

## The Butterflies of the Sinai Peninsula (Lep. Rhopalocera)

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### Abstract

An updated list of 44 species known to exist in the Sinai Peninsula is given. The distribution relative to 6 defined geographical zones, flight period and food plant data are described for each species.

### Introduction

In the beginning of the 19th century two pioneer Germans C. EHRENBURG and F. HEMPRICH collected the first butterflies in Sinai. Their material which was described by KLUG (1829-1845) included 4 new species from "Arabia deserta" namely : *Pontia glauconome*, *Pontia eupompe* (*Colotis danae*), *Hipparchia pisidice* and *Hipparchia* (*Ypthima*) *asterope*. The first 3 are clearly recorded from the Sinai mountains, though *C. danae* is suspect.

WALKER (1870) described 13 species which were collected in Sinai by J. K. LORD, two of which should not be considered (*Lampides ferrana*, *Lycaena cleodora*) (NAKAMURA, 1977).

KNEUCKER (1903) published a list of 7 butterflies. All his material was treated later by REBEL & DAUB (1909) as 14 species, 13 from the Sinai. INNES-BEY (1909), GRAVES (1915) and ANDRES and SEITZ (1923) did not add to the previous records.

BOYD (1917) found *Hesperia amenophis* (*Spialia doris*) in North Sinai. BODENHEIMER and THEODOR (1929) took part in the Hebrew University expedition looking for the Biblical Manna. They collected 6 species, 3 of which were new to Sinai. BODENHEIMER (1935) added previous records to his personal findings and published a list of 17 species. WILTSHIRE (1947, 1948, 1949) who lived in Egypt for a while found "a gold mine" in the well labeled ALFIERI collection that included new records to Sinai and to science. WILTSHIRE's work is the last comprehensive list of the Sinai butterflies including 24 recorded species.

However, judging from his data, he overlooked some previous works (BOYD, BODENHEIMER and THEODOR, BODENHEIMER) and decided that

KNEUCKER's *E. falloui* record was a misidentification. Seventy years later NAKAMURA and BENJAMINI (1973) reconfirmed KNEUCKER's findings. No further publications are known during the 24 years that followed WILTSHIRE's last work. The Middle East conflict in 1967 opened the peninsula to Israeli activities; new roads were paved and field schools were established enabling scientists to penetrate unknown regions.

(NAKAMURA and BENJAMINI 1973 ; NAKAMURA 1975, 1977).

Until the 1979 peace treaty between Israel and Egypt, the author was able to travel and collect all over Sinai. This paper is, therefore, based mainly on material observed and collected during the years 1968-1982. It contains (Table 1) 44 recorded species which almost doubles WILTSHIRE's list.

An additional 10 species that live near the Sinai borders are listed (Table 2).

### **Distribution Zones**

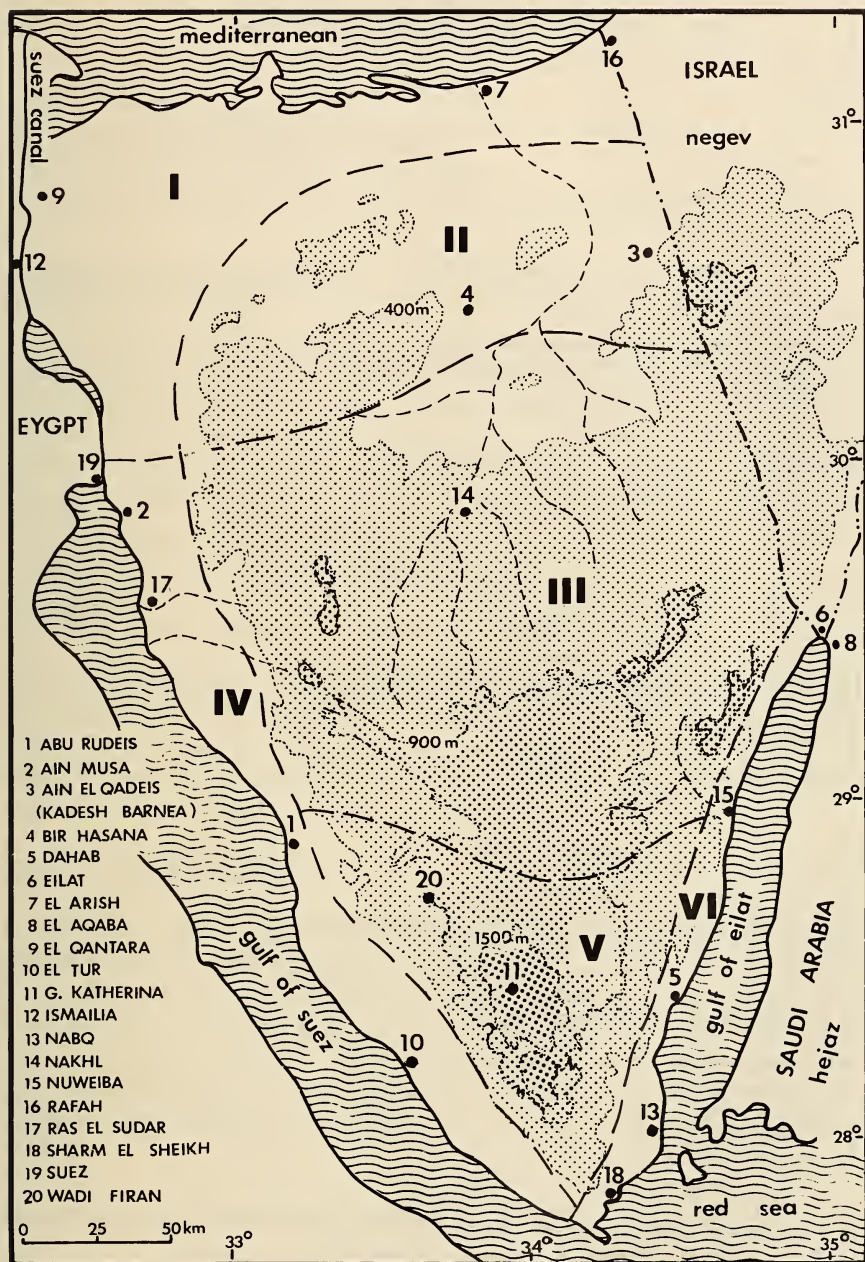
The Sinai peninsula, a bridge between Asia and Africa, is situated east of the Suez Canal and the Gulf of Suez. Its eastern limit is the political border agreed upon in 1906 between England and Turkey and is now the present line between Israel and Egypt. The following 6 zoogeographical zones (Map 1) are defined according to the butterfly distribution patterns and to phytogeographical characteristic zones. See : (DANIN, 1983), (DANIN, SHMIDA & LISTON, 1984) and (ZOHARY, 1935, 1956, 1973).

#### **Zone I, Northern Coast (N.C.)**

Stable sands, salt marshes and mobile dunes of the mediterranean coast and the area east of the Suez Canal. *Stipagrostis scoparia* (Gramineae) and *Convolvulaceae* are the dominant plants. High water table along the NE coast enable thousands of Date palme to grow and the Bedouins to develop their non-irrigated cultivation. This is a northern Saharo – Arabian zone with strong Mediterranean elements.

#### **Zone II, Northern Sinai (N.S.)**

The northern folded mountain ranges of Gebel Halal, Gebel Maghara and Gebel Yiallaq. This zone is a drier and warmer western extension of the Negev mountains. It presents a Saharo-Arabian zone with some mediterranean relicts (*Juniperus phoenicea*) and endemic plants (*Origanum isthmicum/Labiatae*). This is a transition zone between central Sinai (C.S.) and northern coast (N.C.).



Map. 1. Distribution zones of the Rhopalocera of Sinai.

Table 1  
Distribution list of the Sinai Rhopalocera

Species	Zone					
	I	II	III	IV	V	VI
<b>PAPILIONIDAE</b>						
1 <i>Papilio saharae saharae</i> Oberthur, 1879		+	+		+	
<b>PIERIDAE</b>						
2 <i>Artogeia rapae leucosoma</i> Schawerda, 1905	+	+			+	
3 <i>Pontia daplidice daplidice</i> Linnaeus, 1758	+	+		+	+	+
4 <i>Pontia glauconome</i> Klug, 1829		+	+	+	+	+
5 <i>Colotis fausta fausta</i> Olivier, 1804				+	+	+
6 <i>Colotis phisadia phisadia</i> Godart, 1819						+
7 <i>Anaphaeis aurota</i> Fabricius, 1793	E	E	E	E	E	E
8 <i>Euchloe aegyptiaca</i> Verity, 1911		+	+		+	
9 <i>Euchloe falloui</i> Allard, 1867		+	+	+	+	
10 <i>Elphinstonia charlonia charlonia</i> Donzel, 1842			+		+	
11 <i>Colias crocea</i> Geoffroy, 1785	+	+	+		+	?
12 <i>Catopsilia florella</i> Fabricius, 1775			M		M	M
<b>NYMPHALIDAE</b>						
13 <i>Danaus chrysippus chrysippus</i> Linnaeus, 1758	M			M	M	
14 <i>Junonia hierta cebrene</i> Trimen, 1870					M	
15 <i>Vanessa atalanta</i> Linnaeus, 1758					M	
16 <i>Vanessa cardui cardui</i> Linnaeus, 1758	+	+	+	+	+	+
17 <i>Melitaea deserticola macromaculata</i> Belter, 1934		+	+	+	+	
18 <i>Melitaea trivia syriaca</i> Rebel, 1905		+	+	+	+	
<b>SATYRIDAE</b>						
19 <i>Hipparchia pisdice</i> Klug, 1832		+			+	
<b>LYCAENIDAE</b>						
20 <i>Strymonidia jebelia</i> Nakamura, 1975					+	
21 <i>Deudorix livia</i> Klug, 1834	+	+	+	+	+	+
22 <i>Apharitis acamas acamas</i> Klug, 1834	?			+	+	
23 <i>Apharitis myrmecophila myrmecophila</i> Dumont, 1922	?				+	
24 <i>Lycaena phlaeas timeus</i> Cramer, 1777		+			?	
25 <i>Lycaena thersamon omphale</i> Klug, 1834		+				
26 <i>Athene amarah amarah</i> Guerin, 1847					+	+
27 <i>Lampides boeticus</i> Linnaeus, 1767	+	+	+	+	+	+
28 <i>Syntarucus pirithous</i> Linnaeus, 1767	+	+			+	+
29 <i>Tarucus balkanicus</i> Freyer, 1844	+					
30 <i>Tarucus rosaceus</i> Austaut, 1885	+		+	+	+	+
31 <i>Azanus jesous</i> Guerin, 1847		+	+	+	+	+
32 <i>Azanus ubaldus</i> Cramer, 1782				+		+
33 <i>Freyeria trochylus trochylus</i> Freyer, 1844		?			+	
34 <i>Plebejus pylaon philbyi</i> Graves, 1925		+	+		+	
35 <i>Polyommatus icarus zelleri</i> Verity, 1919	+	+			?	
36 <i>Polyommatus loewii uranicola</i> Walker, 1870		+	+	+	+	
37 <i>Pseudophilotes abencerragus nabataeus</i> Graves, 1925		+	+			
38 <i>Pseudophilotes sinaicus</i> Nakamura, 1975					+	
39 <i>Iolana alferii</i> Wiltshire, 1948		+	+		+	
40 <i>Zizeeria karsandra karsandra</i> Moore, 1865	+	+	+	+	+	+



Species	Zone					
	I	II	III	IV	V	VI
<b>HESPERIIDAE</b>						
41 <i>Spialia doris doris</i> Walker, 1870	+		+	+		
42 <i>Carcharodus alceae alceae</i> Esper, 1780	+				+	
43 <i>Carcharodus stauderi ambigua</i> Verity, 1925		+	+		+	
44 <i>Gegenes nostrodamus</i> Fabricius, 1793	+	+	+	+	+	+

### Zone III, Central Sinai (C.S.)

This is the main Saharo-Arabian zone. It has some Irano-Turanian relict elements (*Pistacia atlantica*) which do not grow in N.S. or in South Sinai. It includes from north to south : the large gravelly plains around Nakhl, the Tih desert (Gebel el Tih) and Gebel el Igma. A Nubian sandstone belt going from Sarabit el Khadim through Gebel Dalal to Gebel Gunna is the border between central and south Sinai. The dominant plants are : *Chenopodiaceae*, *Zygophyllaceae*, *Zilla spinosa* (*Cruciferae*), *Pituranthos tortuosus* (*Umbelliferae*) and *Retama raetam*.

### Zone IV, Coastal plain of the gulf of Suez (W.S.)

This zone is mainly an alluvium that came from the hills and mountains to the east. In the south near El Tur, the Kaa desert coinsides with the coastal plain. Here it gets the widest proportion, reaching 20 km. It presents a Saharo-Arabian zone with strong Sudanian elements, out of which *Acacia raddiana* is the most important.

### Zone V, South Sinai (S.S.)

The Sinai Massif is built of old volcanic and metamorphic rocks and younger smooth-faced red granite. It is the highest (2640 m) and coolest area in Sinai. The mean annual rainfall is 80-100 mm, which is five to ten times greater than zones IV & VI. The valleys, where the soil accumulated have many wells, gardens, springs with flowing water and oases. The flora is dominated by Irano-Turanian species, but it also includes many isolated Mediterranean and Sudanian plants. Over 50 endemic plants exist here.

### Zone VI, Coastal plain of the gulf of Eilat (E.S.)

The eastern mountains are composed of metamorphic and magmatic rocks. They descend sharply towards the coast which is covered by

alluvial fans. This is the warmest part of Sinai, limited to the west by the isotherm of 23°C. The flora is dominated by Sudanian species, but almost an equal number of Saharo-Arabian plants exist here as well. The most important Sudanian plants are : *Acacia nilotica*, *A. raddiana*, *Calotropis procera*, *Salvadora persica*, *Capparis cartilaginea* and *Cassia italica*.

Potential Immigrants

Sinai Peninsula is surrounded by 2 gulfs of the Red Sea in the south, the Mediterranean Sea in the north, and also has 2 continental borders. However, these borders are only political and do not offer any biological geographical barriers ; therefore, some neighboring species may sometimes penetrate. Table 2 lists 10 species that are known to occur across the borders.

These borders are defined as follows ;

- A – West of the Suez Canal
- B – East of Rafah in the Gaza Strip
- C – The Negev Mountains
- D – The Arava Valley till Eilat

Table 2  
List of potential immigrants

Species	Zone			
	A	B	C	D
1 <i>Pieris brassicae catoleuca</i> Röber, 1896		+		
2 <i>Euchloe ausonia melisande</i> Fruhstorfer, 1908			+	
3 <i>Euchloe belemia palaestinensis</i> Röber, 1907		+	+	
4 <i>Zegris eupheme uarda</i> Hemming, 1932			+	
5 <i>Junonia orithya here</i> Lang, 1908				+
6 <i>Melitaea phoebe telona</i> Fruhstorfer, 1908			+	
7 <i>Iolais glaucus jordanus</i> Staudinger, 1881				+
8 <i>Chilades galba</i> Lederer, 1855		+		+
9 <i>Pelopidas thrax thrax</i> Hübner, 1821	+			
10 <i>Borbo borbonica zelleri</i> Lederer, 1855	+			

Comparison to neighboring countries

Table 3 presents the total number of species known to occur in the following adjacent areas : Lower Egypt ; Negev Mountains & Arava Valley and northwestern Hejaz in Saudi Arabia.

The decline in the species diversity moving from the northern Mediterranean Irano Turanean climate to the southern Saharo-Arabian drier zones is evident (Table 3).

Table 3  
Comparison to neighboring countries

Country, Zone	South Israel, Negev & Arava	Sinai Peninsula	Lower Egypt	Saudi Arabia, NW Hejaz
Total No. Species	48	44	40	33

## Flight Periods and Food Plants

All reference to months at the beginning of each species indicates adult flight period.

### PAPILIONIDAE

***Papilio saharae*** – March at 500 m to June/July over 2000 m. Eggs and larvae found on *Pituranthos tortuosus*, *Foeniculum vulgare* (*Umbelliferae*) and *Haplophyllum tuberculatum* (*Rutaceae*). Other possible food plants : *Ferula sinaica* ; *F. daninii* ; (*Umbelliferae*) and *Haplophyllum poorei*.

### PIERIDAE

***Artogeia rapae*** – April till July in S.S. ; along the Mediterranean coast and N.E. Sinai almost the whole year, especially around cultivation. Feeds mainly on cultivated *Cruciferae*.

***Pontia daplidice*** – Most places February to November, above 1400 m from April. Females observed laying eggs on *Diplotaxis harra*, *Zilla spinosa* (*Cruciferae*) and species of *Reseda*.

***Pontia glauconome*** – Common everywhere from February to December, at higher elevation one or two months later. The preferred food plant is *Zilla spinosa*, but it also feeds on species of *Reseda*, *Diplotaxis* and *Ochradenus baccatus* (*Resedaceae*).

***Colotis fausta*** – March to November at middle elevations, and May to November above 1500 m. It's main food plant is *Capparis cartilaginea*.

***Colotis phisadia*** – April to October and occasionally later, mainly around its sole food plant *Salvadora persica*.

***Anaphaeis aurota*** – REBEL & DAUB (1909) mentioned a single specimen from Wadi Chaschibi near Sharm el Sheikh (S.S.), collected on 24.iv.1902. The last specimens at Bir Hasana (N.S.) on 16.iv.1969 (personal observation). Since 1969 this species has not been observed in Israel or Sinai (BENJAMINI, 1983).

***Euchloe "aegyptiaca"*** – Mid February 500 m to March/April above 1600 m. A few 2nd. brood specimens may seldom occur in April/May. The females oviposit on *Diplotaxis harra* as the preferred food plant.

***Euchloe falloui*** – There are possibly 3 broods or forms : the first appears at the end of November : the second, and a rare 3rd. flies until the end of May at the 2000 m elevation. It feeds on its preferred food plant *Moricandia sinaica* (Cruciferae), when available, but secondarily on *Zilla spinosa* and different species of *Reseda*. I have found it also on *Diplotaxis acris* (27.iii.1981 Gebel Gunna C.S. 1000 m) and on *Schouwia thebaica* (Cruciferae) (21.iii.1982 near Gebel Baraka E.S. 650 m).

***Elphinstonia charlonia*** – The first Sinai record (a male of the first brood) was collected by the author on top of Gebel um Riglen (W.S.) at 750 m, on 26.i.1979. This locality is only 4 km. southwest of the ancient Farao's temple at Sarabit el Khadim.

The second record is from South Sinai Gebel Beida 1600-1733 m (18 km. East of Gebel Katherina), on 23.iii.1982. These second brood specimens were flying around *Diplotaxis acris* which is common and the only available food plant in the area. It is interesting to note that these two localities present a middle elevation belt of acceptable environmental conditions. The species does not fly up to the massif or down in the Saharo-Arabian zone.

***Colias crocea*** (and f. *helice*) – February till October in N.S. April till October in S.S. It favors cultivated *Medicago*, and also feeds on *Tephrosia apollinea* (Papilionaceae) and *Astragalus* species (S.S.).

***Catopsilia florella*** – Migrating specimens were observed in S.S., at 1400-2000 m, in May and July. Along the eastern coast, especially around Eilat, a permanent colony exists. Larvae, eggs or adults can be seen during the whole year on and around the wild *Cassia italica* (Caesalpiniaceae) but also on the cultivated *Cassia corymbosa* (BENJAMINI, 1983).

#### NYMPHALIDAE

***Danaus chrysippus*** – The usual form is dominant. It is recorded from May, July and September. I saw only one example of the form *alcippus* in wadi Tlach 1400 m, 28.v.1974. The species feeds on *Asclepiadaceae* : *Gomphocarpus sinaicus* which grows above 900 m in S.S. : at lower altitudes it may use *Solenostemma oleifolium* which is common or *Calotropis procera* that grows in zones IV & VI.

***Junonia hierta*** – During 1974, this migrant species was observed in the Santa Katherina area from May till October, at 1400 m to 1850 m ; in 1976, only in June at 1400 m. The species was observed patrolling



territories along wadi beds with water. The preferred resting plant was *Majorana syriaca*. It may feed on *Blepharis ciliaris* which is quite common.

***Vanessa atalanta*** – September to November in 1974 but only November in 1975. All records are restricted to the Santa Katherina area. These astonishing records are 330 km. south-east of Cairo, its known southern limit up till now. It is quite surprising that this species has not become a permanent resident feeding on the local common *Parietaria alsinifolia* (*Urticaceae*).

***Vanessa cardui*** – All the year around. To the many known food plants which are also used in Sinai, I can add *Cruciferae*.

***Melitaea deserticola*** – Mid February at 500 m to July over 1400 m. Possible food plants are species of *Scrophulariaceae*.

***Melitaea trivia*** – January at 750 m to October over 1400 m. *Verbascum sinaiticum* (*Scrophulariaceae*) is preferred in S.S.

#### SATYRIDAE

***Hipparchia pisidice*** – This isolated population of the species is slightly different from the eastern Mediterranean populations. It flies from the end of May to mid November (some aestivation occurs). It possibly feeds on *Piptatherum miliaceum* and *P. holciforme* (*Gramineae*).

#### LYCAENIDAE

***Strymonidia jebelia*** – The first 3 paratypes were collected by the author on 26 May 1974, on the top of Gebel Bab : the remaining types were collected on later dates. The species flies from late May to mid June at 1800 m to 2200 m. Full grown larva is 15 mm long, green with 2 dorsal and 2 lateral yellow bands. The pupa is brown with black points 4.5 mm in diameter, and 10.5 mm long. The hibernating eggs is usually laid at the base of the *Rhamnus dispermus*'s thorns.

***Deudorix livia*** – In zones IV & VI it flies during the whole year. I have collected it even in mid winter in wadi Chashibi (S.S.) on 3.i.1977 and 3.xii.1977. In zone 5 most records are from July to September, up to 1850 m. Larval food plants are *Acacia* species, *Prosopis farcta* (*Mimosaceae*) and *Punica granatum* (Pomegranate).

***Apharitis acamas*** – From the end of April to mid July, up to 1950 m. Its life cycle is probably associated with *Crematogaster* ants, as was found in Oman by LARSEN & PITTAWAY (1982).

***Apharitis myrmecophila*** – From mid May to mid July, up to 1950 m. Like *A. acamas*, I found most of the specimens standing on *Artemisia herba* –

*alba* and *Lactuca orientalis*. The life cycle is possibly similar to the former species.

***Lycaena phlaeas*** – From April to August in N.S. and July in Santa Katherina. There are few known records and its existence in Sinai is uncertain. The larval food plant is possibly *Rumex cyprius* (*Polygonaceae*).

***Lycaena thersamon*** – Only twice recorded ; ALFIERI collected it at Mitla Pass (N.S.) on 8.v.1932 ; and I found it at Kadash Barnea (N.S.) on 3.iii.1978. The food plant is probably *Polygonum* sp. or *Rumex cyprius*.

***Anthene amarah*** – Only twice recorded : 7.vii.1943, Wadi el Lega (S.S., exact locality unknown), EFFLATON BEY leg. ; and 29.ix.1982, at Eilat (zone VI), D. BENJAMINI leg.

***Lampides boeticus*** – From March till October all over the peninsula. Larval food plants include many *Papilionaceae* (*Tephrosia*, *Astragalus*, *Crotalaria*, *Colutea*, *Medicago* etc.) and cultivated beans.

***Syntarucus pirithous*** – From March to October in N.S. & N.C., especially in the Bedouins cultivated Alfalfa fields. In zones V & VI it was recorded from July until October. It feeds on *Papilionaceae* plants.

***Tarucus rosaceus*** – From February to October, all over Sinai on *Ziziphus spina-christi*, above 1400 m it appears from May till September.

***Tarucus balkanicus*** – Only recorded from August till October in the eastern part of N.C., on *Ziziphus spina-christi*.

***Azanus ubaldus*** – From July till December, on its main food plant *Acacia raddiana*.

***Azanus jesous*** – From February till October, feeding on different *Acacia* trees, and *Prosopis farcta*.

***Freyeria trochylus*** – From April till October, up to 2000 m. It is surprising that no records exist for lower elevation in Sinai, while north of Eilat (Timna), I found it from February till October. Larval food plants are *Heliotropium* (*Boraginaceae*) and *Andrachne* (*Euphorbiaceae*) species.

***Plebejus pylaon*** – From the end of March till the end of May at 2000 m. The hibernating larva stays in the ground near the roots of *Astragalus spinosus* ; *A. fresenii* and *A. echinus* may also be chosen as food plants.

***Polyommatus icarus*** – Recorded only from May in N.S. It may possibly feed on *Medicago*.

***Polyommatus loewii*** – From the end of April till mid June at 2000 m. The larva hibernates in the ground close to the roots of *Astragalus spinosus*.

***Pseudophilotes abencerragus*** – Only recorded in May, possibly feeds on *Thymus bovei* or the endemic *Origanum isthricum* both Labiatae.

***Pseudophilotes sinaica*** – From early May to July, around Santa Katherina. There is an earlier record (17.iii.1976) from lower elevation at Gebel Sirbal. The partial second generation specimens are small and the length of a fore-wing is 7-8 mm. They are the smallest butterflies in Sinai. The white egg is laid exclusively on *Thymus decussatus*. This plant grows in wadi beds with small stones above 1800 m. Specimens collected at the Firan Oasis were either blown down from the neighboring Sirbal Mts. or possibly on an introduced Labiatae in the Monastery gardens there, or shifted to another food plant, possibly *Origanum* (Labiatae). The pupa was found under the ground near the roots of the food plant. The *Philotes astabene* male, collected by EFFLATON BEY on 4.viii.1942 at Wadi el Lega (S.S.) (WILTSHIRE, 1948 : 284) is certainly a misidentification of *P. sinaica*.

It is actually the first record for *P. sinaica*, and is a late second generation specimen.

***Iolana alfieri*** – From early March to mid April at 300 m to 1800 m. They can always be found where *Colutea istria* plants grow.

***Zizeeria karsandra*** – From March till November up to 1600 m. I found eggs and larvae on *Medicago*, *Tephrosia*, *Polygonum* and *Tribulus* (Zygophyllaceae).

#### HESPERIIDAE

***Spialia doris*** – From April till October, but most numerous in August-September. Species of *Convolvulus* are the usually reported food plants. I have also found it on *Ipomoea stolonifera* (Convolvulaceae).

***Carcharodus alceae*** – From late March till the end of September and a single record from early November (3.xi.1974, Wadi el Rabaa, S.S., 1600 m). Larval food plants are Malvaceae : *Malva* ; *Alcea* ; *Althaea*. *Alcea* is widely planted in the Bedouin gardens.

***Carcharodus stauderi*** – From late March untill late September, often seen on the flowers of *Stachys aegyptiaca*. The food plant is *Phlomis aurea* (Labiatae).

***Gegenes nostrodamus*** – From August till October up to 1250 m. I found eggs and larvae on *Aeluropus* and *Panicum* (Gramineae).

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