimens bred from material collected almost everywhere in northern and central Israel where cypresses are cultivated.

### 21. *Phloeosinus aubei* Perris

*Phloeosinus bicolor* Brullé: Balachowsky (1949).

*Phloeosinus aubei* Perris: Bodenheimer (1937), Schedl (1969, 1978), Mendel (1984).

*Geographical distribution*: Circum-Mediterranean, Middle Asia, East Africa.

*Hosts*: *Cupressus* spp. (common); *Callitris* spp., *Juniperus* spp., *Taxodium distichum* Richard, *Thuja orientalis* L. (rare).

MATERIAL EXAMINED: Many specimens bred from material collected almost everywhere in Israel where cypresses are cultivated.

### 22. *Phloeotribus scarabaeoides* Bernard

*Phloeotribus scarabaeoides* Bernard: Bodenheimer (1937), Balachowsky (1949), Schedl (1969), Avidov and Harpaz (1969).

*Geographical distribution*: Circum-Mediterranean, Caucasus.

*Hosts: Olea europaea* L. (common); *Fraxinus syriaca* Boissier, *Phillyrea* spp., *Syringa vulgaris* L. (rare).

**MATERIAL EXAMINED:** Many specimens bred from material collected almost everywhere in northern and central Israel where olives are cultivated.

### 23. *Pityogenes calcaratus* Eichhoff

*Pityogenes calcaratus* Eichhoff: Bodenheimer (1937), Bodenheimer and Neumark (1955), Balachowsky (1949), Schedl (1969).

*Geographical distribution:* Circum-Mediterranean.

*Hosts: Pinus* spp. (common); *Cupressus sempervirens* L. (rare).

**MATERIAL EXAMINED:** Many specimens bred from material collected almost everywhere in northern and central Israel where pine trees are cultivated.

### 24. *Pityophthorus pubescens* Marsham

*Pityophthorus pubescens* Marsham: Balachowsky (1949), Schedl (1978).

*Geographical distribution:* Central Europe and Mediterranean, Israel.

*Hosts: Pinus* spp.

**MATERIAL EXAMINED:** Already reported by Schedl (1978).

### 25. *Thamnurgus orientalis* Schedl

*Thamnurgus orientalis* Schedl: Schedl (1978).

*Geographical distribution:* Israel.

*Hosts: Cotoneaster* sp.

**MATERIAL EXAMINED:** Already reported by Schedl (1978).

### 26. *Tomicus destruens* Wollaston

*Blastophagus piniperda* L.: Balachowsky (1949), Schedl (1969, 1978), Halperin (1978).

*Geographical distribution:* Southern Europe and the Middle East.

*Hosts: Pinus* spp.

**MATERIAL EXAMINED:** Bred sporadically from material collected in northern and central Israel.

**REMARK:** Most authors include this species in *B. (Tomicus) piniperda*. Wollaston (1865) and Lundblad (1958, quoted after Lekander, 1971) claimed, that *T. destruens* is a good species and has to be separated from *B. piniperda*. This is also the opinion of Lekander (1971), whose identification of our material was based on examination of both, larvae and adults.

## 27. *Xyleborinus saxeseni* Ratzeburg

*Xyleborus saxeseni* Ratzeburg: Bodenheimer (1937), Balachowsky (1949), Schedl (1969, 1978).

*Geographical distribution:* Cosmopolitan.

*Hosts:* *Acacia farnesiana* Willdenow, *Ceratonia siliqua* L., *Cercis siliquastrum* L., *Pistacia* spp., *Populus* spp., *Robinia pseudacacia* L., *Schinus* spp., *Tamarix aphylla* Karsten, *Vitis vinifera* L.; rare on *Pinus* spp. and *Cupressus* spp.

**MATERIAL EXAMINED:** Reared sporadically from material collected throughout Israel.

## 28. *Xyleborus similis* Ferrari

*Xyleborus similis* Ferrari: Schedl (1962).

*Geographical distribution:* Indo-Malayan; also in Australia. Introduced into Africa and Southern Asia (Schedl, 1962).

*Hosts:* *Delonix regia* Raf., *Ficus sycomorus* L., *Phoenix dactylifera* L., *Populus* sp.

**MATERIAL EXAMINED:** *P. dactylifera*, Netanya (CP) 1.III.77; *F. sycomorus*, Tel Aviv (CP) 28.VIII.1977 (coll. A. Freidberg); *Populus* sp., Hadera (CP) 29.XI, 8.XII.1980 (coll. S. Vernoff); *D. regia*, Netanya 17.VI., 25.VI.84.

**REMARK:** Probably introduced in the early 1970s; well established in the Central Coastal Plain.

## PLATYPODIDAE

## 29. *Platypus solidus* Walker

*Platypus solidus* Walker: Beeson (1961), Schedl (1978).

*Geographical distribution:* Southern Asia and the Far East, including Australia (Beeson, 1961).

*Host:* *Ceratonia siliqua* L.

**MATERIAL EXAMINED:** *C. siliqua*, Tel Aviv (CP) 4.VI.1973; On *Ficus sycomorus* 21.VIII.1977 (coll. A. Freidberg).

**REMARK:** An introduced species, found here breeding in a carob tree, but polyphagous in countries of its origin (Halperin, 1976).

### *Appendix to Part I.*

Species recorded from Israel by various authors, but misidentified, or regarded as synonyms, or not found in the present survey\*.

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\*These species are neither mentioned in Part III, nor referred to in the discussion.

*Carphoborus minimus* F.

Misidentified by Schedl (1969), and should be *Carphoborus henscheli* Reitter. Schedl (1969) included in *C. minimus* F. several different species; *C. henscheli* Rtt. is a distinct species and not a synonym of *C. minimus* F., the latter is not to be expected from Israel.

*Cisurgus maurus* Eggers

Misidentified by Schedl (1978), and should be *Crypturgus mediterraneus* Eichhoff.

*Hylesinus oleiperda* F.

*Hylesinus oleiperda* F.: Balachowsky (1949).

*Geographical distribution*: Circum-Mediterranean, Central Europe, southern Russia (in olive, ash and lilac).

REMARK: Mentioned by Bodenheimer (1937) and quoted by Schedl (1969) from olives, but not found in the present study.

*Hypothenemus simoni* Reitter

Quoted by Schedl (1969) (after Reitter, 1913), as collected in Haifa, but in examination of the specimen collected in Haifa (in Schedl's collection), a note was found written by Schedl, synonymizing the above with *H. eruditus*.

*Pityogenes bidentatus* Herbst

*Pityogenes bidentatus* Herbst: Balachowsky (1949), Schedl (1969).

*Geographical distribution*: Eastern, Central and Southern Europe (in pines).

Mentioned by Bodenheimer (1937) and quoted by Schedl (1969) from pines, but not found in the present study. The material identified as *P. bidentatus* Herbst (and *P. opacifrons* Reitter) was reidentified in recent examination as female of *P. calcaratus* Eichhoff.

## II. NATURAL ENEMIES AND OTHER ORGANISMS ASSOCIATED WITH BARK BEETLES

The bark beetles of Israel are associated with a great number of organisms, especially insects, which are listed below. The numbers in the right column refer to the serial numbers of bark beetles.

1. INSECTA

a. COLOEPTERA. Most of the species are commensal or detrital; only a few feed on the immature stages of bark beetles.

Colydiidae	—	<i>Aulonium ruficorne</i> Olivier	19-21,23,26
Cucujidae	—	<i>Laemophloeus alternans</i> Erichson	13,19,23
		<i>L. ater</i> Olivier	19,23
		<i>L. testaceus</i> F.	19,23
		<i>Lathropus sepicola</i> Mueller	19,23
Histeridae	—	<i>Platysoma angustatum</i> Hoffman	19,23
		<i>P. oblongum</i> F.	19,23
		<i>Plegaderus discisus</i> Erichson	19,23
Rhizophagidae	—	<i>Rhizophagus bipustulatus</i> L.	19,23
Silvanidae	—	<i>Silvanus unidentatus</i> F.	19,23
Tenebrionidae	—	<i>Corticeus (Hypophloeus) pini</i> Panzer	19-21,23
		<i>C. (H.) rufulus</i> Rosenhauer	19-21,23

b. HYMENOPTERA. All species are parasitic.

Braconidae	—	<i>Dendrosoter caenopachoides</i> Ruschka	4,19,23,26
		<i>D. flaviventris</i> Foerster	19
		<i>D. hartigii</i> Ratzeburg	4, 19,23
		<i>D. middendorffii</i> Ratzeburg	12,19,26
		<i>D. protuberans</i> Nees	1-3,6,20-22
		<i>Ecphylus caudatus</i> Ratzeburg	6,13
		<i>E. silesiacus</i> Ratzeburg	2,6,22
		<i>Spathius</i> sp.	2
Eulophidae	—	<i>Entedon ergias</i> Walker	1-3
Eupelmidae	—	<i>Calosota aestivalis</i> Curtis	5,19-21, 23
Eurytomidae	—	<i>Eurytoma maura</i> Bohemann	2,3
		<i>E. morio</i> Bohemann	1,2,19-23,26
Pteromalidae	—	<i>Agrilocida ferrierei</i> Steffan	3
		<i>Cerocephala eccoptogasteri</i> Masi	1,3,5,6,13,15,19-22
		<i>Cheiopachus quadrum</i> F.	1-3,6,22
		<i>Heydenia pretiosa</i> Foerster	1,4,6,12,19-22,26
		<i>Metacolus azureus</i> Ratzeburg	4,19,23
		<i>M. unifasciatus</i> Foerster	4,12,19-21,26
		<i>Rhaphitelus maculatus</i> Walker	1-3,6,13,20,21,23
		<i>Roptrocercus xylophagorum</i> Ratzeburg	4,12,19,23,26
Bethylidae	—	<i>Cephalonomia hypobori</i> Kieffer	1-3,5,6,13,21,22
		<i>Scleroderma domesticus</i> Klug	1,2

c. DIPTERA. The first is preying on immature stages of bark beetles and the second — commensal and detrital.

Dolichopodidae	—	<i>Medetera</i> sp.	19-21,23,26
Stratiomyidae	—	<i>Zabrachia minutissima</i> Zetterstedt	19,21,22

- d. NEUROPTERA. Prey on the immature stages of bark beetles.  
 Raphidiidae – *Raphidia syriaca* Steinmann 19,23
2. ACARI. Only the phoretic species have been identified.
- a. PARASITIFORMES, MESOSTIGMATA  
 Celaenopsidae – *Pleuronectocelaeno austriaca* Vitzthum 19,23  
 Digamasellidae – *Digamasellus quadrisetus* Berlese 19  
 Uropodidae – *Pseudouropoda (?) polytrichia (?)* 19  
                   *Uropoda* sp. 19
- b. ACARIFORMES  
 Tarsonemidae – *Pseudotarsonemoides* sp.nr.  
                   *innumerabilis* Vitzthum 3
3. NEMATODES. The species are commensal; or semiparasitic or parasitic on bark beetles; or secondary inhabitants of wood tissue following the invasion and development of bark beetles. All the species were found in association with bark beetles feeding on pines, e.g. *Tomicus destruens*, *Orthotomicus erosus* and *Pityogenes calcaratus*. The nematodes have not yet been identified.
4. SPOROZOA. All the mentioned species are parasitic.
- a. RHIZOPODEA  
 Endamoebidae – *Endamoeba* sp. 19
- b. TELOSPOREA, Neogregarinida  
 Ophryocystidae – *Menzbieria* sp. 19  
                   *Ophryocystis* sp. 23
- c. MICROSPORIDEA, Microsporida  
 Nosematidae – *Nosema calcarati* Purrini and Halperin 23
5. AVES. Prey on various stages of bark beetles.  
 Picidae – *Picoides syriacus* Hemprich et Ehrenberg 1-3,19,20,22,23,26

### III. A. INDEX OF HOST PLANT GENERA AND THEIR BARK BEETLES IN ISRAEL

(The numbers in parenthesis refer to the family names of the plants; See IIIb.)

- Acacia (11) – \*Hypothenemus crudiae  
                   \*H. eruditus  
                   \*Xyleborinus saxeseni
- Ailanthus (15) – \*\*Hypoborus ficus

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\*Rare  
 \*\*Do not reproduce, or reproduce only occasionally.

Amygdalus (10)	–	Scolytus amygdali
Armeniaca (10)	–	S. amygdali
		S. mediterraneus
Brachychiton (19)	–	Hypothenemus eruditus
Bauhinia (12)	–	*H. crudiae
Callitris (3)	–	**Crypturgus mediterraneus
		Phloeosinus aubei
Calotropis (24)	–	Hypothenemus eruditus
Calycotome (13)	–	H. crudiae
		Liparthrum genistae georgi
Celtis (5)	–	Hypothenemus eruditus
Cerasus (10)	–	Scolytus amygdali
		S. mediterraneus
Ceratonia (12)	–	Hypothenemus eruditus
		Xyleborinus saxeseni
		*Platypus solidus
Cercis (12)		Hypothenemus eruditus
		Xyleborinus saxeseni
Citrus (14)	–	*Hypothenemus eruditus
Cotoneaster (10)	–	Scolytus mediterraneus
	–	Hypothenemus crudiae
		H. eruditus
		*Thamnurgus orientalis
Crataegus (10)	–	Scolytus mediterraneus
Cupressus (3)	–	*Hypothenemus crudiae
		**Orthotomicus erosus
		Phloeosinus armatus
		P. aubei
		**Pityogenes calcaratus
		*Xyleborinus saxeseni
Delonix (12)	–	Hypothenemus crudiae
		H. eruditus
		Xyleborus similis
Erybothrya (10)	–	Hypothenemus eruditus
Ficus (6)	–	Hypoborus ficus
		Hypothenemus eruditus
		*Xyleborus similis
Fraxinus (22)	–	Hypothenemus eruditus
		Phloeotribus scarabaeoides
Juniperus (3)	–	Phloeosinus aubei
Laurus (7)	–	Hypothenemus crudiae
Ligustrum (22)	–	H. eruditus
Malus (10)	–	Scolytus mediterraneus
Morus (6)	–	Hypothenemus crudiae
		H. eruditus
Olea (22)	–	Phloeotribus scarabaeoides
Persea (7)	–	*Hypothenemus crudiae
		**Scolytus amygdali

Persica (10)	–	<i>S. amygdali</i>
Phillyrea (22)	–	<i>Phloeotribus scarabaeoides</i>
Phoenix (26)	–	<i>Coccotrypes dactyliperda</i> <i>Xyleborus similis</i>
Pinus (1)	–	<i>Carphoborus henscheli</i> * <i>Crypturgus cribrellus</i> <i>C. mediterraneus</i> <i>C. numidicus</i> <i>Hylastes linearis</i> <i>Hylurgus micklitzi</i> * <i>Hypothenemus crudiae</i> <i>Orthotomicus erosus</i> ** <i>Phloeosinus aubei</i> <i>Pityogenes calcaratus</i> <i>Pityophthorus pubescens</i> <i>Tomicus destruens</i> * <i>Xyleborinus saxeseni</i>
Pistacia (16)	–	<i>Carphoborus perrisi</i> <i>Chaetoptelius vestitus</i> * <i>Hypothenemus crudiae</i> * <i>H. eruditus</i> * <i>Xyleborinus saxeseni</i>
Pittosporum (8)	–	<i>Hypothenemus eruditus</i>
Platanus (9)	–	<i>H. eruditus</i>
Populus (4)	–	<i>H. eruditus</i> * <i>Xyleborinus saxeseni</i> * <i>Xyleborus similis</i>
Prunus (10)	–	<i>Scolytus amygdali</i> <i>S. mediterraneus</i>
Pyracantha (10)	–	<i>S. mediterraneus</i>
Retama (Lygos) (13)	–	<i>Liparthrum genistae georgi</i>
Rhamnus (17)	–	<i>Hypothenemus crudiae</i> <i>H. eruditus</i>
Robinia (13)	–	<i>Xyleborinus saxeseni</i>
Schinus (16)	–	<i>Hypothenemus eruditus</i> <i>Xyleborinus saxeseni</i>
Styrax (21)	–	* <i>Hypoborus ficus</i>
Syringa (22)	–	<i>Phloeotribus scarabaeoides</i>
Tamarix (20)	–	* <i>Xyleborinus saxeseni</i>
Taxodium (2)	–	<i>Phloeosinus aubei</i>
Thevetia (23)	–	<i>Hypothenemus crudiae</i> <i>H. eruditus</i>
Thuja (3)	–	<i>Phloeosinus armatus</i> <i>P. aubei</i>
Ulmus (5)	–	<i>Scolytus kirschi</i> <i>Hypothenemus crudiae</i> <i>H. eruditus</i>

Vitex (25)	–	H. eruditus
Vitis (18)	–	*H. eruditus
		Xyleborinus saxeseni
Wisteria (13)	–	Hypothenemus eruditus

### III. B. FAMILY NAMES OF PLANTS LISTED IN PART III/A.

1. Pinaceae 2. Taxodiaceae 3. Cupressaceae 4. Salicaceae 5. Ulmaceae 6. Moraceae 7. Lauraceae 8. Pittosporaceae 9. Platanaceae 10. Rosaceae 11. Mimosaceae 12. Caesalpiniaceae 13. Papilionaceae 14. Rutaceae 15. Simarubaceae 16. Anacardiaceae 17. Rhamnaceae 18. Vitaceae 19. Sterculiaceae 20. Tamaricaceae 21. Styracaceae 22. Oleaceae 23. Apocynaceae 24. Asclepiaceae 25. Verbenaceae 26. Palmaceae.

### DISCUSSION

#### 1. Zoogeographical distribution

The total number of the species of bark beetles (s.l.) of Israel is low in comparison with countries of the Euro-Siberian faunal element. This may be due to the poor tree cover of the country, until the last century, especially by conifers, and of the custom of the inhabitants to collect, as fuel, every piece of wood. In the present century, the number of species increased due to at least five (17%) introductions.

There is a great diversity in the faunistic elements of the species, the most common being the Holo-Mediterranean with 9 species (31%). The other elements are: Mediterranean-Central-European and Mediterranean-Irano-Turanian – with 4 species each; East Mediterranean – with 3 species; Sudanian – 1 species; Tropical-Subtropical, Indo-Malayan and Cosmopolitan – with 2 species each.

#### 2. Food habit

All the known species of bark beetles (s.l.) in Israel feed on woody plants; most of them develop in bark of stems and branches; one, viz. *Hylastes linearis* develops also in roots; three species, viz. *Xyleborinus saxeseni*, *Xyleborus similis* and *Platypus solidus*, penetrate into the wood, and one species – *Coccotrypes dactyliperda* – breeds in date seeds.

Twenty three out of the 29 species are monophagous or oligophagous (79%) and feed on pine (10 species), cypress, *Pistacia*, Roseaceae (2 species each); olive, fig, date, *Retama*, *Cotoneaster*, *Acacia* and elm (one species each). Five species are polyphagous and feed on broadleaves; two species – *Hypothenemus crudiae* and *Xyleborinus saxeseni* – were occasionally found feeding also on conifers. Of the monophagous species, 52% feed on conifers, and 48% on broadleaves. The host plant of one species, viz. *Hypothenemus leprieuri* – is unknown.

#### 3. Economic importance

Bark beetles are considered the most dangerous forest pests in many holarctic and some tropical countries. Some species cause damage to ornamental and fruit trees (Balachowsky, 1949).

In Israel, 12 species may be considered as pests. The most important forest pest is *Tomicus destruens*, which caused, in the late 1970s, severe damage to pine plantations 15-27 years of age (Halperin, 1978). Two additional pests of pine are *Pityogenes calcaratus*, which was associated with extensive mortality of young trees affected primarily by *Matsucoccus josephi* (Bodenheimer and Neumark, 1955); and *Orthotomicus erosus*, which attacks trees under stress, mainly after excessive thinning (Halperin *et al.* 1982; Mendel and Halperin, 1982). *Phloeotribus armatus* and *P. aubei* cause damage to cypress by boring into the shoots when the population of the beetles has increased.

The most important bark beetle of broad leaves is the newly introduced *Scolytus kirschi*, which was already involved in killing stressed elms growing naturally, or planted for amenity (Halperin, 1984).

Three species cause damage to fruit trees: *Phloeotribus scarbaeoides* to olive and *Scolytus amygdali* and *S. mediterraneus* – to many rosaceous trees weakened by water deficiency (Avidov and Harpaz, 1969; Gurevitz, 1965).

*Coccotrypes dactyliperda* is a primary pest of date fruits (Kehat *et al.*, 1976).

*Xyleborinus saxeseni*, the most common ambrosia beetle in Israel and *Xyleborus similis* – are noxious by penetration into wood which is later used commercially.

To avoid damage, phytosanitation and frequent surveys are needed. Trap logs were found to be effective (Halperin, 1978). The populations of the most harmful species of bark beetles are often efficiently controlled by various natural enemies (Halperin, 1978 and 1984; Mendel, 1984; Mendel and Halperin, 1981; Purrini and Halperin, 1982, 1983).

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