Israel Journal of Entomology vol. II, 1967.

Insects Associated with Oaks (Quercus) in Israel*

by

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Abstract

370 species of insects are recorded as occuring on the 3 oak species in Israel (Quercus infectoria boistieri, 0. ithaburensis, 0. calliprinos). Of these, 40% are monophagous on Fagaceae, the rest occurring also on other plant families. Groups entirely or prevalently monophagous are: Coccoidea, Aphidoidea, Microlepidoptera, Cynipidae, Hymenoptera parasitica and Cecidomyidae, especially the leaf miners, gall producers and acorn breeders are monophagous, but also in poly- phagous groups certain genera are restricted to oak. All species, with the exception of the endemic ones, are known to occur also on other Quercus species in Centralemopean- and other Mediterranean countries.

A zoogeographical analysis of the fauna shows that it is prevalently of Mediterranean origin (58.5%) roughly half of the species having a Circum-mediterranean, half of an East- mediterranean distribution, followed by the Eurosiberian element (18.5%) and a rather low per- centage of Iranoturanian (3%), Eremian (1.1%) and Ethiopian (0.6%) elements. Species with large distribution areas (Cosmopolitan to Palaearctic 6.3%) are chiefly composed of cultural immigra- tioni and polyphagous predators. The large percentage of endemic elements (12%) is witness to the specialized food requirements of a large number of species of which 53,5% are monophagous.
So, the zoogeographical analysis of the oak fauna agrees well with the European-Mediterranean distribution of the genus Quercus.

Introduction

In this paper we have endeavoured to assemble information on the insect fauna associated with oaks in Israel. The oak tree or the oak forest indubitably forms the ecological base on which a large number of insects are dependent, either for their whole life cycle or for at least part of it.

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Rehovot, Israel,

1967 Series; No. 1217-E.

A list of this fauna poses the question to what degree the zoogeographical origin of these species coincides with the Mediterranean origin of the Quercus species found in Israel.

It is an astonishing fact that almost no investigations of a similar nature have been carried out in the entire palaearctic region. There are many papers giving lists of monophagous species or of economically important insects occurring on different kinds of trees, and also rather complete lists of one or the other order (chiefly Lepidoptera) of insects feeding on them, but, to the best of our knowledge, no complete list of all the insects connected with oaks has ever been published in any country. A partial comparison could perhaps be made with the work of Gusev and Rimsky-Korsakov (1951), which gives keys for the determination of insect species feeding on trees in Russia, according to the damages characteristic for them. 175 species are listed as occurring on seven deciduous and evergreen Quercus species of Central-East-European and Mediterranean origin. Though this list seems rather complete for Cynipidae, leaf feeders and miners, borers and bark beetles, it seems to lack the majority of sucking insects such as Hemiptera, Heteroptera and Aphidoidea, and so no direct comparison is possible. Also a comparison with the faunal analysis given by Bodenheimer (1937) for Palestine is impossible, as not all insect orders are included, and in the orders dealt with, not all their families are included. Furthermore, the endemic species are not dealt with separately, but classified according to the phytogeographical region in which they were found in Palestine. Nevertheless, the overall picture given by Bodenheimer with its predominance of the Mediterranean element (52%) does not disagree too much from the values given in Table 1, though the Irano-turanian (=15%, which is, however, too high!), Eremian (=15%), and Ethiopian (5%, too low!) elements are less well represented in the Quercus fauna.

Several years ago (Bytinski-Salz, 1954) a zoogeographical analysis, similar to that carried out here for Quercus insects, was published for the Acacia species occurring in the southern part of Israel. Here again, the zoogeographical dependence of the insect fauna on the phytogeographical origin of the host plant was evident, 74% of the species being of Ethiopian origin or showing similar Palaeotropic affinities. These two trees have no insect species in common with the exception of one

polyphagous parasitoid (Scolia maculata). This coincides with the geographical distribution of the two plant genera, the territories of which do not overlap. We refrain here from a more detailed discussion of the problems involved, till the insect fauna of other trees (Tamarix, Pinus, Pistacia, etc.) is investigated.

The Quercus species of Israel.

Three species of oaks belonging to three different subgenera are indigenous to Israel.

1. Quercus (sg. Quercus) infectoria Oliv. ssp. boissieri Reut.

The Valona oak, a summergreen oak which is widespread in the Galilee and northern Transjordan, and which is also found locally in the Carmel range. It is usually found at heights above 300 m and annual rainfall in its area varies from 700-1000 m. Its ecological requirements have been investigated by Boyko (1947 a), and Zohary (1966).

2. Quercus (sg. Cerris) ithaburensis Desne.

The Tabor oak, another summergreen oak of the Q. aegilops L. group, is characteristic of the red alluvial soils of the coastal region, but also enters the lower slopes and hills of the Carmel range, the lower Galilee and northern Transjordan; above 400 m it becomes rare. Its southern limit reaches about Tel Aviv. Annual rainfall in its area varies from 550-800 mm. Its ecological requirements, chiefly the insulation factor, have been investigated by Eig (1933) and Boyko (1947 b).

3. Quercus (sg. Sclerophyllodrys) calliprinos Webb

The common or evergreen oak, a member of the Q. coccifera L. group, is characteristic of the mountain ranges, as far as the Mediterranean maquis reaches. Its southern limit lies well south of Hebron, and from there it is typical of the Judean and Nablus mountains, the Carmel and the Galilee; in Transjordan it is found from Amman north to Ajlun only. Where the Carmel reaches the sea it is found almost at sea level, and in the north up to the heights of Mount Meron (1200 m). Annual rainfall in its area varies from 400-1100 m. All three species reach north at least to the Taurus Mountains.

Two European oaks, Q. suber L. and Q. cerris L., have been introduced to Israel and a few mature specimens are found in the Botanical Gardens at Miqwe Yisrael, Haifa and around Tivon.

The three indigenous oak species are components of the Mediterranean maquis but, as stated above, not all three species are found in all the areas covered by maquis. Other characteristic trees and shrubs of this formation include: Pistacia palaestina Boiss., P. lentiscus L., Rhamnus alaternus L., R. palaestina Boiss., Arbutus andrachne L., Phyllirea media L., Ceratonia siliqua L., Styrax officinalis L., Laurus nobilis L., Nerium oleander L., Olea oleaster Hoffmn. and Lmk., Ruscus aculeatus L., Calycotome villosa Lk., and many others. The maquis has been kept low by overgrazing for many centuries, and the oaks, as well as all the other plants mentioned, have been kept low and appear as shrubs or distorted treelets, but where they excaped excessive damage by goats, they now appear as branched trees 2-4 m high. Where oak trees have been protected by the population for centuries, chiefly as isolated shade trees, around tombs, cemetries or places of sacrifice, they may develop into large, well-formed trees of unique beauty, forming groves or even small woods. Such oaks belonging to Q. infectoria are found at the edges of cultivated fields in the wadis of the Galilee, around Peqi'in and Mount Meron. Large single trees of Q. ithaburensis dot the coastal plain around Hadera, Pardess Hanna and Binyamina; at the Arab cemetry near Meged a group of some 50 large trees exists and the whole region around Qiryat Tivon'Alonim'Neve Ya'ar is covered by a regenerated oak forest about 50 years old. However, the most beautiful groves occur near Dafna, where there are about 200 trees, some of them probably more than 600 years old and 5-6 m in circumference. Isolated trees or small groups of Q. calliprinos crown many a hill in the Judean mountains and the Galilee; a small grove exists at the spring in Aqua Bella near Jerusalem and larger woods are found near Khreibe on Mount Carmel, near Sasa and Meron in the upper Galilee, and near Hebron.

Blossoming time, foliation and leaf fall play an important role in the development of many monophagous insects. Of course, specimens of the same species flower earlier at lower altitudes than at higher ones, and earlier on southern slopes than on northern ones, so the flowering time of each species extends over about two months.

Q. ithaburensis is the first to break into bloom (February-March), followed by Q. infectoria (March-April) and Q. calliprinos (April-May). A secondary flowering occurs in Q. ithaburensis in June-July. Foliation in the deciduous oaks begins shortly before bloom and continues until early summer. In the evergreen oak, foliation occurs together with defoliation, during most of the summer. Leaf fall in the deciduous oak species may extend for over eight months, from August to March, with a peak in December-January, and many of these oaks practically never are completely defoliated.

Collection and Determination of the Insect Material.

Both authors have contributed to the assembling of insect material from oaks. The first author's chief interest is devoted to the groups of Lepidoptera, Coleoptera and Hymenoptera, though he contributed also to other groups (e.g. Rhynchota). The second author was collecting all insects associated with oaks, his chief interest lay in biological and ecological observations for which he assembled much data, especially in the groups of Coccoidea, Cynipidae and Microlepidoptera. One study has already been published (Sternlicht, 1967), that on Cynipid galls will appear in the next volume of this journal, and other parts will appear later.

The species included in the list below were always collected more than once, with the exception of those species known from records as oak feeders; one occasional collection of the latter was sufficient to be included in the list.

Both authors and many specialists contributed to the determination of the insects collected.

H. Bytinski-Salz determined the Macrolepidoptera, most of the Coleoptera and Formicidae.

M. Sternlicht determined the Coccoidea (with the aid of D. E. Williams, London) and the Cynipidae (with the aid of R.D. Eady and J. Quinlan, London). Heteroptera and Homoptera were chiefly determined by R. Linnavuori (Helsinki).

Aphidoidea by Hille Ris Lambers (Holland), and E. Swirski (Bet Dagan).

Microlepidoptera by M. Hering (Berlin), D.S. Fletcher, K. Sattler and I. D. Bradley (London).

Curculionidae by the late Sir G. Marshall (London).

Some Microcoleoptera by R.D. Pope (London).

Hymenoptera parasitica by R.D. Eady (London) and Z. Bouček (Prague).

Cecidomyidae by the Department of Entomology, Agricultural Experimental Station, Rothamsted.

Tachinidae by J. Kugler (Tel Aviv).

To all these specialists, our sincerest thanks are expressed.

Families, genera and species were arranged according to the following works, even when some more recent monographs were available for parts of the orders only: Heteroptera and Homoptera: Linnavuori (1960-62); Aphidoidea: Bodenheimer and Swirski (1957); Coccoidea: Bodenheimer (1937); Macrolepidoptera: Seitz (1906-1948); Microlepidoptera: Amsel (1933); Coleoptera: Winkler (1924-1932); Hymenoptera in general: Schmiedeknecht (1938); Cynipidae: Kieffer (1897-1901); Chalcoidea: Peck, Bouček and Hoffer (1964).

New species mentioned by M. Sternlicht in litteris will be described later in a separate paper.

A number of forms could not be determined specifically, for different reasons. Either too little material was available, or, as in some Chalcoid genera , our knowledge is still too restricted to determine East Mediterranean species, or chiefly, because the species are apparently new, but the description would require revision of the whole genus, which the specialists are unable to undertake now. However, for a zoogeographical analysis, these species are less important, as they would only elevate somewhat the percentage of endemic species.

A few records were taken from Bodenheimer (1930, 1935, 1937), but as no material is available to substantiate them, their inclusion requires further confirmation.

The Insect Fauna of the Oaks.

In the following list, all species of insects are included which feed on some part of the oak trees, or as parasites and predators attack those species and/or have been raised from hosts living on oaks. Not included are species only hibernating in fissures of the bark or found under dead bark; also not included are feeders of lichens and mosses growing on the bark, e.g. Dysauxes ancilla (Lepid.) or Lithosia muscula (Lepid.).

After careful consideration, it was decided not to include localities in the faunal list which would have burdened the table even more. Firstly, the north-south extension of the different oak species is not very large: for Q. infectoria 80 km; for Q. ithaburensis, ca. 150 km; and for Q. calliprinos, ca. 200 km. The ecological conditions within the range of each species (and even of all species together) do not differ too much, e.g. specimens of Q. calliprinos in the maquis of the Adula region (near Hebron) do not seem to be less well developed than in the Galilee, and those of Q. ithaburensis in the coastal zone are as majestic as those at Dafna (upper Galilee). Concerning the polyphagous insect fauna, most species are known to occur everywhere within the range of the Mediterranean climate. Most of the monophagous species extend over large areas within the country, and if they have not yet been found in some areas covered by their food plant, more thorough investigations may confirm their occurrence. However, some species, especially among the Macrolepidoptera, seem to be restricted to Q. ithaburensis groves and have so far not been found on isolated trees in the coastal plain. As will be pointed out later, many species may reach their southern geographical limit of distribution in Israel and even within the country, e.g. the monophagous genus Kermes whose species have not yet been found south of the Carmel range. The reader interested in localities of monophagous insects may be referred to the following paper by Sternlicht (1968) where exact localities, at least for the gall producers, are recorded.

Food Preferences of Oak Insects.

As monophagous are defined all insect species occurring on trees of the family Fagaceae, i.e. Quercus, Fagus and Castanea, of which only Quercus occurs in Israel. As polyphagous are defined those which occur also on some other plant families. In some cases, it is, however, difficult to define exactly the status of food preference. For example, many Lepidoptera normally occur only on Quercus, but may occasionally be found also on genera of other plant families, usually closely related, such as Salicaceae, Betulaceae, Ulmaceae, etc. Even the predatory bug Nagusta goedeli is mentioned in four faunistic papers as found on Quercus only, but one also adds Pinus.

There are also decided ecological preferences among polyphagous groups. All the wood borers, with the exception of Latipalpis, are truly polyphagous. The largest Cerambycids, such as Rhesus serricollis and Cerambyx velutinus are found only in the largest specimens of Q. ithaburensis, where they riddle with holes also the major branches 50 cm and over in diameter. In the same way, they occur also in the giant

specimens of Pistacia atlantica Desf. Together with them, occur also Macrotoma, Prionus and Cerambyx cerdo, but these species are found also on smaller trees of Q. ithaburensis and mature specimens of Q. calliprinos. The Purpuricenus species live in smaller branches of all three Quercus species. Most smaller Cerambycids and the small Buprestids of the genera Acmaeodera and Anthaxia can be raised from small dead twigs of many trees and shrubs of the maquis. Each one of the larger species seems to prefer special conditions in the dead wood of live trunks, as they bore in definite areas between the inner dry rot and the peripheral lignose tissue. Exceptions are perhaps Macrotoma, which is also found in dead tree stumps several years after cutting and Stromatium which attacks, as far as is known, only dead wood and dried up timber, in which it may develop several generations. Most of the Buprestids are attracted by freshly broken twigs, which completely dry out during larval development.

Monophageous Species.

A general picture gives about 40% of monophagous insects on Quercus, but monophagy may differ greatly in different orders, as seen in Table 1. Among prevalently polyphagous orders there are, however, also genera and species which are strictly monophagous. In many of these taxonomic groups different genera or species may be monophagous on different plant families, on which in this paper only those on Fagaceae are considered. The gall producing Cynipid genera mentioned in this paper occur only on Quercus, while other genera such as Diplolepis, Xestophanes and Diastrophus occur only on Rosaceae. Almost all palearctic species of the genera Catocala and Ephesia (Lepid.) are monophagous either on Fagaceae or Salicaceae, while not a single species is polyphagous on both families.

Monophagous species within polyphagous families or genera include, for example, among the Hemiptera: Psallus, Heteroptera: Erythroneura, most of the Aphidoidea and among the Coccoidea almost all Kermesidae, Pseudococcidae and Asterolecaniidae. Also among the "Bombyces" a number of monophagous species occur among otherwise polyphagous genera. As already mentioned, among the Noctuidae all Catacola- and Ephesia-species are monophagous; among the Tortricidae, Gelechidae and leaf miners almost all are monophagous. Among the Coleoptera one Buprestid only and the acorn- and gall-breeders of the genus Curculio are confined to Quercus (but in one case attack also hazel nuts). Of course, all the gall wasps and gall midges are confined to Quercus only, while among the Hymenoptera parasitica, chiefly the Tomyridae and Eurytomidae are monophagous.

Monophagous behaviour may be even more restricted, i.e. to only one Quercus species. This is true for many Coccids, especially the genus Kermes, whose species occur either on Q. calliprinos or Q. ithaburensis only. Also all the gall producing Cynipid species are restricted to one of the three oak species, though many of them are known to attack also other Quercus species in other countries (Sternlicht, 1968).

The Abundance of Insect Species on the Different Oaks.

In this paper, 280 insect species are reported as occurring on Q. ithaburensis, 149 on Q. calliprinos, and 16 on Q. infectoria (Table 2). How far do these numbers represent a true picture of the abundance on these species. It is true that much more time was devoted by us to collecting on the trees and in the groves of Q. ithaburensis, where collecting is much easier, than on Q. calliprinos, where most of the trees and shrubs are found in the dense Mediterranean maquis. From Q. infectoria, whose territory is more difficult to reach, our findings were almost completely limited to galls, which were collected during a rather restricted number of collecting trips.

Nevertheless, the difference in the total number of insects collected on Q. ithaburensis and Q. calliprinos (280 vs. 149) may have an ecological significance. Most of the leaf feeders (Rhynchota, Lepidoptera, some Coleoptera) and gall producers appear early in spring when buds, flowers, young twigs and leaves are developing, and only very few species feed on mature leaves. Q. ithaburensis, which develops early, is therefore the preferred food plant, and a second development period in June-July may be of importance to species developing later. Q. calliprinos, which foliates in late spring and summer is, therefore, a less adequate host for these spring feeders. On the other hand, three of the four Curculio species which attack well developed acorns and galls occur also on Q. calliprinos.

The difference in foliation time may perhaps also explain the relatively small number of Cynipid species developing on Q. calliprinos. The percentage of monophagous species varies between 39.3% in Q. ithaburensis and 29.3% in Q. calliprinos and this difference may be explained chiefly by the small number of Cynipid species occurring in the latter (22:5), see below (Table 2).

TABLE 1

Orders and lower groups		No. of species	Food preference		Occuring on Quercus			Zoogeographical Distribution				
			mono-phagous	poly-phagous	Both species	Q. calli-prinos	Q. ithab-urensis	No. of species usable	Cos-mopolit	Paleo-trop.	Hol-arct.	Pale-arct
Orthoptera + Thysanoptera		9		9	6		3	8				
	Total											
	%	100		100	66.7		33.3	100				
Rhynchota	Total	90	37	50	16	18	50	90	3	1	6	1
	%	100	42.5	57.5	19.0	21.4	59.6	100	3.3	1.1	6.6	1.1
Hemiptera		23	6	17	1	3	19	23			2	
Heteroptera		27	7	18	9	5	12	27			2	
Aphidoidea		8	6	1		1	6	8				
Coccoidea		32	18	14	6	9	13	32	3	1	2	1
Lepidoptera	total	75	46	29	28	20	26	75		0.5		
	%	100	61.4	38.6	37.8	27.0	35.2	100		0.6		
Macrolepidoptera+Pyralidae		53	26	27	25	15	12	56.5		0.5		
other Microlepidoptera		22	20	2	3	5	14	18.5				
Coleoptera	total	102	5	97	29	17	52*	98	2			6
	%	100	4.9	95.1	29.5	17.3	53.2	100	2.0			6.1
Hymenoptera	total	85	52	26	4	7	61	65			2	
	%	100	66.7	33.3	5.5	9.7	84.8	100			3.0	
Tenthredinidae+Cynipidae		37	37		1	5	31*	34				
Parasitica		42	15	20	2		35*	25			2	
Aculeata		6		6	1		5	6				
Diptera	total	8	5	2	2		4	5				
	%	100	66.7	33.3			66.7	100				
Cecidomyidae		6	4				4	3				
Tachinidae		2		2	2			2				
	Sa	369	144	213	85	62	196	341	5	1.5	8	7
	%	100	40.3	59.7	24.6	18.5	56.9	100	1.4	0.4	2.2	2
					Simplified Faunal spectrum			341		21.5		
								%		6.3		

* includes Q. infectoria

TABLE 1

Zoogeographical Distribution									
Central Europ.	East Europ.	Euro-sibir.	Circum mediter.	South mediterr.	East mediterr	Irano-turan.	Eremian	Ethio-pian	Endemic
			4	1		0.5		1.5	1
			50.0	12.5		6.3		18.7	12.5
4.5	0.5	2.5	17.5		16.5	3.5	4		30
5.0	0.5	2.7	19.4		18.3	3.8	4.4		33.3
1.5	0.5	0.5	2.5		7	2	3		4
		1	4		9		1		13
0.5			0.5		2				5
2.5		1	10.5		1.5	1.5			8
11.5	2.5	3	24.5	1	26	4			2
15.3	3.3	4.0	32.6	1.3	34.6	5.3			2.6
8	1.5	3	15.5	1	23	4			
3.5	1		9	3					2
8		5.5	23.5	1.5	47	2		0.5	2
8.1		5.6	23.9	1.5	47.9	2		0.5	2
19	4	1.5	23.5		9.5	0.5			5
29.2	6.6	2.3	36.1		14.6	0.7			7.6
9	2.5		16.5		2				4
10	0.5	1.5	5.5		4	0.5			1
	1		1.5		3.5				
1			2		1.5			0.5	
20.0			40.0		30.0			10.0	
1			2						
					1.5			0.5	
44	7	12.5	95	3.5	100.5	10.5	4	2.5	40
12.9	2.0	3.7	27.9	1.0	29.5	3.0	1.1	0.6	12.0
63.5			199			10.5	4	2.5	40
18.5			58.5			3.0	1.1	0.6	12.0

Table 2

Number of insect species on the different oaks

	Quercus ithaburensis			Quercus calliprinos			Quercus infectoria		
	total	polyphag.	monophag.	total	polyphag.	monophag.	total	polyph.	monoph.
	280	167	108	140	99	41	16	2	14
	(275 = 100%) %	60.7	39.3	(140 = 100%)	70.7	29.3		12.5	87.5
Cynipidae species			22			5			12

This list given for Q.infectoria in Table 2 is far from complete. Besides the 12 species of Cynipids mentioned, at least four more galls are known to us but not yet determined, and it may be safely said that the number of species may reach at least 20. In this way the Cynipid fauna may prove to be not much inferior to that of Q. ithaburensis, which also agrees well with the similar early foliation period and the similar leaf structure. If we take the ratio of the total number of insects to Cynipids in Q. ithaburensis as roughly 12:1, the total number of insects finally found to be associated with Q.infectoria may be estimated at about 240.

Zoogeographical Analysis of the Insect Fauna

In this paper we have in general used the phytogeographical term for the different floral elements created by Eig (1931), which have been adapted by Bodenheimer (1935, 1937) for the faunal elements. As there are no Southern Asiatic elements associated with Quercus, and, as is now known, the Sindian element is quite distinct from the Saharian, and the Deccanian distinct from the Soudanian element, we have replaced the terms Saharosindian and Sudanodeccanian here with the terms "Eremian" and "Ethiopian". We feel that all other terms are self-explanatory, perhaps with the exception of the term "endemic". As endemisms are considered all species and subspecies which occur in Israel, Jordan, the Lebanon and Northern Sinai only. But many of them, especially those described by Bodenheimer, Eady, Hille Ris Lambers, Linnaevuori, Sternlicht, Williams, etc., are so far mentioned only from Israel. Those species which occur in two or three different faunistic regions are calculated in the statistical tables 1, 2 with 1/2 or 1/3 point for each region (see also Bytinski-Salz, 1953). Only those insects which were determined specifically could be included in the faunal analysis, and therefore the number of species has been reduced from 369 to 341.

A simplified faunal spectrum is given in the last line of Table 1. It shows that the majority are Mediterranean elements (58.5%), followed by the Eurosiberian elements (18.5%), among which the Centraleuropean element dominates. All other zoogeographical elements are of minor importance, but the percentage of endemic species (12%) is astonishingly high. The dominance of the Mediterranean faunal element agrees well with the phytogeographical origin of the three Quercus species.

As was pointed out earlier, the different insect orders may differ considerably in their faunal spectra according to their zoogeographical origin and their ecological requirements, which, however, in this case are rather uniform, as they are all associated with oaks. Therefore, different orders contribute in varying degrees to the different faunal elements.

The cosmopolitan and paleotropic elements are chiefly represented by polyphagous cultural immigrants among the scale insects and beetles. The Holarctic element is represented by a few chiefly polyphagous Rhynchota. The Palearctic element is represented chiefly by polyphagous coccinellids. The Eurosiberian element in a larger sense is dominantly Centraleuropean, but it must be pointed out that most of the species are not confined to this area but extend also into the Circummediterranean, Eastmediterranean or even Iranoturanian region. This could not be included in Table I and III but can be deducted from the list of insects which follows the general part. It shows that, from 112 species, 102 spread also into other zoogeographical regions (chiefly the Mediterranean), while only ten are confined to the Eurosiberian region (sensu lato).

The same principle applies also to the Mediterranean element, but here, true Mediterranean species are in excess of those which occur also in other faunal regions (137 vs. 120 species). The share of Eastmediterranean species is, at 29.5%, slightly larger than that of Circummediterranean distribution (27.9%). This is chiefly due to a large number of Eastern subspecies of wider Circummediterranean or Central-East-European distribution, or to vicariant species such as among Rhynchota, Lepidoptera, Coleoptera and Formicidae, the large majority of which are polyphagous (especially Coleoptera).

The Irano-Turanian element, with 3% of the total, again comprises chiefly species which occur also in the Mediterranean region (15) and only three true Iranoturanian elements among the Rhynchota.

The Eremian element is also poorly represented (1.1%) and comprises chiefly two polyphagous Loricula species (Rhynch.).

The Ethiopian element, comprising only 0 6%, contains chiefly polyphagous predators (Mantidae) and a Tachinid parasite with Mediterranean affinities.

The Endemisms comprise, as defined, species and subspecies confined to Israel, Jordan and the Lebanon. Most of these forms have strong affinities to closely related Mediterranean species, and in a broader sense may be classified as Mediterranean. We do not think that a too rigid distinction should be made between endemic species and endemic subspecies, which anyhow should be regarded as incipient species. Furthermore, the species concept may differ considerably among specialists working on different groups. Forty species (12%) are classified here as endemic, of which 30 belong to the Rhynchota. Concerning the Hemiptera and Heteroptera, which are polyphagous, most of them may prove to occur also in the eastern Mediterranean when this fauna will be better known. The endemic Aphids and Coccids seem to be more restricted, as these groups are rather well known, especially from Turkey and Iraq (Bodenheimer and Swirsky, 1957; Bodenheimer, 1943, 1953-54). A relatively small number of gall wasps (4=13%), all to be described by Sternlicht in the future, must still be considered as endemic.

Some Remarks on the Zoogeographic Distribution of the Monophagous Species.

Most of the monophagous species belong to the Rhynchota (especially Kermesidae, Asterolecannidae), Lepidoptera and Cynipidae. Out of 40 endemic species 31 are monophagous (23.5% of the total number of monophagous species). Especially high is the percentage of the endemisms among the Rhynchota, where two-thirds of the 36 monophagous species are endemic. These comprise most of the Homoptera, all the Aphidoidea and Kermesidae, and some of the Coccidae, Asterolecaniidae and Pseudococcidae.

The Mediterranean element is again the prevelant one, containing a good percentage of purely Circum- or Eastmediterranean elements. However, there is not a single true Central- or East-European element present, all of the 64 species occurring also in the Mediterranean region. But here we must distinguish clearly between two different modes of distribution of this Centraleuropean element. Among the Lepidoptera almost all of the leaf feeders, gall breeders and leaf miners are found also on the summergreen European oaks such as Q. pubescens Willd., Q. robur L. and Q. petraea (Malluschka), extend through the whole of Central Europe and even reach southern Scandinavia. On the other hand, many of the Cynipidae occurring in Israel on Q. ithaburensis occur in Europe also on Q. cerris L. This latter oak species is in general Mediterranean, but penetrates north of the Alps along the Danube valley into lower Austria and reaches Moravia. Therefore, the species occurring on it must be classified as partially Central European, though they are found only in the

most south-eastern part of this region. The same must be said als for some gall wasps found in Israel on Q.infectoria, which occur also on Q. conferta Kit., an oak species which extends through the Balkans to Hungary, and must therefore be classified as a partial Easteuropean element. It must therefore be stated that the Cynipid fauna, and also its parasites, has a much more Mediterranean character, as may be assumed from the data in Table III.

Table 3 Faunal spectrum of monophagous species

	No. of species usable	Palearctic	Central-europaean	Easteuropean	Eurosiberian	Circummediterr.	Southmediterr.	Eastmediterr.	Iranoturanian	Endemic
Rhynchota total	35	1	1		1	7		1		24
%	100	3	3		3	20.5		3		67.5
Hemiptera + Heteroptera	10				1			1		8
Aphidoidea	6									6
Coccoidea	19	1	1			7				10
Lepidoptera Total	46		7	2.5	1	14.5	1	17.0	1	2
%	100		14.9	5.4	2.1	31.9	2.1	37.3	2.1	4.2
Macrolepidoptera + Pyralidae	29		3.5	1.5	1	7	1	14	1	
Other Microlepidoptera	17		3.5	1.0		7.5		3		2
Coleoptera total	5		1.5			2.5		1		
%	100		30.0			50		20		
Hymenoptera total	44		12.5	3	1.5	18.5		3.5	0.5	5
%	100		28	6.7	3.4	41.6		7.9	1.1	11.3
Tenthredinidae + Cynipidae	34		9	2.5		17		1.5		4
Parasitica	10		3.5	0.5	1.5	1.5		2.0	0.5	1
Diptera total (Cecidomyidae)	3		1			2				
%	100		33.3			66.7				
Sa	133	1	23	5.5	3.5	44.5	1	22.5	1.5	31
%	100	0.7	17.3	4.1	2.5	33.4	0.7	17	1.1	23.2
Simplified faunal spectrum	133	1	32			68			1.5	31
%	100	0.7	23.9			51.1			1.1	23.2

List of Insects occurring on Quercus

ABBREVIATIONS

CE = Centraleuropean
CM = Circummediterranean
Cosm = Cosmopolitan
EE = Easteuropean
EM = Eastmediterranean
End = Endemic
Er = Eremian
ES = Eurosibirian
Et = Ethiopian
Hel = Holarctic
IT = Iranoturanian
Paltrop = Palaeotropic
pen. = penetration
SM = Southmediterranean
Sib. = Siberian

Bod. = Bodenheimer

M = Monophagous (stenophagous): feeding on Fagaceae (Quercus, Fagus) only

P = Polyphagous: feeding also on other plant families

species = no Quercus species recorded
inf. = Quercus infectoria boissieri

(country) = the species occurs in Israel, but has not been recorded from Quercus; it is however quoted to occur on Quercus in the country mentioned.

	Quercus		Food preference	Geographical distribution	Remarks
	calliprinos	ithaburensis			
Orthopteroidea					
Mantidae					
Mantis religiosa L.	+	+	P	CM	predator
Sphodromantis viridis Forsk.	+	+	P	Et	predator
Blepharopsis mendica F.	+	+	P	CM/Et	predator
Rivetina baetica Rmb.	+	+	P	CM/IT	predator
Tettigoniidae					
Pholidoptera punctifrons Burm.	+	+	P	CM	predator
Gryllidae					
Arachnocephalus vestitus Costa		+	P	CM	predator
Thysanoptera					
Thripidae					
Taeniothrips meridionalis Pries.		+	P	SM	
Odontothrips karnyi ssp. rivnai Pries.	+	+	P	End	
Thrips sp.		+			
HEMIPTERA					
Pentatomidae					
Rhaphigaster brevispina Horv.		inf.	P	IT	(from Cyprus)
Sciocoris sahlbergi Wgn.		+	P	End	
Ochetostethus nanus H.Sch.		inf.	P	Hol	(from Cyprus)
Zicrona coerulea L.	+	+	P	Hol	

	Quercus		Food preference	Geographical Distribution	Remarks
	cerris	*ithaburensis*			
Dictyopharidae					
Dictyophara xiphias Pet.	+	+	P	End	
Dictyophara multireticulata M.R.		+	P	CM	
Issidae					
Hysteropterum maculipes Melch.	+	+	P	EM	
Delphacidae					
Calligypone propinqua Fab.	+	+	P	Hol	
Achilidae					
Akotropis quercicola Lv.		+	M ?	End.	
Meenoplidae					
Meenoplus albosignatus Fab.		+	M ?	EM	
Tettigometridae					
Tettigometra obliqua Panz.	+	+	M ?	ES	
Cicadidae					
Cicadatra atra Ol. ssp. platyptera Fieb.	+	+	P	EM	
probably also: C. longipennis Schum. and C. hyalina Fab. found on Quercus sp.			P		
Cercopidae					
Philaenus impictifrons Hv.	+	+	P	Er	
Cicadellidae					
Thamnotettix zelleri Kbm. ssp. seclusus Lv.	+		P	End (CM)	
Thamnotettix allygidioides Lv.	+		M?	End	
Selenocephalus bytinskii Lindb.		+	P	End	
Selenocephalus pallidus Kbm.		+	P	CM	
Allygus theryi Horv.	+	+	P?	CM	
Fieberiella macchiae Lv.	+?		?	End	
Stegelytra albofasciata Lv.		+	P	End	
Alebra albostriella Fn.		+	P?	Hol	
Eurhadina angulata Lv.	+?		?	End	

	Quercus		Food preference	Geogeographical distribution	Remarks
	calliprinos	*ithaburensis*			
Lygaeidae					
Geocoris quercicola Lv.		+	M?	End	
Miridae					
Phytocoris signaticollis Lv.		+	P	End	
Ortholytus ? nassatus Fab.		+	P	CE/EM	
Harpocera hellenica Reut.		+	P	EE/EM	
Psallus perrisi Muls. Rey		+	M?	CE/EM	
Psallus albicans Reut.		+	M	IT?	
Psallus punctatus Fab.		+	M	CM	
Campylomma impicta E.Wgn.		+	P	Er	
Anthocoridae					
Anthocoris nemoralis Fab.	+		P	CE/EM	
Microphysidae					
Loricula basalis Reut.		+	P	Er	
Loricula nigritula Put.		+	P	Er	
Reduviidae					
Nagusta goedeli Klt.		+	M	Es/EM	predator, one record on Pinus
Sphedanolestes pulchellus K.		inf.	P	EM	Bod.1937(from Cyprus)
Tingidae					
Lasiacantha hedenborgi Stal		+	P	EM	
Tingis hellenica Put.		+	P	EM	
Tingis bodenheimeri Ldbg.		+	M?	End	
Stephanitis pyri Fab.	+		P	CM	(from Turkey)
Elasmotropis testacea H.S. ssp. vicina Horv.	+		P	EM	
Monosteira lobulifera Reut.	+		P	EM	(from Turkey)
HOMOPTERA					
Cixiidae					
Oliarius angustiformis Lv.		+	P	End	
Oliarius horridus Lv.	+		P	End	
Oliarius major Kb. ssp. interjectus Lv.	+	+	P	End	
Hyalestes obsoletus Sign.	+	+	P	CM	

	Quercus		Food preference	Geographical distribution	Remarks
	cliprinos	*ithaburensis*			
Youngiada tarsalis Lv.	+		?	End	
Erythroneura adanae Dlab.		+?	P	EM	
Erythroneura ithaburensis Lv.		+	M	End	
Erythroneura discolor Hv.	+		M	EM	
Erythroneura pulcherimma Lv.		+	M	EM	
APHIDOIDEA					
Lachnidae					
Lachnus crassicornis H.R.L.		+	M	End	
Lachnus swirskii H.R.L.		+	M	End	
Lachnus subnudus Born.i.litt.	species		?	End	
Callipteridae					
Myzocallis bodenheimeri H.R.L.		+	M	End	
Myzocallis glandulosus H.R.L.		+	M	End	
Thelaxidae					
Thelaxes confertae Boern.		+	M	EM	
Phylloxeridae					
Phylloxera quercus Boy.	+		M	EM	
COCCOIDEA					
Diaspidae					
Aonidiella aurantii Mask.	+		P	Paltrop	cultural immigrant
Hemiberlesia lataniae Sign.	+	+	P	Cosm.	cultural immigrant
Quadraspidiotus ostreaeformis Cur.	species		P	CM/IT	(from France)
Quadraspidiotus zonatus Frauenf.	+		P	CE/CM	
Diaspidiotus distinctus Leon.		+	M	Pal	
Diaspidotus wunni Lind.	species		P	CE/M	
Diaspidiotus viticola Leon.		+	P	CM	det. doubtful
Genaspidiotus minimus Leon.	+	+	M	CM	

	Quercus		Food preference	Geographical distribution	Remarks
	calliprinos	ithaburensis			
Melanaspis inopinatus Leon.	species		P	EM	
Targionia vitis Sign.		+	P	CM	
Chionaspis lepineyi Bal.	+	+	M	CM	
Lepidosaphes ulmi L.	species		P	Cosm	(in Europe)
Lepidosaphes becki Newm.	species		P	Cosm	(in Europe)
Coccidae					
Eulecanium coryli L.	+	+	P	Hol	
Eulcanium pulchrum Rch.		+	P	ES	
Eulecanium tivoni Sternl.i. litt.		+	M	End	
Kermesidae					
Kermes biblicus Bdh.(syn.:palaestinensis Bal.)		+	M	End	
Kermes nahalali Bdh.	+		M	End	
Kermes greeni Bdh.(syn.: echinatum Bal.) + ssp.tivoni Sternl.i.litt.	+		M	End	
Kermes spatulatus Bal.		+	M	End	
Kermes bytinskii Sternl.i.litt.		+	M	End	
Pseudococcidae					
Eriococcus sp. near thymeleae Newst.	+	+	P	IT	
Phenacococcus sp. near quercus Bougl.		+	M	CE/CM	
Nidularia pulvinata Planch.	+		M	CM	
Nidularia balachowskii Bdh.		+	M	End	
Eurycoccus sternlichti Will.		+	M	End	
Asterolecaniidae					
Asterolecanium quercicola Bouche	species		M	CM	
Asterolecanium ilicicola Targ.	+		M	CM	
Asterolecanium bellum Russel		+	M	CM	
Asterolecanium variolosum Ratz.	+		M	Hol	

	Quercus		Food preference	Geographical distribution	Remarks
	calliprinos	ithaburensis			
Margarodidae					
Kuwania sp. near quercus Kuw.		+	M	CE/CM	
Guerinia serratulae Fab.	+	+	P	CE/M/IT	
LEPIDOPTERA					
Lycaenidae					
Strymon ilicis Esp.ssp.prinoptas Zyn.	+	+	M	EM	
Arctiidae					
Roeselia togatulalis Hb.	+	+	P	CM/IT	
Celama strigula Schiff.	+	+	P	CE/CM	
Celama squalida Stgr.	+	+	P	CM	
Ocnogyna loewi Z.	+	+	P	SM EM	
Callimorpha quadripunctaria Pod. ssp. fulgida Obth.	+		P	EM	
Lymantriidae					
Orgyia trigotephras Bsd. ssp. orientalis Stgr.	+		P	EM	
Lymantria dispar L.f.disparina Mull.		+	P	CM	
Ocnerogyia nora Stgr.		+	M?	EM	
Ocnerogyia samaritana Stgr.		+	M?	EM	
Lasiocampidae					
Eriogaster philippsi Bart.		+	M	EM	
Pachypasa otus Drury		+	P	EM	
Notodontidae					
Hoplitis milhauseri Fab. ssp.albida Pfeiff.		+	P	EM	
Notodonta anceps Goeze		+	M(P)	CE/CM	
Phalera bucephaloides O.ssp.syriaca Zny.		+	M	EM	
Spatalia argentina Fab.		+	M	CE/EM	
Drepanidae					
Drepana binaria Hb.	+	+	P	CE/EM	

	Quercus		Food preference	Geographical distribution	Remarks
	cerris	*ithaburensis*			
Epipyropidae					
Heteropsyche schawerdae Zny	+	+	M	CM	parasite of Hysteropterum maculipes
Sphingidae					
Marumba quercus Schiff. spp. mesopotamica O. Bang Haas		+	M	EM	
Noctuidae					
Acronycta aceris L.ssp. judaea Stg	+		P	EM	
Acronycta rumicis L.	+	+	P	ES/CM	
Dryobota furva Esp.	+	+	P	CM/IT	
Dryobotodes roboris Gey.ssp. taurica Osth.	+		M	EM	
Dryobotodes protea Esp.	+		M	CE/CM	
Spudea ruticilla Esp.	+	+	M	EM	
Amathes helvola L.	+	+	P	ES/CM	
Amathes litura L.	+	+	P	CE/CM/IT	
Amathes macilenta Hbn.	+	+	P	CE/CM	
Dicycla oo L. ssp. griseago Sch.	+	+	M	EE/EM/IT	
Amphipyra pyramidea L.	+	+	M	ES/EM	
Nycteola falsalis H.S.ssp. asiatica Krul.	+		P	EM	
Sarrothripus revayana Scop. f. columbana Turn.	+	+	P		
Hylophilina bicolorana Fuessl. ssp. conversa Warr.		+	M	EE/CM	
Xanthia croceage Schiff.	+	+	M	ES/CM	
Catocala conversa Esp.	+	+	M	CM	
Catocala nymphagoga Esp.	+		M	SM	
Ephesia disjuncta Hb.-Gey.	+		M	CE/EM	
Ephesia nymphaea Esp.	+		M	CM	
Ephesia diversa Hb.-Gey.	+		M	EE/EM	

	Quercus		Food preference	Geographical Distribution	Remarks
	calliprinos	*ithaburensis*			
Catephia alchymista Schiff.	+		M	ES/CM	
Grammodes stolida Fab.	+	+	P	Paltrop pen. CM/T	
Geometridae					
Cosymbia pupillaria Hbn.	+	+	P	CM	
Cosymbia porata L.	+		P	CE/CM	
Cosymbia ruficiliaria H.Sch.	+	+	M	CE/EM	
Eupithecia abbreviata Stph.		+	M	CE/CM/ IT	
Eupithecia dodoneata Guen.	+	+	M	CE/CM/ IT	
Ennomos quercarius Hbn.		+	M	CE/EM	
Eumera regina Steph.	+		M	EM	
Colotois pennaria L.	+	+	P	CE/CM	
Zamacra flabellaria Heeg.	+	+	P	CM	
Biston strataria ssp.n.	+	+	P	EM	
Boarmia rhomboidaria Schiff.ssp. syritaurica Whli.	+	+	P	EM	
Pyralidae					
Acrobasis glaucella Stgr.	+		M	CM	
Tortricidae					
Tortrix sp.		+	M?		
Cacoecia sp.	+		M?		
Pamene amygdalana Dup.	+	+	M	CE/CM	gallbreeder
Pamene gallicolana Zell.		+	M	CE/EM	gallbreeder
Pamene lobarzewskii Now.		+	M	EE/EM	gallbreeder

	Quercus		Food preference	Geographical Distribution	Remarks
	calliprinos	*ithaburensis*			
Gelechidae					
Symmoca sparsella Joan.		+	M	EM	
Sophronia exustella Zell.		+	M	CM	gallbreeder
Tachyptilia quercella Laf.		+	M	CE/CM	
Stenolechia gemella L.	+		M	CE/CM	
Stomopteryx sp.		+	M		
Euteles kollarella Costa	+	+	P	CM	
Heliozelidae					
Heliozela sericiella Haw.		+	M	CM	
Elachistidae					
Cosmopteryx sp.		+	P?		gallbreeder
Gracilariidae					
Lithocolletis quercifolia Zell.		+	M	CE/CM	Leaf miner
Lithocolletis quercus Ams.		+	M	End	" "
Acrocercops cocciferella Chret.		+	M	CM	" "
Acrocercops brongniardella Chret.	+		M	CM	" "
Tischeriidae					
Tischeria dodonaea Stt.		+	M	CM/EE/EM	Leaf miner
Tischeria ekebladella Bjerk.	+		M	CM	" "
Nepticulidae					
Stigmella ruficapitella Haw.		+	M	CM/EM	Leaf miner
Stigmella suberis Staint.	+		M	CM	
Micropsychidae					
Barbaroscardia palestinella Rebel	+	+	M	End	

	Quercus		Food preference	Geographical Distribution	Remarks
	calliprinos	*ithaburensis*			
COLEOPTERA					
Cantharidae					
Cantharis dimidiatipes Rche.		+	P	EM	feeding on flowers
Rhagonycha nigritarsis Brike.		+	P	EM	" " "
Malthodes berytensis Rche.	+	+	P	EM	" " "
Malachidae					
Cephaloncus sp.		+	P		
Cyrtosus cerealis Peyr.		+	P	EM	
Dasytidae					
Dasytes sp.		+	P		
Dolichophron cylindromorphus Kies.	+	+	P	EM	
Cleridae					
Tillus palaestinus Pic.	+		P	EM	predator of wood-boring larvae
Opilo taeniatus Klug ssp. cruentatus Spin.	+		P	EM	" "
Elateridae					
Agrypnus judaicus Rche.	+	+	P	EM	
Adelocera punctata Hbst.	+		P	EM	
Tetrigus cyprius Bdi.	+	+	P	EM	
Buprestidae					
Acmaeodera brevipes Kies.ssp.saducea Obb	+		P	End(EM)	
Acmaeodera flavolineata Cast.Gory ssp. suturalis Gory		+	P	EM	
Acmaeodera ottomana Friv.		+	P	EM	
Acmaeodera quadrizonata Ab.	+	+	P	EM	
Acmaeodera simulans Ab.	+		P	EM	
Acmaeodera undulata Ab.	+		P	EM	
probably also A. lugens Gory ssp.libanotica Obb. saricola Spin. despecta Bdi. reflexangula Rtt. are Quercus feeders.					

	Quercus		Food preference	Geographical Distribution	Remarks
	calliprinos	ithaburensis			
Latipalpis plana Ol.	Quercus		M	CM	(from S. Europe)
Perotis chlorana	Quercus		M	EM	(Halperin, 1963)
Anthaxia diadema Fisch.	+	+	P	EM	
Anthaxia nupta Kies.	+	+	P	EM	
Anthaxia (millefolii Kies.spp. polychloros Ab.)	+	+	P	CE/EM	
Anthaxia cichorii Oliv.	+	+	P	CE/CM/IT	
Anthaxia salicis Fab.		+	P	CE/CM	
Agrilus litura Kies.	+		P	CE/EM	
Janthe felix Mars.	+		P	EM	
Dascyllidae					
Dascyllus sp.		+	P		
Dermestidae					
Anthrenus pimpinellae Fab.		+	P	Paltrop	
Nitidulidae					
Carpophilus obsoletus Ev.		+	P	SIB?	
Cybocephalus festivus Er.		+	P	EM	
Cucujidae					
Oryzaephilus surinamensis Marsh.		+	P	Cosm	cult. immigrant, in galls
Cryptophagidae					
Cryptophagus affinis Sturm		+	P	CE/CM	Fungus feeder?
Phalacridae					
Stilbus consimilis Marsh.		+	P	CM	on flowers
Olibrus affinis Sturm		+	P	ES/CM	
Mycetophagidae					
Berginus tamarisci Woll.	+		P	CM	Fungus feeder
Colydiidae					
Ogmoderus angusticollis Bris.	+		P	CM	
Dastarcus libanicus Frm.	+		P	EM	

	Quercus		Food preference	Geographical Distribution	Remarks
	calliprinos	*ithaburensis*			
Coccinellidae					all predators
Lithophilus marginatus Rtt.		+	P	EM	
Pullus pallidivestis Muls.		+	P	CM	
Nephus cf. 4-maculatus Hbst.		+	P	Pal	
Adalia 10-punctata L.		+	P	Pal	
Synharmonia conglobata L.		+	P	Pal	
Chilocorus bipustulatus L		+	P	Pal	
Exochomus 4-pustulatus L.		+	P	Pal	
Lyctidae					
Lyctus impressus Com.	Quercus		P	CM	
Bostrychidae					
Bostrychus capucinus L.	+	+	P	ES/CM	Introduction
Scobicia chevrieri Villa	+	+	P	CM	
Sinoxylon sexdentatum Ol.	+	+	P	CM	
Anobiidae					
Lasioderma serricorne Fab.		+	P	Cosm.	
Meloidea					
Teratolytta bytinskii Kazab		+	P	End(EM)	
Anaspidae					
Anaspis spec.		+	P		
Sericidae					
Maladera punctatissima Fald.		+	P	EM/IT	
Melolonthidae					
Haplidia chaifensis Kraatz	+	+	P	EM	
Polyphylla olivieri Cast.		+	P	EM/IT	

	Quercus		Food preference	Geographical Distribution	Remarks
	calliprinos	ithaburensis			
Dynastidae					
Oryctes nasicornis L. ssp. kuntzeni Mink		+	P	EM	
Promacrus bimucronatus Pall.		+	P	EM	
Cetonidae					
Potosia speciosa Ad. ssp.jousselini Gory		+	P	EM	
probably also P. cuprea Fab. ssp. igni-collis Gory, P. judith Rch.P.afflicta Gory, P.funesta Men. P. subpilosa Desbr. and P. sibirica Ggl. ssp. galathea Rche. are living in rotten Quercus wood, trunks.					
Lucanidae					
Lucanus cervus L.ssp.syriacus Plan.	+		P	EM	
Dorcus parallelopipedus ssp.reichei Gglb.	+	+	P	EM	
Cerambycidae					
Macrotoma scutellaris Germ.	+	+	P	EM	
Rhesus serricollis Motsch.	+	+	P	EM	
Prionus lefebrei Mars.		+	P	EM	
Cerambyx velutinus Brll.ssp. centurio Czwal.	+	+	P	EM	
Cerambyx cerdo L. ssp. acuminatus Motsch.	+	+	P	EM	
Stromatium fulvum Vill.		+	P	SM-EM	
Leptura cordigera Fuessl.	+	+	P	CM	
Stenopterus flavicornis Kust.	+	+	P	CM	
Stenopterus rufus L.ssp. syriacus Pic	+	+	P	EM	
Callimellum adonis Ab.	+	+	P	EM	
Deilus fugax Oliv.	+	+	P	CE/CM	
Phymatodes testaceus L.	+	+	P	CE/EM/IT	

	Quercus		Food preference	Geographical Distribution	Remarks
	cal1iprinos	ithaburensis			
Chloropnorus sartor Müll.		+	P	ES/EM	
Chlorophorus nivipictus Kraatz		+	P	EM	
Purpuricenus dalmatinus Stum ssp. hirsutus Plav.	+	+	P	EM	
Purpuricenus desfontainesi Fab.ssp. inhumeralis Pic	+		P	CM	
Purpuricenus budensis Goetze		+	P	CM	
Niphona picticornis Muls.	+	+	P	CM	
Chrysomelidae					
Orsodacne lineola Panz.		+	P	CE/CM	
Cryptocephalus sp. near turcicus Suff.		+	P	EM	
Bruchidae					
Bruchidius lividimanus Gill.		+	P	Pal/Et	
Bruchidius bimaculatus Ol.		+	P	CE/CM	
Anthribidae					
Platyrrhinus resinosus Scop.		+	P	ES/EM	
Brenthidae					
Amorphocephalus coronatus Germ.		+	P	CM	predator
Eupsalis reichei Frm.		+	P	SM	predator
Curculionidae					
Auletobius politus Serv.		+	P	CM	
Coenorrhinus pauxillus Germ.	+		P	ES	
Apion longirostre Ol.	+		P	ES/CM	
Apion chenocephalum Desbr.		+	P	EM	
Phyllobius sp.		+			
Polydrosus grandiceps Desbr.		+	P	EM	
Smicronyx jungermanniae Riech		+	P	CE	

	Quercus		Food preference	Geographical Distribution	Remarks
	calliprinos	ithaburensis			
Smicronyx syriacus Faust		+	P	EM	
Curculio elephas Gyll.	+	+	M(P)	CE/CM	Acornbreeder
Curculio villosus Fab.	+	+	M	CE/CM	gallbreeder
Curculio longipennis Rtt.	+	+	M?	CE/CM	" "
Curculio pyrrhoceras Marsh.		+	M	EM	" "
Ceuthorrhynchus sp.		+	P		
Ceuthorrhynchidius sp.	+		P		
Rhynchaenus jota L.		+	P	ES	
Rhynchaenus spec.	+		P		
HYMENOPTERA					
Tenthredinidae					
Profenusa pygmaea Klug		+	M	CE/EM	leaf miner
Cynipidae Cynipinae					
Andricus quercus radicis Fab.		+	M	CE/CM	
Andricus kollari Htg.+ v. minor Kieff.		+	M	Ce/CM	
Andricus miriami Sternl. in litt.		+	M	End.	(nr. mitrata Mayr)
Andricus ostreus Htg.	inf.	+	M	CE/EM	
Andricus cecconii Kieff.		+	M	CM	
Andricus sp.near cecconii		+	M		
Andricus grossulariae Gir.		+	M	CE/CM	
Andricus sp. near trilineatus Htg.	+		M	CE/CM	
Andricus curvator Htg.	inf.		M	CM	Bodenheimer
Andricus fecundator Htg.	inf		M	CE/CM	
Andricus pseudococcus Kieff.	inf.		M	CM	Bodenheimer
Andricus coriarus Htg.	inf		M	CE/CM	
Andricus panteli Kieff.	inf		M	CM	

	Quercus		Food preference	Geographical Distribution	Remarks
	cerris	ithaburensis			
Andricus caput medusae Htg.	inf.		M	EE/CM	
Andricus insanus Westw.	inf.		M	EE/CM	
Andricus quercus tozzae Bosc.	inf.		M	CM	
Andricus hungaricus Htg.	inf.		M	EE/CM	
Callirhytis eadyi Sternl. in litt.		+	M	End.	(nr. rufescens Mayr)
Chilaspis nitida Gir.ssp.israelis Sternl in litt.		+	M	End	(nitida: CE/EM)
Chilaspis tivoni Sternl. in litt.		+	M	End	
Chilaspis spec.	+		M		
Neuroterus macropterus Htg.		+	M	CE/CM	
Neuroterus lanuginosus Gir.		+	M	CE/CM	
Neuroterus aprilinus Gir.		+	M	CE/CM	
Neuroterus saltans Gir.		+	M	EE/CM	
Neuroterus quercus baccarum L.	inf.		M	CE/CM	
Neuroterus numismalis Oliv.	inf.		M	CE/CM	
N. sp. near glandiformis Gir.		+	M	CE/CM	
Plagiotrochus kiefferianus Tav.	+		M	CM	
Plagiotrochus spec.	+		M		
Synophrus politus Htg.		+	M	CE/CM	
Synophrus olivieri Kieff.		+	M	CM	
Aphelonyx cerricola Gir.		+	M	EE/EM	
Synerginae					
Synergus apicalis Htg.	+	+	M	CE/CM	in galls of:A. kollari,P.kiefferianus
Synergus variabilis Mayr		+	M	CE/CM	in galls of:A. kollari, A. cerricola
Saphonecrus haimi Mayr		+	M	CE/CM	in galls of:Ch.nitida, N.lanuginosus, Arnoldia certis
Saphonecrus undulatus Mayr		+	M	CE/CM	in galls of:A.kollari, A. cerricola

	Quercus		Food preference	Geographical Distribution	Remarks
	calliprinos	ithaburensis			
Ceroptres spec.	+		M	CE/CM	in galls of A. trilineatus
Ichneumonidae					
Metopius vespoides Scop.		+	P	CE/CM	parasite of Eriogaster
Enicospilus sp.		+	P		parasite of Pachypasa
Braconidae					
Bracon sp.		+	P		parasite of Tischeria, Lithocolletis quercifoliella
Apanteles congestus Nees	species		P	CE	parasite of Ocnogyna
Perilampilae					
Perilampus tristis Mayr		+	P	CE	secondary parasite of probably Pamene, in galls of A.collari, A. mitrata
Torymidae					
Megastigmus dorsalis Fab.		+	M	CE/EE	parasite of Chilaspis, Andricus, Neuroterus
Megastigmus synophri Mayr		+	M	CE/EM	parasite of Synerginae
Podagrion sp.		+	P		from gall of A. kollari (mantid eggs!)
Torymus spec.	+	+	M		several sp. from most Cynipid galls
Torymus cingulatus Nees		+	M	CE/CM	C. nitida galls
Ormyridae					
Ormyrus tubulosus Fonsc.		+	P	CE/EM	from Cynipid galls
Ormyrus punctiger Westw.		+	P	Hol	from A. kollari, A.grossulariae
Ormyrus sp.		+	P		parasite of Synergus apicalis from gall of A. kollari

	Quercus		Food preference	Geographical Distribution	Remarks
	cliprinos	*ithaburensis*			
Eurytomidae					
Eudecatoma variegata Walk.		+	M	CE/EM/IT	parasite of Neuroterus sp.
Eudecatoma biguttata Swed.	species		M	ES	Bod.1935: parasite of Cynipids
Eudecatoma sp.	+	+	M		parasite of Plagiotrochus, Neuroterus sp.
Eurytoma brunniventris Ratz.	species		M	ES/CM	Bod. 1935: parasite of Cynipids
Eupelmidae					
Eupelmus cerris Forst.		+	M	CE/EM	parasite of Synophrus politus ex Aphelonyx gall
Encyrtidae					
Habrolepis dalmani Westw.		+	P	Hol	in A.kollari, Synergus sp. Asterolecanium quercicola
Blastothrix erythrostetha Wlk.		+	M	CE/EM	parasite of Kermes bytinskii
Pteromalidae					
Mesopolobus juncundus Wlk.		+	P	CE/EM	Neuroterus sp.
Cecidostiba leucopeza Ratz.		+	P	CE/CM	from galls of Ch. nitida
Pteromalus sp.		+			ex A.mitrata, kollari, Aphelonyx, Callirhytis galls
Pteromalus sp.		+			ex Bracon sp.
Pteromalus sp.		+			ex Arnoldia sp.
Eulophidae					
Olynx albipes Ask		+	M	End.	ex Cynipid galls
Olynx obscuripes Mayr	+		M	CE/EM	ex Plagiotrochus gall
Olynx spec.		+	M		ex A.miriami gall
lyncus Wlk.		+	M?		ex leaf miner

	Quercus		Food preference	Geographical Distribution	Remarks
	calliprinos	ithaburensis			
Eulophus spec.		+	P		ex galls of Aphelonx, A.kollari, Synergus; parasite of Tortricidae
Pnigalio mediterranea Ferr. et Del.		+	P	CM	parasite of leaf miners
Sympiesis sericeicornis Nees		+	P	CE/CM	parasite of leaf miners
Sympiesis gyoerfii Erdös		+	P	CE/CM	parasite of leaf miners
Chrysocharis nautius Walk.		+	P	CE/CM	parasite of leaf miners
Pediobius saulius Walk.		+	P	CE/CM	parasite of leaf miners
Entedon spec.		+	P		ex Neuroterus gall
Encarsia spec.		+	P?		parasite of Diaspidae, K.spatulatus
Tetrastichidae					
Tetrastichus platanellus Merc.		+	P?	CE/CM	ex L.quercifoliella
Tetrastichus sp.		+			ex A. cerricola gall
Tetrastichus sp.		+			ex Ch. nitida gall
Tetrastichus sp.					ex Neuroterus sp. gall
Tetrastichus sp.	+				ex P. kiefferianus gall
Formicidae					
Crematogaster jehovae For.		+	P	EM	attending Eurycoccus K.biblicus, K.bytinskii
Tapinoma israelis For.	+	+	P	EM	Attending aphids and K.spatulatus
Tapinoma simrothi V.phoenicium Em.		+	P	EM	attending aphids
Liometopum microcephalum Panz.		+	P	EE/EM	attending K. spatulatus

	Quercus		Food preference	Geographical Distribution	Remarks
	callíprinos	ichaburensis			
Camponotus aethiops Latr. ssp. concavus For.		+	P	CM	nesting in old quercus stumps
Colobopsis truncatus Spin.		+	P	EE/CM	nesting chiefly in Cynipid galls
DIPTERA					
Cecidomyidae					
Arnoldia szepligeti Kieff.		+	M	CE/CM	
Arnoldia sp.		+	M		
Arnoldia sp.		+	M		
Contarinia subulifex Kieff.		+	M	CE/CM	
Contarinia cocciferae Tav.	species		M	CM	(Bod. 1937)
Dicrodiplosis sp.	species				(Bod. 1937) parasite of Pseudococcidae
Tachinidae					
Spoggosia aegyptiaca Vill.	+	+	P	EM	parasite of Ocnoggyna
Drino imberbis Wied.	+	+	P	Et/EM	parasite of Zamacra
Addendum					
Saturnidae					
Saturnia pyri Schiff.	species		P	EE/CM	Gusev et al.: Russia

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