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The butterflies of the Canary Islands
A survey on their distribution, biology and ecology
(*Lepidoptera : Papilionoidea and Hesperioidea*)

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Résumé

Cette publication traite du statut et de l'origine des 31 espèces de Rhopalocères et de la seule Hespéride qui nous sont connus des îles Canaries ; le tout considéré dans un contexte d'un historique évolutif et de végétation. Un tiers des espèces sont endémiques. Des investigations personnelles dans la plupart des îles, des données communiquées par plusieurs collègues et, l'évaluation de la littérature, les habitats, les stades préimaginaux, les plantes-hôtes sont autant d'aspects constituant la base de ce travail. Des ébauches de cartes de répartition détaillées sont présentées pour la première fois.

Summary

This paper discusses the status and origin of the 32 butterfly species, a third of which are endemics, known from the Canary Islands in the context of the evolutionary history and the vegetation of the islands. On the basis of personal investigations on most of the islands, records by several colleagues and an evaluation of the extensive literature, an account of habitats, early stages and larval food-plants is given and detailed distribution maps are presented for the first time.

Zusammenfassung

Von den Kanarischen Inseln sind 32 Tagfalterarten, darunter ein Drittel Endemiten, bekannt, deren Status und Herkunft in dieser Arbeit im Kontext mit der Entstehungsgeschichte und der Vegetation der Kanaren diskutiert werden. Auf der Grundlage eigener Untersuchungen auf fast allen Inseln, Angaben mehrerer Kollegen und einer Auswertung der umfangreichen Literatur werden die Habitate, Präimaginalstadien und Raupenfutterpflanzen aller Arten behandelt, und ihre Verbreitung wird erstmals in detaillierten Rasterverbreitungskarten vorgestellt.

Resumen

De las Islas Canarias se conocen 32 especies de mariposas diurnas, un tercio de ellas endémicas. En este trabajo se analiza su status y origen en el contexto de la vegetación y la historia de la evolución de las islas. Partiendo de investigaciones proprias realizadas en casi todas las islas, informaciones de colegas y datos recogidos en una amplia bibliografía sobre el tema, se estudian el habitat, las fases previas y las plantas alimenticias de las orugas. Por primera vez se presenta un mapa detallado de la distribución de cada especie en las Islas Canarias.

I. General part

Location and general geography

The archipelago of the Canary Islands is situated off the west coast of Africa between 27°37′ N and 29°30′ N and between 13°17′ W and 18°10′ W. The distance between Fuerteventura and Cap Juby (Morocco) is only about 100 km.

Politically, the Canary Islands belong to Spain where they form two distinct provinces, the western province Santa Cruz de Tenerife with the islands Tenerife (2050 km^2), San Miguel de la Palma (730 km^2), La Gomera (380 km^2), El Hierro (280 km^2) and the eastern province Las Palmas de Gran Canaria which includes Gran Canaria (1530 km^2), Fuerteventura (1720 km^2), Lanzarote (830 km^2) and the islets Lobos, Graciosa, Montaña Clara, Alegranza, Roque del Infierno and Roque del Este (45 km^2 altogether).

Geographically, Gran Canaria is often included within the western islands because of its similar montainous topography, elevations reaching about 1500 up to 3718 m (Teide on Tenerife, is the highest Spanish mountain) on the western Canaries, whereas the hills of the eastern islands of Fuerteventura and Lanzarote rarely exceed 500 m.

The islands are divided from each other by considerable depths of 1000-3000 m ; only the

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strait between Fuerteventura and Lanzarote does not exceed 500 m.

Palaeogeography

All the Canary Islands are probably of volcanic origin, formed during the late Tertiary, some 20 million years ago.

The eastern islands formed first. According to SCHMINCKE (1982), the main phase dates back to the following times :

Island	Age (Mio. years)
Lanzarote	17
Fuerteventura	17
Gran Canaria	14
La Gomera	12
Tenerife	5
El Hierro	2
La Palma	2

Some sediments, especially on the eastern islands, have been refered to much earlier periods, from early Tertiary or even late Cretaceous (MITCHELL-THOMÉ 1976), but these sediments might have emerged from the sea floor more recently, and stratigraphy does not prove an age of more than 20 Mio. years.

Lanzarote, Tenerife and La Palma are still volcanically active. The last eruption was near Fuencaliente on La Palma in 1971.

The exact origin of the Canary Islands is still unsolved. The longheld view that they constitute the rest of an ancient macaronesian continent Atlantis together with Madeira, the Azores and the Capverde Islands is not supported by modern geologists, but opinions differ as to whether the islands are of purely oceanic or partly of continental origin.

Zoologists often prefer the socalled "land-bridge theory" which gives an easier explanation for the colonization of the islands by nonflying animals (*e.g.* EVERS 1959) but geological evidence is more in favour of an oceanic origin. ROTHE & SCHMINCKE (1968) considered the possibility of a continental origin of the eastern Islands, but SCHMINCKE (1976) holds the opinion that there is no proof. Instead, SCHMINCKE (1982) postulates a row of ancient volcanic islets which might have served as "stepping-stones" for the colonization of the Canary Islands by animals.

The most recent, although not up-to-date, comprehensive account of the geology of the Canary Islands is MITCHELL-THOMÉ (1976).

Climate

Due to their oceanic situation, the climate of the Canary Islands is mild with relatively little seasonal variation in temperature.

The monthly means in temperature are between 18°C in January and 24°C in August. At high altitudes like at Izaña (2367 m), on Tenerife, they are between 5°C and 18°C. Frost is rare below 1000 m but occurs regularly above 2000 m in December and January. On Mt Teide, a snow cover can last for more than a month (15 days on the average).

The amount of rainfall is different between and within the islands. Whereas the western islands receive about 420 mm precipitation per year (La Palma 586 mm and Gran Canaria about 325 mm), the eastern islands only receive about 140 mm.

This is due to the position of the islands within the trade-winds zone in which north-eastern winds predominate. At an elevation of about 800-1500 m below the inversion layer (which is found at 1270 m in August but at 1740 m in March, according to CEBALLOS & ORTUÑO (1972)), a dense stratum of strato-cumulus clouds is formed between dry and warm air aloft and cool wet air above the ocean. These clouds accumulate on the north side of the mountains, whereas the southern lee-side remains cloudless. Only Lanzarote and Fuerteventura are not high enough to form barriers for the clouds. Therefore the north sides of the western islands receive much precipitation, especially during the winter months, whereas the south sides and the eastern islands are characterized by drought interrupted only by short winter rains. A more exact description of the climate is given by FERNANDOPULLÉ (1976) and a concise description of the ground- and micro-climate by HÖLLERMANN (1985).

Fig. 1 shows typical climate diagrams for the different climate zones on the islands : the semi-desert climate of the eastern islands and some south coasts of the western ones (*e.g.* Tefia/Fuerteventura, Punta Orchilla/Hierro), the semi-arid suptropical climate of most west and east coasts (*e.g.* Sta.Cruz/Tenerife, Las Palmas de Gran Canaria), the wet subtropical climate of the north coasts (*e.g.* Pto. de la Cruz/Tenerife, Sta. Cruz de la Palma), the Mediterranean climate of the higher northern forest zone (*e.g.* Aguamansa/Tenerife, Buenavista/La Palma) and the dry temperate climate of the high altitudes (Izaña/Tenerife). The climate diagrams can be found in LIETH & WALTER (1967) and WALTER *et al.* (1975). These diagrams do not consider the fog precipitation

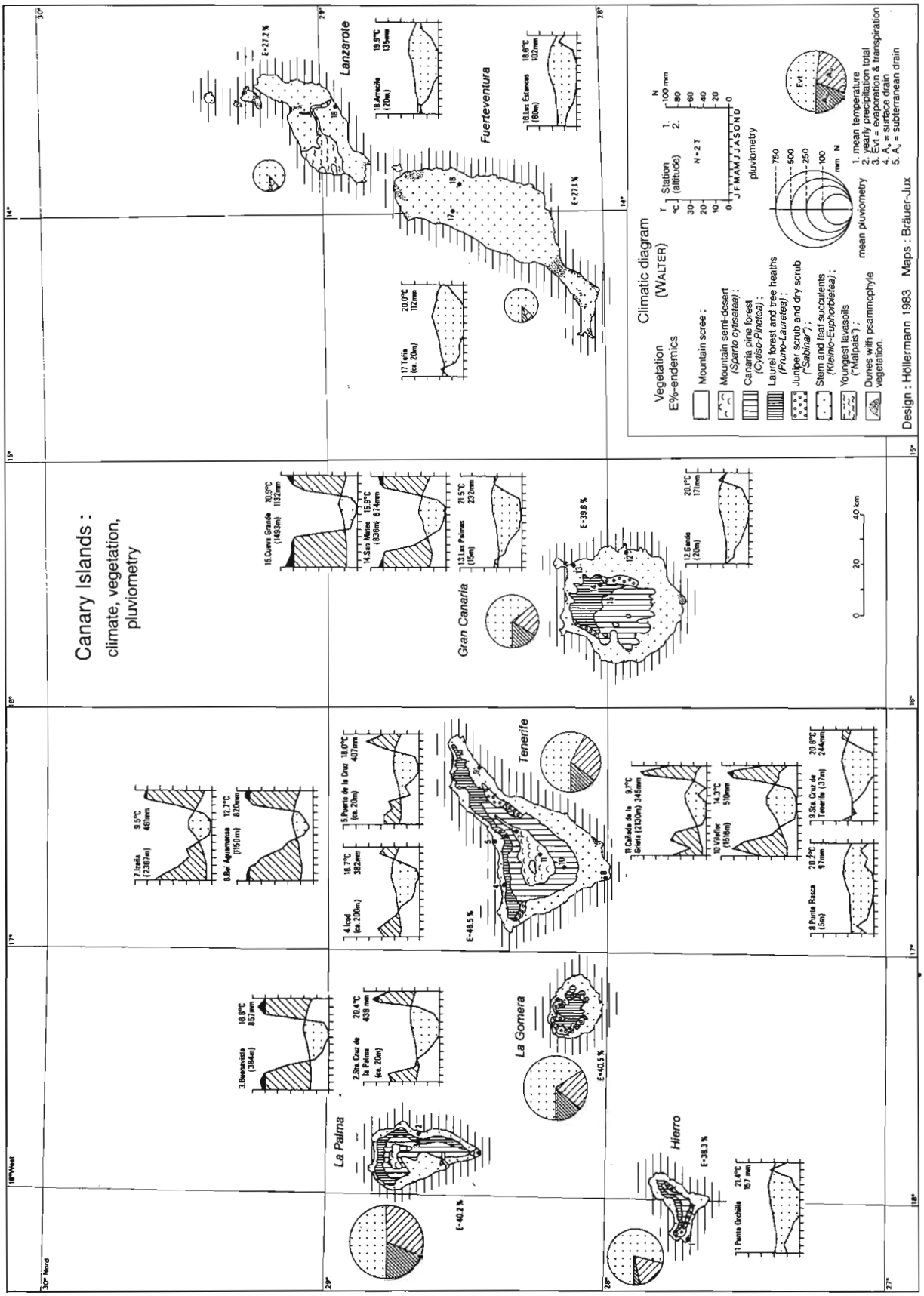


FIG. 1. — Canary Islands : climate, vegetation, pluviometry.

which plays an important role in the forest zone, especially during the period of summer drought.

Flora and vegetation

The Canary Islands are famous for their high endemism : almost half of the 1270 indigenous plants are endemic and often only occur on single islands. Additionally about 680 alien plant species have been introduced.

But for an understanding of the butterflies' ecology the types of vegetation are of special importance. These are as diverse as the climate within the islands, reaching from semi-deserts to jungle-like laurel forests. Most butterfly species of the Canaries are not only restricted to some islands but also to special units of vegetation or they mainly occur there and for that reason the most important vegetational formations are presented.

A good introduction to the flora of the Canary Islands is given by KUNKEL (1992) who includes a concise bibliography. CEBALLOS & ORTUÑO (1976) give good descriptions of the vegetation of the western islands, an up-to-date check-list of vascular plants was published by HANSEN & SUNDING (1985), and HOHENESTER & WELSS (1993) can be recommended for the identification of indigenous plants. OBERDORFER (1965) describes the most important plant-communities of Tenerife and La Gomera.

1. *The subtropical succulent bush*

This complex of succulent plant communities dominates the low levels with little precipitation up to 500 m on the north and 800 m on the south sides of the western islands as well as the higher mountains on Fuerteventura and Lanzarote. Bushy *Euphorbiaceae* dominate, including the candelarum milkweed (*Euphorbia canariensis*), together with *Ceropegia, Allagopappus, Aeonium*-species, *Kleinia neriifolia* etc. *Opuntia* and *Agava*-species introduced from South America have often spread very much at these places too. The famous dragon's tree (*Dracaena drago*), of which only few wild specimens still exist, also belongs to this vegetational unit, as well as the Canary Palm (*Phoenix canariensis*), of which some larger stocks have remained at wet places (e.g. Valle Gran Rey on Gomera).

At the southern tip of Tenerife and in large areas of the eastern islands, the succulent bush gives way to an almost vegetation-free semi-desert, where *Launaea arborescens* (= *Zollikoferia spinosa*) and other spiny shrubs like *Zygophyllum fontanesii, Suaeda*- and *Salsola*- species predominate. Good winter rains can change this picture to a carpet of flowers made up of annuals like *Matthiola parviflora, Echium lancerottense, Mesembryanthemum* spp., *Chrysanthemum coronarium, Reichardia tingitana* and perennials like *Asphodelus tenuifolius, Lotus lancerottensis* or *Kickxia sagittata*. Specialist halophytic plant communities of salt-tolerant plants like *Tamarix* or sedges, can be found at some coasts if they were not destroyed during the development of tourist facilities (like the palm oasis of Maspalomas).

At the upper limit of the xeric basal region, the juniper (*Juniperus phoenicea*) grows on Gomera ("Sabinar"). The numbers of *Juniperus phoenicea* and *J. cedrus* (at higher altitudes) on Gran Canaria, Tenerife and Hierro have been reduced to small areas, so that the "Sabinar" is difficult to recognize as a separate vegetational unit.

Near the coast, succulent bush has often been replaced by urban or tourist developments, which include parks and gardens, where a variety of subtropical and tropical ornamental plants grows. These may sometimes provide substitute habitats for endemic butterfly species and they represent the only habitats of some nonendemic species, including migrants.

2. *The laurel forest*

This impressive and in many respects most important plant formation of the Canary Islands, represents a relic of the late Tertiary. 15-40 million years ago, laurel forests covered a large area around the former Tethys Sea, the present Mediterranean Sea. Whereas the laurel forests in South Europe vanished during the ice-ages because of the colder and drier climate, they disappeared in North Africa because of the spreading of the desert and now survive in the Palaearctic only on the Macaronesian islands — although much impoverished in species-richness.

Unfortunately, the Canary Islands' laurisilva is endangered because of anthropogenic pressures. Initially it covered the northnortheast side of the western islands (including Gran Canaria) which are exposed to the trade winds, from 400 m up to 1400 m (on La Gomera). Some evidence exists for laurel forests on the now desertificated eastern islands in prehistoric times.

An overview of the recent relics of laurisilva is given in MACHADO (1976a). Large laurel forests remain in the Anaga mountains on Tenerife, in the Garajonay National Park on La Gomera and the north-east of La Palma. The relics on the cliffs of the gulf of Hierro and the north side of Tenerife are highly degenerated and Gran Canaria has lost

98-99% of its original laurel forests (KUNKEL 1974).

Characteristic trees of the laurel forest are evergreen *Lauraceae* with *Laurus azorica* (= *Laurus canariensis*) as the most common representative, *Persea indica, Apollonias barbujana* and *Ocotea foetens. Viburnum tinus rigidum* dominates the shrub layer and in wet places fern (especially *Pteridium aquilinum*) and the climbers *Smilax, Convolvulus canariensis* and *Hedera canariensis* are common.

In degraded formations, called Fayal-Brezal, the tree heather (*Erica arborea*) predominates along with *Myrica faya*, which can grow up to 20 m high. Here *Ilex canariensis* and *Phyllis nobla* dominate the shrub layer. Of the many plants growing on sunny clearings, e.g. along forest tracks, only a few endemic plants can be enumerated here, i.e. *Rhamnus glandulosa, Cedronella canariensis, Urtica morifolia* and *Gesnouinia arborea.*

Further degradation of the Fayal-Brezal leads to the Canary dwarf shrub heather (Tomillares) where the tree heather (only growing as a shrub here) is accompanied by different *Genista*-like species of the genera *Adenocarpus, Cytisus, Chamaecytisus, Teline* and *Ulex*. Further typical representatives of this formation are *Dittrichia* (= *Inula*) *viscosa, Cistus, Lavandula-* and *Micromeria*-species.

3. *The pine forest*

The Canary Pine (*Pinus canariensis*), another tertiary relic, forms large stands at elevations between 500 and 2000 m, if these areas are not covered by the laurel forest which is stronger in competition but requires more water. The pine forest can use the fog precipitation efficiently and therefore predominates above 1000 m and on the south side of the western islands up to about 2000 m.

These forests have been heavily exploited. According to SUNDING (1972), the pine forest on Gran Canaria has been reduced to about 20% of its original area, such that larger stands remain only in the north-west (Tamadaba) and the south-west (north of Mogan). On Tenerife the immense loss is being balanced by afforestations during the last 100 years. The pine forests in the south of Hierro and especially the large stands on La Palma still exist in good condition. On La Gomera original pine forests are lacking but unfortunately plantations of the North American *Pinus radiata* have been introduced in the centre of the laurel forest. The herb and shrub layer of pine forests is relatively poor. *Cistus* and *Cytisus*-species predominate, which also colonize areas of destroyed forest.

4. *The mountain semi-desert*

Above 2000 m no forest can persist because of the drought. In the Cañadas around Mt Teide on Tenerife and at the highest altitudes of the Caldera de Taburiente there is a strange plant community made up of globose and often spiny shrubs. The characteristic species are the white-flowering *Spartocytisus supranubium*, the yellow-flowering *Adenocarpus viscosus*, both *Fabaceae*, the violet-flowering *Pterocephalus lasiospermus* and the Crucifer *Descurainia bourgaeana* and *Erysimum scoparium.* (The flowering period of these plants is confined to the spring, only *A. viscosus* and *P. lasiospermus* still flower in summer.) Especially striking are the more than 2 m high candle-like stands of the endemic *Echium wildpretii.*

5. *The alpine-like scree communities*

Above 2600 m, on Mt Teide/Tenerife the endemic violet *Viola cheiranthifolia* represents the only vascular plant and above 3200 m only few blue algae, mosses and lichens persist.

An excellent general map of climatic characteristics and vegetational units of the islands is copied with permission from HÖLLERMANN (1985) (fig. 1).

History of the lepidopterological investigation of the Canary Islands

The Canary Islands have long been a popular destination for European lepidopterists. The first essay on the Lepidoptera of the Canary Islands was that of BORY DE SAINT-VINCENT (1805). It includes a large number of errors discussed in detail by LEESTMANS (1975a).

At the end of the 19th century almost all of the butterfly species were known : CHRIST (1882 and 1889) lists 22 of the 25 species at present known to occur on Tenerife, and the thorough paper by REBEL & ROGENHOFER (1894) treats all Canary Islands' species apart from *Hipparchia tilosi* MANIL and the recent colonists *Catopsilia florella* FABRICIUS and *Azanus ubaldus* CRAMER. During the following years, a first and very reliable comprehensive study of the Canary Island Lepidoptera was compiled by REBEL (1896-1939). Up to the 1960s many short travel lists were published, almost all confined to Tenerife (especially the environs of Puerto de la Cruz formerly called Puerto Orotava) and added little new information. Only STAMM (1963) and GUICHARD (1965 and 1967) explored the smaller islands and were able

to discover new species for these islands. The account of FERNANDEZ (1970) did not offer much more than descriptions of the adult butterflies. (A slightly modified 2nd edition appeared in 1978.) A comprehensive study of the butterflies of Tenerife, especially in respect of the taxonomy is SCHMIDT-KOEHL (1971). The most recent and comprehensive treatise of all Canary Island butterflies is the outstanding work of LEESTMANS (1975a) which puts the accent on biogeographical aspects. The bibliography contains practically all relevant articles until 1973. A quite up-to-date check-list of all Canary Island *Lepidoptera* was published by BACALLADO & PINKER (1982).

Since LEESTMANS (1975a), many articles have been published, especially dealing with the biology and ecology of species and the fauna of the smaller islands, which were previously poorly known. In fact, the number of papers concerned with butterflies of the Canary Islands published during the last 20 years exceeds the number of all papers published prior to 1975. The only more comprehensive work is that of OWEN & SMITH (1993d) which covers all North Atlantic Islands and reveals the origin of their butterfly fauna and its relation to the biogeography of the different islands. For Madeira and the Azores the most recent and detailed survey is MEYER (1993).

Finally, the Canary Islands are included in field guides on the butterflies of Spain (MANLEY & ALLCARD 1970; FERNANDEZ-RUBIO 1991a and 1991b) as well as those of Europe (HIGGINS & RILEY 1970, 1978 and 1983; HIGGINS 1975; HIGGINS & HARGREAVES 1983). These guides provide colour illustrations and descriptions of adults and genitalia of most butterfly species on the Canary Islands, but little information on distribution, phenology, early stages and ecology. Moreover, even this scanty information contains many mistakes. The most recent guide by FERNANDEZ-RUBIO (1991a and 1991b) includes tiny distribution maps for the Canary Islands but unfortunately many are incorrect and often do not coincide with the statements in the text.

We feel that time has come to present another synoptic paper which includes published information which is often inaccessible to most visitors of the Canary Islands, because the papers (about 200) are widely distributed in more than 40 different journals.

The present status of lepidopterology in the Canary Islands

This paper seeks to compile information from all available published material on the butterflies of the Canary Islands, together with a comprehensive bibliography up to 1993. Included are the results of private lepidopterological research trips to Tenerife, La Gomera, La Palma and El Hierro in July/August 1988 and to Fuerteventura and Lanzarote in February/March 1991, during which almost all indigenous species were investigated. The only exceptions are the erratic migrants *Hypolimnas misippus* L., *Vanessa virginiensis* DRURY, *Issoria lathonia* L. and the recently discovered *Azanus ubaldus* CRAMER. On the other hand, one species (*Pieris brassicae* L.) was found in the Canary Islands for the first time (WIEMERS 1992), and on the island of El Hierro two species (*Argynnis pandora* DENIS & SCHIFFERMULLER and *Thymelicus christi* REBEL) were discovered which had not previously been found there (see systematic part).

A number of colleagues who are mentioned at the end of this paper also provided important records and much useful information. Museum material has only occasionally been included. Checks in some local museums (*e.g.* in Bonn, Düsseldorf and Münster) have shown that most material is old and inadequately labelled, only rarely with exact localities (most often only the name of the island is stated). The more reliable collectors have published at least the most important of their records.

The number of published records in the past decades attributed to the different Canary Islands is shown in tab. 1. Whereas most visits to the Canary Islands until the 1960s have been during the winter months, most islands have now been visited throughout the year, the only exception is El Hierro with no records from October to February (tab. 2). Nevertheless the seasonal distribution of records is not even, as it is partly following the holiday seasons, and only a few records exist from the eastern islands for the summer months.

Tab. 3 is an up-to-date check-list of the butterflies of the Canary Islands. I have taken care to include only reliable records, and all records which do not indicate indigenous populations but possibly vagrants or migrants or which might be due to mistakes in identification, have been marked as such.

The flight periods of all taxa are given in the systematic part of the paper, but Tab. 4 shows the months in which a species has actually been reported (the common lack of November records is because of insufficient sampling) together with the number of all known records for each species.

The number of species on the different islands and the similarity of the latter in terms of their

TABLEAU 1. — Distribution of records over time (deadline : 31 Dec. 1993)

	1880	90s	1900	10s	20s	30s	40s	50s	60s	70s	80s	90s	Σ	%
H	5	0	0	0	0	0	0	0	12	1	60	13	91	4.4
P	12	6	0	0	0	2	15	0	32	56	137	54	314	15.0
G	8	3	1	0	0	9	0	0	37	10	85	41	194	9.3
T	54	71	19	1	18	55	76	26	127	375	243	14	1079	51.8
C	4	27	0	0	0	17	0	5	25	85	91	9	263	12.6
F	3	0	0	0	0	0	0	0	5	8	33	30	79	3.8
L	10	0	0	0	0	0	0	0	3	4	21	31	69	3.3
Σ	96	107	20	1	18	83	91	31	241	539	670	192	2089	
%	4.6	5.1	1.0	0.0	0.9	4.0	4.4	1.5	11.5	25.8	32.1	9.2		

TABLEAU 2. — Reported lepidopterological trips (deadline : 31 Dec. 1993)

	J	F	M	A	M	J	J	A	S	O	N	D
El Hierro			X	X		X	X	X	X			
La Palma	X	X	X	X	X	X	X	X	X	X	X	X
La Gomera	X	X	X	X	X	X	X	X	X			X
Tenerife	X	X	X	X	X	X	X	X	X	X	X	X
Gran Canaria	X	X	X	X	X	X	X	X	X	X	X	X
Fuerteventura	X	X	X	X	X	X		X	X	X		X
Lanzarote	X	X	X	X	X			X	X	X		X

butterfly fauna is shown in Tab. 5. The number of species is highest in the more elevated islands with a wetter climate and more diverse habitat, provided they are not too small and remote (like El Hierro). The similarity of their butterfly faunas seems to be highly correlated with their similarity in climate.

A more thorough correlation analysis of the butterfly faunas with biogeographic parameters by OWEN & SMITH (1993d) also indicates that the number of butterfly species on all Macaronesian islands is positively correlated with vegetation diversity and negatively correlated with distance from the nearest continent. (The last point is of less importance for the difference between the Canary Islands.)

For the first time detailed maps are compiled to show the distribution of all butterfly species in the Canary Islands. These were prepared with the help of a computer program (called MAPPING) ; this program allows storage of data records according to their coordinates and the preparation of maps with different symbols (e.g. for variable periods of time).

As coordinate system the UTM grid was choosen for two reasons : first it is a system already used in mapping the distribution of butterflies on the Spanish mainland as well as in other European countries (also employed by the European Invertebrate Survey) and secondly the UTM grid is drawn in Spanish military maps (Mapa Militar 1 : 50000, 1 : 100000, 1 : 200000), which are easily available.

Coordinates were stored with a precision of 1 km², if possible, but in the maps presented in this paper a square size of 5 × 5 km² was chosen for practical reasons. Two different periods have been chosen, a period before and a period after 1975. An open circle indicates one or more records in the first period and a closed circle represents one or more records in the second or in both periods. Semicircles are used to mark doubtful records or records of single vagrants or migrants which probably never established colonies.

The year 1975 was chosen as the turningpoint for two reasons. First this is the date of publication of the synopsis by LEESTMANS (1975a), and secondly it divides the number of records into two sets of approximately equal size.

I stress that these maps are tentative. Many squares have not been checked for butterflies (p. 79), or at least not throughout the season. Additional records would be appreciated to produce a more complete atlas in the future.

Origin and future of the butterfly fauna in the Canary Islands

Of the 32 species recently found in the Canary Islands some of them colonized only during the last 100 years (e.g. *Danaus plexippus* L. about 1887, *Catopsilia florella* FABRICIUS about 1965, *Azanus ubaldus* CRAMER about 1982), at least one species (*Hypolimnas misippus* L.) seems to reach the islands at irregular intervals and another one (*Pieris brassicae* L.) was recorded only once in

TABLEAU 3. — Checklist of the Butterflies of the Canary Islands (deadline : 31 Dec. 1993)

	Species	L	F	C	T	G	P	H	
E	***Pieris cheiranthi*** **(HÜBNER, 1808)**	F		?	X	+	X		95
	Pieris brassicae **(LINNAEUS, 1758)**	M							1
	Pieris rapae **(LINNAEUS, 1758)**	?	X	X	X	X	X	X	176
	Pontia daplidice **(LINNAEUS, 1758)**	?	X	X	X	X	X	X	143
e	***Euchloe belemia*** **(ESPER, 1799)**		X	X	X	?			48
	Euchloe charlonia **(DONZEL, 1842)**	X	X		F	F			34
	Colias crocea **(GEOFFROY, 1785)**	X	X	X	X	X	X	X	128
	Catopsilia florella **(FABRICIUS, 1775)**	X	X	X	X	X	X		69
E	***Gonepteryx cleobule*** **HÜBNER, 1825**		F	F	X	X	X		88
	Danaus plexippus **(LINNAEUS, 1758)**		M	X	X	X	X	X	92
	Danaus chrysippus **(LINNAEUS, 1758)**		X	X	+	X	X		60
	Hypolimnas misippus **(LINNAEUS, 1764)**				M	X	M		5
	Vanessa atalanta **(LINNAEUS, 1758)**	M	M	X	X	X	X	X	82
E*	***Vanessa vulcania*** **(GODART, 1819)**		M	X	X	X	X	X	131
	Vanessa cardui **(LINNAEUS, 1758)**	X	X	X	X	X	X	X	101
	Vanessa virginiensis **(DRURY, 1770)**	F			X	+	+		26
	Argynnis pandora **(DENIS & SCHIFF., 1775)**				X	X	X	X	40
	Issoria lathonia **(LINNAEUS, 1758)**			M	M	M	M		17
E	***Hipparchia wyssii*** **(CHRIST, 1889)**			X	X				24
E	***Hipparchia bacchus*** **(HIGGINS, 1967)**							X	8
E	***Hipparchia gomera*** **(HIGGINS, 1967)**					X			14
E	***Hipparchia tilosi*** **(MANIL, 1984)**						X		6
	Maniola jurtina **(LINNAEUS, 1758)**	M?		X	X	X	X	X	83
E	***Pararge xiphioides*** **STAUDINGER, 1871**			X	X	X	X		127
	Callophrys rubi **(LINNAEUS, 1758)**				M				1
	Lycaena phlaeas **(LINNAEUS, 1761)**	X	?	X	X	X	X	X	129
	Lampides boeticus **(LINNAEUS, 1767)**	?	X	X	X	X	X	X	86
	Azanus ubaldus **(CRAMER, 1782)**			X					2
E	***Cyclyrius webbianus*** **(BRULLÉ, 1839)**			X	X	X	X	+	149
	Zizeeria knysna **(TRIMEN, 1862)**	X	?	X	X	X	X	X	86
	Aricia cramera **(ESCHSCHOLTZ, 1821)**			X	X	X	X	X	73
	Polyommatus icarus **(ROTTEMBURG, 1775)**	X	X	?	X		?		25
E	***Thymelicus christi*** **(REBEL, 1894)**			X	X	X	X	X	63

Explanation :
E = Canarian endemic species.
E* = Macaronesian endemics.
e = Canarian endemic subspecies.
X = confirmed occurrence.
+ = ancient certain occurence, but no recent records.
M = only single immigrant or accidentally imported individuals reported.
? = unconfirmed doubtful records, partly without precise locality data.
F = false records.

1991. The establishment of these species can be explained by the introduction of their food-plants by man in historical times. Some other butterfly species which do not differ from their continental counterparts and almost exclusively occur in man-made habitats (like *Pieris rapae* L. or *Vanessa virginiensis* DRURY) probably also colonized the Canary Islands in historical times. But a third of the total number of butterfly species have evolved into distinct subspecies or species (the level of which often is debated ; Tab. 3) and hence are of much more ancient origin.

Most of the butterfly fauna is of Palaearctic origin (75%), five are Ethiopian (16%), two Nearctic (6%) and one has Oriental affinities (3%).

As already discussed in the chapter on palaeogeography, the Canary Islands are of volcanic origin and most probably have never had contact with each other or with the African continent. Hence the butterflies must have crossed the ocean. This is relatively easy for many of the migrant species. In fact some species have been observed crossing the ocean between the Canary Islands : *Issoria lathonia* L. (FERNANDEZ VIDAL 1986) and *Danaus plexippus* L. (FERNANDEZ VIDAL 1979). Other species are less strong flyers and might have been blown over to the islands from Northwest Africa, the nearest continental source. Although the desert area around Cap Juby would not be expected to constitute a likely source nowadays, the situation was different in prehistoric times. The Sahara desert experienced much wetter periods, e.g. in the Neolithicum (6000 years ago) as well as during the Pleistocene interstadials, whereas during the ice-ages the Sahara seems to have been even drier than today. Previously similar cycles

TABLEAU 4. — Flight period of the imagines (actually reported months) (deadline : 31 Dec. 1993)

Species	J	F	M	A	M	J	J	A	S	O	N	D
Pieris cheiranthi HÜBNER	X	X	X	X	X	X	X	X	X	X		X
ssp. benchoavensis PINKER		X	X	X	X	X	X	X	X	X	X	X
Pieris brassicae L.			X									
Peris rapae L.	X	X	X	X	X	X	X	X	X	X	X	X
Pontia daplidice L.	X	X	X	X	X	X	X	X	X	X	X	X
Euchloe belemia ESPER												
ssp. hesperidum ROTSCHILD	X	X	X	X	X	X						X
ssp. eversi STAMM			X	X	X	X	X	X		X		
Euchloe charlonia DONZEL	X	X	X	X	X					X		X
Colias crocea GEOFFROY	X	X	X	X	X	X	X	X	X	X	X	X
Catopsilia florella FABRICIUS	X	X	X	X	X	X	X	X	X	X	X	X
Gonepteryx cleobule HÜBNER	X	X	X	X	X	X	X	X	X	X	X	X
ssp. eversi REHNELT			X	X	X		X	X	X			X
ssp. palmae STAMM			X	X		X	X	X	X			X
Danaus plexippus L.	X	X	X	X	X	X	X	X	X	X	X	X
Danaus chrysippus L.	X	X	X	X	X	X	X	X	X	X	X	X
Hypolimnas misippus L.										X	X	X
Vanessa atalanta L.	X	X	X	X	X	X	X	X	X	X	X	X
Vanessa vulcania GODART	X	X	X	X	X	X	X	X	X	X	X	X
Vanessa cardui L.	X	X	X	X	X	X	X	X	X	X	X	X
Vanessa virginiensis DRURY	X		X	X	X	X	X	X	X	X		X
Argynnis pandora DENIS & SCHIFF.			X	X	X	X	X	X	X			
Issoria lathonia L.	X			X	X	X	X	X	X	X		
Hipparchia wyssii CHRIST			X	X	X	X	X	X				
Hipparchia bacchus HIGGINS							X	X				
Hipparchia gomera HIGGINS					X		X	X	X			
Hipparchia tilosi MANIL							X	X	X			
Maniola jurtina L.			X	X	X	X	X	X	X			
Pararge xiphioides STAUDINGER	X	X	X	X	X	X	X	X	X	X	X	X
Callophrys rubi L.				X								
Lycaena phlaeas L.	X	X	X	X	X	X	X	X	X	X	X	X
Lampides boeticus L.	X	X	X	X	X	X	X	X	X	X	X	X
Azanus ubaldus CRAMER	X		X									
Cyclyrius webbianus BRULLÉ	X	X	X	X	X	X	X	X	X	X	X	X
Zizeeria knysna TRIMEN	X	X	X	X	X	X	X	X	X	X	X	X
Aricia cramera ESCHSCHOLTZ	X	X	X	X	X	X	X	X	X	X		X
Polyommatus icarus ROTTEMBURG	X	X	X	X	X		X		X	X		X
Thymelicus christi REBEL		X	X	X	X	X	X	X	X			

have probably occurred throughout the upper Miocene (5-11 Mio. years ago), whereas during Pliocene (2-5 Mio. years ago) humid conditions remained stable (SARNTHEIN 1980).

At first sight two mystery cases remain. The first is *Vanessa vulcania* GODART with its Oriental sister species *V. indica* HERBST and a vast distributional gap between the two. This case has already attracted several lepidopterists (LEESTMANS 1978 ; SHAPIRO 1992a/b ; OWEN & SMITH 1993c) and is explained in the following way : there is evidence of warmer and more humid conditions around the former Tethys Sea (the present Mediterranean Sea) during the Pliocene, supporting laurel forests similar to those of the Canary Islands. Since both taxa are vagrants with a strong flight and adapted to laurel forests, their common ancestor could have been able to colonize the present gap in distribution.

Even more intriguing is the second case, *Cyclyrius webbianus* BRULLÉ, whose nearest relative seems to be *Cyclyrius mandersi* DRUCE, an endemic of Mauritius in the Indian Ocean. *C. webbianus* is thought to be a tertiary relic species. This suggests that a close relative must have occurred on the African continent which became extinct during the Pleistocene. At first sight the drastic climatic changes during this period might be thought of having erased the ancestor species on the African continent, whereas the more stable oceanic island climate provided better conditions for survival. But a closer look at the ecology of *Cyclyrius webbianus* questions this assumption. Obviously *C. webbianus* is an ubiquitous species, not bound to a special habitat and common from sea-level up to the high altitudes. (The huge population densities with millions of individuals at several places might also explain the strange fact that, although the species is supposed to be the most ancient Canary Island endemic and without a strong flight, no inter-island variation has been discovered.)

It is difficult to imagine how such a species became extinct throughout the African continent. I propose another explanation : the Canary Blue seems to be a generalist not only in habitat choice but also in a number of other life history parameters, e.g. in contrast to most other *Lycaenidae*, a wide variety of food-plants is utilized, larvae seem to feed on any parts of the food-plant and apparently are not visited by ants. Although some of these features could have arisen in the isolation of the islands due to lack of competition (*C. webbianus* is usually the only *Lycaenidae* in natural habitats), it is not improbable that the generalist behaviour derived from the African ancestor species which was unable to compete with other species of fast-evolving and specializing *Lycaenidae* on the continent.

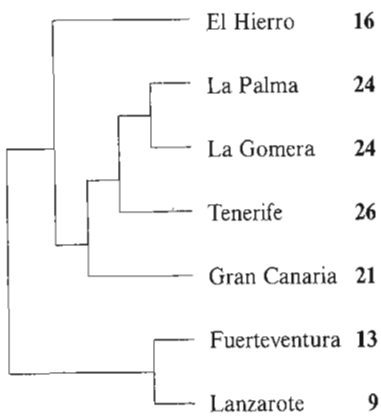
It could be argued that the existence of other species of *Lycaenidae* in the Canary Islands falsifies this assumption. But with one exception, these species utilize very different food-plants or (in the case of *Lampides boeticus*) are specialized on special parts of the plants (the fruits). The only exception is the generalist *Polyommatus icarus* ROTTEMBURG, the most common blue of the Palaearctic region including all of the Mediterranean islands (BERNARDI 1961). Strangely enough, the only colonies of *P.icarus* in the Canary Islands exist on the eastern islands of Lanzarote (known since 1890) and Fuerteventura (known since 1965),

TABLEAU 5. — Similarity in butterfly fauna between islands

Islands	H	P	G	T	C	F	L
El Hierro	**16**	15	15	15	14	8	5
La Palma	*0.75*	**24**	23	22	18	10	6
La Gomera	*0.75*	*0.96*	**24**	23	17	10	6
Tenerife	*0.73*	*0.92*	*0.92*	**26**	20	12	7
Gran Canaria	*0.76*	*0.80*	*0.79*	*0.85*	**21**	11	6
Fuerteventura	*0.55*	*0.54*	*0.54*	*0.62*	*0.65*	**13**	6
Lanzarote	*0.40*	*0.36*	*0.36*	*0.40*	*0.40*	*0.55*	**9**

Values : shared number of butterfly species.
Italics : Sørensen index of similarity.

Cluster phenogram :



where *C. webbianus* is absent. Recently single records have been made in the western islands which demonstrate that the species is able to reach them, but until now it has been unable to colonize them. Is this because of the presence of *C. webbianus* ? It remains to be seen if *P. icarus* will be able to get a foothold on the western islands, facilitated by human distortion of natural habitats, and if there is a negative effect on *C. webbianus*.

The most serious threat to the endemic butterflies of the Canary Islands is habitat destruction. Although no species seems to be actually endangered, the survival of many of them (and *Gonepteryx cleobule* HÜBNER in particular) is tied to the conservation of natural units of vegetation like laurel forest. Fortunately, efforts are made to protect the remains of this forest, but urban and especially tourist developments destroy more and more valuable habitats, especially in coastal districts.

It could be argued that human influence has also created new habitats, thereby increasing diversity. Obviously, a change in species composition is a natural phenomenon and if there are gains to a fauna there are also losses. The problem is the present tempo of change which is much too fast on an evolutionary time scale.

II. Systematic section

This section deals with the distribution, habitats, phenology, early stages and larval food-plants of all butterfly species found on the Canary Islands. Each species is introduced with a list of its most important synonyms as well as with a short account on its general range and taxonomy should this be in dispute. Excluded are a number of doubtful single records from the last century (mostly from BORY DE ST. VINCENT 1805) which have already been discussed by LEESTMANS (1975a) in detail : *Papilio machaon* L., *Aporia crataegi* L., *Belenois calypso* DRURY, *Catopsilia scylla* L., *Phoebis argante* ROBER, *Mylothris chloris* FABRICIUS., *Limenitis reducta* STAUDINGER., *Aglais urticae* L., *Polygonia egea* CRAMER, *Agraulis vanillae* L.

Abbreviations of informants

AB = Andreas BECK, D-Freiburg (La Gomera).
DF = Detlev FEIERABEND, D-Leverkusen (La Gomera).
DG = Dietrich GANTZHORN, D-Wilhelmshaven (La Palma, Gran Canaria).
DO = Dr Denis OWEN, GB-Oxford (Fuerteventura with MW).

GJ = Gerd JENSCH, D-Edemissen (El Hierro, La Palma).
GM = Günter MADER, D-Erlangen (Gran Canaria).
HR = Hans RETZLAFF, D-Bielefeld (Gran Canaria).
LM = Dr Luc MANIL, F-Bures-sur-Yvette (El Hierro, La Palma, La Gomera, Tenerife, Gran Canaria).
MW = Martin WIEMERS, D-Münster (El Hierro, La Palma, La Gomera, Tenerife, Fuerteventura (with DO), Lanzarote).
OL = Otfried LEGLER, D-Butzbach (Gran Canaria).
PN = Paul NEF, CH-Zürich (La Palma).
PO = Dr Pedro OROMÍ, E-La Laguna (La Gomera, Tenerife).
TH = Torsten VAN DER HEYDEN, D-Hamburg (Gran Canaria).
WB = Wolfgang BISCHOFF, D-Bonn (El Hierro, La Palma, La Gomera, Tenerife, Gran Canaria, Fuerteventura, Lanzarote, in coll. ZFMK).
WF = Werner FLACKE, D-Schweitenkirchen (El Hierro, La Palma, Tenerife).

PIERIDAE

***Pieris cheiranthi* (HÜBNER, 1808)**

Synonyms

Papilio brassicae L.
Pieris brassicae cheiranthi HÜBNER

Taxonomy and range

An endemic species closely related to the Palaearctic *Pieris brassicae*. There is still an argument on the specific status of *cheiranthi*. This point will not be discussed here but instead I refer to the papers of GARDINER (1964), KUDRNA (1973) and SCHURIAN (1975). I only want to note that modern enzyme electrophoretic studies carried out by GEIGER (1981) and GEIGER & SCHOLL (1985) supports the specific separation from *P. brassicae*.

PINKER (1968) has described the **ssp. *benchoavensis*** from La Palma, quoted to differ from nominate *cheiranthi* by the disconnection of the large black markings in the female. This character, which is most often found in specimens of small size is not confined to individuals from La Palma (see ROSE 1976) and therefore does not warrant subspecific differentiation. The extent of the black markings in *cheiranthi* is subject to strong individual variation which may be due to microclimatic factors. Nevertheless La Palma specimens seem to differ from their Tenerife counterparts by the extension of the black apical suffusion reaching vein 2 in the forewings and its better-defined zigzag borderline. The few specimens which I have seen from La Gomera are very close to those from La Palma and I suggest that populations of the former island belong to ssp. *benchoavensis* as well.

A review of the variation in *Pieris brassicae* including *P. cheiranthi* and hybrids obtained from crossing experiments between both taxa is given by GARDINER (1979) who postulates that *P. cheiranthi* originates from *brassicae*-stock introduced into the Canary Islands "some time in the sixteenth century after the introduction of Nasturtium from the newly discovered Americas". This opinion, partly based upon the false assumption of a special relationship between *P. cheiranthi* and *Tropaeolum majus*, must be rejected (WIEMERS 1992), because the large differences in adults and early stages could not have arisen in such a short period of time.

Distribution

Confined to the north of Tenerife and La Palma. Formerly also in the north and centre of La Gomera, where it seems to have become extinct during the last 20 years. Despite of extensive searches in recent years no specimens have been found (OROMÍ, *in litt.*). The last published record from La Gomera dates back to 1966 (GUICHARD 1967) and in 1975 the last specimen seems to have been captured (v. unpublished records). The distribution record "Gran Canaria" in HIGGINS & RILEY (1970), accepted also in the German translation by FORSTER (HIGGINS & RILEY 1978) is an error which has been corrected in the updated English edition (HIGGINS & RILEY 1983). Nevertheless I have received information on a possible recent occurrence (introduction ?) of *cheiranthi* on Gran Canaria : Hans RETZLAFF (Bielefeld) told me of his observations of a pupa at Mogan in the end of XII 1975 and several butterflies in the Jardín Canário (at Monte Coello) in the end of XII 1984 which he did not publish due to the statement in HIGGINS & RILEY (1978). Unfortunately he was not able to collect any samples for verification. Additional observations are needed to clarify this matter. A sighting recorded by BALDWIN (1991) from Lanzarote most probably is a misidentification of *Catopsilia florella* or possibly of *Pieris brassicae*.

Single small "aberrant" specimens, which might represent hybrids between *cheiranthi* and *brassicae*, have been found on La Palma (WIEMERS 1992) ; they conform to specimens obtained from crossing experiments (GARDINER, in litt.).

Habitat

The original habitat as described by PINKER (1968) are wet, deeply excavated barrancos in the

laurel forest area at altitudes of 200-1400 m. On the island of La Palma with the highest precipitation in the Canary Islands, wet cliffs in the Caldera de Taburiente (outside the laurel forest) are also inhabited. At first sight the well-known occurrence of *cheiranthi* in La Orotava above Puerto de la Cruz on Tenerife seems to contradict this habitat description, but I subscribe to PINKER's (1968) point of view that this is a secondary habitat with similar microclimate where populations of *cheiranthi* managed to survive after the anthropogenic destruction of the original habitat.

Phenology

The species breeds in a succession of about 7-8 not well-separated generations, so that any stadia can be found at a given locality at any time. Experimental breeding with shortened photoperiod did not produce diapause pupae (SCHURIAN 1975).

Early stages

The early stages of *P. cheiranthi* show marked differences compared to its continental sister species *P. brassicae*.

The yellow egg bears 13-14 longitudinal ribs (17-18 in *P. brassicae*), about 8 of them reaching the micropyle zone where they protrude above the micropyle plate (this is not the case in *P. brassicae*) bearing not more than one aeropyle. The detailed description and SEM-photographs can be found in EITSCHBERGER & WIEMERS (1991).

The ground colour of the caterpillars is a greenish grey, La Palma specimens with a yellow touch, but not whitish-yellow as in *P. brassicae*, so that it contrasts well with the dorsal and lateral yellow stripes. The black markings are more regular and smaller than in *P. brassicae* and the hair is shorter. The most distinctive difference can be seen in the head capsule : *P. brassicae* bears a broad black band around the yellow triangular front and this band is almost absent in *P. cheiranthi*.

The pupa has reduced markings and long lateral spines in comparison with Central European brassicae, but south Mediterranean *brassicae* show similar characters.

Larval food-plants

Until recently *Tropaeolum majus* (= "Nasturtium") was said to be the only food-plant of *P. cheiranthi*. This was derived from observations at La Orotava. This non-native plant, an introduction from South America, has become widely distributed on all the Canary Islands, contains mustard oil glycosides like the cruciferous plants (*Brassicaceae*) and is therefore also fed upon by *Pieris brassicae* and *Pieris rapae* in Europe. The oligophagy of *cheiranthi* has been shown in several feeding experiments by SCHURIAN (1975), KÜHNERT (1977), GOLTZ (1978) and VALLETTA (1978). GARDINER (1978) even fed the caterpillars successfully with artificial diet. ALLCARD & VALLETTA (1984) were the first to discover an original food plant. They found larvae on *Crambe strigosa*, an endemic *Brassicaceae* confined to wet rocks inside the laurel forest. This plant offers sufficient large leaves to give enough food for a colony of caterpillars. According to my observations on La Palma the size of an egg batch varies between 5 and 50 eggs depending on the size of the plant. An exceptionally large batch was found on a cabbage plant (*Brassica oleracea*) in a small garden inside the laurel forest which confirms the observations of ALLCARD & VALLETTA (1984) that eggs are also laid on this cultivated plant if the microclimate fits, which is normally not the case in cabbage fields. (Economic damage in cabbage cultivations by *P. cheiranthi* has never been reported.)

Unpublished records

La Palma : Bco. del Agua (300-700 m) — Adults as well as eggs and larvae on *Crambe strigosa* (at Los Tilos) and *Brassica oleracea* (in a small garden under high chestnut trees), Bco. de la Galga (400-800 m), San Isidro, Cumbre Nueva (1000 m), Caldera de Taburiente : Bco. de las Angustias : Roque de la Mocana (500 m), Sta. Cruz : Bco. de la Rio de las Nieves (500 m), 31.VII.-4.VIII.88 (MW) ; Bco. de San Juan / Los Sauces, 24.VI.89 (WB) ; Bco. de Jieque (near Tijarafe, 600 m), Mña. de la Venta (1320 m), Pto. de Tazacorte, 6.-18.IV.93 (GJ) ; La Laguna (200 m), 1.XI.93 (PN) ; Los Tilos and Fuencaliente, 26.XII.81 (LM) ;

La Gomera : Hermigua, 3.VIII.74, 1 ♀ F. García Talavera *leg.* (PO) ; El Cedro, 5.VII.75, 1 ♂ M. Morales *leg.* (PO) ;

Tenerife : Pto. Cruz, 15.19.XII.81 and 15.VII.83, Icod Alto, 18.-19.VII.83 (LM) ;

Gran Canaria : v. Distribution (HR).

***Pieris brassicae brassicae* (LINNAEUS, 1758)**

Taxonomy and range

Palaearctic sister species of *P. cheiranthi* and well-known migrant with a vast range from North Africa to the Himalayas.

Distribution

The capture of one female on Lanzarote on 3.III.91 (WIEMERS 1992) constitutes the first record of this species for the Canary Islands, although BALDWIN (1991) might already have observed a specimen in April 1988 (reported as a male of *cheiranthi*, but most probably a misidentification of *Catopsilia florella*).

Habitat

The female caught was flying in open country along a hillside of the Mña. Blanca. At the time these were covered by dense flowering meadows of annuals. In the village of Tias, 2 km away, cabbage is grown in many small plantations, which the caterpillars could have fed upon, but a search for larvae was not successful.

Larval food-plants

Unknown, but *Brassica oleracea* would be the most probable food-plant because native *Brassicaceae* on Lanzarote have small leaves which could not support a colony of larvae.

Unpublished records

None.

***Pieris rapae* (LINNAEUS, 1758)**

Synonyms

Artogeia rapae L.

Taxonomy and range

This well-known pest on cabbage is distributed throughout the Palaearctic region and has been introduced to North America and Australia.

Distribution

Widely distributed on all islands, but rare on Fuerteventura and Lanzarote. For this last island there is only one record by GUICHARD (1967) without information on locality.

Habitat

Cultivated open country at low to moderate altitudes is prefered where it can be by far the dominant butterfly species, but *P. rapae* can be found at most places, even in the Cañadas on Tenerife (especially at the service stations) and single adults have been observed as high as 3000 m on Mt Teide (REGTEREN ALTENA 1948).

Phenology

Throughout the year in several generations. At low elevations population densities rise to high levels in winter and decrease during the period of summer drought (ARANGUREN & BAEZ 1984). At high altitudes the species is observed almost exclusively during the summer months.

Early stages

The early stages do not differ from European populations.

Larval food-plants

Caterpillars have been found on *Brassica oleracea, Tropaeolum majus, Reseda* and even on *Atriplex* by RETZLAFF (1986).

Unpublished records

El Hierro : Valverde (600 m), Frontera (300-1300 m), 26.-29.VII.88 (MW) ; Asanaque, Taibique, 18.III.-2.IV.91 (GJ) ; San Andres, Jinama, Frontera, 16.-17.VII.83 (LM) ;

La Palma : Sta. Cruz : ♀♀ egg-laying on *Tropaeolum majus*, San Isidro : Cumbre Nueva (1000 m), Los Llanos de Aridane (350 m) — also larvae on *Brassica oleracea*, Bco. del Agua (200-700 m), Bco. de la Galga (400-800 m), 30.VII.-3.VIII.88 (MW) ; Los Codesos (1200 m), Bco. de Jieque (600 m), Tamano (1200 m), Mña. de la Venta (1320 m), 1.-18.IV.93 (GJ) ; La Laguna (250 m) : larvae and pupae on *Brassica oleracea*, 25.X.93 (PN) ; Fuencaliente, Los Sauces, 26.XII.81, Los Tilos, 24.-26.VII.83 (LM) ;

La Gomera : Valle Gran Rey : La Calera and Bco. de Arure (100-200 m), Las Hayas : Mt. Quemado (700-1200 m), 19.-21.VII.88 (MW) ; Valle Gran Rey : Vueltas and Bco. de Arure, Las Hayas, Mt. Garajonay, El Cedro, Hermigua and Vallehermoso, 8.-18.III.93 (AB) ; Las Rosas, Chipude, Agulo, 10.-22.VII.83 (LM) ;

Tenerife : Puerto de la Cruz, Las Cañadas : El Portillo and Los Roques (2000-2300 m), 5.-6.VIII.88 (MW) ; Chinobre / Anaga, 2.IV.85 (WB) ; Pto. Cruz, Orotava (1300 m), Las Mercedes, Sta. Cruz, Candelaria, Güimar, Las Calletillas, Las Galletas, Los Christianos, Gigantes, 12.-25.XII.81, Pto. Cruz, Icod Alto, Aguamansa, Mña. Roja (1800 m), Las Cañadas (2300 m), Vilaflor, Las Mercedes, Güimar, 13.-19.VII.83 (LM) ;

Gran Canaria : Maspalomas, III.80 (OL) ; Pto. Rico, Sta. Lucia, Cruz Tejeda, Fontanales,

Firgas, Tafira, Pozo Nieves, 7.-12.VII.83 (LM) ;

Fuerteventura : Betancuria, Vega de Rio Palmas, 300-400 m, 23.-24.II.91 (DO and MW).

***Pontia daplidice* (Linnaeus, 1758)**

Synonyms

Papilio daplidicae L.
Pieris daplidice L.

Taxonomy and range

This Palaearctic (but predominantly Holomediterranean) species has been split into two distinct taxa by means of electrophoresis (Geiger & Scholl 1982). The populations of the Canary Islands, of which samples have also been investigated, belong to the western Atlantomediterranean taxon which retains the name *daplidice* L. (Wagener 1988) and inhabits North Africa and Southwest Europe to Liguria.

Distribution

Widely distributed on all islands but there is only one record for Lanzarote (Guichard 1967) without exact data on locality.

Habitat

As adults can be observed everywhere, but the population size is highest in arid zones (semi-desert, succulent bush, sparse pine-wood).

Phenology

Throughout the year in several generations.

Early stages

Not described from the Canary Islands, but probably indistinguishable from European specimens.

Larval food-plants

Owen (1988) found the caterpillars on El Hierro on an undetermined *Reseda-species*. According to Hansen & Sunding (1985) *Reseda luteola* is the only species of the genus known to occur on La Gomera. Fernandez (1978) found them in the Cañadas on "*Sisymbrium*" (*Descurainia*).

Unpublished records

El Hierro : Valverde, Frontera (300 m), 26.-28. VII.88 (MW) ; Las Montañetas, 18.VIII.86 (WB) ; Asanaque, Taibique, 29.III.-2.IV.91 (GJ) ; San Andres, Jinama, Frontera, 16.-17.VII.83 (LM) ;

La Palma : Sta. Cruz : Quintero and Bco. de la Rio de las Nieves (200-300 m), Caldera de Taburiente : Bco. Angustias (200-400 m), 2.-4.VIII.88 (MW) ; Los Codesos (1200 m), Bco. de Jieque (600 m), 1.-18.IV.93 (GJ) ; Los Tilos, 24.-26.VII.83 (LM) ;

La Gomera : Valle Gran Rey : Bco. de Arure (200-400 m), 20.-24.VII.88 (MW) ; Hermigua, 5.VIII.86 (WB) ; Valle Gran Rey : Vueltas and Bco. de Arure, Las Hayas, El Cedro and Vallehermoso, 8.-13.III.93 (AB) ; Chipude, 21.VII.83 (LM) ;

Tenerife : Mña. Roja between El Portillo (2000 m) and La Caldera (1200 m), 7.VIII.88 (MW) ; Ladera de Güimar, Bajamar 7.-12.IV.85 (WB) ; Candelaria, Güimar, Las Caletillas, 18.-25.XII.81, Pto. Cruz, Icod Alto, Aguamansa, Mña. Roja (1800 m), Las Cañadas (2300 m), Vilaflor, Güimar, 13.-19.VII.83 (LM) ;

Gran Canaria : Arinaga, 25.III.85 (WB) ; Sta. Lucia, Cruz Tejeda, Fontanales, Tafira, Pozo Nieves, 7.-11.VII.83 (LM) ;

Fuerteventura : Betancuria, Vega de Rio Palmas, 300-400 m, 23.-26.II.91 (DO and MW).

***Euchloe belemia* (Esper, 1799)**

Synonyms

Anthocharis belemia Esper

Taxonomy and range

Atlanto- and Pontomediterranean species.

Fig. 1-6 : *Pieris cheiranthi* :

1 : egg batch, shortly before batching : Barranco del Agua, Los Tilos, La Palma, 31.VII.1988 ;
2 : caterpillar : idem ;
3 : pupae : Puerto de la Cruz, Tenerife ;
4 : adult female, same data ;
5 : host-plant, *Crambe strigosa* wiht frass : Barranco del Agua, Los Tilos, La Palma, 31.VII.1988 ;
6 : typical habitat : Barranco de la Galga, La Palma, same data.

Fig. 7-11 : *Gonepteryx cleobule* :

7 : caterpillar : Barranco del Agua, Los Tilos, La Palma ;
8 : pupa, idem ;
9 : adult male, idem ;
10 : holotype of *Gonepteryx "cleopatra" rosei* (K. Rose, *leg.*), Las Mercedes, Tenerife, 2.-8.X.1972 ;
11 : habitat of *G. cleobule* : Roque de Agando, Gomera, with a view on Mt Teide, Tenerife : 23.VII.1988.

(Photos : M. Wiemers).

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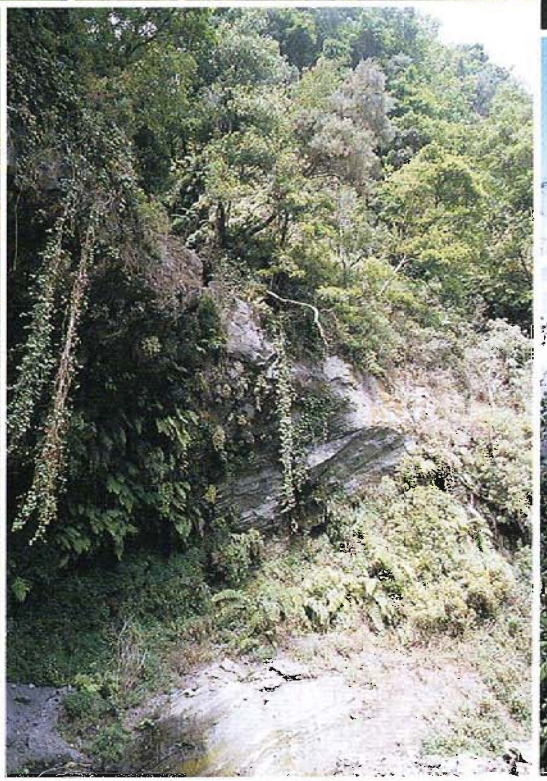

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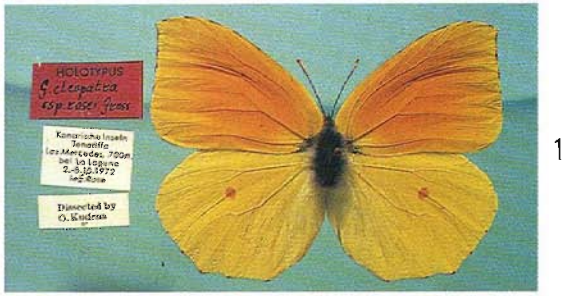

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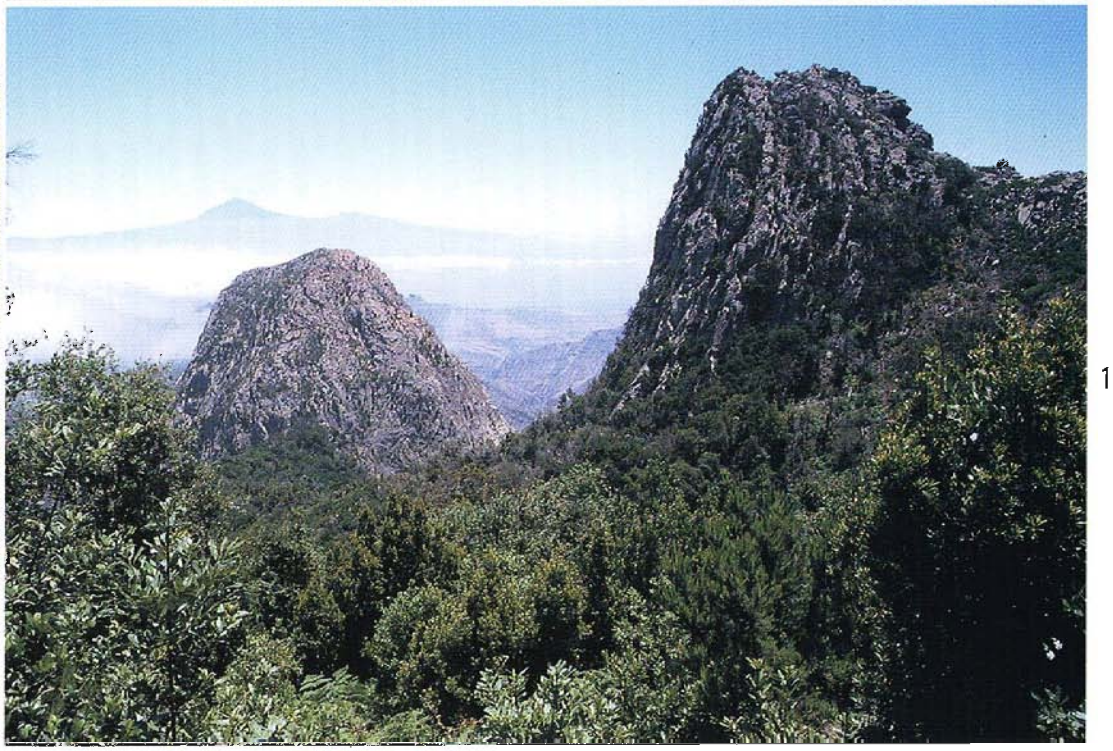


11

Distribution

The **ssp. *hesperidum*** ROTHSCHILD, 1913, described from Fuerteventura, where it is local, is also widely distributed in the northern part of Gran Canaria (detailed information : FERNANDEZ VIDAL (1982)). There is also a doubtful record from La Gomera (sightings of several specimens near San Sebastian) by GORIUP (1976).

On Tenerife, *E. belemia* had not been found until STAMM (1963) discovered a population in the Cañadas and described it as **ssp. *eversi*** (with whitish underside of the apex, not yellowish as in ssp. *hesperidum*). Single specimens have also been found at Güimar and at the southern tip of the island at El Roque.

FERNANDEZ-RUBIO (1985) states that ssp. *eversi* is the only subspecies of *E. belemia* with a continuous white band in the blackish apex (ups. fw.) and along with its different ecology might be viewed as a species "*in statu nascendi*".

Habitat

On Tenerife, *E. belemia* colonizes the semi-desert of the Cañadas and adjacent sparse pine-woods in altitudes of 1800-2300 m, whereas on Gran Canaria, it is most common in middle heights of 200-1000 m (only rarely up to the summits) flying in uncultivated places with *Sisymbrium* (FERNANDEZ VIDAL 1982). On Fuerteventura, OWEN & WIEMERS (1992) found them only on damp meadows and fallow land (especially ruderal *Sisymbrium* plant associations on wet loamy soils).

Phenology

Two generations, on Tenerife found from 22.III.-4.VI., on Gran Canaria and Fuerteventura from 25.XII.-6.V. GUICHARD (1967) found a fresh specimen on the 22.VI. Fully-grown caterpillars, found by me on the 26.II.91, produced one adult of the second generation which emerged on the 11.III.91 from a green pupa, whereas the other (brown) pupae entered diapause (until winter 93/94).

Early stages

The fully grown caterpillar is green with a pink dorsal and lateral lines, the latter closely connected to white lines underneath. The head is pink, too.

The pupa, which may be green or brownish with brown lateral stripes (s. phenology), has a long-drawn-out head like *Anthocharis cardamines* L.

Larval food-plants

In the Cañadas, caterpillars have been found on the local endemic *Descurainia bourgeana* (S. OEHMIG, pers. comm.). Larval food-plants have not been recorded from Gran Canaria but on Fuerteventura fully-grown caterpillars have been found feeding on the fruits of *Carrichtera annua* and *Sisymbrium erysimoides* by myself (OWEN & WIEMERS 1992), both south Mediterranean *Brassicaceae* with extensive distribution in the Canary Islands.

Unpublished records

Fuerteventura : Tetir, La Matilla, La Oliva, Tindaya, Betancuria, Vega de Rio Palmas — at the last two places also fully grown larvae on *Carrichtera annua* and *Sisymbrium erysimoides*, 200-400 m, 20.-26.II.91 (DO and MW).

***Euchloe charlonia charlonia* (DONZEL, 1842)**

Synonyms

Anthocharis levaillantii LUCAS
Anthocharis charlonia DONZEL
Elphinstonia charlonia DONZEL

Taxonomy and range

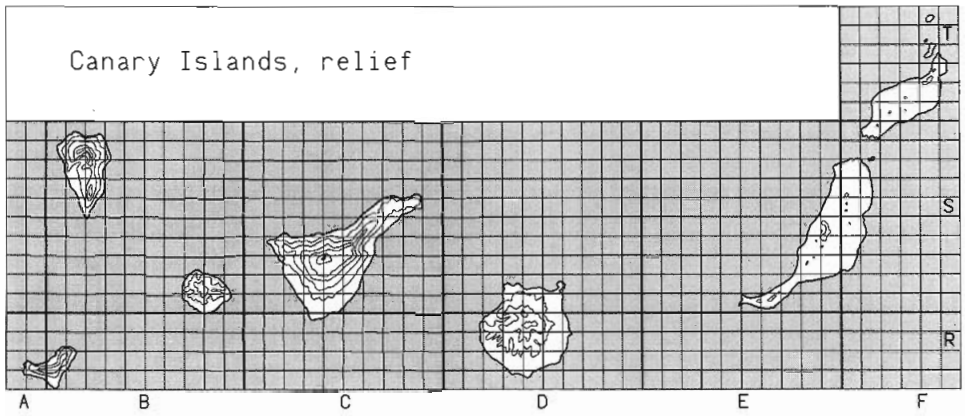
The taxonomy of the subgenus *Elphinstonia* KLOTS is discussed in BACK & EITSCHBERGER (1976) and LEESTMANS & BACK (1992). The Southmediterranean *E. charlonia* is distributed throughout Northwest Africa to the Arab peninsula, with relic populations in the Sahara (Tibesti and Hoggar). Recently restricted colonies were discovered in Spain near Baza/Granada in Andalusia (FABIANO 1993) and near Fraga/Huesca in Aragon (PEREZ DE-GREGORIO *et al.* 1992).

Distribution

Restricted to Fuerteventura and Lanzarote including Graciosa (BALDWIN 1991), but widely distributed on these islands. The only record from Tenerife (Orotava) by HOLT-WHITE (1894) was already denoted false by REBEL (1896) for good reason. Nonetheless this record has been accepted by many later authors, even by HIGGINS & RILEY (1983). The only record from La Gomera by GORIUP (1976), a sighting near San Sebastian, probably is a misidentification.

Habitat

Semi-deserts of Fuerteventura and Lanzarote at places richer in vegetation ; loamy soils with dense stands of the food-plant are especially favoured.


Canary Islands, relief
T
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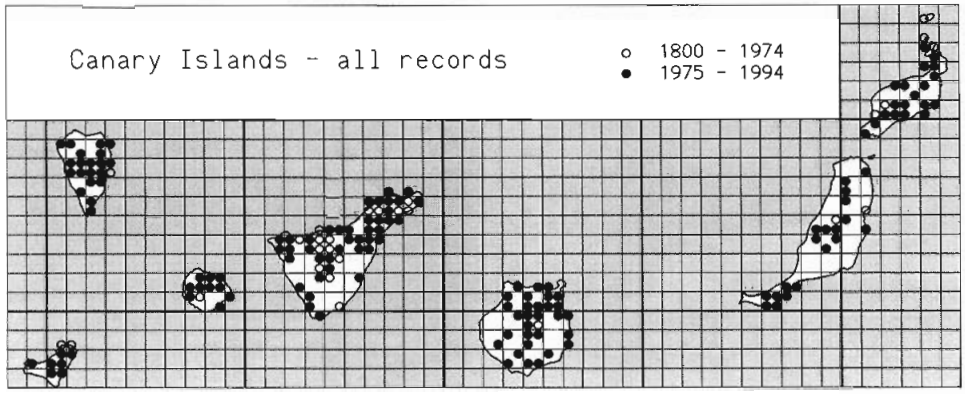
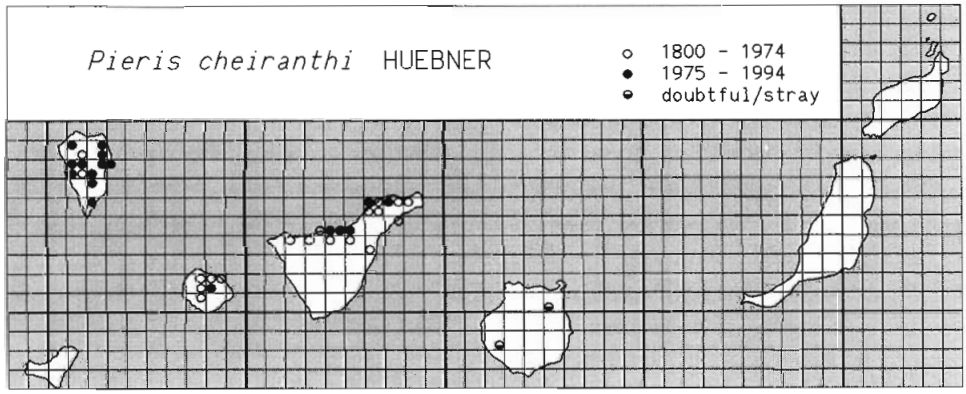
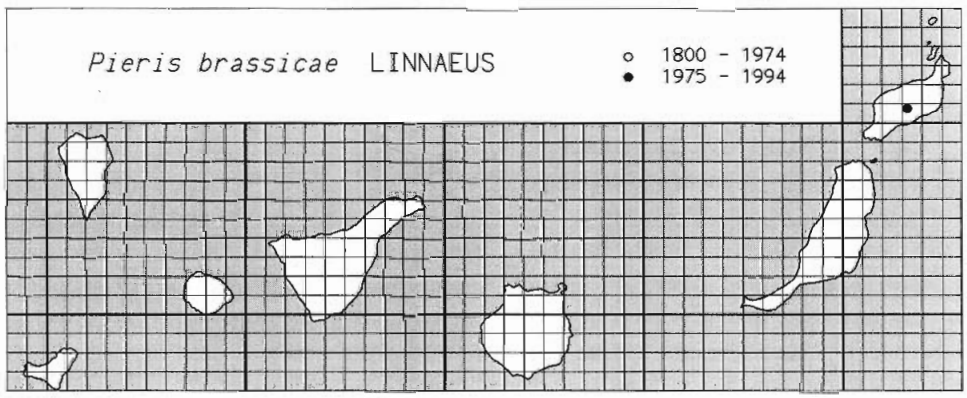
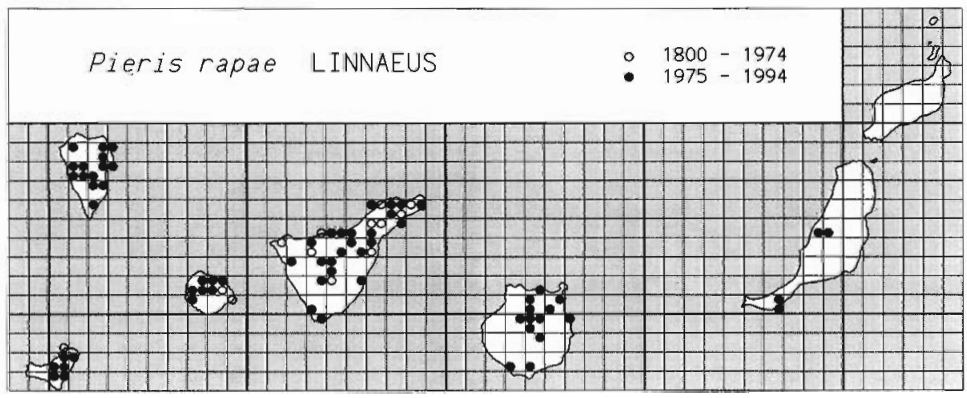

Canary Islands - all records
1800 - 1974
1975 - 1994


Pieris cheiranthi HUEBNER
1800 - 1974
1975 - 1994
doubtful/stray


Pieris brassicae LINNAEUS
1800 - 1974
1975 - 1994


Pieris rapae LINNAEUS
1800 - 1974
1975 - 1994

The highest population densities could be observed at Vega de Rio Palmas on fallow land with an estimate of more than 100 individuals (OWEN & WIEMERS 1992).

Eggs are most often deposited on plants at the border of small ruptures.

Phenology

At least two generations appear in XII-V, dependent on the beginning of the winter rains. An early individual has been recorded on 14.X. (REBEL & ROGENHOFER 1894).

From the pupae, obtained from larvae found by myself on the 26.II. at Betancuria/Fuerteventura, two butterflies of the second generation emerged on the 6. and 8.III., the other pupae have entered diapause.

Early stages

The egg, which is figured in LEESTMANS & BACK (1992), bears about 18 longitudinal ribs which protrude from a six-leaved inner and nine-leaved outer micropyle rosette and which is connected by more than 20 transverse ribs.

The caterpillars are uniform green with a white lateral stripe, which can be almost absent in some cases. The chrysalis is light brown or green (in subitan pupae) with a brown dorsal stripe ; whereas diapause pupae possess a well pointed head, it is only slightly pointed in subitan pupae (OWEN & WIEMERS 1992, figured in LEESTMANS & BACK 1992). The larvae and pupae of related taxa are described and figured in BACK (1982) and LEESTMANS & BACK (1992).

Larval food-plant

According to MYLIUS-JOR (1986a, 1986b and 1987) the caterpillars feed on *Kickxia sagittata* (syn. *K. heterophylla*), a yellow-blossomed creeper of the *Scrophulariaceae* family, which is especially common in the lava semi-deserts of Fuerteventura and Lanzarote. This is quite a strange observation taking into account that this plant family is otherwise unknown to contain hostplants for *E. charlonia* and related taxa. All other food-plant records for this species belong to the *Brassicaceae* or *Resedaceae* family, *e.g. Moricandia arvensis* in Morocco (RUNGS 1981) and *Lonchophora capiomontana* and *Cleome arabica* in Algeria (BACK & EITSCHBERGER 1976 ; SPEIDEL & HASSLER 1989).

OWEN & WIEMERS (1992) detected *Carrichtera annua* as a new food-plant of the species. On Fuerteventura, I was able to observe females laying single eggs on the underside of leaves of this plant, a south Mediterranean *Brassicaceae*, and further searches revealed a large number of eggs as well as several larvae in different stages. Larvae were observed to feed primarily on the linear leaves and flowers. Although several other species of *Brassicaceae* were common in the neighbourhood, no eggs or larvae could be found.

Kickxia was absent at most flight-places of *E. charlonia* (with exception of Las Casitas de Femés on Lanzarote, e.g.) and eggs or caterpillars were not found on this plant despite extensive searches. On the contrary, *Carrichtera annua* was present in all habitats of *E. charlonia*. Collected larvae refused to feed on *Kickxia* whereas *Sisymbrium* was readily accepted by them. OWEN (1988) and BACK (1991) observed egg-laying on *Reseda lancerotae* (syn. *R. crystallina*) on Lanzarote, but DENIS OWEN and I did not find this plant on our visit to Fuerteventura.

Unpublished records

Fuerteventura : Castillo de Fuste, La Corte/Valles de Ortega, Los Lavaderos, La Oliva, Betancuria, Vega de Rio Palmas — at the two latter localities also eggs, larvae and females laying eggs on *Carrichtera annua*, 0-400 m, 21.-25.II.91 (DO and MW) ;

Lanzarote : Uga, Tabayesco, Mña. Blanca, Tegoyo, La Vegueta/Mácher, Femés, Las Casitas de Femés, Masión, 100-400 m, 28.II.-3.III.91 (MW).

***Colias crocea* (GEOFFROY, 1785)**

Synonyms

Papilio aedusa FABRICIUS
Colias edusa FABRICIUS
Colias croceus FOURCROY

Taxonomy and range

Holomediterranen species with great migratory potential, often reaching England and even South Scandinavia. The female-limited colour form *helice* is found frequently throughout the Canary Islands.

Distribution :

Widely distributed on all islands.

Habitat

This migrant species can be found in any biotope and has been even found on Mt Teide at 3200 m by REBEL & ROGENHOFER (1894). Populations can sometimes reach high densities, especially in arid areas.

Phenology

Throughout the year in several generations.

Early stages

Not described for the Canary Islands but probably indistinguishable from Mediterranean populations.

Larval food-plants

Not recorded for the Canary Islands, presumably several small *Fabaceae* like *Trifolium* or *Lotus*.

Unpublished records

El Hierro : Frontera (300 m), 29.VII.88 (MW) ; Asanaque, Taibique, 29.III.-2.IV.91 (GJ) ; San Andres, Jinama, Frontera, 16.-17.VII.83 (LM) ;

La Palma : Sta. Cruz : Quintero (200 m), San Isidro : Cumbre Nueva (1000 m), Bco. de las Angustias (200-500 m), Bco. del Agua (200-500 m), Bco. de la Galga (400-800 m), 31.VII.-4.VIII.88 (MW) ; Monte de Luna, 19.VIII.86 (WB) ; Los Codesos (1200 m), Bco. de Jieque (600 m), Mña de la Venta (1320 m), 1.-18.IV.93 (GJ) ; Caldera de Taburiente : Dos Aguas (400 m), 4.XI.93 (PN) ; Fuencaliente, Los Sauces, 26.XII.81, Los Tilos, 24.-26.VII.83 (LM) ;

La Gomera : Valle Gran Rey : Bco. de Arure (200 m), Mt. Garajonay (1200 m), 23.-24. VII.88 (MW) ; Bco. de Arure, El Cedro and Vallehermoso, 11.-13.III.93 (AB) ;

Tenerife : Las Cañadas (2000-2300 m), Mña. Roja (1800 m), 6.-7.VIII.88 (MW) ; Benijo / Anaga, Ladera de Güimar, 4.-7.IV.85 (WB) ; Candelaria, Güimar, Las Caletillas, 18.-25. XII.81, Las Mercedes, Pto. Cruz, Aguamansa, 13.-15.VII.83 (LM) ;

Fuerteventura : Betancuria (400 m), 23.-26.II.91 (DO and MW) ; La Oliva, 26.-27.III.85 (WB) ;

Lanzarote : Tabayesco, Hária, 100-300 m, 1.-2. III.1 (MW).

***Catopsilia florella* (Fabricius, 1775)**

Taxonomy and range

Afro- and Palaeotropical element and well-known migrant (Larsen 1992 ; Samraoui 1993), not known from Europe or Northwest Africa.

Distribution

This species colonized the Canary Islands only during the last three decades. The first well-documented records date back to 1965 for Tenerife and 1966 for Gran Canaria (Pinker 1968 and Guichard 1967) but single individuals of the African migrant probably reached the Canary Islands even earlier. (In the coll. René Oberthür and Max Cretschmar in ZFMK Bonn there are specimens labeled "Tenerife" (unfortunately without any more precise data) which must have been captured before 1965 (R. Oberthür died in 1944, M. Cretschmar in 1961). Meanwhile the species has been found on all Canary Islands with the exception of El Hierro. It is now well established especially in coastal districts. The first records for the other islands are : 1976 on Gomera (Pérez Padron 1977), Fuerteventura (Schmitz 1990) and Lanzarote (Kühnert 1977), 1986 on La Palma (Owen 1988). Both female forms, the white form *pyrene* and yellow form *florella*, are common.

Habitat

Parks and gardens near the coast with its larval food-plant, rarely above 500 m.

Phenology

Throughout the year in several generations. Adults have been found in all and larvae in almost all months of the year. It can be assumed that the species has about 9 generations per year, because caterpillars need about three weeks for development and the pupal stage lasts 10 days.

Early stages

These are quite similar to those of *Gonepteryx*, but the larvae are much more variable and tend to take the colour of the substrate (yellow on flowers and green on leaves without becoming lighter to the sides) with variations in the width of the brownish or blackish lateral stripes which adjoin the white lines dorsally. The pupa is turquoise and lacks markings apart from the whitish lateral stripes.

Larval food-plant

The caterpillars feed on the leaves and flowers of *Cassia didymobotrya* (originating from Africa) and possibly (as in Africa) also other *Cassia*-species grown as ornamentals in subtropical parks or gardens. The *Cassia*-plants can bear large numbers of the singly laid eggs and defoliation has been recorded several times. Although only recently established, the larvae are already heavily parasitized by tachinids and braconids (Pérez Padron 1977 and own unpubl. obs.).

Unpublished records

La Palma : Pto. de Tazacorte, 14.IV.93 — larvae on *Cassia* (GJ) ; Tazacorte (50 m), 3.XI.93 (PN) ;

Tenerife : Pto. Cruz, Arafo, Candelaria, Güimar, Las Caletillas, Las Galletas, Los Christianos, 15.-27.XII.81, Pto. Cruz, 15.VII.83 (LM) ;

Gran Canaria : Maspalomas, end of III.80 (OL) ;

Fuerteventura : Castillo de Fuste (50 m), 22.-25. II.91 — also egg-laying, eggs and larvae on *Cassia didymobotrya* (DO and MW) ;

Lanzarote : Playa Blanca, 28.II. and 3.III.91 — eggs and larvae on *Cassia didymobotrya* (MW).

***Gonepteryx cleobule* Hübner, 1825**

Synonyms

Rhodocera cleobule Hübner
Gonopteryx cleobule Hübner
Gonepteryx cleopatra cleobule Hübner
Gonepteryx eversi Rehnelt
Gonepteryx palmae Stamm
Gonepteryx cleopatra rosei Gross

Taxonomy and range

A Canary Island endemic but closely related to the Holomediterranean *G. cleopatra* and the intermediate *G.(c.) maderensis* Felder from Madeira.

Distribution and interisland variation

Confined to the laurel forest areas in the north of Tenerife (**ssp. *cleobule* Hübner, 1825**), La Gomera (**ssp. *eversi* Rehnelt, 1974**) and La Palma (**ssp. *palmae* Stamm, 1963**). The elevation of these latter two taxa to the species level by several authors, especially in very recent years can not be accepted. Ziegler & Jost (1990) state that Rehnelt (1989) has shown that the ♂-genitalia differ in these taxa, but this is incorrect. In fact the alleged "difference" according to Rehnelt (1989), a small protrusion in the distal shape of the valvae of *palmae* (and less clear in *eversi*), is of no taxonomic importance, because this is subject to a considerable infrasubspecific variation in *G. cleobule* (own investigations), as well as in many other *Gonepteryx* (see illustrations in Kudrna 1975). As early stages also do not seem to show specific characters on the different Islands, the only remaining differences are those in wing coloration (see Rehnelt 1974a, 1974b and 1989), which are not so constant as they are often claimed to be ; *e.g.* males of *palmae* can have quite an intensive orange upper wing coloration, similar to *eversi*, and on the other hand I have seen an extremely pale male of *cleobule* from Tenerife. A similar aberrant male from Tenerife has been described as a subspecies of *G. cleopatra* (*G. c. rosei*) by Gross (1973), which for him is a proof that *cleobule* is different from *cleopatra* at the species level. In fact *Gonepteryx cleopatra* has never been found in the Canary Islands.

Matsuno (1988) follows Kudrna (1975) in his systematic evaluation of the *Gonepteryx*-taxa in the Atlantic Islands, without proving it by the ultraviolet reflectance pattern he investigates. He illustrates only a couple of *G. cleobule* from Tenerife along with one male of *G. cleopatra* from southern France. These demonstrate that the area of UV-reflectance on the upper wings is slightly more expanded in the *cleobule*-♂ than in the *cleopatra*-♂. On the other hand no marked differences in UV-reflectance pattern could be found between the taxa *cleobule, eversi, palmae* and *maderensis*, neither in males nor females. The females of all taxa investigated by myself almost never show UV reflection on the upper side, with the exception of the cell spot and sometimes a weak stripe of reflection at the costal margin of the forewings. However, Matsuno (1988) illustrates a *cleobule*-♀ (aberrant ?) with extensive UV-reflection !

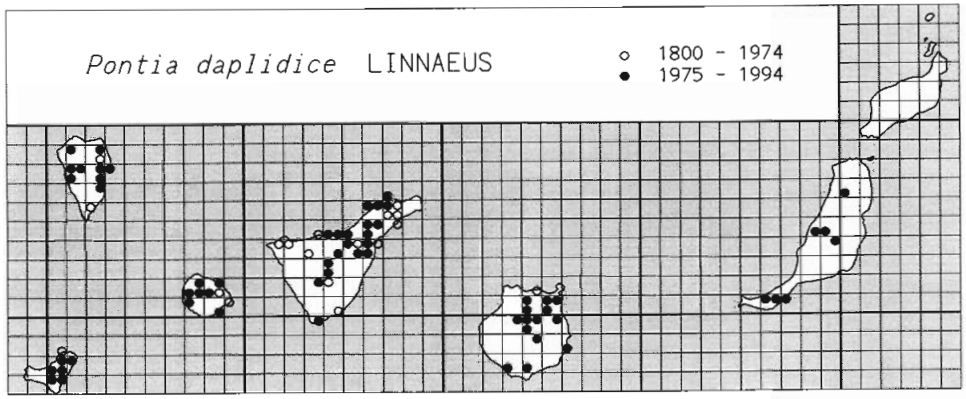
Nordman (1935) states that *G. cleobule* also inhabits Gran Canaria and Fuerteventura which is unequivocally false. Nevertheless Fernandez (1978) accepts this without comment.

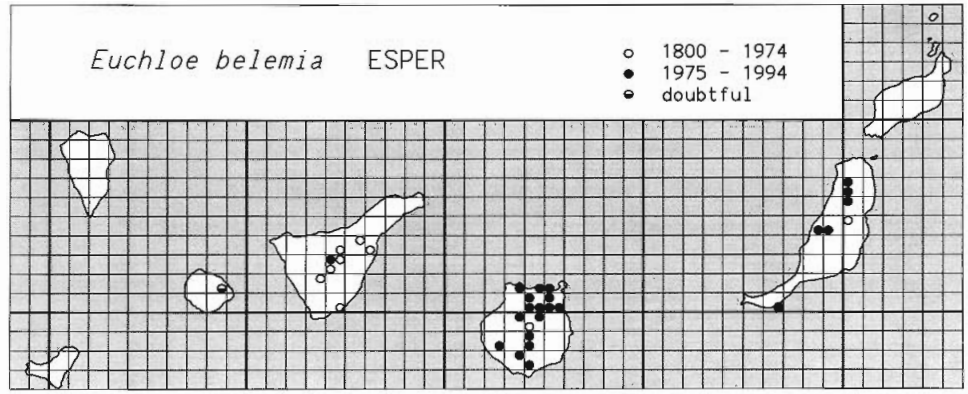
Habitat

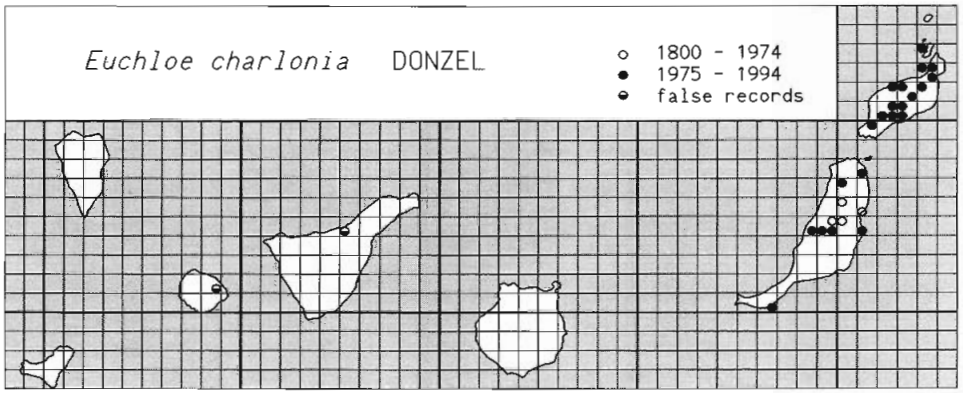
G. cleobule inhabits barrancos, sunny clearings and paths in the laurel forest up to 1500 m, during the summer adults can be found up to 2000 m ; the butterflies like to feed on blossoms of *Cedronella canariensis*. According to Ziegler & Jost (1990), they fly at lower elevations in winter than in summer.

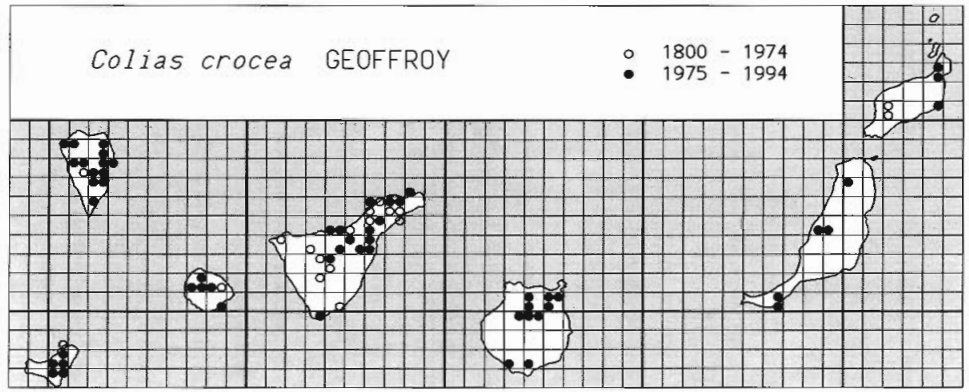
Phenology

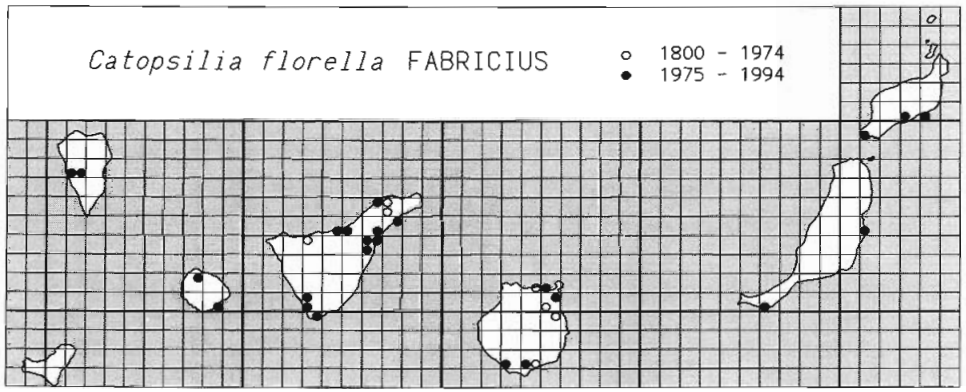
Adults can be observed throughout the year. Due to the longevity of the adults, the succession of broods is unclear. The records of caterpillars in April (Oehmig 1977, Zieger & Jost 1990), as well as in August and December (own obs., see below), indicate that adults breed throughout the year. Nevertheless this does not answer the question if at least part of the adults enter into winter diapause and if there is more than one generation per annum.

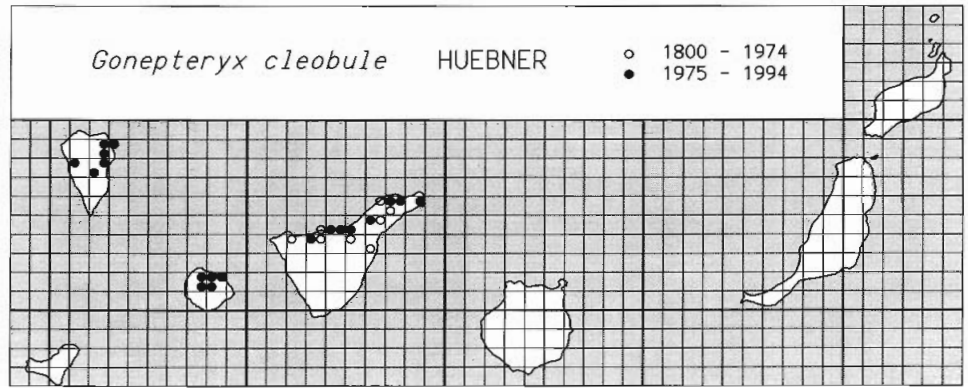

Pontia daplidice LINNAEUS
1800 - 1974
1975 - 1994


Euchloe belemia ESPER
1800 - 1974
1975 - 1994
doubtful


Euchloe charlonia DONZEL
1800 - 1974
1975 - 1994
false records


Colias crocea GEOFFROY
1800 - 1974
1975 - 1994


Catopsilia florella FABRICIUS
1800 - 1974
1975 - 1994


Gonepteryx cleobule HUEBNER
1800 - 1974
1975 - 1994

Early stages

A detailed description of specimens from La Gomera can be found in ZIEGLER & JOST (1990). Larvae and pupae from La Palma were found to be indistinguishable from those of La Gomera and also do not seem to differ from those of *Gonepteryx cleopatra* from France. The yellow egg has 8 longitudinal ribs. The larvae are green with white lateral stripes bordered ventrally by fine yellow lines. The ground colour of the pupa is green too, apart from the brown head spine, brown markings at the wing origins, many small brown spots across the body and along the outer border of the wing sheath, as well as white lateral stripes.

Larval food-plants

ZIEGLER & JOST (1990) observed egg-laying and larvae in lower parts of La Gomera on *Rhamnus crenulata*, which grows at the border between succulent bush vegetation and laurel forest, and which is replaced by the endemic *Rhamnus glandulosa* inside the laurel forest. Larvae on this latter plant were found by OEHMIG (1977) on Tenerife and by myself on La Palma (see below).

Unpublished records

La Palma : Sta. Cruz : Quintero (200 m) and Bco. Rio de las Nieves (400 m), Cumbre Nueva (1000 m), Bco. del Agua (300-700 m) — also larvae on *Rhamnus glandulosa*, Bco. de la Galga (400-800 m), 31.VII.-4.VIII.88 (MW) ; Bco. de Jieque (near Tijarafe, 600 m), 18.IV.93 (GJ) ; Los Sauces, 26.XII.81, Los Tilos, 24.-26.VII.83 (LM) ;

La Gomera : In the laurel forest : Las Hayas, Roque de Agando, Mt. Garajonay, Laguna Grande and Mña. Quemada (700-1200 m), 21.-23.VII.88 (MW) ; Vallehermoso and Hermigua — also larvae, end XII.87 (DF) ; Vallehermoso, Hermigua and La Palmita, 11.-18.III.93 (AB) ; Las Rosas, 20.-22.VII.83 (LM) ;

Tenerife : Chinobre / Anaga, 2.IV.85 and 6.VIII.86 (WB) ; Icod Alto, Las Mercedes, 14.-19. VII.83 (LM).

(*to be continued*)

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Corrigenda : Prière de bien vouloir corriger au sommaires des fascicules 1 et 2 le Pars XV au lieu de Pars XIV.

Frontispiece : *Cyclyrius webbianus* feeding on *Micromeria sp.*, Gomera, Mt Garajonay, 23.VII.1988 (photo : M. WIEMERS).

Linneana Belgica, Pars XV, n° 3, octobre 1995.

The butterflies of the Canary Islands
A survey on their distribution, biology and ecology
(*Lepidoptera : Papilionoidea and Hesperioidea*)
(second part)

by Martin WIEMERS (*)

NYMPHALIDAE

Danaus plexippus (LINNAEUS, 1758)

Synonyms

Danais archippus FABRICIUS
Danais erippus CRAMER
Anosia plexippus L.
Danaida plexippus L.
Danaus curassavica FABRICIUS

Taxonomy and range

This famous North and Central American migrant extended its range across the Pacific and colonized Hawaii and New Zealand in 1840, Australia and the South Pacific in 1870, India in 1901, as well as across the Atlantic, establishing colonies in the Azores (1864) and the Canary Islands (1887). In Europe, migrant specimens have regularly been found along the western coastline but it was not until 1980, that colonies established along the South Spanish coast in the surroundings of Málaga, which still persist (MARTIN & GURREA 1988 ; own unpubl. obs.). Most recently, with first captures in 1983, *plexippus* has even established on Mauritius from an unknown source of origin (DAVIS & BARNES 1993).

Distribution

First recorded in the 1880s in the Canary Islands (REBEL & ROGENHOFER 1894), the species now inhabits coastal districts of all islands with the exception of Lanzarote. Whereas a large number of observations exist from Tenerife, few records are known from the other islands where the species seems to be rare and perhaps not permanently resident. On La Gomera, the Monarch has been recorded only from San Sebastian (POLATZEK, according to REBEL 1906 ; PEREZ PADRON (1975) ; D. OWEN, pers. comm.).

Habitat

Parks and gardens in subtropical coastal areas, only rarely migrating to higher elevations (Cañadas according to GUICHARD 1967). The often disputed migratory activity in the Canary Islands is proved by captures of individuals at sea, between Fuerteventura and Lanzarote, as well as between La Gomera and El Hierro (FERNANDEZ VIDAL 1979). The two adults, observed by DENIS OWEN and myself on Fuerteventura, were migrating through the hillside.

Phenology

Adults fly throughout the year and larvae have been found in all seasons. The species seems to breed throughout the year in the Canary Islands.

Early stages

These do not differ from North American populations.

Larval food-plants

On Tenerife, larvae have most often been found on *Asclepias curassavica* and on *Gomphocarpus fruticosus*, both members of the *Asclepiadaceae*. Cotton (*Gossipium arboreum*), given as the food-plant by REBEL & ROGENHOFER (1894), clearly is of no importance nowadays. OWEN & SMITH (1989) discuss the choice of food-plants utilized by the species on the Atlantic Islands. It is remarkable that only alien *Asclepiadaceae* (from Central America and Africa) and no native species, neither the widely distributed *Periploca laevigata*, nor one of the endemic *Ceropegia species*, have been

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recorded as food-plants. In greenhouse experiments by the same authors, six females bred from larvae which were found on El Hierro (on *Gomphocarpus fruticosus*), also showed a strong preference to lay their eggs on *Asclepias* species or *Gomphocarpus fruticosus*. The Africa derived *Calotropis procera* was also not found to be exploited by Gran Canaria populations (VAN DER HEYDEN 1992b).

Unpublished records

El Hierro : Frontera (300 m), 28.-29.VII.88 (MW) ;
La Palma : Pto. de Tazacorte, 9.IV.93 (GJ) ; Pto. Naos, Tazacorte — also eggs and larvae, Los Sauces (300 m), 28.X.-3.XI.93 (PN) ;
Tenerife : Puerto de la Cruz, 5.VIII.88 (MW) ; Sta. Cruz, Las Galletas, Los Cristianos, Los Gigantes, 17.-27.XII.81, Pto. Cruz, 15.VII.83 (LM) ;
Gran Canaria : Maspalomas, end III.80 (OL) ; Pto. Rico, Firgas, Tafira, 8.-12.VII.83 (LM) ;
Fuerteventura : Betancuria, Bco. de Ajuy (400 m), 23.II.91 (DO and MW).

Danaus chrysippus (LINNAEUS, 1758)

Synonyms

Papilio chrysipus L.
Danais chrysippus L.
Danaida chrysippus L.

Taxonomy and range

Distributed throughout the Old World tropics, in North Africa as a migrant (e.g. SAMRAOUI & BENYACOUB 1991 ; SAMRAOUI 1993) which may at least become temporarily resident (SAMRAOUI *et al.* 1992). TENNENT (1995) states that there is a strong evidence that the species has established breeding colonies in Morocco, Algeria and Tunisia within the last 50 years. In South Europe only migrants have been found, but since 1979, when the first Spanish colony was reported from Almeria, the species has spread along the Spanish coast up to southern France and Corsica (BOIREAU 1984, 1988 ; JACK 1985 ; OWEN 1991 ; MASO 1992 ; MORGENROTH 1993 ; QUIVRON 1993), reaching Sardinia (KAGER 1992).

Distribution

In contrast to *D. plexippus*, the African migrant seems to be an original element in the Canary Islands. The f. *aegyptius* (= *chrysippus*) is most common which indicates that populations originate from Asia and not from tropical western Africa (OWEN & WIEMERS 1992). It is widespread on La Palma and La Gomera, previously also on Tenerife where it seems to have become extinct since the beginning of the 1970s. Since 1972 it has been recorded only once, in 1990. In the course of a levante (a hot eastern wind from the Sahara desert) PEREZ PADRON (1990) was able to collect three specimens of f. *alcippus* near Güimar. This colour form (with white on the hindwings) is rare in the Canary Islands but predominant in tropical western Africa.

The species seems to be rare on Gran Canaria, maybe only as an immigrant (VAN DER HEYDEN 1991) ; apart from the record in REBEL & ROGENHOFER (1894), only two more recent records have been notified. It is extremely localized on Fuerteventura.

Habitat

Although most records come from the gardens and parks of Puerto de la Cruz, where the species flew together with *D. plexippus*, before the most important site (in the Bco. Martianez) was destroyed in the course of road construction (OWEN & SMITH 1993d), succulent bush (from sea level to 500 m) represents the primary habitat in the Canary Islands.

Phenology

The time of appearance is the same as in *D. plexippus* : adults and caterpillars are observed throughout the year, thus *D. chrysippus* breeds continuously.

Early stages

These do not differ from African populations. Caterpillars can be easily distinguished from those of *D. plexippus* by their two additional filaments between the first and second abdominal segment. Additionally, the yellow rings of *D. plexippus* are reduced in *D. chrysippus* : they are divided at the ridge and do not reach the ventral side. One larva from Fuerteventura, which pupated in a grey-brown paper box, produced a greyish-white chrysalis similar to the box, colour instead of the usual turquoise colour.

Larval food-plants

Like *D. plexippus*, this species feeds only on members of the *Asclepiadaceae*. In parks and gardens, caterpillars have often been found on *Asclepias curassavica*. In its original habitat, the succulent bush, larvae feed on *Gomphocarpus fruticosus* and probably also on endemic *Cero-*

pegia-species like *Ceropegia hians* on la Palma (PEREZ PADRON 1975). A recently discovered population on Fuerteventura uses *Caralluma burchardii* as larval food-plant (OWEN & WIEMERS 1992). This endemic succulent *Asclepiadaceae* is confined to a few places in the hillsides of Fuerteventura, Lobos and La Graciosa. The tropical *Calotropis procera*, a food-plant of African populations, recently established on Gran Canaria, might be exploited in the future (VAN DER HEYDEN 1992b).

Unpublished records

La Palma : Bco. del Agua (300 m), Caldera de Taburiente : Dos Aguas (500 m), 31.VII.-2.VIII.88 (MW) ; Bco. de Jieque (near Tijarafe, 600 m), 7.IV.93 (GJ) ; Caldera de Taburiente : Dos Aguas (400 m), Tazacorte — also eggs and larvae, 3.-4.XI.93 (PN) ; Los Sauces, 26.XII.81 (LM) ;

La Gomera : Valle Gran Rey : La Calera and Bco. de Arure (200-300 m), 19.-24.VII.88 (MW) ; Bco. de Arure 12.III.93 (AB) ;

Gran Canaria : Bco. Guiniguada/Las Palmas-Vegueta, I.85 (GM) ; Puerto Rico, end XII.83 (HR) ;

Fuerteventura : Betancuria, Bco. de Ajuy (400 m) — also larvae on *Caralluma burchardii*, 23.-26.II.91 (DO and MW) ; Vega de Rio Palmas, 24.VIII.86 (WB).

Hypolimnas misippus (LINNAEUS, 1764)

Synonyms

Diadema misippus L.

Taxonomy and range

This chiefly Afrotropical element now occurs throughout the Old World tropics, and is established in the West Indies, sometimes reaching the American continent. Not known from Europe or North Africa.

Vagrants are known from the Azores, Lebanon, Turkey, as far as Australia (R. LEESTMANS, pers. commun.).

Distribution

Probably only a very rare immigrant to the Canary Islands from tropical Africa, but some colonies established on La Gomera in recent years : FEIERABEND (1989) was first to collect two males (from several other observed males) in the end of XII. 1987 in Vueltas/Valle Gran Rey. PEREZ PADRON & CARNERO HERNANDEZ (1988) record further captures near Tecina/Playa de Santiago on the 25. II. 1988, including ♀♀, which might be overlooked as mimetics of *Danaus chrysippus*. Half a year later I could not find the species in Valle Gran Rey.

Old records of this species also exist from Tenerife (3 ♂♂ in X.-XI. 1895 near Orotava according to CROMPTON (1896), 1 ♂ captured by KILIAN (1897) near Sta. Cruz and 1 ♂ leg. 1913 in coll. ZFMK, Bonn) and FERNANDEZ (1978) has seen a specimen in a foreign collection which was allegedly caught in Sta. Cruz de la Palma.

Habitat

The few records all come from gardens in coastal districts.

Phenology

So far found only in winter.

Early stages

The early stages have not been found in the Canary Islands.

Larval food-plant

Unknown in the Canary Islands.

Unpublished records

See "Distribution".

Vanessa atalanta (LINNAEUS, 1758)

Synonyms

Pyrameis atalanta L.

Taxonomy and range

Holarctic species, in temperate regions a migrant, probably introduced to New Zealand.

Distribution

Widely distributed on all islands but rarer in the dry eastern ones.

Habitat

Adults can be observed everywhere from sea level to over 2000 m, but as in Europe, flowery parks and orchards (with rotten fruit), as well as deciduous forests, are preferred and arid places avoided.

Phenology

Throughout the year in many not well separated

generations. Larvae have also been found during the winter months.

Early stages

Indistinguishable from European populations.

Larval food-plants

Urtica-species, only by OEHMIG (1974) identified as *Urtica urens*, have been reported as food-plants.

Unpublished records

El Hierro : Valverde (600 m), Frontera (300-1300 m), 26.-28.VII.88 (MW) ; Taibique, Hoya del Morcillo, 21.III.-1.IV.91 (GJ) ; Jinama, 16.VII.83 (LM) ;
La Palma : Bco. de la Galga (700 m), 3.VIII.88 (MW) ; Los Tilos, 26.-26.VII.83 (LM) ;
La Gomera : Mt. Quemado (800 m), Mt. Garajonay (1200 m), 21.-23.VII.88 (MW) ; Valle Gran Rey, end XII.87 (DF) ; Vueltas and La Palmita, 8.-18.III.93 (AB) ;
Tenerife : Aguamansa (1200 m), 7.VIII.88 (MW) ; Pto. Cruz, 15.-19.XII.81, Pto. Cruz, Las Mercedes, 14.-15.VII.83 (LM) ;
Gran Canaria : Fontanales, Tafira, 8.-11.VII.83 (LM) ;
Fuerteventura : Betancuria, Vega de Rio Palmas, 300-400 m, 24.II.91 (DO and MW) ;
Lanzarote : Hária (300 m), 2.III.91 (MW).

***Vanessa vulcania* (GODART, 1819)**

Synonyms

Papilio atalanta L.
Pyrameis indica vulcania GODART
Pyrameis atalanta vulcanica GODART
Vanessa callirhoe FABRICIUS
Vanessa indica volcanica GODART
Vanessa indica vulcania GODART
Vanessa indica calliroe HÜBNER

Taxonomy and range

Macaronesian endemic confined to Madeira and the Canary Islands but closely related to the South-East Asian *Vanessa indica* (HERBST, 1794) and sometimes considered as subspecies of the latter. LEESTMANS (1978), in his revision of the genus *Vanessa*, discusses the probable palaeoclimatic reasons for the vast gap in distribution between *vulcania* and *indica* in detail and ranks *vulcania* as a separate species, based upon differences in wing pattern and shape, as well as small differences in ♂ genitalia. Another paper on the probable origin of *vulcania* without much new information and similar results has recently been published by SHAPIRO (1992a). Unfortunately he was unaware of LEESTMANS' publication (SHAPIRO 1992b).

Single records of *vulcania* have also been made in the Iberian Peninsula (GOMEZ-BUSTILLO & FERNANDEZ-RUBIO 1974 ; FERNÁNDEZ-VIDAL 1989) and also in East Germany (GERISCH 1975 and 1979 ; REINHARDT & GERISCH 1982), whereas a record from Britain (TURNER 1982), possibly an introduction by breeders, belongs to the related *indica* from S.E. Asia.

Distribution

Widely distributed in the western islands including Gran Canaria, but predominantly in their northern parts. Single specimens, probably immigrants, have also been recorded from Fuerteventura (REBEL & ROGENHOFER 1894 ; MOSBACHER 1978).

Habitat

Like *V. atalanta*, flowery parks, gardens, orchards and sunny spots in laurel forests are preferred, but its population density generally seems to be higher, especially in laurel forests with its original food-plant.

Phenology

Like *V. atalanta*, adults fly all year round in several generations. Caterpillars have also been found in the winter months.

Early stages

The ova, which has 10 ribs and the larva have been described by SCHURIAN (1976) who found them to be indistinguishable from *V. atalanta*-caterpillars (which are very variable). It is also well figured in BODI (1985).

Larval food-plants

The main food-plant in the laurel forests seems to be the endemic *Urtica morifolia*, egg-laying and larval behaviour is like in *V. atalanta* (OWEN 1988b ; OWEN & SMITH 1993c), in disturbed places near the coast also *Urtica urens* (OEHMIG 1974). LEESTMANS (1975a) takes over the old record "*Urtica dioica*" from REBEL & ROGENHOFER (1894), although this plant does not occur in the Canary Islands. POULTON (1928) allegedly found the larvae in 1888 (sic !) on *Malva*, but the long time between observation and publication suggests the possibility of an error (confusion with *V. cardui*).

Unpublished records

El Hierro : Frontera (300-1300 m), 26.-29.VII.88 (MW) ; Jinama, Frontera, 16.-17.VII.83 (LM) ;

La Palma : Bco. del Agua (300-700 m), Bco. de la Galga (700 m), Bco. de la Rio de las Nieves (500 m), 31.VII.-4.VIII.88 (MW) ; Los Codesos (1200 m), Bco. de Jieque (600 m), 4.-18.IV.93 (GJ) ; El Time (350 m), Breña Alta (300 m), 29.-30.X.93 (PN) ; Fuencaliente, 26.XII.81, Los Tilos, 24.-26.VII.83 (LM) ;

La Gomera : Las Hayas : Mt.Quemado (800 m), Mña. Quemada (1000 m), 21.-23.VII.88 (MW) ; Valle Gran Rey, Vallehermoso, end XII.87 (DF) ; Hermigua, 5,VIII.86 (WB) ; Mt. Garajonay, El Cedro, La Palmita, 11.-14.III.93 (AB) ; Las Rosas, Chipude, 20.-22.VII.83 (LM) ;

Tenerife : Chinobre / Anaga, 2.IV.85, Teno, 16. VII.89 (WB) ; Pto. Cruz, Sta. Cruz, Güimar, Las Caletillas, Las Galletas, Los Christianos, Los Gigantes, 15.-27.XII.81, Pto. Cruz, Icod Alto, Las Mercedes, 14.-19.VII.83 (LM) ;

Gran Canaria : Maspalomas, end III.80 (OL) ; Fontanales, 11.VII.83 (LM).

Vanessa cardui (Linnaeus, 1758)

Synonyms

Papilio cardui L.
Pyrameis cardui L.
Cynthia cardui L.

Taxonomy and range

A cosmopolitan migrant (only unknown from South America) but unable to survive cold winters and thus not permanently resident in temperate regions.

Distribution

Found everywhere on all islands including the small so-called "Isletas" Alegranza, Montaña Clara and Graciosa, fluctuating in numbers. The species is often the most common and sometimes even the only butterfly on Fuerteventura and Lanzarote. As few exact localities are mentioned in the literature and statements like "common everywhere" predominate, the distribution map is incomplete and does not show the true pattern.

Habitat

The species can be found in any type of habitat, also and especially in semi-desert areas, but forests are avoided.

Phenology

Adults and larvae are found throughout the year. In the winter months a mass augmentation of population size and migrant movements have been observed in the eastern islands (Gantzhorn 1988, van der Heyden 1989, Mader 1989, Mosbacher 1978). Alone on a single spot of fallow land of about 1000 m², more than 7000 larvae were estimated to feed on *Malva parviflora*, about half of the 30 collected were parasitized by the braconid *Cotesia vanessae* (Owen & Wiemers 1992).

Along with southern Morocco, the eastern Canary Islands might play a role for the immigrations into southwestern Europe, where *V. cardui*, with the exception of some southern Spanish coastal districts (Malaga), cannot survive the winter (Owen 1989).

Early stages

Identical to European populations.

Larval food-plants

Caterpillars of this extremely polyphagous species have often been recorded from "thistles and mallows" (only specified as *Malva parviflora* by Sheldon (1935) and Owen & Wiemers (1992)), as well as on *Urtica* and undetermined species of *Asteraceae*.

Unpublished records

El Hierro : Taibique, Sabinosa, 20.III.-3.IV.91 (GJ) ;

La Palma : Cumbre Nueva (1000 m), 1.VIII.88 (MW) ; Ermita Virgen del Pino (900 m), 31.III.93 (GJ) ; Tazacorte (150 m) — laying eggs on thistle, 3.XI.93 (PN) ; Fuencaliente, Los Sauces, 26.XII.81, Los Tilos, 24.-26.VII.83 (LM) ;

La Gomera : Valle Gran Rey : Bco. de Arure, 20.VII.88 (MW) ; Las Hayas and El Cedro, 9.-11.III.93 (AB) ;

Tenerife : Pto. Cruz, Orotava, Candelaria, Güimar, Las Caletillas, Las Galletas, Los Christianos, Los Gigantes, 12.-27.XII.81 (LM) ;

Gran Canaria : Maspalomas, end III.80 (OL) ;

Fuerteventura : Triquivijate, Tetir, Tuineje, Costa Calma, La Oliva, Betancuria, Vega de Rio Palmas — also larvae at many places on *Malva parviflora*, thistles and another *Asteraceae*, 0-400 m, 18.-26.II.91 (DO and MW) ;

Lanzarote : Uga, Tabayesco, Máguez, Hária, Mña. Blanca, Tias, La Vegueta/Mácher, Las Casitas de Femés — also larvae at many places

on *Malva parviflora*, 0-400 m, 28.II.-3.III.91 (MW).

***Vanessa virginiensis* (DRURY, 1770)**

Synonyms

Papilio huntera FABRICIUS
Vanessa huntera FABRICIUS
Pyrameis virginiensis DRURY
Cynthia virginiensis DRURY

Taxonomy and range

A North and Central American species which occasionnally reaches western Europe. Established and still expanding in Portugal where it was first encountered in 1949, and scattered colonies in Spain since 1959 (LEESTMANS 1975b ; REI MUÑIZ 1986). Most other European records are from the Atlantic coast but a single specimen was even caught near Frankfurt/Main far away from the sea (SCHROTH 1988).

Distribution

This migrant, originating in North America, has been widely distributred on Tenerife in the past, but disappeared in the 1970s from its last strongholds in Puerto de la Cruz (LEESTMANS 1975b ; KÜHNERT 1977 ; EITSCHBERGER & STEINIGER 1981). No records are known from the 1980s and thus it could have become extinct in the Canary Islands. But recently a single specimen has been captured (see below), indicating that it might turn up again. From Gran Canaria and La Gomera it has not been recorded since GUICHARD (1967). According to LEESTMANS (1975a and 1975b), *V. virginiensis* has also been found on La Palma. The "occasional sightings" from Lanzarote by BALDWIN (1991) must in fact have been some small *V. cardui*.

Habitat

Most observations have been made in parks near the coast as well as in laurel forests, but single individuals have been found up to 2000 m.

Phenology

Adults have been observed throughout the year.

Early stages

These do not seem to have been described from the Canary Islands.

Larval food-plants

Not reported in the Canary Islands. According to FERNANDEZ (1978), the larvae feed on *Urtica*. In North America the species is polyphagous.

Unpublished records

Tenerife : Hoya Fría, 27.IX.92, 1 R. CITORES *leg.* (PO).

***Argynnis pandora seitzi* (FRUHSTORFER, 1908)**

Synonyms

Argynnis maja CRAMER
Pandoriana pandora DENIS & SCHIFFERMÜLLER
ssp. *chrysobarylla* FRUHSTORFER

Taxonomy and range

Holomediterranean element and probably of ancient origin. Specimens are very similar to North African ones. The last revision of its subspecific differentiation was written by MOUCHA (1967).

Distribution

Restricted to the northern forested regions of Tenerife, La Gomera, La Palma and El Hierro ; on the latter island first found by the author (see below).

Habitat

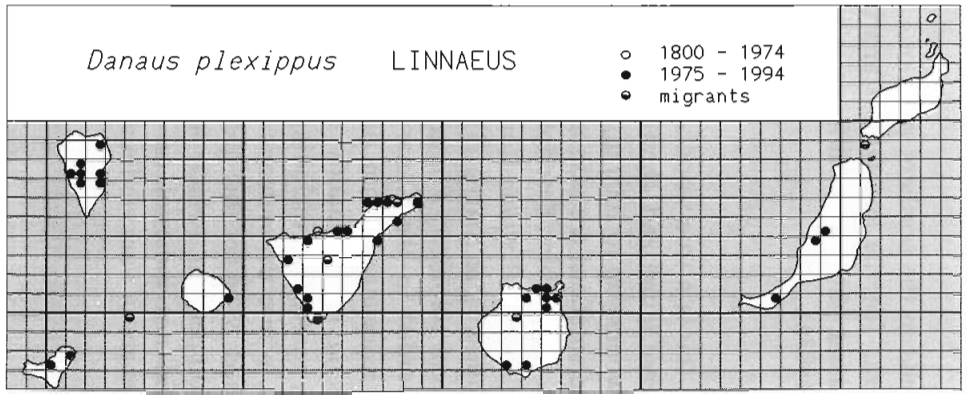
The species inhabits laurel forests at elevations of 500-1500 m, but in adjacent pine forests, adults may also be observed.

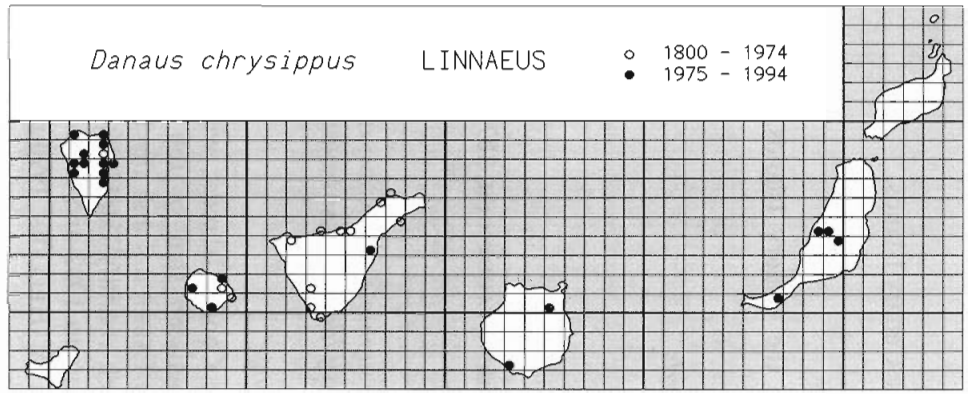
Phenology

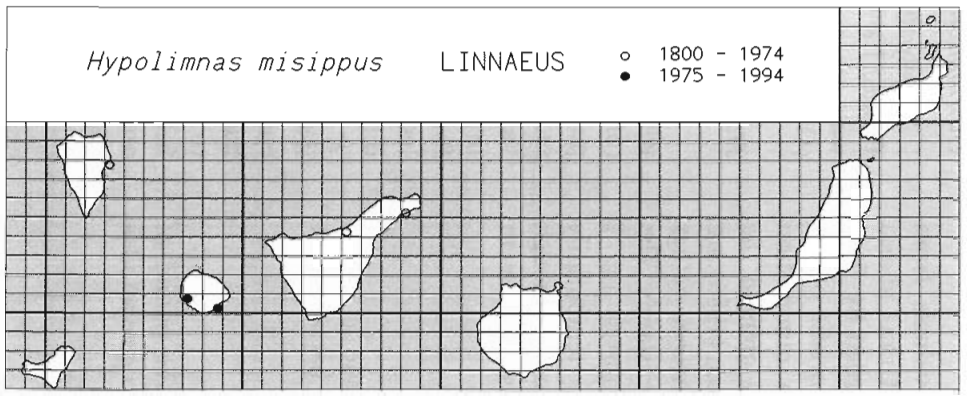
The flight period extends from E. V. to M. IX ; REGTEREN ALTENA (1948) allegedly found an individual at E. IV. Because records do not show discontinuity, I doubt the existence of more than one generation per year. The statement by HIGGINS & RILEY (1978 and 1983) that in Europe the species flies VI-VII in one generation, but in North Africa V-VI and VIII-IX in two generations, cannot be true, because the butterfly can be found until the end of September in southern Europe too (e.g. own observations).

Early stages

These are unknown in the Canary Islands.


Danaus plexippus LINNAEUS
1800 - 1974
1975 - 1994
migrants


Danaus chrysippus LINNAEUS
1800 - 1974
1975 - 1994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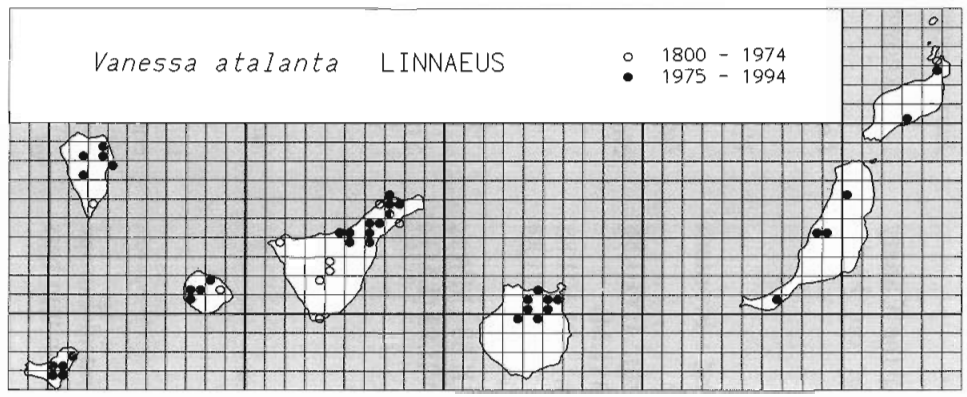
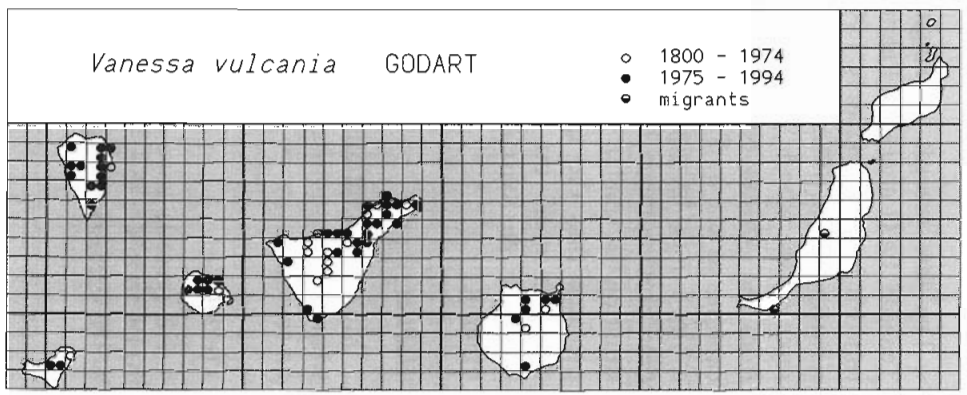
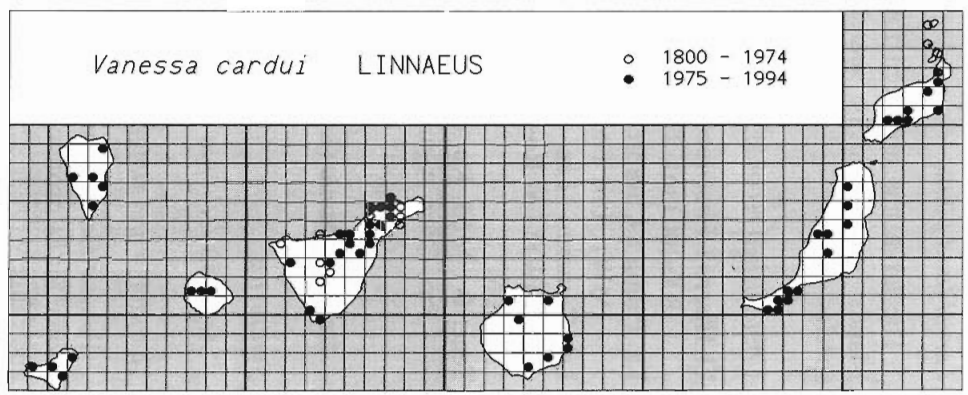
1800 - 1974
1975 - 1994


Vanessa atalanta LINNAEUS
1800 - 1974
1975 - 1994


Vanessa vulcania GODART
1800 - 1974
1975 - 1994
migrants


Vanessa cardui LINNAEUS
1800 - 1974
1975 - 1994

Larval food-plants

The larva has not been found in the Canary Islands but should be searched for on *Viola*-species.

Unpublished records

El Hierro : First record for the island : Frontera (800-1000 m), 27.VII.88 (MW) ;
La Palma : Cumbre Nueva (1000 m), 1.VIII.88 (MW) ; Los Tilos, 24.-26.VII.83 (LM) ;
La Gomera : Las Hayas (1200 m), 21.VII.88 (MW) ; Las Rosas, Guadalupe, 20.-22.VII.83 (LM) ;
Tenerife : Mña. Roja (1500 m), 7.VIII.88 (MW) ; Pto. Cruz, Aguamansa, 13.-15.VII.83 (LM) ;

Issoria lathonia (Linnaeus, 1758)

Synonyms

Argynnis lathonia L.

Taxonomy and range

Palaearctic migrant species, in Central Europe known for its pronounced fluctuations in numbers and range.

Distribution

The few records of single individuals from Tenerife, La Gomera, La Palma and Gran Canaria (on this latter island only 1 ♂ recorded by Fernandez Vidal 1986) indicate a sporadic occurrence on the islands, possibly due to immigration from the African continent. In my opinion the captures at sea by Fernandez Vidal (1986) are a hint for an immigration from Morocco rather than proving migrations between the islands. The situation is similar to that on Madeira and I presume that the species can only temporarily establish itself on this island, too, although Shreeve & Smith (1990) express a different opinion.

Habitat

Most observations have been made in forests where the butterflies were flying in barrancos or on clearings.

Phenology

All records have been made in the period of 20.IV. to 8.X. ; they do not suffice to give an idea of the succession of generations.

Early stages

Unknown in the Canary Islands.

Larval food-plants

Not known in the Canary Islands, probably *Viola* species.

Unpublished records

None.

Pararge xiphioides Staudinger, 1871

Synonyms

Pararge aegeria xiphioides Staudinger
Pararge xiphia xiphioides Staudinger

Taxonomy and range

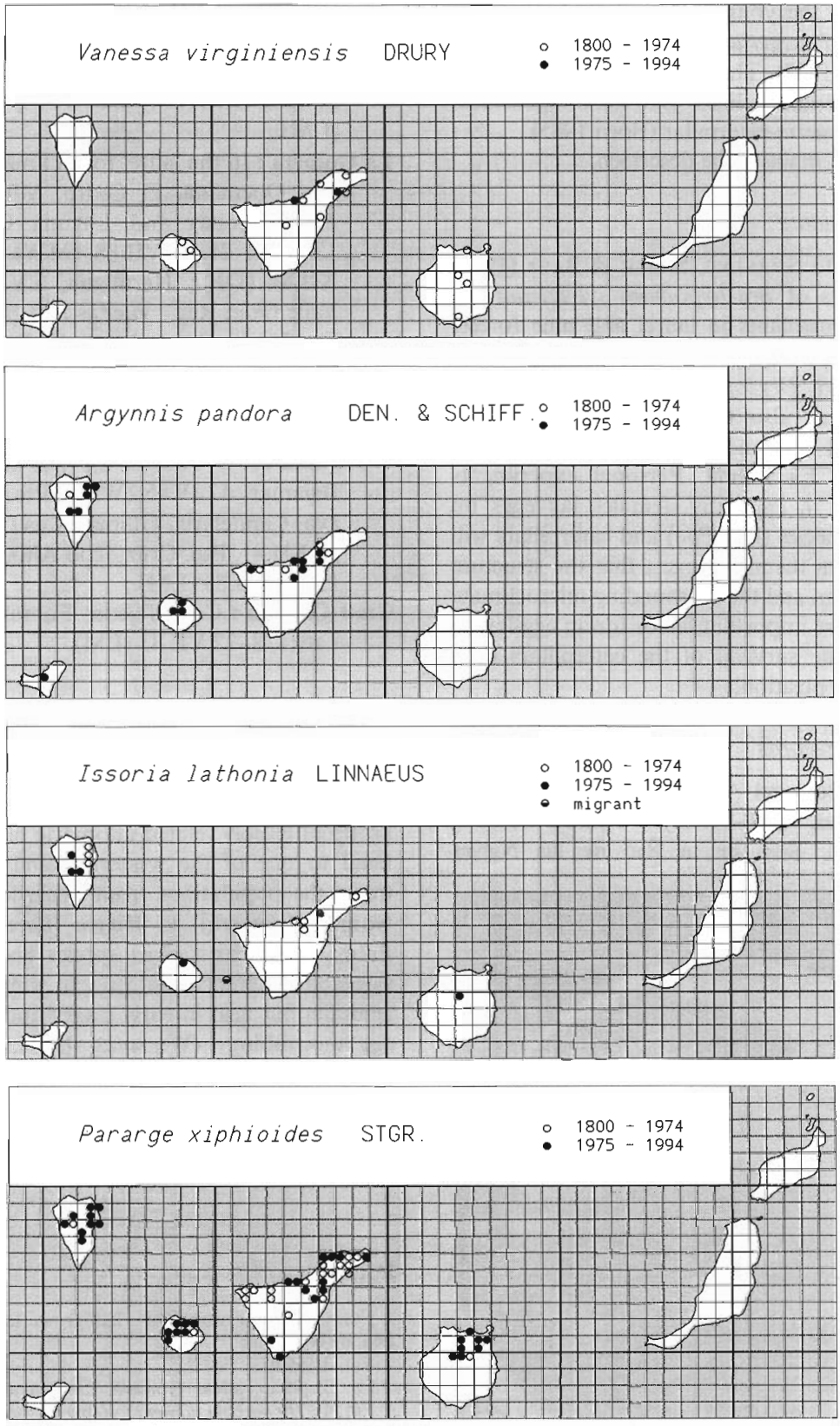
Endemic to the Canary Islands ; wing pattern is intermediate between that of the Madeiran endemic *P. xiphia* Fabricius and the Palaearctic *P. aegeria* L. which recently established itself on Madeira, too (Oehmig 1982 and 1983 ; Owen *et al.* 1986 ; Meyer & Hellers 1990 ; Owen & Smith 1994).

Distribution

Widely distributed in the northern parts of La Palma, La Gomera, Tenerife and Gran Canaria with some interisland phenotypic differentiation (Owen & Smith 1993a).

Habitat

Like *P. aegeria*, this is a true woodland species which inhabits dense laurel and chestnut forests (only rarely pine woods) up to 2000 m, but shady parks or banana plantations are also accepted as secondary habitat. This habitat description is also valid for the sister species *P. xiphia* from Madeira investigated by Shreeve & Smith (1992). They found that the recent colonizer, *P. aegeria* (which has not been recorded in the Canary Islands), differs in habitat associations from the endemic *P. xiphia*. *P. aegeria* predominantly established itself in disturbed, sunny sites including pine and eucalyptus forests, where the endemic vegetation has recently declined. Whether this decline is due to interspecific competition (which interactions between adults did not indicate) or caused by anthropogenic changes of surroundings is an unsolved matter.



Phenology

Throughout the year in several not well separated generations but with a peak of abundance in spring. Outside dense laurel forest, numbers decrease in summer, similar to *P. xiphia* but in contrast to *P. aegeria* on Madeira (Aranguren & Baez 1984 ; Shreeve & Smith 1992).

Early stages

These are described here for the first time : the white egg is about 1 mm in diameter (thus intermediate in size between *P. aegeria* and *P. xiphia* (Oehmig 1979)), but the fine retiform structure of the chorion is like in *P. aegeria*. The young larva is white with long black hairs and a white

head whereas the young caterpillar's head of its sister species *P. aegeria* is black and the hairs are white (Roos 1977). The adult larva is green with whitish longitudinal lines and indistinguishable from the *P. aegeria*-caterpillar (Bodi 1985).

The pupa remains to be described.

Larval food-plants

According to Shreeve, Smith & Baez (1992) isolated plants of *Brachypodium sylvaticum* are prefered as hostplants in laurel and pine forests on Tenerife, but *Agrostis tenuis, Carex divulsa, Luzula forsteri, Oryzopsis miliacea* and *Dactylis glomerata* were also noted to be used. Owen (1988a) found eggs and larvae on *Brachypodium pinnatum* on La Palma. Personal experiments indicate that, in captivitiy, females lay eggs on many grass species (like *Poa*) and caterpillars will readily feed on them. I suggest that the structure of the hostplant and the surrounding microclimate is a much more important factor for an egg-laying female and the survival of the caterpillars than its taxonomic position.

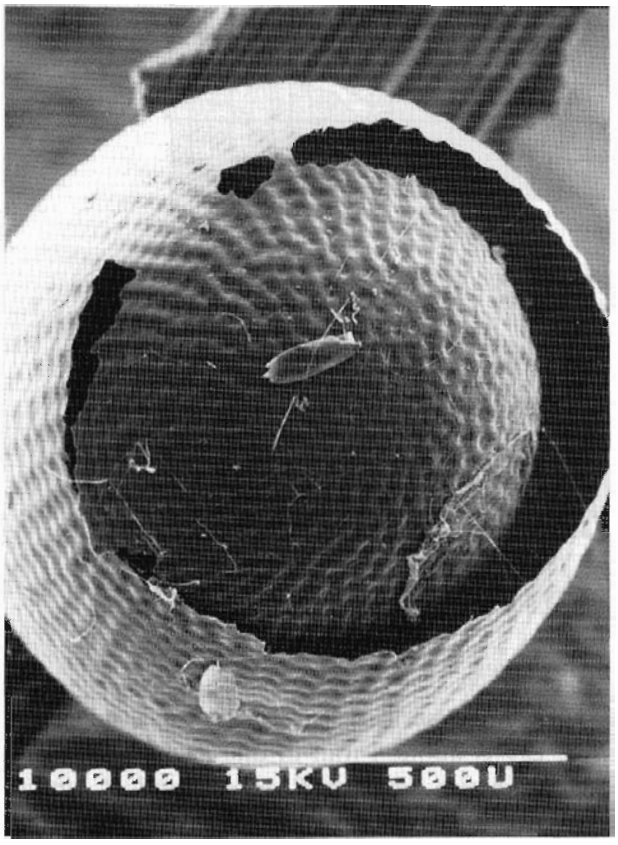
Unpublished records

La Palma : Bco. del Agua (200-700 m), Bco. de la Galga (400-800 m), Cumbre Nueva (1000 m), Bco. de la Rio de las Nieves (500 m), 31.VII.-4.VIII.88 (MW) ; Bco. de Jieque (600 m), Tamano (1200 m), Mña. de la Venta (1320 m), 5.-18.IV.93 (GJ) ; Los Sauces, 26.XII.81, Los Tilos, 24.-26.VII.83 (LM) ;

La Gomera : In the laurel forest area : Las Hayas, Mt. Quemada, El Cedro, Mña. Quemada, Mt.Garajonay and Laguna Grande (700-1200 m), 21.-23.VII.88 (MW) ; Arure, end XII.87 (DF) ; Hermigua, 5.VIII.86 (WB) ; Valle Gran Rey : Vueltas and Bco. de Arure, Las Hayas, La Palmita, El Cedro and Vallehermoso, 8.-18.III.93 (AB) ; Las Rosas, Chipude, 20.-21.VII.83 (LM) ;

Tenerife : Puerto de la Cruz, 5.VIII.88 (MW) ; Chinobre / Anaga, 2.IV.85 and 6.VIII.86, Bajamar, 12.IV.85 (WB) ; Pto. Cruz, Orotava, Candelaria, Güimar, Las Caletillas, 12.-25.XII.81, Pto. Cruz, Icod Alto, Aguamansa, 13.-19.VII.83 (LM) ;

Gran Canaria : Cruz Tejeda, Fontanales, Firgas, Tafira, 8.-12.VII.83 (LM).



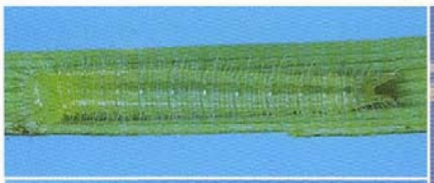
Egg of *Pararge xiphioides* : Bco. de la Galga, La Palma : S.E.M. photo by M. Ruppel (Frankfurt a.M.).

***Hipparchia wyssii* (Christ, 1889)** — complex

In the Canary Islands, the genus *Hipparchia* (subgenus *Pseudotergumia*) is represented by a group of closely related allopatric taxa, each confined to one of the western islands. This paper treats the populations from Tenerife (*wyssii*), La Gomera (*gomera*), El Hierro (*bacchus*) and La Palma (*tilosi*) as distinct species because of considerable differences not only in wing pattern and genitalia but also in early stages and especially in egg morphology (Wiemers 1991), whereas the populations from Gran Canaria (*tamadabae*) are provisionally treated as a subspecies of *wyssii*, so long as its early stages remain unknown. Although the morphological differences are strong indicators

Plate II

Fig. 1 : *Pararge xiphioides* : half-grown larva : La Palma, Bco. de la Galga ;
Fig. 2 : idem ;
Fig. 3 : idem, adult, Gomera, Las Hayas : 21.VII.1988 ;
Fig. 4 : *Hipparchia gomera* : young larvae : Gomera, Bco. de Argaga ;
Fig. 5 : idem, ♀ Gomera, Bco. de Arure : 24.VII.1988 ;
Fig. 6 : *Hipparchia wyssii* : *ovae*, Tenerife, Bco. de la Arena, Aguamansa ;
Fig. 7 : idem, larva in L1 : same locality ;
Fig. 8 : idem, adult ♀ : same locality ;
Fig. 9 : Habitat of *Vanessa vulcania* : Fayal-Brezal association, El Hierro, Mt Tabano, 27.VII.1988 ;
Fig. 10 : Habitat of *Hipparchia gomera* : cliffs with succulent bush vegetation : Gomera, Valle Gran Rey, 21.VII.1988.
(photos : M. Wiemers)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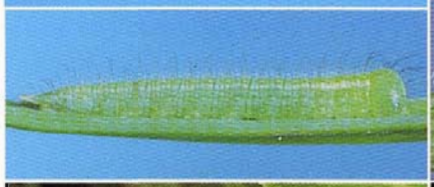
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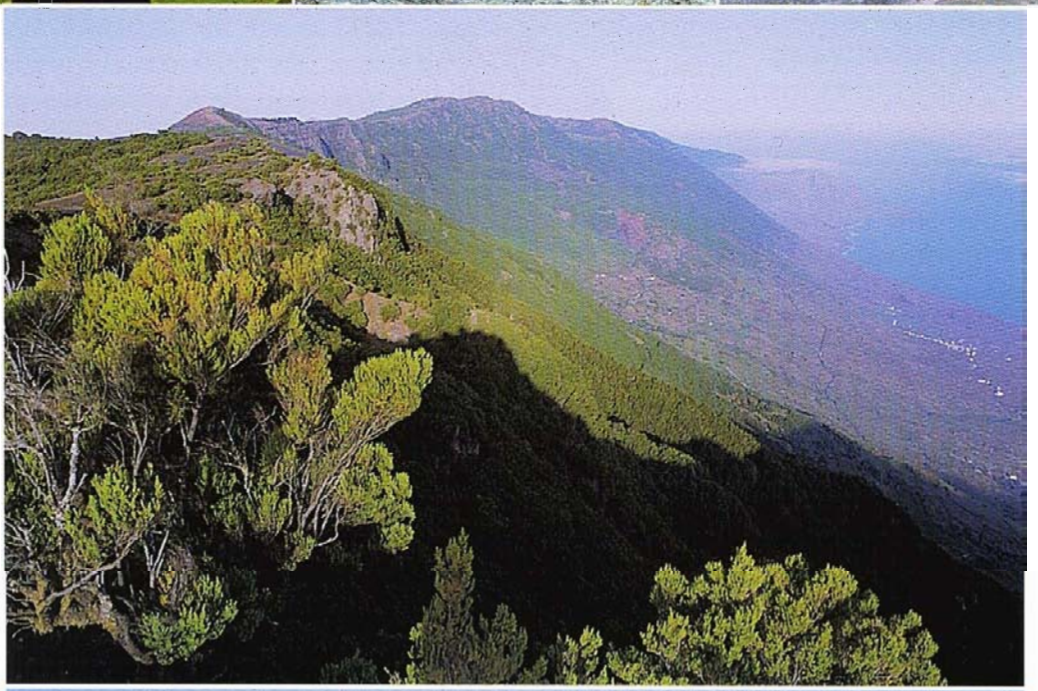
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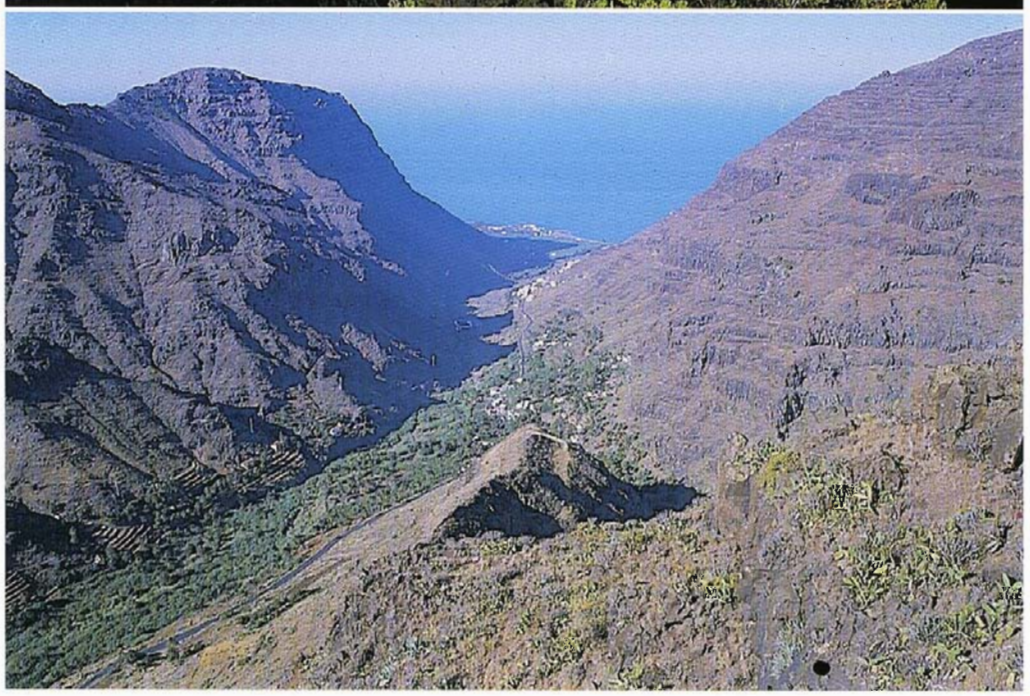
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to suggest species status, the ultimate proof for the biospecies is the test of reproductive isolation which is very difficult to accomplish in these allopatric taxa.

Their phylogeny is unsolved, but they are probably derived from each other, and may therefore be regarded as belonging to a single taxonomic unit at or above the species level. The term "superspecies", created by MAYR (1931), has been used to designate similar cases, which are especially common among arquipelago biotas, but its merit, apart from merely practical reasons to deal with groups of taxa, whose status is uncertain, has been seriously questioned (e.g. WILLMANN 1985).

***Hipparchia wyssii* (CHRIST, 1889)**

Synonyms

Satyrus fidia wyssii CHRIST
Satyrus wyssii CHRIST
Satyrus fatua wyssii CHRIST
Pseudotergumia wyssii CHRIST

(*Satyrus fidia wyssii* CHRIST is the correct original combination, not *Satyrus fatua wyssii* CHRIST, as erroneously stated in WIEMERS (1991). In fact SEITZ (1908) and GAEDE (1931) place *wyssii* as a subspecies of *fatua*.)

Taxonomy and range

Endemic species, confined to Tenerife and Gran Canaria. Taxonomy, biology and ecology of the *Hipparchia-wyssii*-species group with the sister species *H. bacchus*, *H. gomera* and *H. tilosi* is discussed by WIEMERS (1991) in detail. The nearest relative on the continent might be *H. tewfiki* WILTSHIRE from the Arab peninsula (SMITH & OWEN (1995)). The latter have also investigated interisland variation of some wing pattern characters and discuss their probable evolution. Their conclusions on the relationships between the taxa are based on wing pattern alone, without considering differences in genitalia or early stages. If these had been taken into account, a different and much more complicated picture would have emerged.

Distribution

Locally distributed in the pine forest regions of Tenerife and Gran Canaria (**ssp. *tamadabae* OWEN & SMITH, 1992** with distinctive wing pattern).

Habitat

Rocky places in barrancos in the *Pinus canariensis* woods between 400 m (Gran Canaria) or 1400 m (Tenerife) and 2000 m, often found drinking at wet places.

Phenology

The long, single generation emerges in the beginning of April at lower places on Gran Canaria and from the beginning of June on Tenerife. Worn specimens can be found until the beginning of September in the higher mountains. The larvae hibernate.

Early stages

The following descriptions are based on the nominate subspecies. Early stages of ssp. *tamadabae* are unknown, yet, but their knowledge might clarify if this subspecies is correctly placed with *H. wyssii*.

The white eggs are large (1.5-1.6 mm in height and 1.25-1.35 mm in diameter) bearing 14-15 longitudinal ribs which dissolve towards the micropyle zone where three micropyles were detected in electron micrographs. The chorion is becoming much thinner along the ribs thus producing a strange appearance especially a short time before the caterpillars hatch.

The young larva is light-brown with fine dark-brown dorsal, subdorsal and stigmata-lines as well as a broad dark-brown line above the stigmata.

The pupa is unknown.

Larval food-plants

Larvae have not been found yet. When bred, they feed on many different grass species (WIEMERS 1991).

Unpublished records

Tenerife : Aguamansa, Bco. de la Arena (1400 m), 7.VIII.88 (MW) ; Mña. Roja (1800 m), 13.-15.VII.83 (LM) ;

Gran Canaria : Mogan : above Soria, V.88 (TH) ; Maspalomas : Bco. de los Palmitos (400 m), 6.-20.IV.89 (TH) ; Pozo Nieves, 9.VII.83 (LM) ; Tiraiana, V.1934 (LNMD, 1 ♀ *leg.* A. CABRERA *in coll.* ZUKOWSKY) ; Roque Nublo (1100 m), 29.V.1981 (ZFMK, 1 ♀ *leg.* HUTTERER).

***Hipparchia bacchus* (HIGGINS, 1967)**

Synonyms

Satyrus wyssii CHRIST
Pseudotergumia wyssii bacchus HIGGINS

Taxonomy and range

Endemic species confined to the island of El Hierro. SMITH & OWEN (1995) state that the species is closest to *H. gomera* but this is only true for wing characters, not for genitalia or egg sculpture.

Distribution

Confined to the cliffs of the gulf of Hierro near Frontera and Sabinosa.

Habitat

The 1500 m high and extremely steep grass-covered cliffs of the Risco de Tibataje probably represent the breeding habitat. Adults have most often been found in vineyards at the bottom of the cliffs but also on the cliffs in the habitat of the famous Hierro endemic Giant Lizard (*Gallotia simonyi* STEINDACHNER, 1889) at Fuga de Gorreta (MACHADO 1985).

Phenology

Adults have been observed between 17.VII. and 29.VIII. in one generation. The larvae hibernate.

Early stages

The eggs are smaller than those of all other *Hipparchia* in the Canary Islands (1.2 mm in height and 1.0-1.1 mm in diameter). They bear 16-17 longitudinal ribs dissolving towards the micropyle zone. The 3 micropyles are surrounded by a six-leaved rosette.

The caterpillar is similar to the one of *H. wyssii*. The pupa remains unknown.

Larval food-plants :

See *H. wyssii*. MACHADO (1985) presumes that the food-plant might include *Brachypodium* species which are abundant on the cliffs.

Unpublished records

Hierro : Frontera, Pie del Risco (300 m), 28.-29.VII.88 (MW) ; Frontera, 16.-17.VII.83 (LM) ; Sabinosa, 19.VIII.76 (WF).

***Hipparchia gomera* (HIGGINS, 1967)**

Synonyms

Satyrus wyssii CHRIST
Pseudotergumia wyssii gomera HIGGINS
Pseudotergumia wyssii bacchus HIGGINS

Taxonomy and range

Endemic to the island of Gomera. Closest to *H. bacchus* in wing pattern but genitalia intermediate between *H. wyssii* and *H. tilosi* and eggs similar to those of *H. tilosi*.

Distribution

Confined to coastal regions of Gomera.

Habitat

Barrancos, rocky slopes and steep cliffs covered by grass in the succulent bush zone, sometimes also found in vine-yards.

Phenology

The long flight period lasts from 23.V. to 8.IX. Nevertheless there is only one generation. The larvae hibernate.

Early stages

The eggs are 1.3 mm in height, 1.1 mm in diameter and thus only slightly larger than those of *H. bacchus*, but they bear 21 ribs which reach the micropyle zone. This shows 4 micropyles which are surrounded by a six-leafed rosette.

The young larva is similar to that of *H. bacchus*. Grown up larvae show additional white lines between the brown lines and three brown stripes across the head capsule.

The pupa remains unknown.

Larval food-plants

V. *H. wyssii*.

Unpublished records

La Gomera : Bco. de Argaga (200 m), Valle Gran Rey : Bco. de Arure (200-300 m), 19.-24.VII.88 (MW) ; Vallehermoso, Hermigua, Agulo, 21.-22.VII.83 (LM) ;

***Hipparchia tilosi* (MANIL, 1984)**

Synonyms

Hipparchia wyssii tilosi MANIL

Taxonomy and range

Endemic to the island of La Palma. The wing pattern is very distinctive, with the general appearance much like *H. bacchus* but some forewing characters like *H. wyssii tamadabae*. Genitalia are intermediate between *H. bacchus* and *H. gomera* and the egg sculpture is closest to *H. gomera*.

PLATE III


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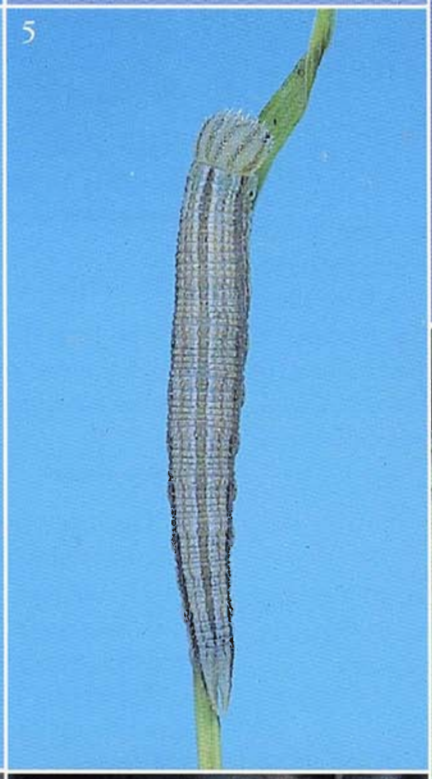
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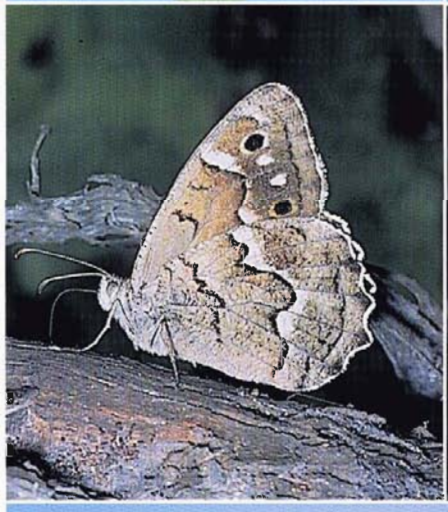
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Distribution

Confined to La Palma where it has been discovered recently and is known only from a few localities in the northeast of the island.

Habitat

Rocky, not too shady places in barranco bottoms inside the laurel forest. BECK (1991) also records it from light pine forests.

Phenology

As yet only been found from 25.VII. to the beginning of IX.

Early stages

The egg is similar to that of *H. gomera* in size and bears 22 longitudinal ribs, whose structure is dissolving towards the micropyle zone, even more than in *H. bacchus*.

The larva is not different from the *H. gomera*-larva.

The pupa is unknown.

Larval food-plants

See *H. wyssii*.

Unpublished records

La Palma : Bco. del Agua : Los Tilos (600 m), 31.VII.88, Sta. Cruz : Bco. de la Rio de las Nieves (400-500 m), 4.VIII.88 (MW) ; La Cumbrecita (1300 m), M.VIII.88 (WF).

PLATE III

FIG. 1 : *Hipparchia bacchus* : *ovae*, El Hierro, Pie del Risco de Tibataje ;
FIG. 2 : idem, larvae in L1, same locality ;
FIG. 3 : idem, ♂, same locality, 28.VII.1988 ;
FIG. 4 : *Hipparchia tilosi* : *ova*, La Palma, Bco. de Las Nieves ;
FIG. 5 : idem, half-grown larva, same locality ;
FIG. 6 : *Cyclyrius webbianus* ♀ : Gomera, Las Hayas, 21.VII.1988 ;
FIG. 7 : *Cyclyrius webbianus* : larva (green-red-white form), La Palma, La Galga ;
FIG. 8 : idem, pupa, same locality ;
FIG. 9 : *Hipparchia tilosi* ♂ : La Palma, Bco. de la Nieves ;
FIG. 10 : Habitat of *Hipparchia bacchus*, El Hierro, Risco de Tibataje, Frontera, 28.VII.1988 ;
FIG. 11 : Habitat of *Hipparchia tilosi*, La Palma, Bco. de Rio de Las Nieves, 4.VIII.1988.
(photos : M. WIEMERS)

Maniola jurtina jurtina (LINNAEUS, 1758)

Synonyms

Epinephele janira fortunata ALPHERAKY
Epinephele janira hispulla HÜBNER
Epinephele jurtina fortunata ALPHERAKY

Taxonomy and range

The Canary Island populations belong to the same subspecies as those of North Africa, where the nominate ssp. is found (THOMSON 1973). (This restriction of LINNÉ's type locality is in dispute.) I cannot support a separation of the Canary populations as a different ssp. (*fortunata* ALPHERAKY, 1889). Spot variation between different islands and in comparison with southern Portugal has been investigated by OWEN & SMITH (1990 and 1993b). They also conclude that the origin is to be found in North Africa.

Distribution

Widely distributed on La Palma, El Hierro and La Gomera ; on Tenerife and Gran Canaria confined to the northern parts. A solitary specimen noted by BALDWIN (1991) at Costa Teguise on Lanzarote probably was a stray, perhaps from Morocco, provided that it was correctly identified.

Habitat

Grassy, not too dry places in the laurel forest zone but not confined to laurel forest and also common near cultivations.

Phenology

The flight period of the single generation beginning 22.III. at lower elevations, while adults do not emerge until May at high altitudes. There (especially in the laurel forests) they also seem to aestivate like in southern Europe (v. DOWDESWELL 1981) and worn specimens can be found until 25.IX.

Early stages

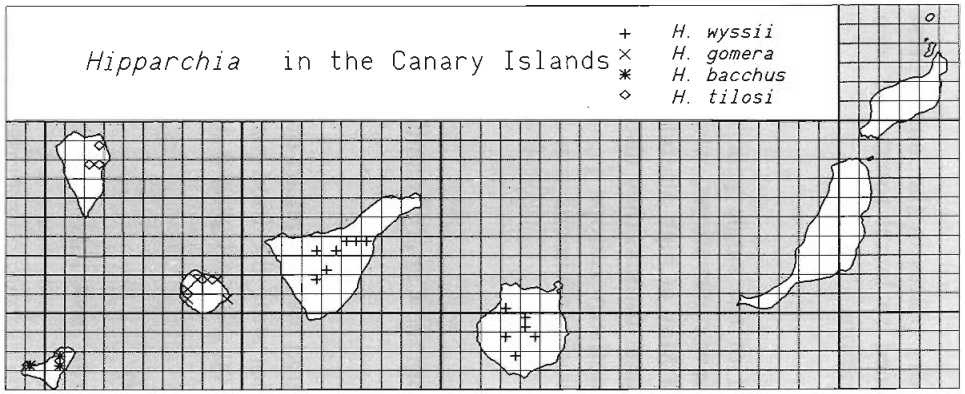
Not described from the Canary Islands.

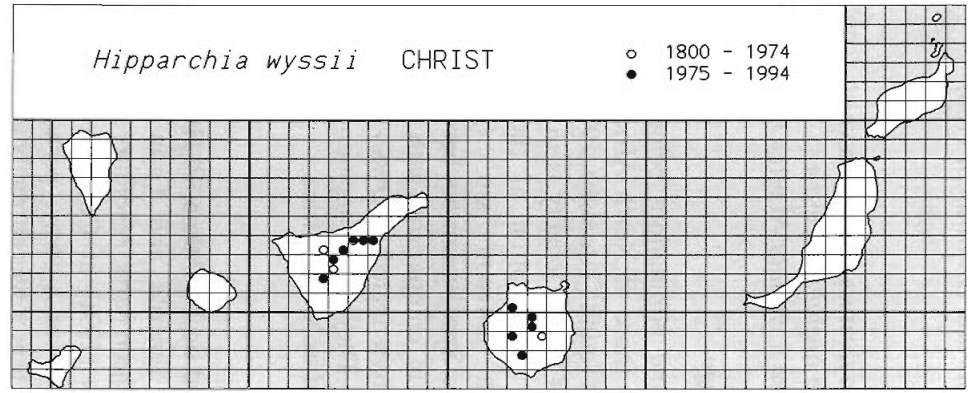
Larval food-plants

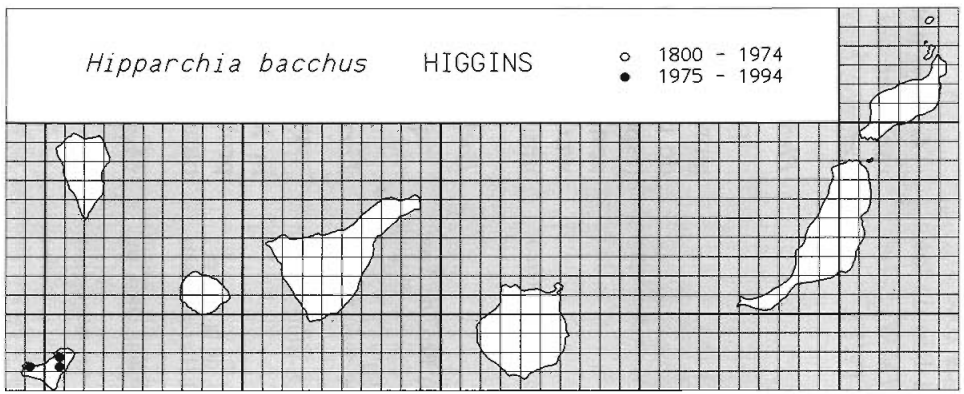
KILIAN (1896) found the caterpillars on Tenerife in May but does not state the food-plant. Most probably they feed on different grasses and hibernate.

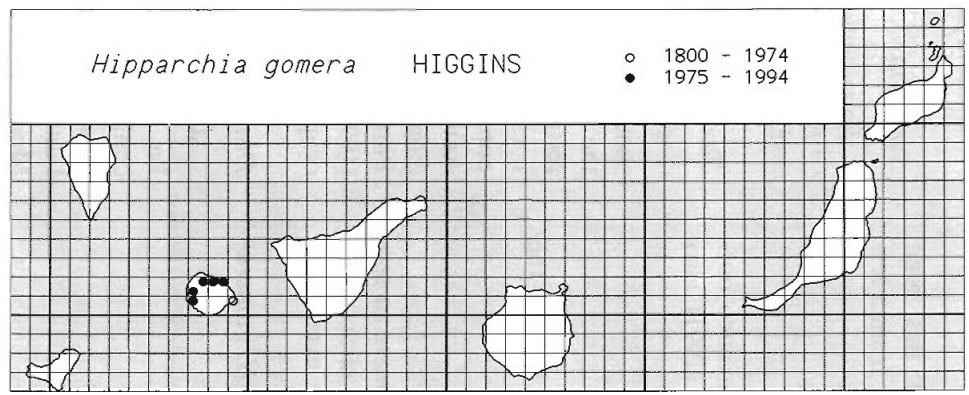
Unpublished records

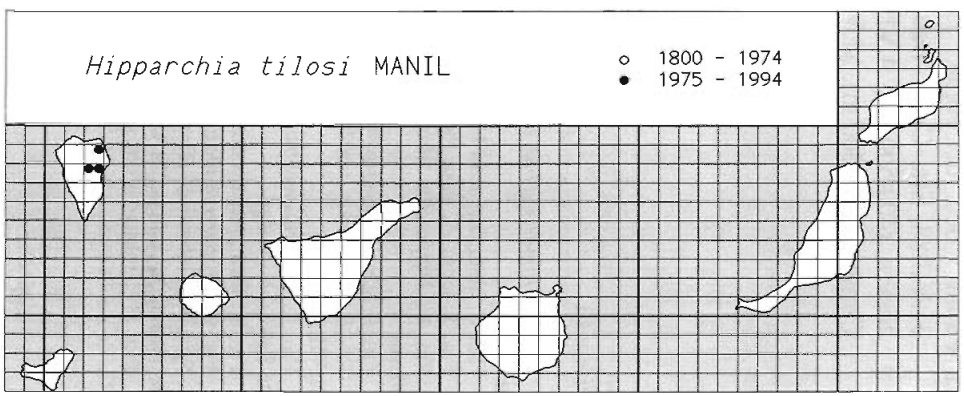
El Hierro : Valverde (600 m), Frontera (300-

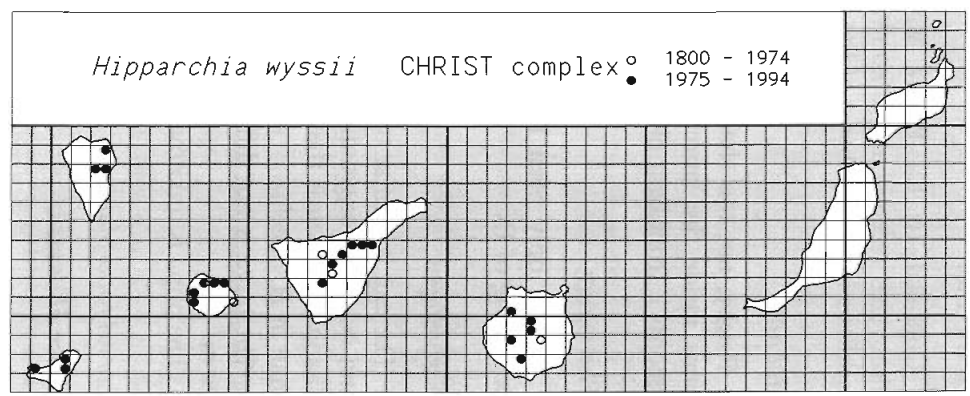

Hipparchia in the Canary Islands
+ *H. wyssii*
× *H. gomera*
✱ *H. bacchus*
◇ *H. tilosi*


Hipparchia wyssii CHRIST
○ 1800 - 1974
● 1975 - 1994


Hipparchia bacchus HIGGINS
○ 1800 - 1974
● 1975 - 1994


Hipparchia gomera HIGGINS
○ 1800 - 1974
● 1975 - 1994


Hipparchia tilosi MANIL
○ 1800 - 1974
● 1975 - 1994


Hipparchia wyssii CHRIST complex
○ 1800 - 1974
● 1975 - 1994

1300 m), 26.-29.VII.88 (MW) ; Jinama, Frontera, 16.-17.VII.83 (LM) ;

La Palma : Bco. del Agua (200-700 m), Bco. de la Galga (400-800 m), Sta. Cruz : Quintero (200 m) and Bco. de la Rio de las Nieves (300-500 m), Cumbre Nueva (1000 m), Bco. de las Angustias (200 m), 31.VII.-4.VIII.88 (MW) ; Bco. de Jieque (600 m), 14.-18.IV.93 (GJ) ; Los Tilos, 24.-26.VII.83 (LM) ;

La Gomera : Valle Gran Rey : Bco. de Arure (200 m), In the laurel forest zone : Las Hayas, Mt. Quemado, El Cedro, Roque de Agando, Mt. Garajonay, Mña. Quemada and Laguna Grande (700-1200 m), 19.-23.VII.88 (MW) ; Las Rosas, 20.-22.VII.83 (LM) ;

Tenerife : Pto. Cruz, Aguamansa, Las Mercedes, 13.-15.VII.83 (LM) ;

Gran Canaria : Cruz Tejeda, Fontanales, Tafira, 8.-11.VII.83 (LM).

LYCAENIDAE

Callophrys rubi (Linnaeus, 1758)

Taxonomy and range

Distributed throughout the Palaearctic region including Northwest Africa and many Mediterranean islands.

Distribution

Apart from the dubious record by Holt-White (1894), *C. rubi* was never recorded from the Canary Islands. Nevertheless Higgins & Riley (1983) indicate its occurrence on Tenerife. According to letters of the late L. G. Higgins to R. Leestmans (*in litt.* 7.XII.1974 and 11.X.1975) this is based on captures of several specimens taken by the son of Douglas Cottrill on a holiday on Tenerife in April 1963. One of them (labelled Santa Cruz, 4. IV. 1963) was sent to L. G. Higgins. This record is best explained as an accidental introduction. However it is most interesting to note that this ubiquitous species has not been able to establish on Tenerife despite of having somehow reached the island.

Unpublished records

Tenerife : Santa Cruz, 4. IV. 1963 (Cottrill leg.) — s. *Distribution.*

Lycaena phlaeas (Linnaeus, 1761)

Synonyms

Polyommatus phlaeas L.

Taxonomy and range

Widely distributed throughout the Palaearctic up to North Cape ; also in easternmost Africa and eastern North America. Specimens of *L. phlaeas* from the Canary Islands show extreme individual variation in brightness of coloration which might be induced by ecological factors but they do not seem to differ from the nominate subspecies.

Distribution

Widely distributed on all islands, but rarely found on Lanzarote and Fuerteventura. (For the latter island it is only noted by Guichard (1967) without precise data.)

Habitat

Flowery places in all habitat types up to 2300 m in the Cañadas but most abundant in light pine forests.

Phenology

Throughout the year in several generations with no apparent seasonal change in population densities.

Early stages

Similar to European populations ; larvae with a remarkably high percentage of the reddish colour form (K. Schurian, pers. comm.)

Larval food-plants

Egg-laying was observed on *Rumex* species (*R. maderensis* or *R. vesicarius*) on Gran Canaria, but larvae which were reared in captivity readily accepted *Rumex acetosa* and *R. acetosella* (K. Schurian, pers. comm.).

Unpublished records

El Hierro : Frontera (300-1300 m), 26.-28.VII.88 (MW) ; Mirador de las Playas, Taibique, 18.-31.III.91 (GJ) ; San Andres, Jinama, Frontera, 16.-17.VII.83 (LM) ;

La Palma : Bco. de la Galga (400-800 m), Cumbre Nueva (1000 m), Caldera de Taburiente : Bco. de las Angustias (200-500 m), 1.-3.VIII.88 (MW) ; Charco Verde, 23.VI.89 (WB) ; Los Codesos, 1.-9.IV.93 (GJ) ; Hoya Grande (1200 m), Tinizara (500 m), 26.X.93 (PN) ; Los Tilos, 24.-26.VII.83 (LM) ;

La Gomera : Mt. Quemado, Laguna Grande, Mt. Garajonay (700-1200 m), Valle Gran Rey : Bco. de Arure (200 m), 21.-23.VII.88 (MW) ; Hermigua, 5.VIII.86 (WB) ; Bco. de Arure,

Las Hayas, El Cedro, La Palmita and Vallehermoso, 9.-18.III.93 (AB) ; Las Rosas, 20.-22.VII.83 (LM) ;

Tenerife : Mña. Roja (1400-1800 m), 7.VIII.88 (MW) ; Masca / Teno, 6.IV.85 (WB) ; Orotava, Las Mercedes, Güimar, 12.-25.XII.81, Pto. Cruz, Aguamansa, Cañadas (2300 m), Vilaflor, Las Mercedes, Güimar, 13.-18.VII.83 (LM) ;

Gran Canaria : Sta. Lucia, Cruz Tejeda, Fontanales, Firgas, Tafira, Pozo Nieves, 8.-11.VII.83 (LM) ;

Lanzarote : Hária, II.88 (DO).

Lampides boeticus (Linnaeus, 1767)

Synonyms

Lycaena baetica L.
Lycaena baeticus L.
Cosmolyce boetica L.

Taxonomy and range

Cosmopolitan migrant in tropical and subtropical regions throughout the world.

Distribution

Widespread on all islands, on Tenerife particularly along the north coast. From Lanzarote recorded only by Guichard (1967) without precise data.

Habitat

Not confined to a specific habitat type if larval food-plants are present, occurring at altitudes up to 2000 m, but more common at lower elevations. High population densities can be observed in the "Ginsterbuschland" characterized by bushy *Fabaceae* of the genus *Adenocarpus, Chamaecytisus, Teline* and *Ulex*.

Phenology

Throughout the year in several generations.

Early stages

Probably indistinguishable from Mediterranean populations. The ground colour of the larva varies from clear green to deep red with all intermediates. It has a dark dorsal line and many light lateral diagonal lines. The pupa is grey with many black spots especially on the dorsal side.

Larval food-plants

The larvae feed in fruits of different *Fabaceae*, including peas (*Pisum sativum*), *Cassia* or *Chamaecytisus* (see below). According to my own observations, they are often visited by ants, *Lasius niger* L. (identified by K. Fiedler, pers. comm.).

Unpublished records

El Hierro : Valverde (600 m), Frontera (300-500 m), 27.-29.VII.88 (MW) ; Taibique, 31.III.91 (GJ) ; Frontera, 16.-17.VII.83 (LM) ;

La Palma : Bco. del Agua (200-700 m), Bco. de la Galga (400-800 m) — eggs and larvae on *Chamaecytisus palmensis*, 31.VII.-3.VIII.88 (MW) ; Los Tilos, 24.-26.VII.83 (LM) ;

La Gomera : Valle Gran Rey : La Calera and Bco. de Arure (200 m), Las Hayas, Roque de Agando, Mt. Garajonay, Laguna Grande, Chipude (700-1200 m), 20.-24.VII.88 (MW) ; Las Rosas, 20.-22.VII.83 (LM) ;

Tenerife : La Laguna — eggs, larvae and pupae, 1.VIII.74 (WF) ; Candelaria, Güimar, 18.-25.XII.81, Pto. Cruz, Icod Alto, Aguamansa, 13.-19.VII.83 (LM) ;

Gran Canaria : Maspalomas, end III.80 (OL) ; Tafira, 8.VII.83 (LM).

Azanus ubaldus (Cramer, 1782)

Taxonomy and range

Palaeotropical element with vast distribution in savannas from Morocco to India.

Distribution :

Only known from Playa del Inglés/ Maspalomas on Gran Canaria. The first specimens were captured by P. Nijssen (Schiedam, NL) in 1982 but were not identified until 1992 (Olivier & Van Der Poorten 1992). The recent record by Schurian & Hornemann (1992) indicates that the species is permanently established at Maspalomas.

Habitat

Subdesert coastal districts around *Acacia* trees whose flowers are used as nectar sources by the adults.

Phenology

Only found in the end of January and April, but probably flying throughout the year in several generations as in Africa.

Early stages

Not known from the Canary Islands.

Larval food-plants :

Not known for the Canary Islands, most probably ornamental *Acacia*.

Unpublished records

None.

Cyclyrius webbianus (BRULLÉ, 1839)

Synonyms

Lycaena fortunata STAUDINGER
Lycaena webbianus BRULLÉ
Lycaena webbiana BRULLÉ
Cyclirius webbianus BRULLÉ

Taxonomy and range

This Canary Island endemic is not especially closely related to any other butterfly. Its next relative is *Cyclyrius mandersi* DRUCE 1907 from Mauritius which may have become extinct in recent decades (WILLIAMS 1989 ; DAVIS & BARNES 1993).

Distribution

Widespread on La Palma, La Gomera, Tenerife and Gran Canaria. On El Hierro, the species has been found only once (on the 29.VIII.1889 3 ♂♂ in the Mña. Tenezedra (700 m) SIMONY *leg.*, according to REBEL & ROGENHOFER 1894). This record is reliable, but the actual occurrence remains to be confirmed.

Habitat

On the western islands, *C. webbianus* is not restricted to a specific habitat and is missing only in the arid zones of the central islands. Like its food-plants, the species profits from the degradation and opening of the laurel forests and it is much more numerous at higher altitudes than at low elevations. On the 2000 m high plateau of the Cañadas on Tenerife, the species can develop extremely high population densities with hundreds of thousands if not millions of individuals (own observations) and specimens have been observed up to 3500 m near the summit of Mt Teide (LEESTMANS, 1975a). On the Cañadas, I found the butterflies particularly flying around the dominating *Spartocytisus supranubium* shrubs and sucking at the pink flowers of *Pterocephalus lasiospermum*. (At middle heights *Dittrichia viscosa* and *Micromeria*-species are preferred as nectar plants.) Surprisingly REBEL & ROGENHOFER (1894) note the absence of *C. webbianus* on the pumice-stone fields of the Pico de los Muchachos (1600-2000 m) on La Palma, a site comparable to the Cañadas on Tenerife.

Phenology

The species has several inseparable generations throughout the year, at least at low elevations. Towards higher altitudes, population densities become very high during summer months but decrease to zero in autumn.

It is not known how *C. webbianus* survives the winter at high altitudes. On the Cañadas, no specimens have been found between 5.X. and 2.V.

Early stages

These have been described by BACALLADO (1976).

The eggs bear about 40 spiral ribs, half of them laevorotatory, the other dextrorotatory towards the micropyle zone.

The young larva is whitish whereas the full-grown larva is very variable in colour. It can be light green with a pair of slightly lighter dorsal lines, several diagonal lateral lines and white lateral stigmata-lines or change to deep red with all intermediates. It can also be densely covered with white excluding only the regions of the reddish lines.

The larva is densely covered with fine white hair. The light-brown pupa is hairy, too, with many fine dark-brown spots across the body.

Larval food-plants

Different *Fabaceae*, according to BACALLADO (1976), *Lotus sessilifolius* at low elevations, *Adenocarpus foliolosus* and *Lotus glaucus* at higher elevations and *Adenocarpus viscosus* (but not *Spartocytisus supranubius* !) at the high altitudes on Tenerife. On La Palma, the larva feeds on *Lotus hillebrandii,* according to the same author, and I found them on *Teline stenopetala* (see below). In feeding experiments the larvae accept many other *Fabaceae*, including *Onobrychis* (K. SCHURIAN, pers. comm.).

Unpublished records

La Palma : Bco. del Agua (200-700 m), Bco. de la Galga (400-800 m), — ♀ egg-laying, eggs and larvae on *Teline stenopetala*, Sta. Cruz : Quintero and Bco. de la Rio de las Nieves (200-500 m), Cumbre Nueva (1000 m), Caldera de Taburiente : Dos Aguas (500 m), 31.VII.-4.VIII.88 (MW) ; Monte de Luna, 19.VIII.86 (WB) ; Los Codesos (1200 m),

Bco. de Jieque (600 m), Ermita de San Nicolas (600 m), 1.-16.IV.93 (GJ) ; Fuencaliente, Los Sauces, 26.XII.81, Los Tilos, 24.-26.VII.83 (LM) ;

La Gomera : Arure (800 m) ; in the laurel forest : Las Hayas, Mt. Quemado, El Cedro, Roque de Agando, Mt. Garajonay, Mña. Quemada, Laguna Grande (700-1200 m), 21.-23.VII.88 (MW) ; Hermigua, end XII.87 (OL) ; Las Rosas, Chipude, 20.-22.VII.83 (LM) ;

Tenerife : Las Cañadas : El Portillo, Mña. Blanca, Teide, Los Roques (2000-2300 m) — eggs and larvae on *Adenocarpus viscosus*, Mña. Roja (1400-2000 m), 6.-7.VIII.88 (MW) ; Ft. Esperanza, Erjos/Teno, Benijo / Anaga, 9.-12.VIII.86 (WB) ; Orotava (1300 m), Las Mercedes. Arafo, Candelaria, Güimar, Las Caletillas, 12.-25.XII.81, Pto. Cruz, Icod Alto, Aguamansa, Mña. Roja (1800 m), Las Cañadas (2300 m), Las Mercedes, 13.-19.VII.83 (LM) ;

Gran Canaria : Maspalomas, end III.80 (OL) ; Sta. Lucia, Cruz de Tejeda, Fontanales, Pozo Nieves, 8.-11.VII.83 (LM).

Zizeeria knysna (Trimen, 1862)

Synonyms

Lycaena lysimon Hübner
Zizera lysimon corneliae Regteren Altena
Zizera lysimon Hübner

Taxonomy and range

Atlantomediterranean element with scattered colonies on the Iberian peninsula and Northwest Africa, but the range of its close sister species, *Z. karsandra* Moore, includes the entire Old World tropics.

Distribution

Localized in the coastal districts of all islands ; single records only for El Hierro, La Gomera and Lanzarote ; Guichard (1967) is the only one who notes its occurrence on Fuerteventura.

Habitat

Subtropical plant associations of weeds growing in disturbed areas much influenced by man and vehicles, like the *Polycarpon-Alternanthera*-association ("Trittpflanzen-Gesellschaft" in German, compare Oberdorfer 1967) at verges near the coast, most often in villages, only rarely in barrancos of the laurel forest zone. Only Regteren Altena (1948) notes its occurrence in the Cañadas. The adults fly close above sparse vegetation ; feeding has been observed on flowers of *Heliotropium ramosissimum* and *Mesembryanthemum nodiflorum* (Schurian 1994).

Phenology

Throughout the year in several inseparable generations.

Early stages

Schurian (1994) reared the species from Gran Canaria populations. He describes courtship behaviour and illustrates the early stages. The larvae were polymorphic with a ground-colour ranging from green to red with various intermediate forms. They are visited by ants (identified as belonging to the genus *Pheidole*). Eggs were partly parasitized by *Chalcididae*, and larvae of *Cotesia cupreus* Lyle (*Braconidae*) emerged from one of the caterpillars.

Larval food-plants

Schurian (1994) found eggs and larvae on *Amaranthus*, and single eggs were layed on *Malva* and one other plant (*Fagonia* ?). Egg-laying was observed at verges on solitary plants which were frequently tread or rolled down. When reared in captivity, larvae accepted different *Fabaceae* (*Trifolium, Lotus, Coronilla*) and females deposited some eggs on *Trifolium repens*.

Unpublished records

La Palma : Sta. Cruz, Los Llanos de Aridane (350 m), 30.VII.-2.VIII.88 (MW) ; Pto. de Tazacorte, 17.IV.93 (GJ) ; Tazacorte, Pto. Naos, 3.-4.XI.93 (PN) ;

La Gomera : Valle Gran Rey : La Calera, Vueltas, Bco. de Arure (100-200 m), 19.-24.VII.88 (MW) ; Valle Gran Rey, end XII.87 (DF) ;

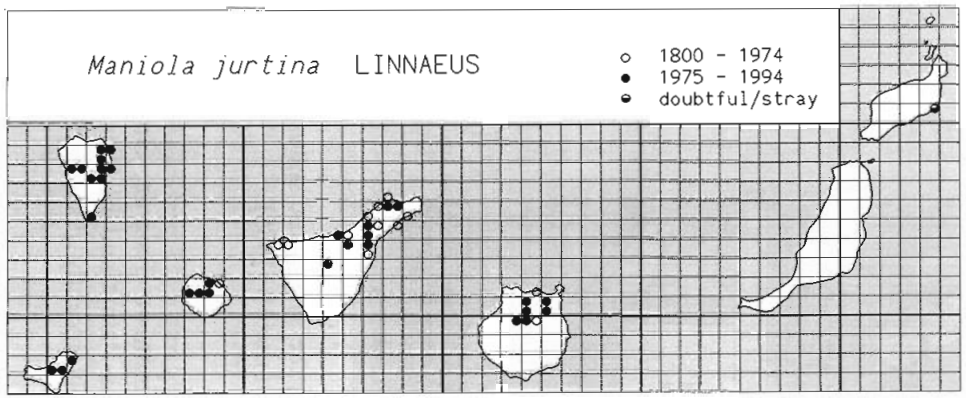
Tenerife : Puerto de la Cruz, 5.VIII.88 (MW) ; Pto. Cruz, Las Mercedes, Candelaria, Güimar, Las Caletillas, Las Galletas, Los Gigantes, 15.-27.XII.81, Pto. Cruz, 15.VII.83 (LM) ;

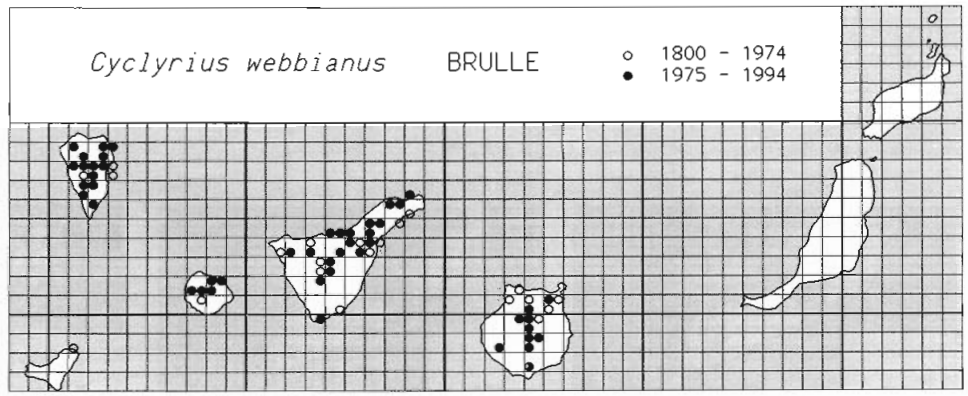
Gran Canaria : Pto. Rico, Sta. Lucia, Firgas, 7.12.VII.83 (LM).

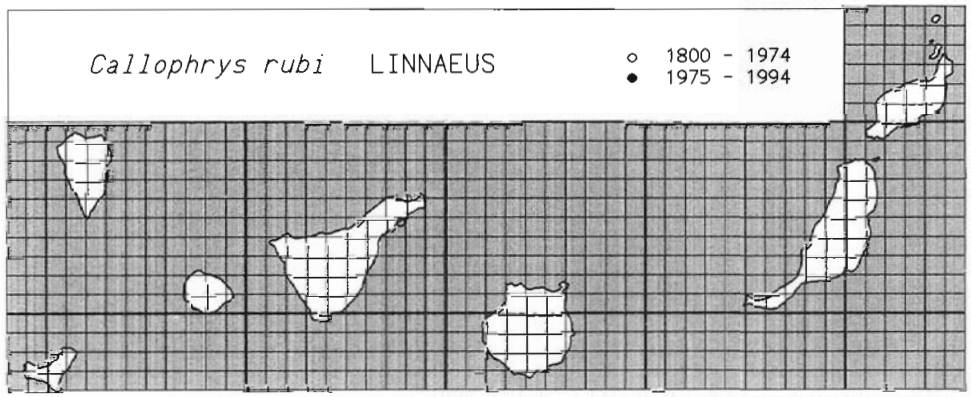
Aricia cramera (Eschscholtz, 1821)

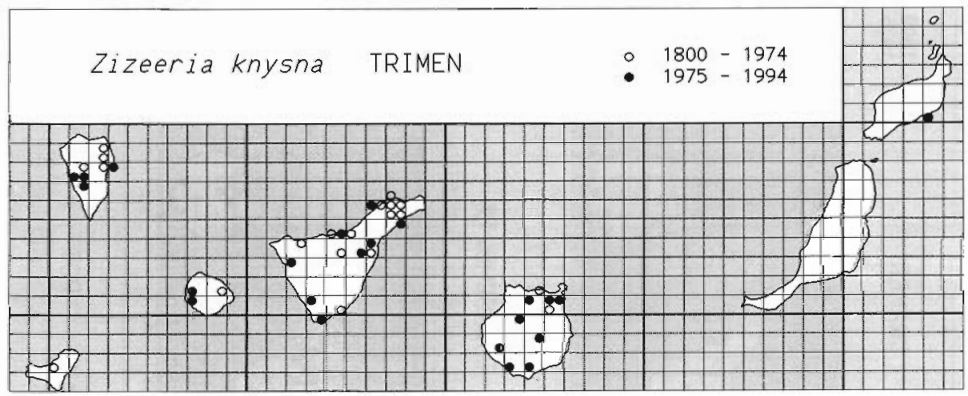
Synonyms

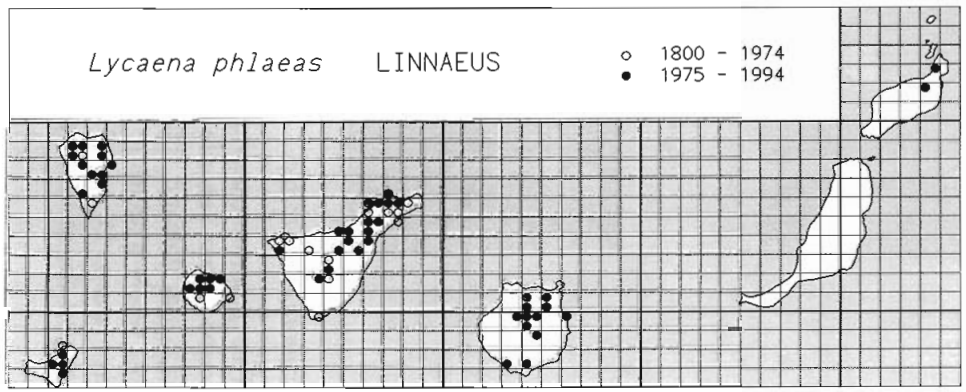
Lycaena astrarche canariensis Blachier
Aricia medon cramera Eschscholtz
Aricia canariensis Blachier
Aricia agestis cramera Eschscholtz

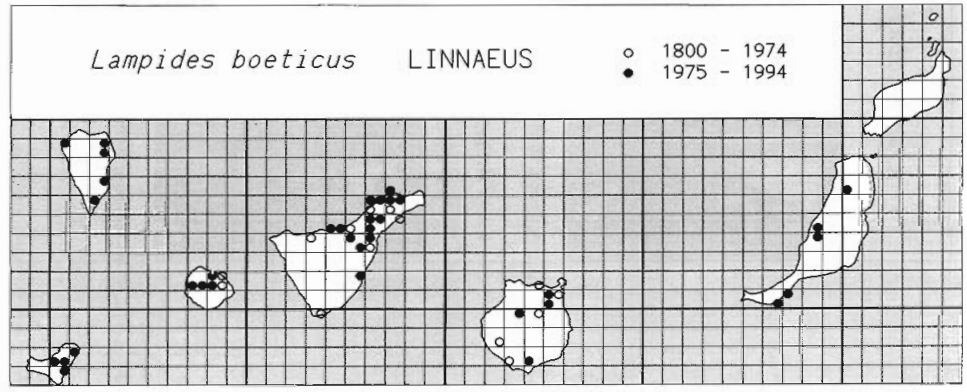

Maniola jurtina LINNAEUS
1800 - 1974
1975 - 1994
doubtful/stray

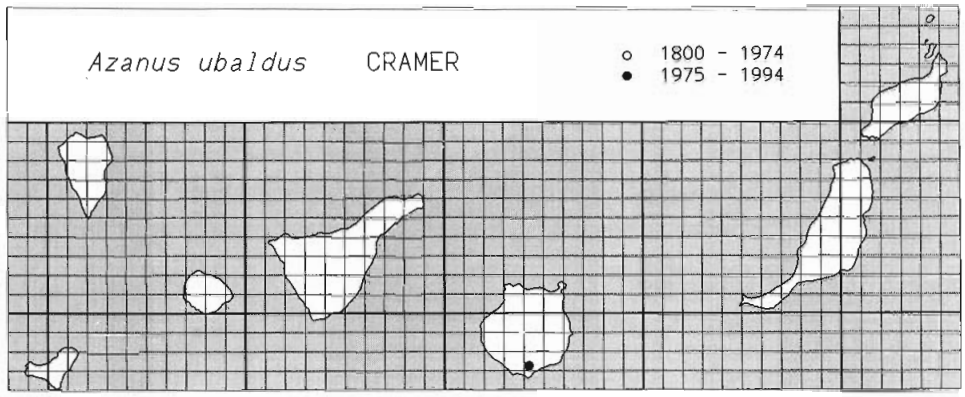

Cyclyrius webbianus BRULLE
1800 - 1974
1975 - 1994

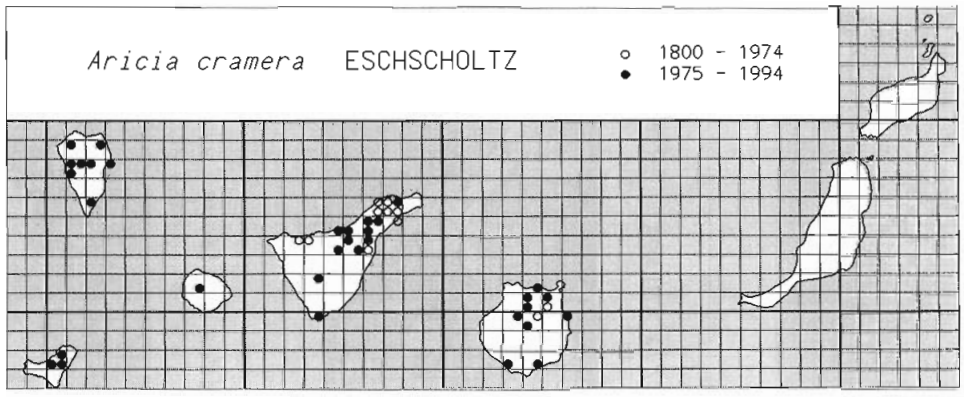

Callophrys rubi LINNAEUS
1800 - 1974
1975 - 1994

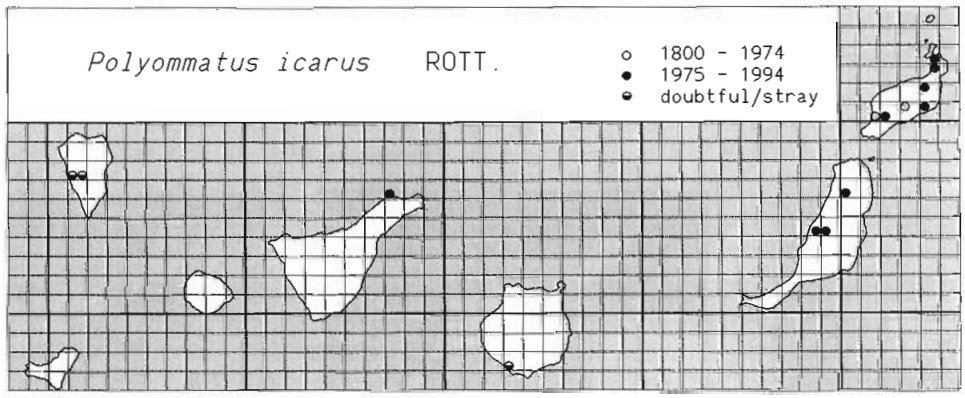

Zizeeria knysna TRIMEN
1800 - 1974
1975 - 1994

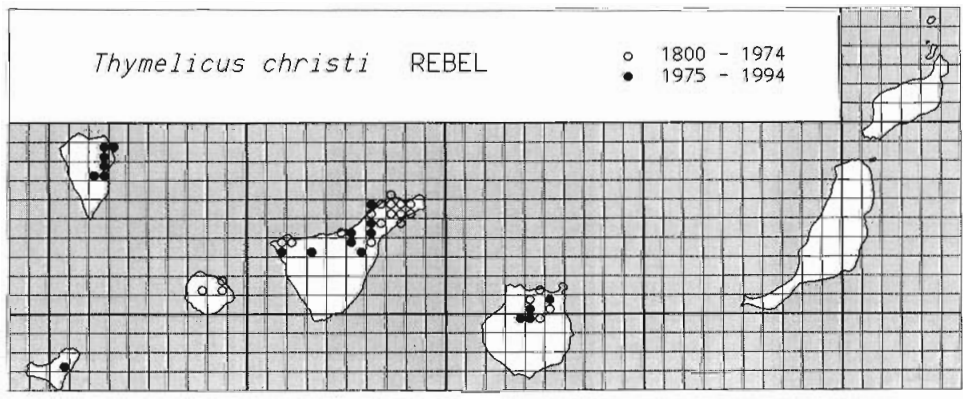

Lycaena phlaeas LINNAEUS
1800 - 1974
1975 - 1994


Lampides boeticus LINNAEUS
1800 - 1974
1975 - 1994









Taxonomy and range

This atlantomediterranean species which was described from Tenerife also occurs in Northwest Africa, the Balearic Islands and the Iberian peninsula where it seems to be locally sympatric with *Aricia agestis* D. and S. SCHMIDT-KOEHL (1971) entangled the at times confused nomenclature of the Canarian *Aricia* ; the systematic status is discussed by HØEGH-GULDBERG (1985).

Distribution

Local and uncommon on Tenerife, Gran Canaria, La Gomera, La Palma and El Hierro ; on the latter island, only recently discovered (first

reported by OWEN 1988, but already found in 1983 by L. MANIL).

Habitat

Flowery sunny spots inside the forests, in particular sucking at yellow-flowering *Asteraceae*. On Tenerife and La Palma, the species is most often observed in pine forests and on La Gomera, where natural pine woods are absent, it is also especially common in plantations of pines. On El Hierro, I found it at a sheltered wet spot covered with grass and fern at the bottom of the cliffs and a similar habitat is described by RETZLAFF (1978) for Gran Canaria.

Phenology

The butterflies fly throughout the year in several generations.

Early stages

See SCHURIAN (1995).

Larval food-plants

SCHURIAN (1995) observed oviposition in Tenerife on *Tuberaria guttata* L. (*Cistaceae*).

Unpublished records

El Hierro : Frontera and Pie del Risco (300 m), 28.VII.88 (MW) ; San Andres, Jinama, Frontera, 16.-17.VII.83 (LM) ;
La Palma : Caldera de Taburiente : Dos Aguas (500 m), 2.VIII.88 (MW) ; Los Tilos, 24.-26.VII.83 (LM) ;
La Gomera : Las Hayas (1200 m), Mt. Garajonay (1200 m), 21.-23.VII.88 (MW) ; Valle Gran Rey, end XII.87 (DF) ;
Tenerife : Mña. Roja (1500 m), 7.VIII.88 (MW) ; Las Caletillas, 19.XII.81, Vilaflor, Las Mercedes, Güimar, 13.-18.VII.83 (LM) ;
Gran Canaria : Fontanales, Pozo Nieves, 9.-11.VII.83 (LM).

Polyommatus icarus **(ROTTEMBURG, 1775)**

Synonyms

Lycaena icarus celina AUSTAUT

Taxonomy and range

This Palaearctic species is the most common blue in large parts of its vast range and no subspecific differentiation seems to have evolved, at least in Europe. The female-form *caerulescens* WHEELER with blue suffusion on the upperside is common in the Canary Islands.

Distribution

A local species on Fuerteventura and Lanzarote, particularly in the hillsides. The species has never been reported from the western islands, but recently single individuals have been observed (but unfortunately no proofs have been collected) on Gran Canaria and La Palma (see unpublished records). The authenticity of these records is increased after the discovery of two specimens (1 ♂ + 1 ♀) in coll. ZFMK (Bonn) which were still in their original labeled envelopes (see *Unpublished records*). These constitute the first record for Tenerife. Possibly these records indicate a recent colonization of the western islands. On Gran Canaria, the species was first encountered in 1978, whereas both the records from Tenerife and La Palma are from 1989. All these records are from sites near the coast.

Habitat

Flowery meadows and coastal cliffs with large stocks of the larval food-plant in sheltered positions.

Phenology

Several generations throughout the year although almost no observations exist for the summer months. Therefore it might be that the larvae aestivate during summer when their food-plants are desiccated.

Early stages

The adult larva is green with pairs of only slightly lighter dorsal and stigmata-lines.

Larval food-plants

On Lanzarote, egg-laying was observed on the leaves of *Lotus lancerottensis* (OWEN 1988 ; K. SCHURIAN, pers. comm.) and on Fuerteventura, the larva was found to feed on the same plant (OWEN & WIEMERS 1992).

Unpublished records

La Palma : ? Los Llanos, 25.I.8.II.89 (DG) ; ? Pto. de Tazacorte, 15.IV.93 (GJ) ;
Tenerife : Punta Hidalgo, 10.VII.89 (WB) — identification confirmed by the author ;
Gran Canaria : ? Arguineguin, VIII.78 and I.86 (DG) ;
Fuerteventura : Tindaya, Betancuria — also an adult larva on *Lotus lancerottensis*, Vega de Rio Palmas, 300-400 m, 22.-26.II.91 (DO and MW) ;

Lanzarote : Hária, Las Casitas de Femés, 300 m, 2.-3.III.91 (MW).

HESPERIIDAE

Thymelicus christi (REBEL, 1894)

Synonyms

Hesperia actaeon ESPER
Adopaea acteon ROTTEMBURG
Adopaea christi REBEL
Thymelicus acteon christi REBEL
Thymelicus actaeon christi REBEL

Taxonomy and range

Many authors consider the Canary Island endemic, *T. christi*, as a subspecies of *Thymelicus acteon* ROTTEMBURG, a holomediterranean element with a northern range extending to Central Europe, although differences in wing coloration are quite obvious (LEESTMANS 1975a).

NORDMAN (1933) cites a specimen captured by LINDBERG in 1926 in the High Atlas (Morocco) and ZERNY (1935) mentions a few captured by SCHWINGENSCHUSS in 1933 in the same range. ZERNY (1935) is much in doubt of their exact taxonomic status due to lack of material. The Atlas population probably belongs to *T. acteon oranus* EVANS as suggested by LEESTMANS (1975a).

Distribution

Locally distributed in the north of the western islands (incl. Gran Canaria). First identified on El Hierro by the author (see below).

Habitat

Grassy places in the lower transition zones between the laurel forest and the succulent bush represent the favoured habitat of the species.

Phenology

From 11.III. to 25.IX., probably in 2-3 generations.

Early stages

These remain to be described and do not seem to have been found.

Larval food-plants

Not known in the Canary Islands, probably species of grass.

Unpublished records

El Hierro : First record for this island : Frontera, Pie del Risco (300 m), 28.-29.VII.88 (MW) ;
La Palma : Bco. del Agua (200 m), Bco. de la Galga (400-800 m), Cumbre Nueva (1000 m), Sta. Cruz : Quintero (200 m) and Bco. de la Rio de las Nieves (300-400 m), 31.VII.-4.VIII.88 (MW) ; Los Tilos, 24.-26.VII.83 (LM) ;
Tenerife : Masca / Teno, 6.IV.85 (WB) ; Aguamansa, Güimar, 13.-18.VII.83 (LM) ;
Gran Canaria : Cruz de Tejeda, Fontanales, 8.-11.VII.83 (LM).

Acknowledgements

Many colleagues gave their records for inclusion into this paper which helped to improve the distribution maps. I am grateful to all of them. The list of informants (1st part, pp. 72-73) is ordered according to the abbreviations used to mark their records in this paper and includes an enumeration of the islands from which records have been obtained.

I am also obliged to those colleagues who contributed to this paper in different ways ;

Prof. Dr Klaus ROSE (Mainz) granted me to examine and photograph the type of *Gonepteryx cleopatra rosei* GROSS, 1973 in his collection.

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Finally I thank Ronny LEESTMANS for his interest in publishing this paper and his competent advice in the stage of terminating the manuscript.

Bibliography

Apart from the papers cited in the text I have made an effort to include all papers dealing with butterflies of the Canary Islands, especially those which appeared after the last comprehensive bibliography by LEESTMANS (1975a). With the only exception of HOLT-WHITE (1894) which turned out to be inaccessible, all these papers have been read and evaluated by the author, especially for the production of the distribution maps.

Also included are some of the most recent and more comprehensive papers on the butterflies of the other North Atlantic Islands. A Canary bibliography for all insect orders has been compiled by MACHADO (1987).

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