

er sich von seiner intensiven Sammeltätigkeit nach und nach zurückzog. Nur noch mit einigen wenigen seiner Sammelfreunde pflegte er weiteren Kontakt. Trotz erheblicher gesundheitlicher Belastung hat der alte Naturfreund, wenn es das Wetter irgend zuließ, seinen Garten im schönen Bamberger Berggebiet bestellt. Hier fand er seine Ruhe und seinen Frieden.

Sein Ende kam für uns alle überraschend. Er starb an Lungenentzündung als Folge einer Erkältung. Zäh bis zuletzt lehnte er es ab, sich auf einer Trage zum Krankenwagen bringen zu lassen, er ging zu Fuß dorthin und bat, ihm auch ja entomologische Literatur mit ins Krankenhaus zu geben. Am nächsten Tag schon war HEINRICH WITTSTADT ohne Kampf in seine ewigen Jagdgründe hinübergewandert. Wir werden ihm stets ein achtungsvolles Andenken bewahren.

Dr. ERICH GARTHE

## PROVISIONAL NOTES ON MIGRANT BUTTERFLIES

### IN LEBANON

by

TORBEN B. LARSEN

#### Introduction

In my recent monograph on the Rhopalocera of Lebanon (LARSEN, 1974) notes on migration are given under the individual species, but lack of time and sufficient data precluded the systematic treatment of migration in a separate introductory chapter. These notes are based mainly on my personal observations over the last four years, but I believe they are still a useful starting point for an analysis of the importance of migration to the butterfly populations in this area. I should be grateful for comments and additions to these provisional notes in the hope that a later paper may provide a more adequate overview of butterfly migration in Syria, Lebanon and Palestine.

The species included in the analysis are those of interest to the DFZS in addition to others which are known migrants in Lebanon. The special interest of these studies in relation to those of Central Europe is that many species have their southernmost limit of distribution in Lebanon. As regards the classification of migrants by type, I have followed the DFZS framework; I am not entirely certain how useful this is as an analytical tool in relation to the migrant species of Lebanon.

Detailed ecological, phytogeographical and faunistic information is given in my book, as well as colour photographs of all the species mentioned

and relevant maps. This information will not be repeated here to save space.

## Einführung

In meiner soeben erschienenen Monographie über die Rhopaloceren des Libanons (LARSEN, 1974) wurden zwar bei den einzelnen Arten Hinweise auf ihr Wanderverhalten gegeben, Mangel an Zeit und Mangel an genügenden Daten schlossen jedoch eine systematische Behandlung der Wanderfalter in einem gesonderten Kapitel aus. Die nachfolgenden Hinweise beruhen in erster Linie auf meinen persönlichen Beobachtungen während der letzten vier Jahre und ich glaube, daß sie eine nützliche Ausgangsbasis für die Untersuchung des Migrationsverhaltens der Schmetterlingspopulationen in diesem Gebiet darstellen. In der Hoffnung, daß eine spätere Arbeit eine umfangreichere Übersicht über die Schmetterlingswanderung in Syrien, im Libanon und in Palästina liefern wird, wäre ich für Stellungnahmen und Ergänzungen zu diesen vorläufigen Hinweisen dankbar.

Die in dieser Untersuchung behandelten Arten sind solche, die für die DFZS von Interesse sind und zusätzlich solche, die im Libanon als Wanderfalter bekannt sind. Besonders interessant ist hierbei, daß - verglichen mit Mitteleuropa - viele Arten ihre südlichste Verbreitungsgrenze im Libanon erreichen. Hinsichtlich der Einordnung der wandernden Arten in bestimmte Typen, bin ich der Gliederung der DFZS gefolgt, ich bin jedoch nicht sicher, inwieweit diese Gliederung auch für die Wanderfalter im Libanon zutrifft.

Detaillierte ökologische, phytogeographische und faunistische Hinweise, sowie Farbabbildungen und entsprechende Verbreitungskarten sind in meinem Buch zu finden. Diese Angaben möchte ich hier aus Platzgründen nicht wiederholen.

## List of migrant butterflies and DFZS Group IV species

The four categories of species are fully defined by EITSCHBERGER & STEINIGER (1973), but may be summarised as follows:

Saisonwanderer	species which regularly migrate beyond their winter quarters and which have a return migration
Binnenwanderer I	species which migrate within their normal area of distribution, either regularly or irregularly
Binnenwanderer II	species which regularly penetrate beyond their normal area of distribution without undertaking a return migration
Group IV	other species of special interest to the DFZS, such as threatened species and suspected migrants.

The number preceding each species is a cross-reference to the numbering in LARSEN (1974).

1. Papilio machaon syriacus VERITY (Group IV)

The species is widespread and is found in almost all ecological zones. It is interesting to note that it flies in sand dunes also in Lebanon. It is localised, and may be found year after year in the same localities. The autumn broods are by far the largest. Although single specimens may often be met with, it is almost certainly not a migrant in Lebanon.

3. Iphiclides podalirius virgatus BUTLER (Group IV)

Common and widespread throughout the country, though rare on the coast and above 2000 m NN. There is a succession of broods and potential for large-scale population build-ups. It is almost certainly not a regular migrant, but it may stray from the Beqaa Valley toward Palestine in a non-organised manner (BODENHEIMER, 1935).

8. Aporia crataegi augustior GRAVES (Binnenwanderer I)

This butterfly is very abundant in the mountains, though never occurring in as large numbers or in the agglomerative manner shown in some recent issues of ATALANTA. Its propensity to migrate is probably limited. I have caught a single specimen near Beirut (15. V. 1973) and BODENHEIMER (1935) recorded disorganised penetrations of the species into Palestine from Lebanon. Its occurrence in Jordan also seems somewhat erratic. I have not noted any fluctuation in populations during 1971-74.

9. Pieris brassicae catoleuca RÖBER (Binnenwanderer I)

This is not generally among our most common butterflies, but it may be found in limited numbers all over the country, usually in conjunction with human habitation. On the coast it either aestivates or disappears during the hottest summer months to reappear in October. It does not appear to be a regular migratory species and I have only observed a few cases of typical, but small-scale, migratory activity. There is a good deal of fluctuation in population size. BODENHEIMER (1935) believes that it dies out in Palestine every summer and is reinforced by migration from the north. I doubt this. Occasional specimens make their way to Egypt where it is not a permanent resident.

10. Pieris rapae leucosoma SCHAWERDA (Binnenwanderer I)

This species is common throughout the season in the mountains and all year on the coast. I have seen no instances of migration. BODENHEIMER (1935) thinks the Palestine populations of rapae are reinforced by migration from Lebanon every year without giving any reason. It is possibly a migrant also in the Middle East, since it has penetrated the Nile valley at least as far as Luxor, where it is common.

11. Pieris napi dubiosa RÖBER (Binnenwanderer I)

This butterfly is locally common through most of the country, though less so in the mountains. On the coast it has a succession of broods throughout the year. It reappears in the same localities year after year in equal num-

ber and is almost certainly not migratory. This impression is supported by the fact that it has not been recorded in coastal Palestine although this is only 60 km south of permanent Lebanese populations.

13. Pontia daplidice daplidice LINNÉ (Binnenwanderer I)

One wonders whether daplidice, at least in parts of its area of distribution, is not a true migrant with return flights (Saisonwanderer). Its presence on the Arabian Peninsula seems to indicate this. It is probably able to survive permanently on the Lebanese coast (observations in January 1971, 72) but fluctuates so much in numbers that migrations are the main determinant of its abundance. I have observed two major migrations. The first, as quoted from my book (LARSEN, 1974): "Jabal Barouk and near Ain Zhalta, 28.V.1971. Over a front covering at least 4 km and during the four hours my wife and I spent in the locality there was a continuous migration of this species. All were flying single and purposefully about half a metre above the ground in a WNW direction, never pausing to feed. Judging from the direction they may have originated in the Jordan Valley. On an average one individual would pass a 20 m front every minute and with the information given above this indicates a minimum of 50.000 individuals." The second was in 1974, when for more than one week a steady stream of butterflies flew southwards over a broad front between 500 and 1700 m in the mountains. I observed this on 31.VI. and 1.VII. on the road leading from the coast to Faraya. During four to five hours on each occasion one specimen per minute would cross a hundred metres front. The width of the migration path was about 8 km. All specimens flew singly just under one metre above the ground and hardly any paused to feed. The migration was still in progress eight days later. Assuming 8 hours of daily activity for a minimum of 8 days, at least 300.000 individuals must have been involved. SELIM ABOUD (personal communication) observed the same migration at 1000 m near Jezzine, some 50 km further south, on 6.VII. Topographical conditions had narrowed the front and in a narrow, defined valley running north/south 20 to 30 specimens passed a ten metres front every minute for three hours of observation. They were travelling at 1 to 1 1/2 m above the ground. Mr. ABOUD decided to follow the migration and found conditions 20 km further south similar, though less concentrated in density. The following day only half as many specimens were flying and the migration subsequently petered out. In both cases most specimens were quite fresh, significant numbers very small in size. It is notable that the direction of the migration was almost the opposite of that in 1971. The origin may have been the plains between Latakia and Palmyra and the flight provoked by food shortages. In early April 1973 moderate numbers of worn specimens occurred suddenly in and around Beirut.

15. Colotis fausta fausta OLIVIER (Saisonwanderer)

This is the most regular and predictable of all the Lebanese migrants. Small numbers arrive in June each year, giving rise to a succession of large broods from August onwards. By September and October the species is very abundant, though 1973 was a bad year. In November, with the

coming of the winter rains, it dies out entirely, though the mild winter of 1972 produced a small brood in mild-December. Small numbers of the late broods undoubtedly undertake a return migration though this has not been observed. Judging from my observations only moderate numbers actually invade the country in June and July, but the population build-up is extremely rapid and strong. It seems quite probable that fausta cannot survive permanently anywhere in the Middle East, and that it is a permanent nomad with regular migration. It certainly can survive neither a Lebanese winter nor a Saudi Arabian summer. All material I have bred has had a 100% rate of success and its rapid population build-up may be due to the absence of natural enemies which cannot participate in the incessant migration. A co-ordinated study on the movements of Colotis fausta should be a priority in insect migration research.

16. Anaphaeis aurota aurota FABRICIUS (? Saisonwanderer)

Between 1900 and 1940 this species was a regular visitor to Lebanon, often building up enormous populations by October and November when, apparently, all died out though some may have undertaken a form of return migration. There are no records from the last 35 years, and it has definitely not occurred during my stay in Lebanon, nor has it been found in Palestine during this period. The most recent observations in Palestine have been 1962, 1967 and 1969 (NAKAMURA, personal communication). Its closest area of permanent settlement appears to be Africa, and possibly it invades the Middle East from there with the Sinai as a bridge. NAKAMURA does not believe it to be permanently resident in the Sinai. It has been recorded as far north as Malta.

22. Catopsilia florella florella FABRICIUS (Binnenwanderer II)

This well known migrant has been recorded only a few times in Lebanon, and never in recent years. It undoubtedly comes from Egypt, where it is generally common, either directly or via the Sinai. Palestine had an invasion of florella in 1974, appearing in the Sinai in May and establishing itself in Palestine by July after which it was quite frequent through autumn (NAKAMURA, personal communication). This is probably the progeny of relatively few migrants, and they were probably in turn stationary since the butterfly certainly did not turn up in Beirut. It is worthwhile noting that florella was unusually abundant in Cairo in October 1974.

24. Colias crocea crocea GEOFFROY (Binnenwanderer II)

One wonders whether this butterfly could not be categorised as Saisonwanderer in at least parts of its territory. The species may be found on the Lebanese coast all through the year, and throughout the season in the mountains. It fluctuates widely in numbers and migratory movements are frequent. Its ability to survive the Lebanese winter in one or more of its stages has not been studied and is possibly marginal. Indigenous specimens caught very early in the year are often small and pallid, contrasting with the first migrant arrivals, and presumably the result of unsatisfactory

ecological conditions. I know of no definite migration observations, but in a butterfly like crocea it is not easy to discern migrants from residents. However, it is clear that in late March and early April of both 1973 and 74 moderate numbers of worn specimens suddenly occurred in and around Beirut. It is my impression that Lebanon affords suboptimal conditions for crocea and that it may not be tolerant of the wet winters.

25. Colias erate erate ESPER (Binnenwanderer I)

Three specimens have been recorded in the Lebanese mountains, all in 1971. They either represent a small migration or the progeny of a single female migrant. There is no doubt concerning their identity or authenticity (see LARSEN, 1974). These specimens stand in splendid isolation, since erate apparently has never been found in Asiatic Turkey (HIGGINS, 1966). They certainly do not represent an overlooked indigenous colony.

26. Gonepteryx rhamni meridionalis RÖBER (Binnenwanderer I)

This butterfly performs short local migrations within Lebanon, descending from the high mountains in October and November and moving back up in April and May. Specimens may be found on the wing at low altitudes also in December and January. Since it breeds only above 1500 m NN, it must prefer to hibernate at lower levels. Unfortunately rhamni is so rare in Lebanon that sweeping conclusions are not possible. It is clear, however, that a significant part of the single brood flies from the breeding grounds to lower level on both sides of the Lebanon range, and that its sporadic and unpredictable occurrence is linked to these migrations. I have mainly seen migrations uphill from the western slopes in late March, through April and part of May. In all cases, several dozen in all, single specimens travelling purposefully uphill have been observed. I have seen a few descending specimens in October and November, as well as a few flying rather aimlessly about at low levels in December and January. ROUGEOT (1973) saw specimens flying uphill on the eastern slopes. Most specimens appear to hibernate at 500-1200 m NN, but the species has been observed also on the coast. Actual distances involved are short, probably rarely more than 20 km or so, but they lead to areas with very different ecological conditions, with average temperatures 5 degrees more than in the breeding areas. It is probable that hibernation takes place in the breeding areas as well.

27. Gonepteryx farinosa farinosa ZELLER (Binnenwanderer I)

It seems that farinosa shares the habits of rhamni, except that it prefers the eastern slopes to the western and is also found in the Antilebanon. ROUGEOT (1973) has seen it migrating uphill from the Beqaa Valley and I have seen a single specimen travelling almost vertically down the eastern slopes of the Cedar Mountain in October 1971. It is, however, a very scarce species and even its distribution in Lebanon is not well known. Records of a large hatching at Ain Zhalta (HIGGINS, 1964) indicate that it may also travel west occasionally.

31. Danaus chrysippus chrysippus LINNÉ (Binnenwanderer II)

This beautiful butterfly is normally rare in Lebanon, and may even be entirely absent in some years. Occasionally large populations can build up in suitable areas on the coast during the autumn months. Between 1900 and 1940 it was certainly much more frequent than at present, possibly because the chief food plant, semi-cultivated Asclepias curassavica, was more widespread then. The two loci where chrysippus is established closest to Lebanon are Egypt and the Jordan Valley, the latter probably being most important to Lebanon. In May and June the resident population of the Jordan Valley migrates west and north, and with luck large colonies are established along the Lebanese coast. However, except in exceptional years, it seems unlikely that they can survive winter here. In one locality studied in some detail butterflies were still on the wing in early December as well as larvae in various instars, one of which hatched in my house in early January, 1973. On the 15th of January imagines were no longer present, though some larvae could still be found. In mid-February there was no trace of the butterfly in any of its instars, and the locality was not repopulated in 1973 or 1974. In spite of this there may be a tendency towards re-emigration; PÈRE F. TOMB (personal communication) saw a single specimen travelling east on the Jabal Qammoua at 1400 m NN on 20.XI.1974. This is an area where the species could not even survive summer. A possible sighting in the Beqaa Valley near Anjar (T. CAWSTON, personal communication) would fit well with a northward migration from the Jordan Valley.

34. Hypolimnas misippus misippus LINNÉ (? Binnenwanderer II)

Only a dozen or so undated specimens are known from Lebanon, and it has not been seen in recent years. The situation in Palestine is analogous. They are doubtless of Egyptian origin helped across by the spring Khamsin winds. The species could not survive in the area, nor would it be able to perform a return migration. Its presence is probably more accidental than truly migratory.

35. Precis hierta crebrene TRIMEN (? Binnenwanderer II)

A short series was taken in Beirut at the beginning of the century. According to WILTSHIRE (1952) hierta may be considered "somewhat migratory", but its presence in Lebanon is probably accidental. It may even have been introduced with agricultural produce, especially raw cotton from Egypt where it is common in cotton fields.

36. Nymphalis polychloros polychloros LINNÉ (Group IV)

There are only a few records of this butterfly from the area. NICHOLL, CREMONA and others have found it in Bludan in Syrian Antilebanon in the early part of this century, and HIGGINS (personal communication) took one at Bscherre, 1800 m NN in June, 1962. There are obviously no records of migration, but the possibility that the isolated Lebanese records are related to the permanent presence in the Taurus mountains of Turkey may

be entertained. Collecting in Lebanon during 1970 to 1974 has been so intensive that a resident colony is unlikely to have been overlooked.

37. Vanessa atalanta atalanta LINNÉ (Saisonwanderer)

On the whole this species is scarce in Lebanon, and I have not seen more than a hundred in nature. On the coast most records are from early spring (February to May) while it is found in the mountains throughout the season. There are no records of migration, but they probably occur, and there may be fluctuations in population size from year to year with the present situation as a nadir.

38. Vanessa cardui cardui LINNÉ (Saisonwanderer)

This is a butterfly whose migratory habits are as easy to observe as they are difficult to interpret. The most frequent observations are of northwards migrations in March and April, in Palestine as well as Lebanon. BODENHEIMER (1935) describes several such migrations and a detailed description of another one given in my book (LARSEN, 1974) will not be repeated. It is interesting to note that southwards migrations in Palestine have been noted during the same time of the year (BODENHEIMER, 1935). In October and November of 1974 the species was so abundant on the Lebanese coast and in Egypt that I decided to pay special attention to their fate. In the second part of November most specimens had disappeared from Lebanon, and in December investigations for larvae yielded small numbers only on Malva, Althaea and later on the first Carduus, the latter only just recovering from the dessicated state of summer. There were certainly not enough larvae to represent the full breeding of November's hordes of butterflies and one must assume that most have left the country without breeding. In December, January and February no imagines were seen, although special efforts were made to find them. Most larvae reared died in the second to fourth instars for no obvious reason, and the few who successfully pupated did not hatch. Attempts at pupation were often made by undersized larvae. The tentative impression thus is that the species departed almost fully from the country, and that it has difficulties surviving winter if eggs are laid. The mass appearances of cardui in March cannot be due to local hatchings from this brood, and in any case an invasion near Beirut on 10. III. 1973 consisted exclusively of very worn specimens. My field notes show that in 1971 and 1972 only odd specimens were observed in December and February. These data should be seen in relation to observations made in Egypt at the same time. During a visit lasting from 25. X. to 3. XI. 1974, cardui was unbelievably common. Every available flower was covered with butterflies, and on good Lantana hedges dozens could be taken with the sweep of a net. During four previous visits to Cairo at the same time of the year I have seen cardui, but never in quantity, and many Egyptian friends spontaneously commented on the phenomenon. During a further visit covering 20. /29. XII. 1974 only a few worn specimens were still present. Attempts at finding the larvae were fruitless on Malva, and I did not find quantities of Carduus or indeed any



other potential food except artichoke. Examination of a large artichoke field revealed one tent only, obviously made by a mature cardui larva. It is possible that an alternative food, not recognised, is used in Egypt, but this is unimportant as given the climatic conditions and the six weeks elapsed since my last visit one would have expected a fresh brood to be on the wing which it was obviously not. Since they do not winter in Lebanon or Egypt, to where have these hordes of butterflies then gone? The Arabian Peninsula and Africa seem the logical candidates. PÈRE F. TOMB (personal communication) has observed large migrations into Kuwait, and I found cardui in large quantity in and around Khartoum, Sudan in mid-October 1972, when they were not present in quantity in Egypt which I visited at the same time. How clearly defined the breeding areas of cardui are and how it really runs the course of its annual cycle must remain something of an enigma . . . . . Although not related to the situation in Lebanon, it seems appropriate to give some observations from other areas as well. In July, 1969 cardui was common in most of northern Nigeria (Zaria, Kaduna, Kano) although it is not normally frequent. This ties in very well with observations of an invasion into Freetown, Sierra Leone in September and October of the same year (OWEN, 1971). Finally, I observed the species in numbers almost as large as in Cairo near Tetouan, Marocco in mid-June, 1968, where the ground in places was literally carpeted with butterflies, all fresh and possibly posed for northwards migration.

39. Aglais urticae turcica STAUDINGER (Binnenwanderer I)

This butterfly breeds only in and just below the subalpine zone, i. e. down to about 1600 m NN. Some specimens hibernate in the breeding areas, and I have seen specimens on the wing on fine winter days with deep snow in February at more than 2000 m NN. However, others migrate further down the mountain for hibernation, and I have seen it in several places between 900 and 1100 m NN in the Beqaa Valley in April and early May. It certainly does not breed in these localities, and probably reenters the subalpine zone in May.

43. Issoria lathonia lathonia LINNÉ (Binnenwanderer I)

The species fluctuates considerably in numbers and is undoubtedly a migrant, although there are no actual observations. Early and late in the year, in April and November, it may be found down to 1000 m NN in the Beqaa Valley and on the western slopes, while it breeds only above 1500 m NN as far as has been observed. It probably migrates down to hibernate as imago.

57. Pseudochazara telephassa telephassa HÜBNER (Binnenwanderer I)

It is interesting that one of our Satyrinae should be a migrant since this seems rather unusual. I have seen a small but sustained migration of telephassa at Nabi Sbat, 1600 m NN, Antilebanon, 20. V. 1972. All specimens were flying fast about one metre above the ground in a northwestern

direction, maintaining an absolutely straight line despite a difficult topography. During the four hours I stayed in the area I saw more specimens of the species than during my four year of collecting. OSTHELDER & PFEIFFER (1932) observed a large-scale migration of telephassa, lasting three days in early June 1929, at Marasch, Taurus, Turkey. Mass assemblies of telephassa on the coast, where it normally does not occur, such as the one observed by ROSE (personal communication) in June, 1969, may be linked to such migration. The species has been very scarce during my stay in Lebanon in marked contrast to the reports by earlier visitors. Its close relative, P. pelopea is restricted to the high mountains and never migrates.

78. Deudorix livia livia KLUG (Binnenwanderer II)

As far as can be observed livia is unable to survive winter in Lebanon, at least a normal cool and wet winter. The Lebanese population is therefore regularly or irregularly supplemented by migrants from the south. It has been very scarce during the last five years and was definitely more frequent in the 1930ies when ELLISON and WILTSHIRE collected. Possibly the species survives very mild winters and is common in the following year.

79. Lycaena phlaeas timeus CRAMER (Binnenwanderer I)

The name timeus is employed mainly in deference to traditional usage; I wonder whether it is really justified to separate the Syrian population from the nominate phlaeas. I also very much doubt whether this butterfly can be classified as a migrant anywhere. In Lebanon the species is not very common and quite localised. It may be found in the same narrowly constricted locality year after year.

86. Lampides boeticus boeticus LINNÉ (Binnenwanderer II)

Generally abundant throughout the season all over the country. It is probable that it can survive on the coast during winter at least in mild years, but it is probably reinforced by migration from the south. BODENHEIMER (1935) believes this to be the case in Palestine. It colonises the mountains up to 3000 m NN every year very thoroughly, and I doubt if it is possible to find a single bush of Colutea arborescens which does not contain larvae.

88. Syntarucus pirithous pirithous LINNÉ (Binnenwanderer II)

The presence and ecology of pirithous in Lebanon is somewhat enigmatic. In North Africa, Spain and South France the species flies from March onwards in a succession of broods. In Lebanon it flies only on the coast in late autumn till January. Furthermore it fluctuates immensely in quantity. In 1970 it was abundant along the coast and was then nearly or wholly absent for the next three years. In 1974 it became slightly more common again. This seems to indicate that it cannot thrive without reinforcements, and the late date at which it flies suggests it may even die out each year.

It is the most common butterfly in and around Cairo.

89. Azanus jesous gamra LEDERER (Binnenwanderer I)

There are few definite records of this butterfly and as is the case with other tropical butterflies it seems much rarer now than at the time of ELLISON and WILTSHIRE. It is undoubtedly a migrant as it may turn up in unexpected places, but it is possible that it can survive permanently on the coast. Information is too scarce to allow further comments at present.

136. Gegenes nostrodamus nostrodamus FABRICIUS (? Binnenwanderer I)

This species has been reliably recorded a few times on the Lebanese coast. It is well established, but local, in Palestine. It seems likely that migration is involved and that the wetness of the Lebanese winter does not allow for permanent colonisation.

137. Gegenes pumilio pumilio HOFFMANNSEGG (? Binnenwanderer I)

This butterfly is common and widespread on the coast from June onwards, with the autumn broods being by far the largest. It descends the Beqaa Valley from the Syrian desert, and in late autumn may be found to 1400 m NN in the mountains occasionally. It is probably permanently established in Lebanon, but is supplemented by migration from the south and attempts to colonise the mountains in autumn.

138. Pelopidas thrax thrax LEDERER (? Saisonwanderer)

This is a certain migrant, specimens arriving in small quantity from the south in May and June, later building up populations in suitable localities on the coast. It may be locally abundant in good years. It even occasionally pushes up into the mountains (i. e. Laklouk, 1700 m NN, IX. 1970) where it certainly cannot survive. The earliest specimen I have caught (Beirut, 28.IV.1974) was genuinely very worn and caught outside its normal biotope. The male gonads showed a very retarded spermatogenesis; first order metaphases and untransformed spermatogonia abounded. This indicates a delayed sexual maturity geared to allowing for migration. No observations of migration exist, but its regularity of appearance suggests that it could be a genuine migrant with return flight.

139. Borbo borbonica zelleri LEDERER (? Binnenwanderer II)

Very few Lebanese specimens of this butterfly are known, all from the coastal zone. Like G. nostrodamus it is locally common in Egypt, but unlike the latter it is as rare in Palestine as it is in Lebanon. It is not suited to the climate of coastal Syria and the few records are most probably linked to migratory movements of a random nature.

### Discussion

Of the 21 species recorded as migrants by the DFZS (excluding L. phlaeas), 15, or 75 %, are re-found in Lebanon. This compares to the fact that only about 60 of the 250 or so species found in Central Europe, or 25 % of the

total number, are refound. Conversely, 60 of 139 Lebanese species are also found in Europe, while of the 28 Lebanese migrants listed above 15 are refound in Europe, the relative percentages being 43 and 54 % of the totals. This confirms the a priori assumption that migratory species have larger territories than non-migratory species.

Furthermore it is clear that migration plays a much more significant part in the Lebanese entomological fauna than it does in Europe.

The importance of migration to the Lebanese fauna is so high that one in five of the species to a larger or smaller extent are dependent upon it, which is about three times as high as for Europe. This is due to Lebanon's position as the southern outpost of the Palaearctic region where significant penetration of the desert fauna can take place. However, even the 15 species of the DFZS list constitute 11 % of the fauna, indicating that the migratory species of the Palaearctic are, quite naturally, relatively overrepresented. The Levantine zone seems ripe for serious, scientific studies of migration; it is my hope that this provisional set of notes from Lebanon will lead to increasing concern for these aspects, and that further observations will allow for a more comprehensive overview in the future.

## Diskussion

Von den 21 von der DFZS als Wanderfalter erwähnten Rhopaloceren (ausgenommen L. phlaeas) werden 15 (= 75 %) im Libanon angetroffen. Zum Vergleich dazu werden nur etwa 60 (=25 %) von etwa 250 in Europa vorkommenden Rhopaloceren im Libanon vorgefunden. Umgekehrt kommen nur 60 von 139 libanesischen Rhopaloceren auch in Europa vor, während von den 28 für den Libanon aufgeführten wandernden Tagfaltern etwa 15 auch in Europa vorkommen. Die jeweiligen Prozentsätze betragen hierbei 43 % und 54 %. Dies ist eine Bestätigung, daß Wanderfalter größere Areale bewohnen als nichtwandernde Arten. Darüberhinaus wird deutlich, daß in der entomologischen Fauna des Libanons die wandernden Arten eine viel bedeutendere Rolle spielen als in Europa.

Im Libanon zeigt jeder fünfte Tagfalter Wanderverhalten. Das sind dreimal so viele Arten wie in Europa. Dies entspricht jedoch der Lage des Libanons als südlicher Vorposten der Palaearktischen Region, in welche in großem Maße ein Eindringen von Faunenelementen aus der Wüste stattfinden kann. Jedoch sprechen die 15 Arten, die von der DFZS aufgeführt sind und die 11 % der Fauna betragen dafür, daß die Wanderfalter der Palaearktik relativ überrepräsentiert sind. Die Levante-Zone scheint reif für ernsthafte, wissenschaftliche Untersuchungen des Migrationsproblems; ich hoffe, daß diese Ausführungen dazu anregen und künftige Beobachtungen einen umfassenderen Überblick erlauben mögen.

Table 1 Migratory species in relation to the total fauna in Europe, Central Europe and Lebanon

Category	All Europe	Central Europe	Lebanon
Saisonwanderer	2	2	5
Binnenwanderer I	11	11	14
Binnenwanderer II	8	3	9
Total migrants	21 <sup>1)</sup>	16 <sup>1)</sup>	28
Total butterflies	377 <sup>2)</sup>	231 <sup>3)</sup>	139 <sup>4)</sup>
Percent Migrants	6 %	7 %	20 %

Sources: 1) EITSCHBERGER & STEINIGER, 1973. 2) HIGGINS & RILEY, 1970. 3) FORSTER & WOHLFAHRT, 1955. 4) LARSEN, 1974.

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