Taxonomy and geographical variation of *Hipparchia mersina* (STAUDINGER, 1871) with notes on its ecology and phenology (Lepidoptera : Nymphalidae Satyrinae)

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Samenvatting. Taxonomie en geografische variatie van *Hipparchia mersina* (STAUDINGER, 1871) met notities betreffende de ecologie en fenologie (Lepidoptera : Nymphalidae Satyrinae).

In de inleiding wordt de historiek van de taxonomie van *Hipparchia mersina* (STAUDINGER, 1871) besproken. De doelstellingen van de studie worden geformuleerd : het bespreken van de geografische variatie van *H. mersina*, informatie geven over de ecologie en fenologie van deze soort en het evalueren van de taxonomische status van *Hipparchia mersina malickyi* KUDRNA, 1977.

Hierop volgt een lijst van het onderzochte materiaal, alsook een bespreking van de methodiek betreffende o.a. de preparatie van de genitalia en het tekenen en meten van bepaalde strukturen. Vervolgens komt de gedetailleerde beschrijving van het adult, met uitvoerig kommentaar betreffende de benaming van de diverse strukturen van de mannelijke en vrouwelijke genitaliën.

De ecologie en de fenologie van de soort worden besproken. *H. mersina* vliegt in droge en warme lokaliteiten, meestal in lichte dennenbossen met open plekken. De vroege aanvang van de vliegtijd van de soort (gewoonlijk rond half mei) wordt aangehaald als een efficiënte reproduktief isolerende barrière ten opzichte van andere nauwverwante taxa welke sympatrisch en (gedeeltelijk) synchroon met *H. mersina* voorkomen, toegelicht door persoonlijke waarnemingen van de eerste auteur op het Griekse eiland Lésvos, waar naast *H. mersina* ook *Hipparchia pellucida pellucida* (STAUDER, 1923) en *Hipparchia aristaeus senthes* (FRUHSTORFER, 1908) in dezelfde lokaliteiten voorkomen. De vliegtijd van beide laatstgenoemde soorten begint ongeveer 3 weken later dan die van *H. mersina*, wanneer de meeste wijfjes van deze laatste soort reeds bevrucht zijn. In de volgende sektie wordt dieper ingegaan op de geografische variatie van diverse eigenschappen van het fenotype (o.a. grootte, vleugeltekening, onderlinge verhoudingen van diverse genitaalstrukturen). Twee kenmerken variëren zonder dat een duidelijke geografische trend kan worden aangetoond. De grootte is mogelijk gedeeltelijk te correleren met de hoeveelheid jaarlijkse neerslag in de diverse gebieden. Voor 4 kenmerken wordt een duidelijke clinale variatie van oost naar west aangetoond; zes andere kenmerken werden niet verder uitgediept maar er zijn aanwijzingen dat ze hetzelfde clinale patroon zouden vertonen. De evidentie voor de invloed van klimatologische faktoren op dit variatiepatroon is gering en weinig overtuigend. De aard van de selektieve faktoren is niet duidelijk. Er wordt aangenomen dat de gradatie in de expressie van bepaalde eigenschappen, zoals bijvoorbeeld de witte postdiskale band op de onderkant van de achtervleugel van het mannetje veroorzaakt wordt door polygene complexen. Het patroon van geleidelijke clinale variatie is waarschijnlijk het resultaat van een compromis tussen het diversifiërende effekt van selektie door de omgeving op de verschillende demen enerzijds en het cohesieve effekt van gene flow tussen deze demen anderzijds.

De populatie van het Griekse eiland Lésvos blijkt niet konstant te verschillen van de overige populaties van *H. mersina*. Daarom wordt *Hipparchia mersina malickyi* KUDRNA, 1977 in synonymie geplaatst onder de nominaatvorm. KUDRNA (1977) had als lectotype van *H. mersina* een eksemplaar afkomstig van Izmir aangeduid. De diverse redenen waarom de typelokaliteit van deze soort Mersin moet zijn, worden aangehaald en een nieuw lectotype wordt aangeduid.

Résumé. Taxonomie et variation géographique de *Hipparchia mersina* (STAUDINGER, 1871). Notes concernant son écologie et sa phénologie (Lepidoptera : Nymphalidae Satyrinae).

L'introduction expose l'historique de la taxonomie de *Hipparchia mersina* (STAUDINGER,

1871). Les objectifs de la présente étude sont présentés : la discussion de la variation géographique de *H. mersina*, donner des informations concernant l'écologie et la phénologie de l'espèce, ainsi que l'évaluation du statut taxonomique de *Hipparchia mersina malickyi* KUDRNA, 1977. Suivent alors une liste du matériel examiné ainsi qu'une discussion des méthodes employées concernant entre autres la préparation des génitalia ainsi que le dessin et les mensurations des diverses structures des génitalia mâle et femelle. Ensuite vient la description détaillée de l'adulte avec des commentaires détaillés concernant la nomenclature adoptée pour les diverses structures des génitalia mâle et femelle. L'écologie et la phénologie de l'espèce sont traitées. *H. mersina* vole en des endroits chauds et secs avec une préférence pour des forêts de pins clairsemées avec des clairières. Le début précoce de la période de vol de l'espèce (normalement vers la mi-mai) est avancé comme élément d'isolement reproductif efficace envers d'autres taxa apparentés qui sont sympatriques et (partiellement) synchrones avec *H. mersina*, comme illustré par les expériences personnelles du premier auteur sur l'île grecque de Lésvos où, à côté de *H. mersina* les espèces *Hipparchia pellucida pellucida* (STAUDER, 1923) et *H. aristaeus senthes* (FRUHSTORFER, 1908) cohabitent également dans les mêmes localités. La période de vol de ces deux dernières espèces débute approximativement 3 semaines après celle de *H. mersina*, quand la plupart des femelles de celle-ci ont déjà été fécondées.
Dans la section suivante la variation géographique des divers caractères du phénotype (entre autres la taille, les dessins alaires, les proportions des diverses structures des genitalia) est analysée d'une manière plus approfondie. 2 caractères varient sans qu'une tendance géographique particulière ne puisse être démontrée. Il y a une corrélation partielle possible entre la taille et la quantité des précipitations annuelles dans les diverses régions considérées. Pour 4 caractères une variation clinale d'est en ouest peut être clairement démontrée, 6 autres caractères ne furent pas analysés de façon plus approfondie mais il y a certains facteurs indiquant qu'ils pourraient être soumis à la même variation clinale. Il est peu évident qu'une influence de facteurs climatiques existe sur la variation observée. La nature des facteurs sélectifs n'est pas claire. Il est admis que la gradation de l'expression de certains caractères, tels que par exemple la bande postdiscale blanche au dessous de l'aile postérieure du mâle, est causée par des complexes polygéniques. Le modèle de variation clinale et graduelle est probablement le résultat d'un compromis existant entre l'influence de deux facteurs antagoniques : d'une part, l'effet diversifiant de la sélection du milieu opérant sur les divers dèmes et, d'autre part, l'effet cohésif du flux génique entre ces mêmes dèmes.
La population de l'île grecque de Lésvos ne présente aucune différence constante par rapport aux autres populations de *H. mersina*. C'est pour cette raison que *Hipparchia mersina malickyi* KUDRNA, 1977 est placé en synonymie par rapport à la sous-espèce nominale. KUDRNA (1977) avait désigné comme lectotype de *H. mersina* un exemplaire originaire d'Izmir. Les diverses raisons pour lesquelles la localité-type de cette espèce doit être Mersin sont exposées et un nouveau lectotype est désigné.

Key words : *Hipparchia - mersina - malickyi - pellucida - aristaeus senthes* - Lésvos - Sámos - Turkey - ecology - phenology - geographical variation - clinal variation - polygenes - gene flow - lectotype.

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1. Introduction

Satyrus Semele L. v. *Mersina* was described by STAUDINGER (1871 : 28) as a «variety» of *Hipparchia semele* (LINNAEUS, 1758) [in contemporary terms one would use the term «subspecies» for it] from «Lyd. m.; Cyprus». The description is as follows : «*al. post. subt. fere unicolor griseis*». The same

author (STAUDINGER 1878 : 277) subsequently explicitly excludes specimens from Smyrna [=Izmir] and Cyprus from the material that he considers to belong to v. *mersina* («Dahingegen sind Stücke von Smyrna und Cypern unten schon etwas eintöniger, und bilden einen Uebergang zur v. *Mersina*, oben sind sie indessen noch wie typische *Semele*»). He further clearly states that the material he used for his description comes from Mersin [a town in Turkey in the province of Içel], as was already suggested by the very name of the taxon itself (STAUDINGER l.c. : 277 : «Die v. *Mersina*, welche ich nach Stücken aus Lederer's Sammlung mit der Bezeichnung 'Mersin' aufstellte, und die warscheinlich von ihm selbst oder von Kindermann dort gefangen wurden, ist eine sehr hübsche Lokalform der *Semele*»).

RÜHL (1895 : 537) mentions «var. *mersina*» from «Französische Ostpyrenäen, südliches Lydien, Cypern». STAUDINGER & REBEL (1901 : 55), SEITZ (1908 : 125), OBERTHÜR (1909 : 269), GAEDE (1930 : 165; 1931 : 150-151) and VERITY (1953 : 304-305) also mention *Satyrus Semele* var. *mersina* but they add no information of interest. FOUTAINE (1904 : 184) records *S. semele* var. *mersina* Stgr. as «very common all around Amasia» but she very probably found either *Hipparchia aristaeus senthes* (FRUHSTORFER, 1908) or *Hipparchia pellucida pellucida* (STAUDER, 1923) and not *H. mersina*. VERITY (1923-1924) also considers *mersina* to be a race of *H. semele*. PFEIFFER (1939 : 80) mentions *Satyrus semele* L. ssp. from Jeschil Dere (green valley in the Yüksek Dagh, Amanus, SW. of Maraş). The short description clearly suggests that these specimens do belong to *H. mersina*.

HOLIK (1949) describes *Satyrus semele* ssp. *cypriensis* from Cyprus and discusses the difference between this taxon and *Satyrus semele* var. *mersina* Stgr. For the latter taxon he mentions the following material in the STAUDINGER collection : Mardin (2 ♂, 2 ♀ ex coll. LEDERER, Cotypes), Taurus (2 ♂, 2 ♀, leg. HABERHAUER), Hadjin [Saimbeyli] (2 ♂, 1 ♀), Smyrna [Izmir] (1 ♂, 1 ♀) and Aintab [Gaziantep] (1 ♀). Interestingly he also mentions another form that is partially sympatric with *mersina* (HOLIK l.c. : 100 : «Neben der var. *mersina* Stgr. fliegt in Kleinasien, und zwar z.T. an den gleichen Orten, noch eine zweite *semele*-Form, die der in Südost-Europa fliegenden nahesteht. Von dieser stecken in der Staudinger-Sammlung : Amasia (2 ♂, 2 ♀), Eibes (1 ♂, 1 ♀), Tokat (1 ♂), Hadjin (2 ♀), Diabekir (1 ♂), Aintab (1 ♂) und Mardin (2 ♂, 2 ♀). Der Unterschied zwischen diesen beiden Formen ist so gross, dass man fast annehmen könnte, var. *mersina* Stgr. sei keine *semele*-Form, sondern eine eigene Art.» Here the other taxon flying with *H. mersina* is either *H. aristaeus senthes* or *H. pellucida pellucida* (or both?).

DE LATTIN (1949) studies the male and female genitalia of the several «varieties» of the *Hipparchia semele*-group and comes to the conclusion that one can distinguish 6 species in this group. He definitively establishes species status for *Hipparchia mersina* and also gives a short description of the male and female genitalia. The species is briefly mentioned again in DE LATTIN (1950). DE LESSE (1951, 1952) also treats *mersina* as a distinct species and ranges it as a member of the subgenus *Hipparchia*, as opposed to the

subgenera *Pseudotergumia* AGENJO, 1948 and *Neohipparchia* DE LESSE, 1951. HIGGINS (1966) records *Hipparchia mersina* from the Turkish provinces of Konya, Içel, Maraş and from the «Taurus». KUDRNA (1975) briefly mentions *Hipparchia mersina* in a preliminary review of the *Hipparchia semele*-group and gives a description of its male genitalia.

Of particular interest is the monographic revision of the genus *Hipparchia* by KUDRNA (1977) and this for the following reasons :

1. for what was formerly called the *Hipparchia semele*-group he describes a new subgenus *Parahipparchia* with the following characteristics : «Jullien's organ rudimentary, consisting of numerous fine hairs; androconia palaeomorphic or - in one species only - transitional palaeomorphic to neomorphic».
2. he gives the first description and illustration of the androconium of *H. mersina*. It is shown to have a unique form when compared to that of all the other *Parahipparchia* taxa.
3. the male and female genitalia are described and illustrated by means of a photograph.
4. he mentions the type-material he studied of *H. mersina* and selects a male lectotype bearing the data : «[Turkey] : Smyrna (=Izmir) : Type : *mersina* Stgr.; depository : ex coll. Staudinger via coll. Bang-Haas in Zoologisches Museum (Humboldt-Universität), Berlin. Paralectotypes 2 ♂♂ & 1 ♀ [Turkey] : Mersin (locality almost illegible); depository as Lectotype».
5. he describes a new subspecies, *Hipparchia mersina malickyi* from the Greek island of Lésvos, close to the Turkish Aegean coast. The material available to him consists of only 2 male specimens («Holotype : Greece : Lesvos : W. Agiasos : 26.V.1975 : H. Malicky leg.; depository : O. KUDRNA. Paratype : ♂ : Greece : Lesvos : Mesotopos : 29.V.1975 : H. Malicky leg.; depository : O. KUDRNA»). The diagnostic features are said to be the paler colour of upper- and underside forewings, the darker underside hindwing with more pronounced fine pattern and the genitalia («similar to the nominate *mersina*, but approximately one quarter smaller in overall size and in size of every structure (e.g. uncus, tegumen, phallus, valva); valva («slightly different in its apical half») and the androconium («similar to *mersina mersina*, but somewhat shorter; lamina narrowing less steeply to a slender 'shaft' before apex and terminal points»).

Hipparchia mersina mersina is reported from the Greek island of Sámos, facing the Turkish Aegean coast (ASSELBERGS 1978, OLIVIER 1987, 1989). COUTSIS (1984) presents an extensive paper about the genitalia of the «*Hipparchia fagi*-group» (although neither *Hipparchia neomiris* (GODART, 1822) nor *Hipparchia autonoe* (ESPER, 1783) are included) and of the «*Hipparchia semele*-group» [=subgenus *Parahipparchia*] (most of the then known taxa are included : however, he does not possess material of *H. mersina malickyi* KUDRNA, 1977 at that time). The male genitalia of the treated taxa are illustrated for comparative purposes, but the stress is laid on a detailed description and illustration of the female genitalia. The chief merit of this

contribution lies in that the attention is drawn to some structures in the female genitalia that may prove to be of taxonomic significance : some of these structures are named in that paper. The genitalia of 2 ♀ *H. mersina* from Turkey are examined and described, those of one specimen are illustrated.

KUDRNA (1986) gives an extensive discussion on the species concept in which the subspecies concept is rejected. In application of this concept of «morphospecies» he now elevates the taxon from Lésvos to species level : *Hipparchia malickyi* KUDRNA, 1977.

The first author of the present contribution has been able to collect extensive series of *H. mersina* from the island of Sámos in 1986 and 1988 and from Çamlik (Prov. Aydin, Turkey) in 1988, as well as from the taxon currently known as *H. malickyi* from the island of Lésvos in 1986, 1987 and 1988. Both authors further have been able to examine the very extensive series of *H. mersina* from various parts of Turkey (from Prov. Bursa and Izmir in the west to Prov. Gaziantep in the east) deposited in several museums and private collections (see below under «Material and methods» and «Acknowledgments») as well as good numbers of other *Hipparchia* species for comparative purposes. We will discuss here :

1. the geographical variation of *Hipparchia mersina*, as expressed in its size, colour and wing markings of upper- and underside, male and female genitalia, androconium and sphragis.
2. the ecology and phenology of *H. mersina*.
3. the taxonomic status of *H. malickyi* : is it a species, or a subspecies of *H. mersina*, or is it not separable at all from *H. mersina mersina* and, consequently, just a synonym?

2. Material and methods

2.1. Material

We list here all the material of *H. mersina* examined for the present study according to its geographical origin from east to west and from west to north. The number of specimens on which the present study is based is of 633 ♂ and 188 ♀. All specimens have been measured (except in a very few cases when wing damage resulting in the absence of the apex of the right forewing made this impossible) and analysed (see also the introduction). Of some specimens we also studied the genitalia and androconia. Not all the material from Sámos that was available to us has been examined, due to the very great numbers (indeed, for the males we restricted ourselves to 150 specimens). This was also the case with the Lésvos material (none but 4 ♂ of the specimens collected in 1988 and only part of the material collected in 1987 were studied : we investigated 150 ♂ and 100 ♀). All available Turkish material was examined. The material is as follows (see also map 1) :

Prov. Gaziantep (Turkey) : Ormani, W. Gaziantep (800-1000 m), St. 157, 30.V.1984, leg. H. VAN OORSCHOT & H. VAN DEN BRINK, coll. ITZ : 3 ♀.

Prov. Gaziantep (Turkey) : Fevsipaşa (550 m), St. 211, 27.V.1985, leg. H. VAN OORSCHOT & H. VAN DEN BRINK, coll. ITZ : 9 ♂, 1 ♀.

Prov. Maraş (Turkey) : 30 km N. Maraş (600-800 m), St. 161, 31.V.1984, leg. H. VAN OORSCHOT &

H. VAN DEN BRINK, coll. ITZ : 10 ♂.

Prov. Maraş (Turkey) : Hills N. Maraş (800-1200 m), St. 213, 28.V.1985, leg. H. VAN OORSCHOT & H. VAN DEN BRINK, coll. ITZ : 29 ♂, 3 ♀.

Prov. Maraş (Turkey) : Hills NW. Maraş, 5-10 km along road to Ağabeyli (800-900 m), St. 214, 29.V.1985, leg. H. VAN OORSCHOT & H. VAN DEN BRINK, coll. ITZ : 11 ♂, 1 ♀.

Prov. Maraş (Turkey) : vic. Maraş, Ağabeyli (700-1200 m), 25/28.V.1978, leg. J. DE FREINA, coll. ITZ & coll. G. HESSELBARTH : 2 ♂, 2 ♀.

Prov. Adana (Turkey) : 5 km W. Pozantı (1000-1400 m), St. 36, 26.VI.1982, leg. H. VAN OORSCHOT & H. VAN DEN BRINK, coll. ITZ : 38 ♂, 6 ♀.

Prov. Adana (Turkey) : 10 km N. Pozantı (1050 m), St. 37, 27.VI.1982, leg. H. VAN OORSCHOT & H. VAN DEN BRINK, coll. ITZ : 23 ♂, 3 ♀.

Prov. Adana (Turkey) : vic. Pozantı, Ak Dağ (eastern side) (1530 m), 26.VI.1977, leg. et coll. G. HESSELBARTH : 1 ♂.

Prov. Adana (Turkey) : vic. Pozantı, Asmalik valley (1000-1500 m), 28.VI.1977, leg. et coll. G. HESSELBARTH : 1 ♀.

Prov. Adana (Turkey) : Şihli, 3 km NW. Tekir (1300-1700 m), St. 41, 28/29.VI.1982, leg. H. VAN OORSCHOT & H. VAN DEN BRINK, coll. ITZ : 10 ♂, 8 ♀.

Prov. Adana (Turkey) S. Tekir (900 m), St. 208, 8/10.VIII.1984, leg. B. VAN OORSCHOT, coll. ITZ: 10 ♂, 10 ♀.

Prov. Adana (Turkey) : 8-18 km N. Saimbeyli (1600-1750 m), St. 121, 27/28.VII.1983, leg. H. VAN OORSCHOT, H. VAN DEN BRINK & H. WIERING, coll. ITZ : 1 ♀; 26.VII.1984, leg. B. VAN OORSCHOT, coll. ITZ : 1 ♀.

Prov. Adana (Turkey) : Tekir, Elmalı Boğazı (1350 m), 4.VII.1982, leg. et coll. G. HESSELBARTH : 2 ♂.

Prov. Içel (Turkey) : vic. Boğsak (100 m), 16.IV/1.V.1974, leg. G. HESSELBARTH, coll. G. HESSELBARTH & ITZ : 10 ♂, 3 ♀.

Prov. Içel (Turkey) : Silifke vic. Turtel Motel Boğsak (100 m), 14.IV/3.V.1974, leg. H. SCHWEIGER & E. SCHWEIGER, coll. ITZ : 4 ♂.

Prov. Içel (Turkey) : Silifke, 10 & 12.X.1983, leg. C. JEEKEL & A. JEEKEL, coll. ITZ : 1 ♂.

Prov. Içel (Turkey) : Demircili, 5 km N. Silifke (300 m), St. 84, 14.V.1983, leg. H. VAN OORSCHOT & Th. VAN OORSCHOT, coll. ITZ : 5 ♂.

Prov. Içel (Turkey) : 15 km W. Silifke (700 m), St. 82, 12/13.V.1983, leg. H. VAN OORSCHOT & Th. VAN OORSCHOT, coll. ITZ : 2 ♂.

Prov. Içel (Turkey) : Uzuncaburç, 35 km N. Silifke (1000-1200 m), 20/22.VI.1983, leg. G. HESSELBARTH, coll. G. HESSELBARTH & ITZ : 5 ♂.

Prov. Içel (Turkey) : Göksü Bridge, 20 km NW. Silifke (250 m), 29.IV.1982, leg. Fam. VAN OORSCHOT & G. HESSELBARTH, coll. ITZ : 1 ♂.

Prov. Içel (Turkey) : Taşucu, 10 km SW. Silifke (10-100 m), 28.IV/1.V.1982, leg. Fam. VAN OORSCHOT & G. HESSELBARTH, coll. ITZ & coll. G. HESSELBARTH : 2 ♂.

Prov. Içel (Turkey) : 10 km N. Mut (400-600 m), St. 77, 10.V.1983, leg. H. VAN OORSCHOT & Th. VAN OORSCHOT, coll. ITZ : 41 ♂, 5 ♀.

Prov. Içel (Turkey) : env. Mut (275 m), St. 79, 12.V.1983, leg. H. VAN OORSCHOT & Th. VAN OORSCHOT, coll. ITZ : 3 ♂, 2 ♀.

Prov. Içel (Turkey) : 7 km E. Çamlıyayla (1100 m), Nr. 157, 23.VI.1988, leg. et coll. S. WAGENER : 1 ♂.

Prov. Içel (Turkey) : Taurus, NW. Mersin, above Akarca (1100 m), loc. 26, 5.VI.1973, leg. WAGENER & SCHMITZ, coll. G. HESSELBARTH : 1 ♂.

Prov. Içel (Turkey) : Akarca (1100 m), 1.VII.1980, leg. et coll. G. HESSELBARTH : 1 ♂.

Prov. Konya (Turkey) : Palaz Dağı Hadım (1500 m), St. 75, 11.VIII.1982, leg. B. VAN OORSCHOT, coll. ITZ : 2 ♂.

Prov. Konya (Turkey) : 15 km S. Karaman (1200 m), St. 30, 22/23.VI.1982, leg. H. VAN OORSCHOT & H. VAN DEN BRINK, coll. ITZ : 14 ♂.

Prov. Isparta (Turkey) : W. Yenişar Bademli (1420 m), Nr. 206, 10.VII.1988, leg. et coll. S. WAGENER : 1 ♂.

Prov. Antalya (Turkey) : Alanya, 26.IV.1974, leg. et coll. G. HESSELBARTH : 1 ♂; idem, 27.IX.

1975, leg. DE MOLIERE, coll. ITZ : 1 ♂.

Prov. Antalya (Turkey) : Akseki (1300-1600 m), 8/11.VII.1981, leg. H. VAN OORSCHOT, Th. VAN OORSCHOT & H. VAN DEN BRINK, coll. ITZ : 2 ♂; idem (1530 m), e.l. 19.VI.1978, leg. HEUBERGER, coll. G. HESSELBARTH : 1 ♂.

Prov. Antalya (Turkey) : vic. Korcuteli (1000 m), 8.VI.1980, leg. et coll. G. HESSELBARTH : 1 ♂.

Prov. Antalya (Turkey) : Murtiçi (500-600 m), 3.VI.1980, leg. et coll. G. HESSELBARTH : 3 ♂.

Prov. Antalya (Turkey) : Çubuk Boğazi, 40 km N. Antalya (950 m), 6.VI.1981, leg. B. VAN OORSCHOT, coll. ITZ & G. HESSELBARTH : 65 ♂, 6 ♀.

Prov. Antalya (Turkey) : Sinekcibeli Geçidi, 50 km N. Kaş (1500 m), 2.VII.1981, leg. H. VAN OORSCHOT, Th. VAN OORSCHOT & H. VAN DEN BRINK, coll. ITZ : 1 ♂.

Prov. Antalya (Turkey) : Termessos (800-1000 m), 9.VI.1980, leg. et coll. G. HESSELBARTH : 1 ♂; idem (800 m), 3/10.VI.1980, leg. BATTENFELD, coll. ITZ : 2 ♂.

Prov. Antalya (Turkey) : Antalya (Turkey) : Yenice-Termessos (400-700 m), 13.VI.1980, leg. et coll. G. HESSELBARTH : 3 ♀.

Prov. Muğla (Turkey) : 60 km NE. Fethiye (1050 m), 6.VII.1981, leg. H. VAN OORSCHOT, Th. VAN OORSCHOT & H. VAN DEN BRINK, coll. ITZ : 1 ♂.

Prov. Muğla (Turkey) : vic. Ula (600 m), 14.V.1981, leg. G. HESSELBARTH, coll. G. HESSELBARTH & ITZ : 3 ♂; idem, 20.V.1981, leg. et coll. G. HESSELBARTH : 2 ♂.

Prov. Muğla (Turkey) : vic. Doğanköy (700 m), 22.V.1981, leg. et coll. G. HESSELBARTH : 1 ♂.

Prov. Aydin (Turkey) : Çamlik (200 m), 2.VI.1988, leg. et coll. A. OLIVIER : 6 ♂, 7 ♀.

Prov. Manisa (Turkey) : Karacora, 28.VI.1986, leg. D.E. GASKIN, coll. A. OLIVIER : 1 ♂.

Prov. Izmir (Turkey) : vic. Kesre, 17.VIII.1972, leg. et coll. G. HESSELBARTH : 1 ♀.

Sámos (Greece) : Pírgos (500 m), 24.V.1963, leg. S. DAAN & V. VAN LAAR, coll. ITZ : 1 ♂; idem, 21.V.1986, leg. et coll. J. DILS : 21 ♂, 1 ♀.

Sámos (Greece) : 5 km SW. Vathí (300 m), 18.V.1986, leg. et coll. A. OLIVIER : 1 ♀.

Sámos (Greece) : Pándrosso (700 m), 20.V.1986, leg. et coll. J. DILS & A. OLIVIER : 15 ♂, 1 ♀; idem, 21.V.1986, leg. et coll. J. DILS, D. VAN DER POORTEN & A. OLIVIER : 4 ♂, 6 ♀.

Sámos (Greece) : 5 km SW. Pagóndas (600 m), 21.V.1986, leg. et coll. J. DILS & A. OLIVIER : 24 ♂.

Sámos (Greece) : 2 km SE. Plátanos (600 m), 18.V.1986, leg. et coll. D. VAN DER POORTEN : 1 ♀; idem, 22.V.1986, leg. et coll. J. DILS & A. OLIVIER : 24 ♂, 3 ♀; idem, 23.V.1986, leg. et coll. J. DILS & A. OLIVIER : 23 ♂, 4 ♀; idem, 24.V.1986, leg. et coll. A. OLIVIER : 9 ♂, 2 ♀; idem, 30.V.1988, leg. et coll. A. OLIVIER : 23 ♂.

Sámos (Greece) : Mt. Karvoúni (700 m), 11.VI.1988, leg. et coll. A. OLIVIER : 2 ♂; idem (1150 m), 11.VI.1988, leg. et coll. A. OLIVIER : 1 ♂; idem (1150 m), 13.VI.1988, leg. et coll. A. OLIVIER : 1 ♂.

Sámos (Greece) : Manolátes (300 m), 12.VI.1988, leg. et coll. A. OLIVIER : 2 ♂.

Lésvos (Greece) : Agiásos (400-600 m), 1.VI.1986, leg. et coll. A. OLIVIER : 2 ♂; idem, 5.VI.1986, leg. et coll. A. OLIVIER : 1 ♀.

Lésvos (Greece) : 4 km NW. Agiásos (400 m), 5.VI.1986, leg. A. OLIVIER : 28 ♂, 3 ♀; idem, 6.VI. 1986, leg. et coll. A. OLIVIER : 32 ♂, 2 ♀; idem, 8.VI.1986, leg. et coll. A. OLIVIER : 4 ♂, 4 ♀; idem, 17.VI.1987, leg. et coll. A. OLIVIER : 15 ♂; idem, 13.VII.1988, leg. et coll. A. OLIVIER : 1 ♂; idem, 14.VII.1988, leg. et coll. A. OLIVIER : 1 ♂.

Lésvos (Greece) : Ágra (450 m), 4.VI.1986, leg. et coll. A. OLIVIER: 10 ♀; idem, 27.V.1987, leg. et coll. A. OLIVIER: 14 ♂, 5 ♀; idem, 30.V.1987, leg. et coll. A. OLIVIER: 34 ♂, 8 ♀; idem, 19.VI.1987, leg. et coll. A. OLIVIER: 1 ♂, 40 ♀; idem, 22.VI.1987, leg. et coll. A. OLIVIER: 8 ♀; idem, 23.VI. 1987, leg. et coll. A. OLIVIER: 19 ♀; idem, 17.VI.1988, leg. et coll. A. OLIVIER: 1 ♂.

Lésvos (Greece) : Fília (250 m), 28.V.1987, leg. et coll. A. OLIVIER: 1 ♂.

Lésvos (Greece) : 5 km N. Kalloní (150 m), 28.V.1987, leg. et coll. A. OLIVIER: 1 ♂.

Lésvos (Greece) : Mesótopos (300 m), 27.V.1987, leg. et coll. A. OLIVIER: 1 ♂.

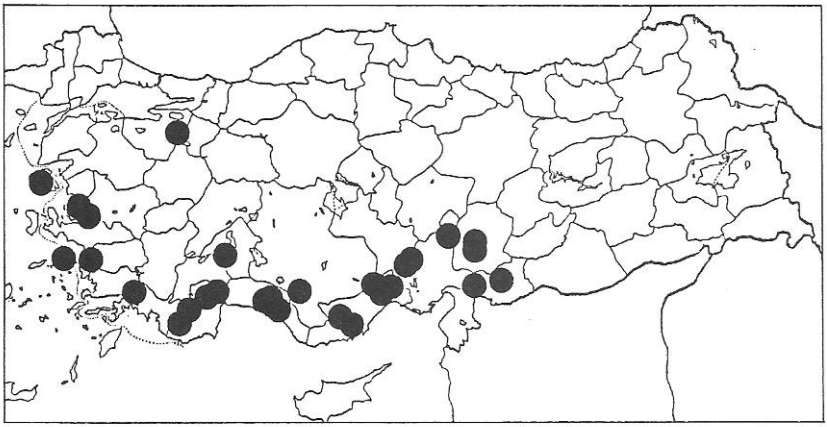
Lésvos (Greece) : 3 km NW. Mesótopos (150 m), 27.V.1987, leg. et coll. A. OLIVIER: 2 ♂.

Lésvos (Greece) : 5 km NW. Lámbou Míli (200 m), 28.V.1987, leg. et coll. A. OLIVIER: 8 ♂.

Lésvos (Greece) : 2 km N. Megalohóri (600 m), 20.VI.1987, leg. et coll. A. OLIVIER: 3 ♂.

Lésvos (Greece) : M. Ipsiloú (400 m), 18.VI.1988, leg. et coll. A. OLIVIER: 1 ♂.

Prov. Bursa (Turkey) : Boldan, towards Inegöl (600 m), St. 107, 27.V.1931, «Orch.», ex coll. F.J. BALL in coll. K.B.I.N. : 2 ♂, 2 ♀.



Map 1 : Localities from where material of *Hipparchia mersina* (STAUDINGER, 1871) was examined for the present study (simplified).

Note : Part of the material from Sámos and Lésvos that is listed here, as well as material not mentioned here, will be deposited in various museums and private collections in due course.

2.2. Methods

All measurements of the forewing size are from the base (at the costa) to the apex (without fringes). The genitalia examined were prepared by overnight maceration in a 10% KOH solution and washing in water. In a few instances we have «boiled» the genitalia for immediate identification and examination purposes, but generally we have avoided this procedure because of the damage that is often caused to some delicate structures like the corpus bursae using this method. The genitalia were deshydrated by submersion for about 5-10 minutes in 90° acetic acid. They were then mounted on slides, embedded in entellan and covered with a cover glass. The drawkback of this method as compared to that of examining the structures floating freely in a solution of 80% ethyl alcohol (cf. COUTSIS 1984) consists in the fact that distortions due to pressure from mounting might give a false impression of the shape and relative position of some structures (e.g. the valves). We do believe however that the great number of genitalia of both sexes that we examined allows us to believe that such false impression is reduced to a minimum. Furthermore, considering the great quantity of material examined it appeared to us that mounting on slides was the most practical way of proceeding.

The entire male genitalia, and for the females the corpus bursae and ductus bursae were mounted laterally, the sterigma dorsally. For our analysis of the genitalia all slides were placed into a microfiche reader and projected on a screen with a 37x magnification. Contour drawings of all the observed structures could thus be made. For the resulting measurements as presented on tables 6 and 7 the values obtained from the drawings simply had to be

divided by 37. We have not included calculations of standard errors nor standard deviations.

For the photographs used in the present study a series of representative specimens were photographed (in colour) in natural size (the resulting photographs were a little darker than the real colour). Single androconia were photographed in black and white (phase constrast) with a 100x magnification. All photographs were made by Mr J. HUISENGA (Amsterdam).

3. Description of the adult

We have included material from the island of Lésvos in our general description of *Hipparchia mersina* (STAUDINGER, 1871). The evaluation of the taxonomic status of this population follows in a later section.

3.1. External characters

Male (figs. 1-14). Forewing length variable individually and geographically, but not clinal, the largest specimens occurring in the province of Antalya and the smallest ones coming from the island of Lésvos; among Turkish material the sample from Prov. Konya, spatially close to the population from Prov. Içel, is markedly smaller, this possibly being due to the influence of more continental climatic conditions (see table 1).

Upperside forewing groundcolour uniformly brown, with 2 small dark brown postdiscal ocelli situated in s2 and in s5, the latter best developed and often - but not always - white pupilled, the former very rarely white pupilled; both ocelli often encircled by a small diffuse orange-ochreous patch that is rarely extended and mostly quite reduced, sometimes entirely absent; sex brand more greyish than groundcolour and only faintly contrasting, often starting below v1 in s1a, running along the outer part of the cell to the starting point of s5 and s6, invading the cell along the median vein; fringes chequered pale greyish and brown; apex rounded, outer margin straight.

Table 1 : *Hipparchia mersina* (STAUDINGER, 1871) : forewing size ♂(from base to apex) [3 ♂ from Prov. Adana and 1 ♂ from Prov. Aydin were not measured because of wing damage]

Province or island	Number of specimens measured	Min. size (in mm)	Max. size (in mm)	Mean size (in mm)
Gaziantep	9	26,3	28,8	27,79
Maraş	52	24,6	30,1	27,35
Adana	81	24,5	29,1	27,01
Içel	77	22,8	29,3	27,21
Konya	16	24,6	27,7	26,04
Isparta	1	26,8	26,8	26,8
Antalya	78	22,7	30,3	27,96
Muğla	7	26,1	27,4	26,94
Aydin	5	25,5	29,1	27,06
Izmir	0	-	-	-
Manisa	1	26,0	26,0	26,0
Sámos	150	23,7	29,2	26,86
Lésvos	150	23,0	28,1	25,70
Bursa	2	26,7	26,8	26,75

Upperside hindwing groundcolour as on upperside forewing; postdiscal band on underside hindwing becoming visible on upperside when well developed, thus giving the upperside hindwing a more contrasted pattern, especially in specimens from Lésvos, Sámos and W. Turkey eastwards till Prov. Antalya (see figs. 5, 7, 9, 11 and 13); usually 4 small orange-ochreous, more or less triangular, diffused submarginal patches, usually well expressed (as on figs. 1, 5, 7, 9, 11 and 13), sometimes reduced or even (partly) absent (see fig. 3), that are situated in s2-s5, patch in s5 can be absent, patch in s2 with small dark brown, mostly white-pupilled ocellus that is only rarely absent; fringes as on upperside forewing.

Underside forewing basal and discal area predominantly orange-ochreous, largely corresponding in extension with the sex brand on upperside but larger, postdiscal area lighter and more creamy yellow; the orange-ochreous colour extends well into the postdiscal and submarginal area in most specimens from the eastern part of the distribution range (provinces of Gaziantep, Maraş, Adana, Içel and Konya; see figs. 2 and 4), but also in part of the specimens from Antalya, Muğla and (more rarely) Aydin, Sámos and (rarely) Lésvos; basal area near inner margin brownish grey; apical ocellus in s5 black, white pupilled, always present and conspicuous, usually surrounded by a creamy yellow patch that may be bordered by a small whitish patch at the costa; smaller postdiscal ocellus in s2 mostly present, often with white pupil, sometimes vestigial and without pupil or even absent (as in fig. 8, see also table 4); cell bordered distally by a small transverse blackish brown line, that is parallelled by a second one a little distally, the area in-between more greyish brown; spot at about the two-thirds of the cell; costal margin, apex and outer margin grey to brownish grey, often with a variably expressed narrow dark brown line parallel to the outer margin.

Underside hindwing very variable individually and geographically: groundcolour grey to brownish grey, mostly rather uniform but sometimes marbled in appearence (especially in specimens from the western part of the distribution range, e.g. on Lésvos), with two variably expressed blackish brown zig-zag lines bordering distally resp. the basal and discal area, generally (rather) weakly developed in specimens from the eastern populations (provinces of Gaziantep, Maraş, Adana, Içel) and well developed in western specimens (provinces of Antalya and Aydin, islands of Sámos and Lésvos, e.g. fig. 14), but exceptions to the rule are common everywhere; a third submarginal dark brown line may run parallel with the outer margin, but it can be ill-defined or even totally absent; the postdiscal area may be of a lighter tinge than the basal and discal area; basal line often bordered distally by a whitish or dirty yellowish patch (e.g. figs. 8, 10, 12 and 14), discal line bordered distally by a postdiscal band of an average width of 2-4 mm (Exceptionally 5 or even 6 mm) of a colour that varies from pure white via dirty yellow to brownish, but still lighter than groundcolour: this band can be absent (exceptionally), vestigial (figs. 2 and 4), normally expressed (figs. 6, 8, 10 and 12) or sharply contrasting (fig. 14), the last character being subject to

clinal variation and becoming more and more developed westwards (see table 3); when present the band is usually best developed from the apex to v4, but it may continue until v2 or even further down, almost reaching the inner margin.

Female (figs. 15-36). Larger than the male, variability of forewing length shown in detail on table 2 : the same remarks as to the males apply to the females; no specimens from the provinces of Konya, Isparta and Muğla were available for the present study.

Upperside forewing similar to male in basic pattern, but submarginal ocelli larger, both mostly white pupilled, surrounded by patches of a colour varying from orange-ochreous (from province of Gaziantep westwards till province of Antalya) to creamy yellow (from Lésvos via Sámos and the provinces of Izmir and Aydin eastwards to Antalya, where intermediate specimens do occur), often tending to converge and extending to the adjacent spaces, dominating the submarginal area, usually least expressed in s4-s5; ocellus in s2 can be duplicated by a blackish brown dot in s3 (rarely; one single female from Lésvos showed this dot as well as an additional one in s1b!); area between end of cell and upper part of postdiscal area much darker, sometimes almost black; fringes as in male; apex more rounded than in male, outer margin straight or slightly convex.

Upperside hindwing similar to male, also with a more contrasted wing pattern in western specimens (e.g. figs. 27, 29 and 33); submarginal patches usually better developed and more extensive than in male, sometimes with an additional vestigial patch in s6.

Underside forewing basal, discal and postdiscal area individually and geographically variable in colour, with a more or less sharp contrast between a generally darker basal-discal area and a brighter postdiscal area (figs. 16, 18,

Table 2 : *Hipparchia mersina* (STAUDINGER, 1871) : forewing size ♀ (from base to apex).

Province or island	Number of specimens measured	Min. size (in mm)	Max. size (in mm)	Mean size (in mm)
Gaziantep	4	28,6	30,2	29,15
Maraş	6	28,0	29,9	28,83
Adana	30	26,0	32,0	29,02
Içel	10	26,8	30,8	28,88
Konya	0	-	-	-
Isparta	0	-	-	-
Antalya	9	27,8	31,7	29,99
Muğla	0	-	-	-
Aydin	7	27,4	29,8	28,26
Izmir	1	30,1	30,1	30,1
Manisa	0	-	-	-
Sámos	19	26,4	30,9	28,89
Lésvos	100	23,9	30,3	27,33
Bursa	2	27,4	28,7	28,05

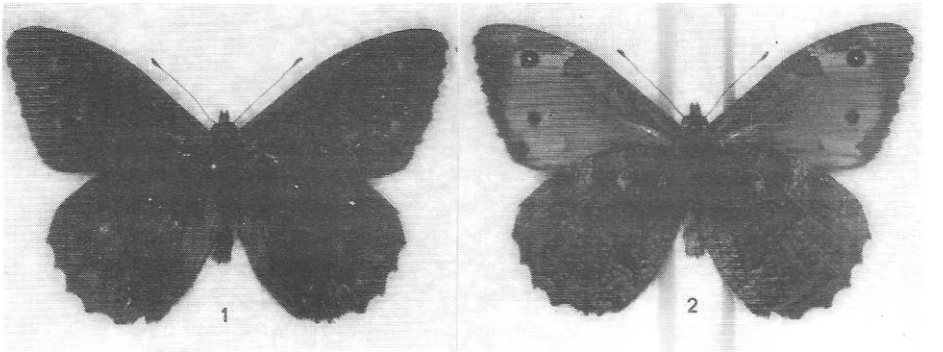


Fig. 1 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♂, Fevsipaşa (Prov. Gaziantep, Turkey) (550 m), st. 211, 27.V.1985, leg. H. VAN OORSCHOT & H. VAN DEN BRINK, in coll. ITZ.
Fig. 2 : as fig. 1 (underside). (Figs. 1-36 slightly enlarged).

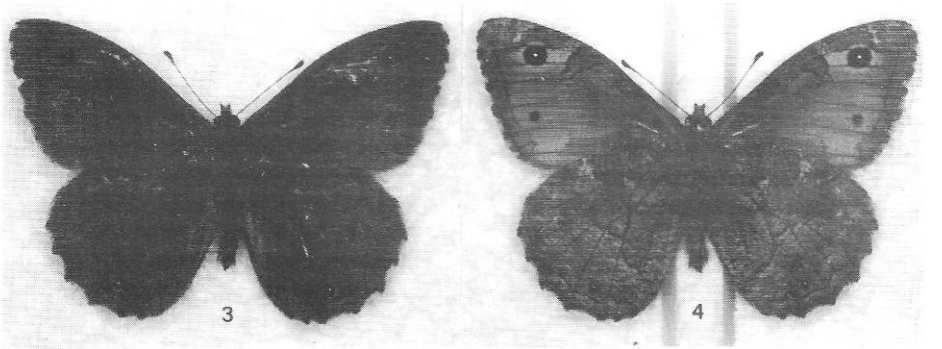


Fig. 3 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♂, 10 km N. Mut (Prov. Içel, Turkey) (400-600 m), st. 77, 10.V.1983, leg. H. & Th. VAN OORSCHOT, in coll. ITZ.
Fig. 4 : as fig. 3 (underside).

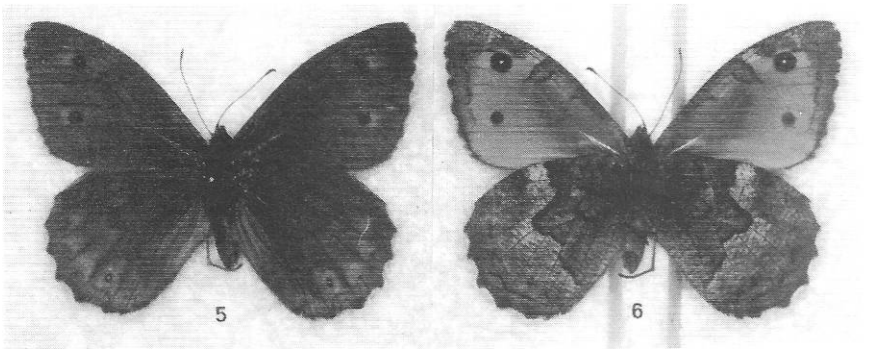


Fig. 5 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♂, Çubuk Boğazi, 40 km N. Antalya (Prov. Antalya, Turkey) (950 m), 6.VI.1981, leg. B. VAN OORSCHOT, in coll. ITZ.
Fig. 6 : as fig. 5 (underside).

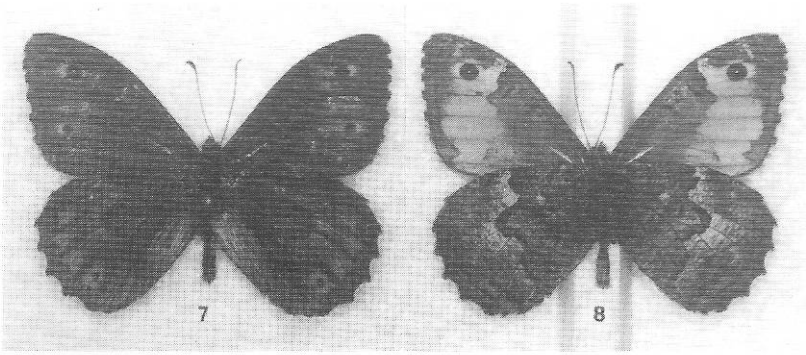


Fig. 7 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♂, Çamlik (Prov. Aydin, Turkey) (200 m), 2.VI.1988, leg. et coll. A. OLIVIER.
Fig. 8 : as fig. 7 (underside).

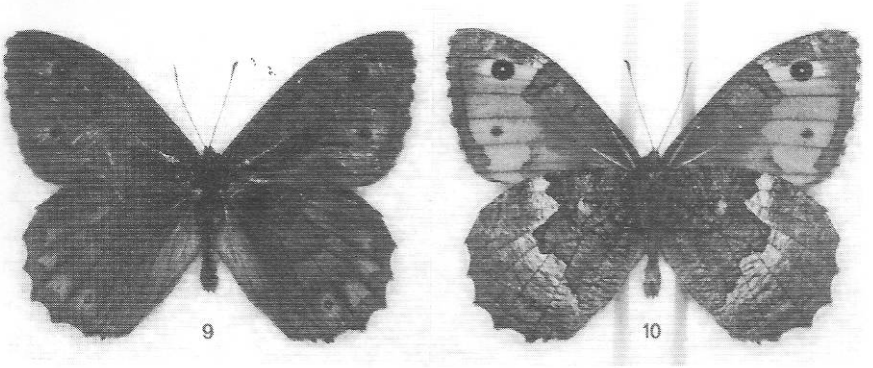


Fig. 9 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♂, 2 km SE. Plátanos (Sámos, Greece) (600 m), 30.V.1988, leg. et coll. A. OLIVIER.
Fig. 10 : as fig. 9 (underside).

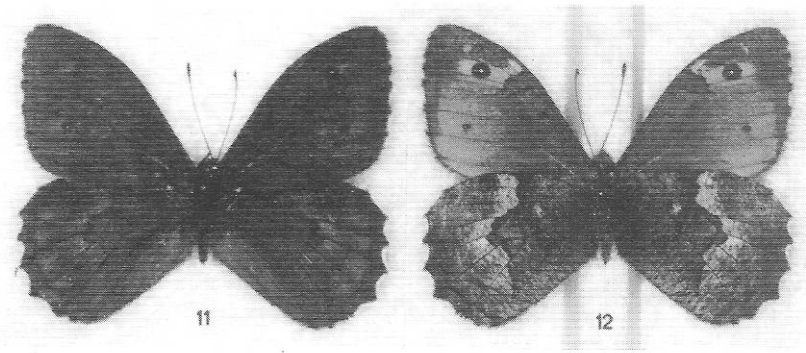


Fig. 11 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♂, 4 km NW. Agiásos (Lésvos, Greece) (400 m), 5.VI.1986, leg. et coll. A. OLIVIER.
Fig. 12 : as fig. 11 (underside).

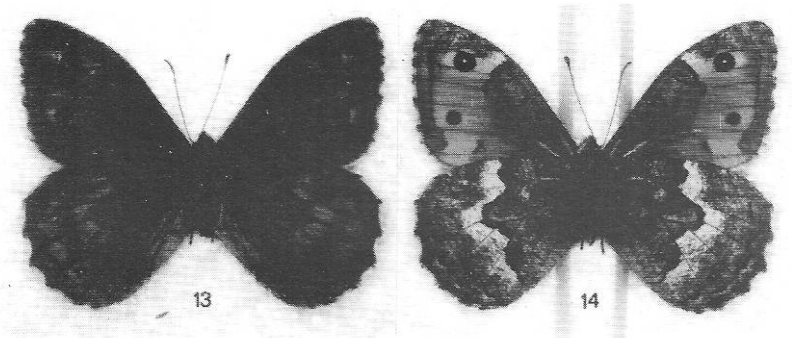


Fig. 13 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♂, Ágra (Lésvos, Greece) (450 m), 30.V.1987, leg. et coll. A. OLIVIER.
Fig. 14 : as fig. 13 (underside).

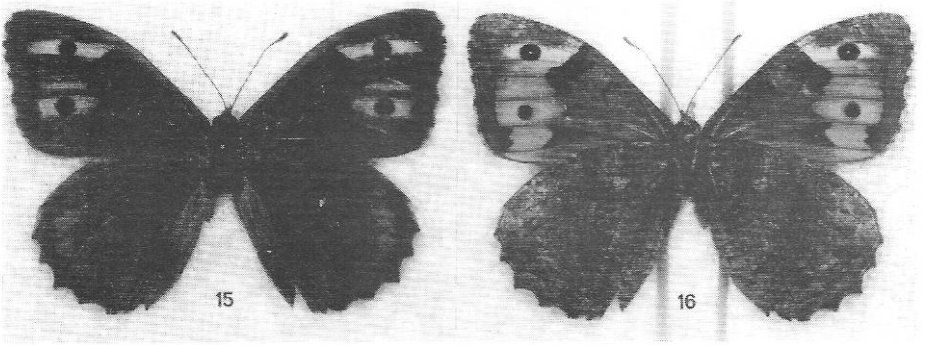


Fig. 15 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♀, Ormani, W. Gaziantep (Prov. Gaziantep, Turkey) (800-1000 m), st. 157, 30.V.1984, leg. H. VAN OORSCHOT & H. VAN DEN BRINK, in coll. ITZ.
Fig. 16 : as fig. 15 (underside).

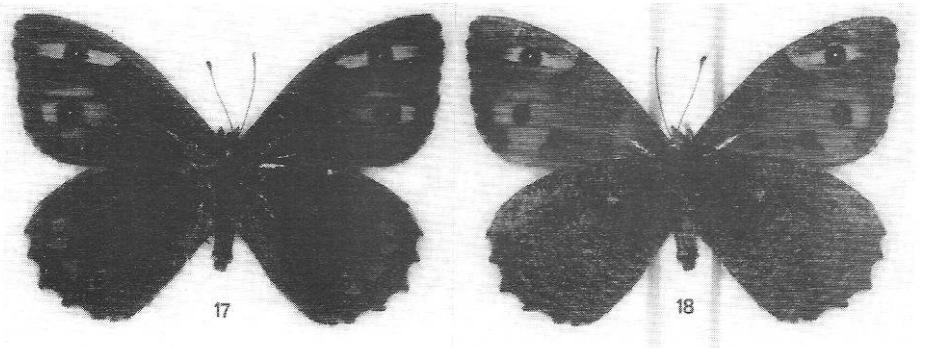


Fig. 17 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♀, 5 km W. Pozantı (Prov. Adana, Turkey) (1000-1400 m), st. 36, 26.VI.1982, leg. H. VAN OORSCHOT & H. VAN DEN BRINK, in coll. ITZ.
Fig. 18 : as fig. 17 (underside).

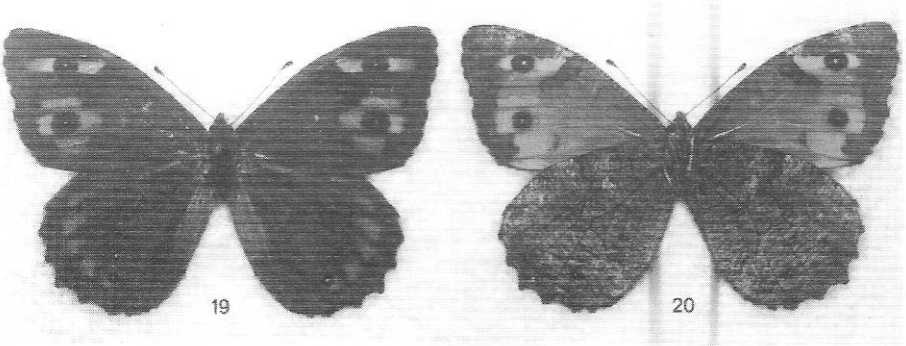


Fig. 19 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♀, 10 km N. Mut (Prov. Içel, Turkey) (400-600 m), st. 77, 10.V.1983, leg. H. & Th. VAN OORSCHOT, in coll. ITZ.
Fig. 20 : as fig. 19 (underside).

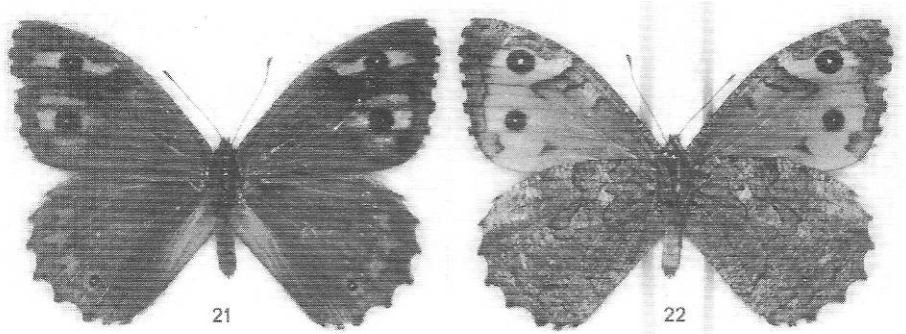


Fig. 21 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♀, Yenice-Termessos (Prov. Antalya, Turkey) (400-700 m), 13.VI.1980, leg. et coll. G. HESSELBARTH.
Fig. 22 : as fig. 21 (underside).

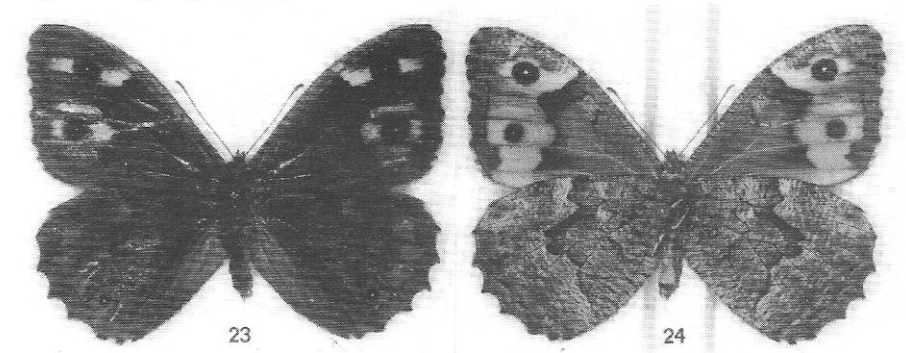


Fig. 23 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♀, Yenice-Termessos (Prov. Antalya, Turkey) (400-700 m), 13.VI.1980, leg. et coll. G. HESSELBARTH.
Fig. 24 : as fig. 23 (underside).

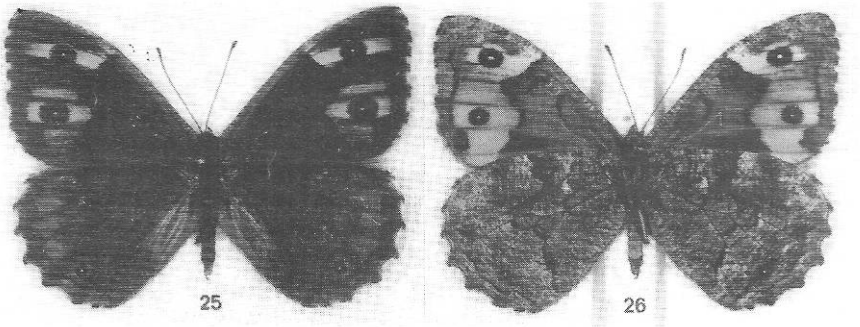


Fig. 25 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♀, Çamlik (Prov. Aydin, Turkey) (200 m), 2.VI.1988, leg. et coll. A. OLIVIER.
Fig. 26 : as fig. 25 (underside).

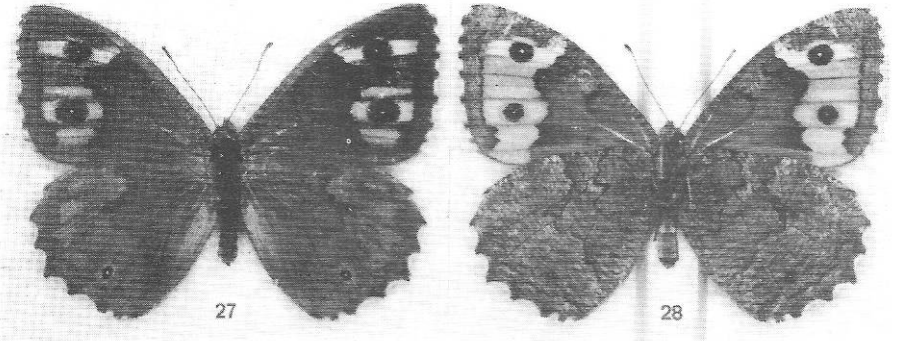


Fig. 27 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♀, vic. Kesre (Prov. Izmir, Turkey), 13.VIII.1972, leg. et coll. G. HESSELBARTH.
Fig. 28 : as fig. 27 (underside).

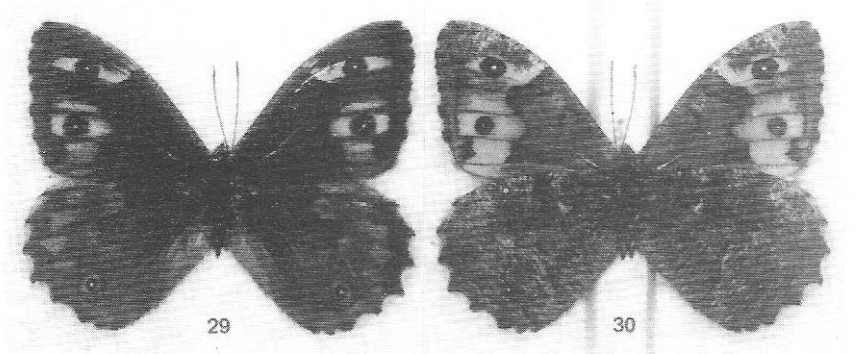


Fig. 29 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♀, 2 km SE. Plátanos (Sámos, Greece) (600 m), 24.V.1986, leg. et coll. A. OLIVIER.
Fig. 30 : as fig. 29 (underside).

Fig. 31 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♀, Ágra (Lésvos, Greece) (450 m), 4.VI.1986, leg. et coll. A. OLIVIER.
Fig. 32 : as fig. 31 (underside).

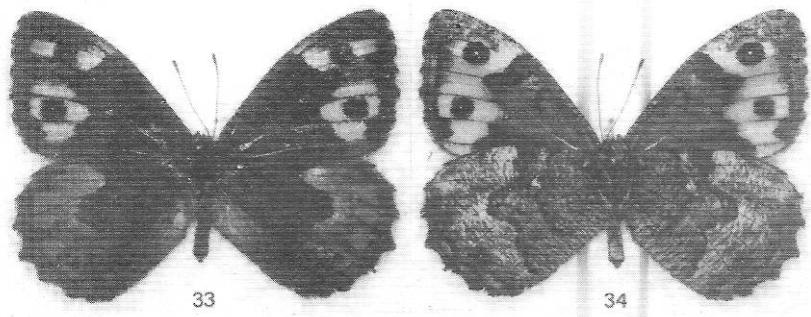


Fig. 33 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♀, Ágra (Lésvos, Greece) (450 m), 19.VI.1987, leg. et coll. A. OLIVIER.
Fig. 34 : as fig. 33 (underside).

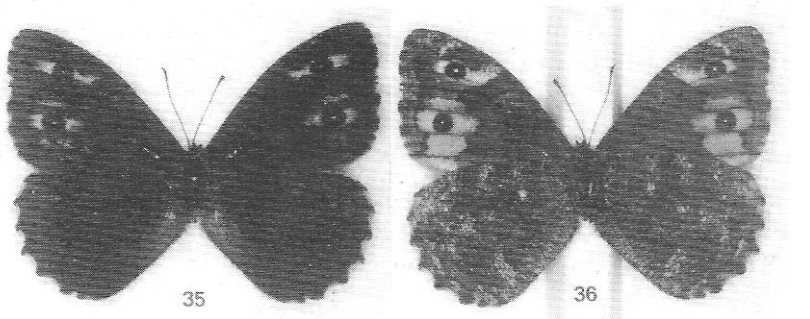


Fig. 35 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♀, Ágra (Lésvos, Greece) (450 m), 22.VI.1987, leg. et coll. A. OLIVIER.
Fig. 36 : as fig. 35 (underside).

20, 22, 24, 26, 28, 30, 32, 34 and 36, see also table 5 : note the large dominance of classes 1 and 2 in populations east of Prov. Antalya and the large dominance of class 3 in populations west of Prov. Antalya; unfortunately the sample from Prov. Antalya is too small to allow for conclusions, we also regret that we had no females from Prov. Muğla at our disposition); other components of wing pattern also more developed than in male, both postdiscal ocelli greater and mostly white pupilled, ocellus in s2 always present; dark area distally from cell much more developed than in male and always of a much darker greyish brown to blackish brown colour; basal area at inner margin dark greyish brown to blackish brown, extending along the inner margin through the discal area; the greatest range of variability of the wing pattern on underside forewing was observed in specimens from Lésvos.

Underside hindwing groundcolour usually more grey than in male (ash grey in specimens from the provinces of Antalya and Içel), becoming more brownish grey westwards (e.g. on Sámos and in Prov. Aydin) as in male; basal, discal and submarginal line usually less well developed than in male, but showing the same general geographical variation : on Lésvos the females are variable to such an incredible degree that these lines may be almost vestigial (fig. 32) to very strongly marked, much more than in male (figs. 24 and 34); postdiscal band usually absent or only very weakly expressed in populations to the east of Prov. Antalya, better developed in e.g. the provinces of Antalya and Aydin and on the island of Lésvos (on the latter island one sometimes finds specimens with a well developed whitish postdiscal band, like the specimen on fig. 34).

3.2. Structural characters

Under the present heading we will describe the *male and female genitalia*, the *Jullien organ*, the *androconium* and the *sphragis*. For the naming of the various structures of the *male genitalia* (fig. 37) we use the terminology of KLOTS (1970), thus distinguishing the *tegumen*, the *pedunculus*, the *appendix angularis*, the *vinculum*, the *saccus*, the *uncus*, the *gnathos* (often designated as *brachia*, *subunci* or *falces* in various studies) and the *valve* (for which one can distinguish a *sacculus* and a *costa* [two terms not used in the further discussion]). It was necessary to use a few more terms to describe some additional features of the valve that we believe to be of interest for the present study, viz. the *dorsal process*, the *apical margin* and the *terminal extension* (sensu KUDRNA 1977). Finally we have the *penis*, consisting of a *phallobase* and an *aedeagus* (sensu KLOTS l.c.).

For the naming of the various structures of the *female genitalia* (fig. 38) we have followed COUTSIS (1984) with two notable exceptions (see discussion below). COUTSIS (l.c.) makes a distinction between the *primary genitalia* for egg production, fertilization and laying and the *bursa copulatrix* for sperm reception and temporary storage, consisting of at least three parts : the *sterigma*, the *corpus bursae* and the *ductus bursae*. Like COUTSIS (l.c.) we only deal here with the *bursa copulatrix*.

COUTSIS (l.c.) subdivides the sterigma in three units that, however, are

intricately interconnected and that form a compact whole. We distinguish here the *mid-dorsal process*, the *dorsal lamella*, the *dorso-lateral lobe*, the *postostial funnel*, the *ventral arm* and the *ventral keel*. The *corpus bursae* consists of a membranous expansible sac with various longitudinal folds and ventrally carrying two rows of highly sclerotized teeth, the *signae*; the *ductus bursae* connects the *proximal end of the corpus bursae* (and not the *distal end* as stated by COUTSIS l.c. : we have to do here with the beginning of the corpus bursae!) to the sterigma. This area at the beginning of the corpus bursae, from where the *ductus seminalis* starts (through which sperm is transferred to the primary genitalia) is named *atrium* by COUTSIS (l.c.) (sic! recte *antrum*, COUTSIS in litt.). We cannot follow him here for the following reason : the *antrum* is a term that was created by HIGGINS (1941 : 179) to designate an area in the female genitalia of the genus *Euphydryas* SCUDDER, 1872 : «the ostium leads into a short and wide chitinous canal which I term the *antrum*, ... The bursa ... appears to be intimately connected with the antrum by a short neck from which arises the seminal duct». It is thus clear that the antrum lies just distad of the *ostium bursae* (the receptive copulatory opening leading into the bursa copulatrix; see also KLOTS 1970 : 123, fig. 151). Therefore the antrum as conceived by HIGGINS (l.c.) and KLOTS (l.c.) is not homologous with the «atrium» of COUTSIS (1984). We replace here the term antrum (sensu COUTSIS l.c.) by the term *cervix bursae*, defined by KLOTS (l.c. : 239) as «a differentiated region between ductus bursae and corpus bursae, often with special sclerotizations or invaginations of its wall».

Measurements of the various parts of the male and female genitalia were carried out in the way as shown on figs. 39 and 40. For the naming of the parts of the *androconium* we follow KUDRNA (1977 : 207, fig. 9), distinguishing the *base*, the *lamina*, the *apex* and the *terminal points*.

Male genitalia (figs. 37, 39, 41-48 and table 6). Tegumen straight or slightly curved dorsally, length usually about 1,25-1,40 mm, without any significant geographical variation throughout the distribution range; tegumen height (including pedunculus and appendix angularis) variable, usually about 2,80-3,20 mm in specimens from Prov. Gaziantep, Maraş, Adana, Içel, Konya, Antalya and 2 out of 4 specimens from Muğla (figs. 41-44) and usually about 2,35-2,70 mm in specimens from Prov. Muğla (2 specimens), Aydin and from Sámos and Lésvos (figs. 45-48) with exceptions everywhere, but generally suggesting a clinal reduction in height as one goes westwards; uncus slender and of variable length (usually about 2,35-2,80 mm in specimens from Prov. Gaziantep, Maraş, Adana, Içel, Konya and Antalya; usually about 1,95-2,30 mm in specimens from Prov. Muğla and Aydin and from Sámos and Lésvos; compare e.g. figs. 41-42 to figs. 47-48), with some exceptions everywhere, but generally showing a clinal reduction in length towards the west : in eastern specimens uncus length often about 1,80-2x tegumen length, in western specimens often about 1,50-1,70x; uncus usually small in its basal two-thirds and broadening ventrally in its apical third, thus being often 1,40-2x as broad

as more basally, the expression of this feature apparently being more or less positively correlated with the uncus length; uncus ending usually in a hooked tip; gnathos relatively broad at base and narrowing distally, curved, variable in length : on average shorter in specimens from Lésvos, Sámos and Prov. Aydin; gnathos a little shorter, as long or a little longer than uncus; vinculum + saccus usually about 1,25-1,80 mm high, quite variable with the greatest values found in material from Prov. Içel eastwards, but geographical variation negligible; valve slender with well-developed triangular dorsal process, about 1,20-1,40x as high as area just basally of it and slightly higher than height of valve at costa (where it is mostly about 0,35 - 0,45 mm high), apical margin tapering gradually towards the well pronounced, more or less pointed terminal extension; penis regularly curved, aedeagus usually twice as long as phallobase, phallobase tubular; penis slightly shorter than uncus and tegumen together.

Female genitalia (figs. 38, 40, 49-56 and table 7). Sterigma variable in size and usually, but not always, higher than it is wide, specimens from Lésvos generally having the smallest one; dorso-lateral lobe more or less sickle-shaped and narrow, nearly contiguous with dorsal lamella; dorsal lamella shorter and broader than dorso-lateral lobe, slightly broadening distally; mid-dorsal process in most cases slender and pointed and reaching about half the height of dorsal lamellae (figs. 49, 50, 52-56), but sometimes short, broad and triangular (in 5 out of the 59 specimens examined, cf. fig. 51); ventral arm screw-shaped; length of ductus bursae mostly about 0,40-0,70 mm; ductus bursae usually straight and broad (figs. 50, 52, 53 and 56; slender in about 30% of the specimens examined, e.g. figs. 49 and 54), in a few specimens slightly curved; the ductus bursae is usually membranous or weakly sclerotized (well sclerotized in 5 out of the 59 specimens examined); cervix bursae on average about 0,50-0,60 mm broad (WCB1 on table 7), usually well sclerotized and often cup-shaped (figs. 50, 52, 53 and 56); corpus bursae pear-shaped and variable in size (it can be contracted in genital preparations, see e.g. figs. 50 and 51, giving a false impression of being of a smaller size : when a sufficient number of preparations is examined however, one can get a good idea of its real size), usually about 2,50-3 mm long and about 1-1,50 mm wide (WCB2 on table 7); signum variable in length (see also table 7), possibly subject to clinal variation with progressive reduction in size towards the western part of the distribution range (but more material from the eastern part of the distribution range should have been disponible to us to allow for some definite conclusions), size usually varying between 1,50 and 1,90 mm.

Jullien organ (figs. 37, 44, 46-48). Situated on the 8th tergite of the male, this structure consists of two basally fused, parallel sclerotized pieces crowned with a multitude of long modified scales.

Androconium (figs. 37, 57-64). Long and narrow, small at base, lamina progressively narrowing towards the apex with a more or less differentiated filiform apex, with terminal points on top (the «transitional palaeomorphic to neomorphic androconium» sensu KUDRNA 1977, e.g. on figs. 57, 58, 60 and

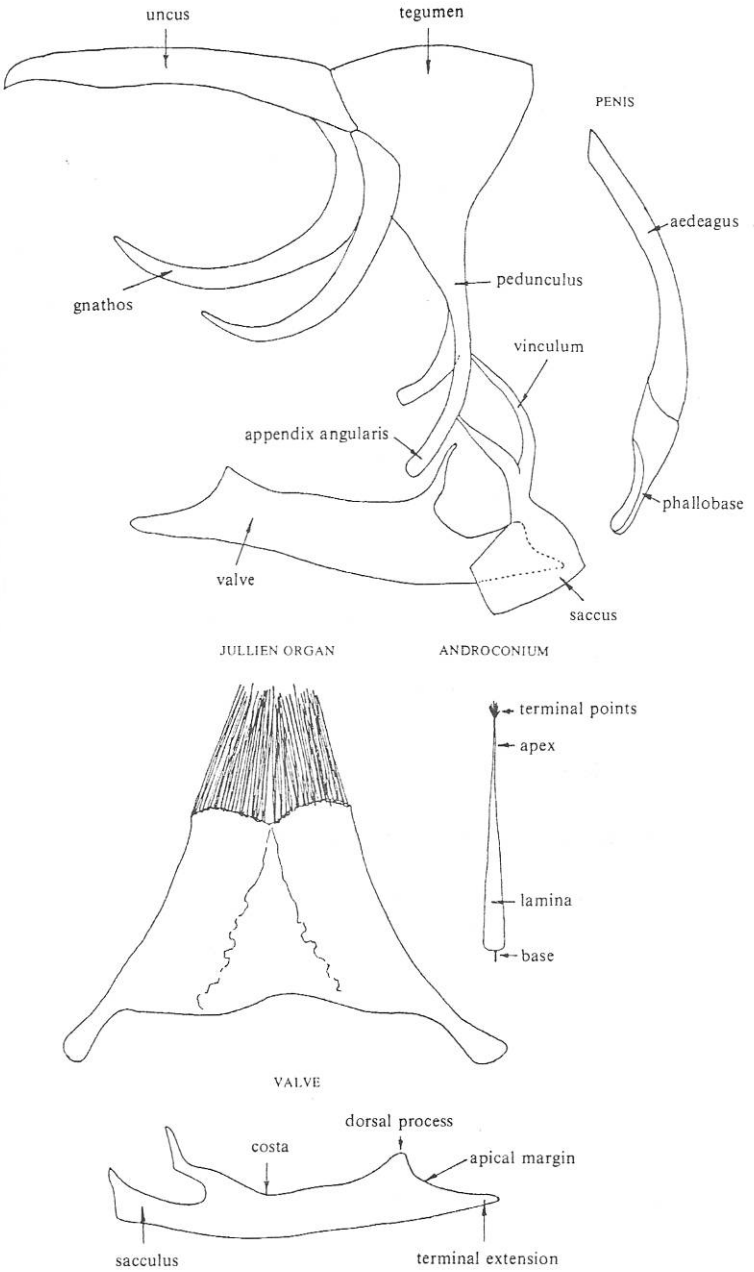
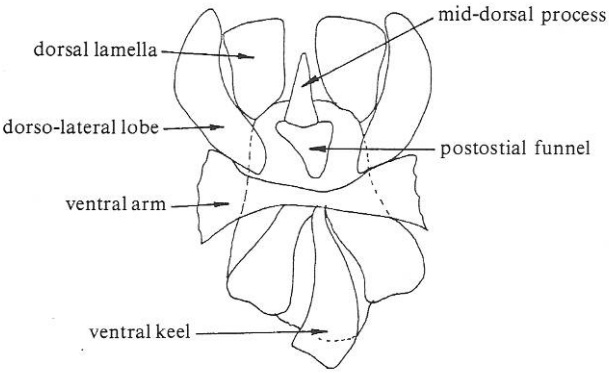


Fig. 37 : Male genitalia : structures.



CORPUS BURSAE + DUCTUS BURSAE

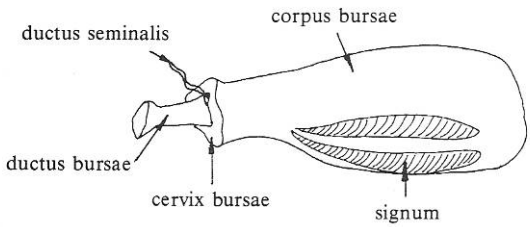


Fig. 38 : Female genitalia (bursa copulatrix) : structures.

62) or continuously narrowing until the terminal points, without differentiation of the apex (the «neomorphic androconium» sensu KUDRNA l.c., e.g. on figs. 59, 61, 63 and 64); individually - but not geographically - variable : length about 0,85-1 mm.

Sphragis. Small to very small in specimens from Lésvos, Sámos and Prov. Aydin; better developed to carinate in (part of the) specimens from Prov. Antalya, Adana, Maraş and Gaziantep.

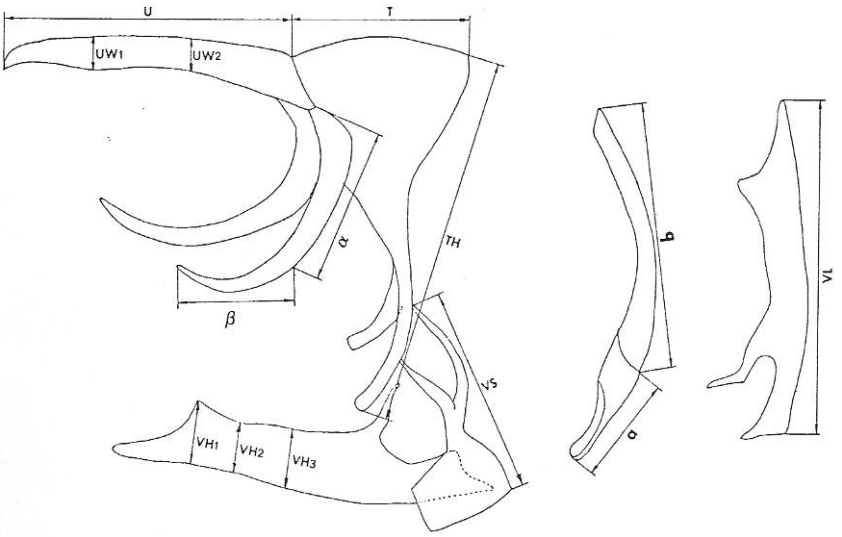


Fig. 39 : Male genitalia : measurements used for table 6.

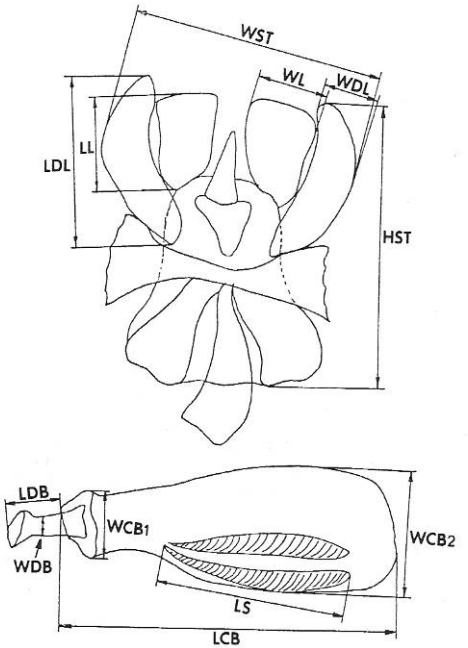


Fig. 40 : Female genitalia : measurements used for table 7.

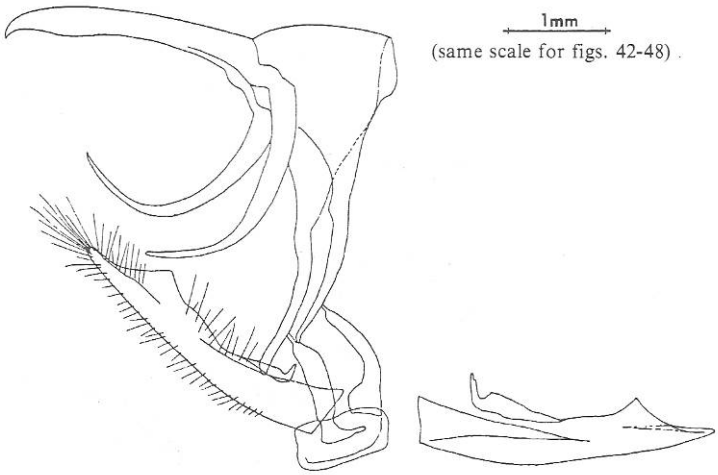


Fig. 41 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♂, Hills N. Maraş (Prov. Maraş, Turkey) (800-1200 m), st. 213, 28.V.1985, leg. H. VAN OORSCHOT & H. VAN DEN BRINK, in coll. ITZ, gen. 2405 [W.O. DE PRINS].

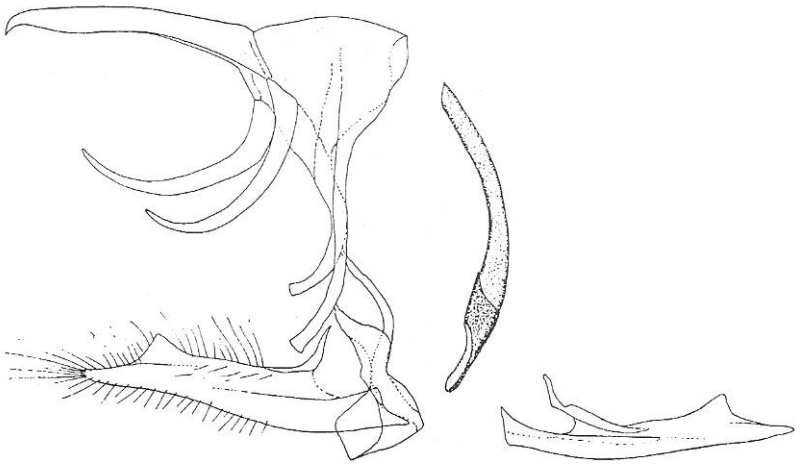


Fig. 42 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♂, 5 km W. Pozantı (Prov. Adana, Turkey) (1000-1400 m), st. 36, 26.VI.1982, leg. H. VAN OORSCHOT & H. VAN DEN BRINK, in coll. ITZ, gen. 2402 [W.O. DE PRINS].

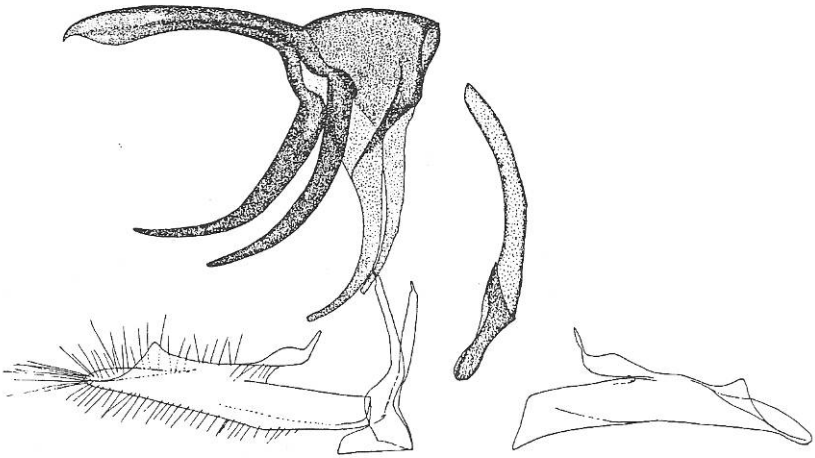


Fig. 43 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♂, 15 km W. Silifke (Prov. Içel, Turkey) (700 m), st. 82, 12/13.V.1983, leg. H. & Th. VAN OORSCHOT, in coll. ITZ, gen. 2401 [W.O. DE PRINS].

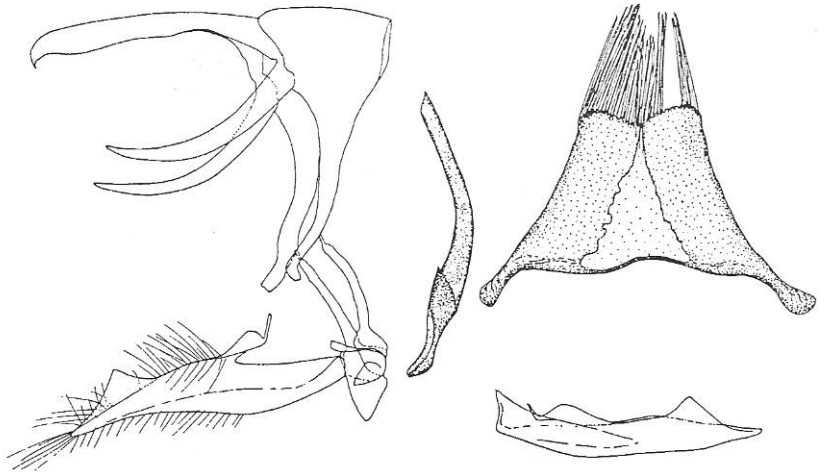


Fig. 44 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♂, Çubuk Boğazı, 40 km N. Antalya (Prov. Antalya, Turkey) (950 m), 6.VI.1981, leg. B. VAN OORSCHOT, in coll. ITZ, gen. 2481 [W.O. DE PRINS].

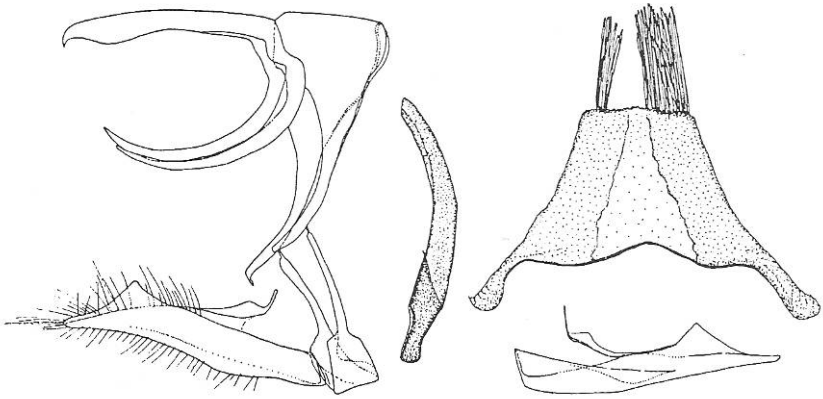


Fig. 45 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♂, Çamlik (Prov. Aydin, Turkey) (200 m), 2.VI.1988, leg. et coll. A. OLIVIER, gen. 2699 [W.O. DE PRINS].

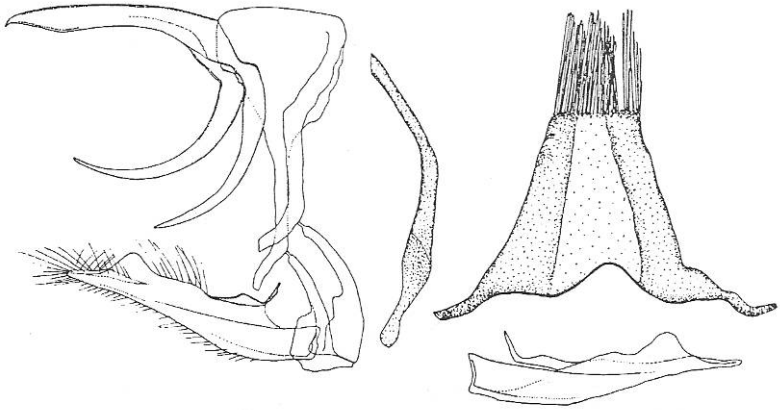


Fig. 46 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♂, 2 km SE. Plátanos (Sámos, Greece) (600 m), 24.V.1986, leg. et coll. A. OLIVIER, gen. 2630 [W.O. DE PRINS].

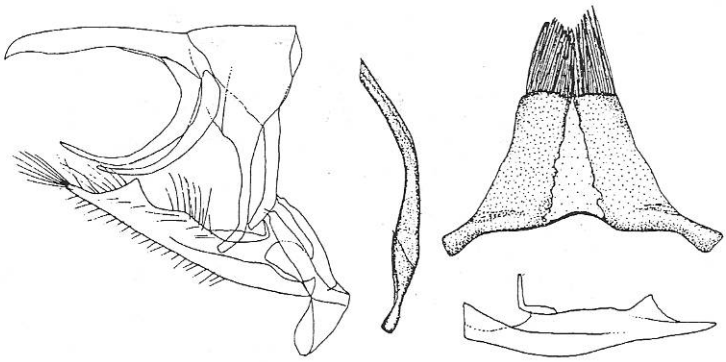


Fig. 47 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♂, 5 km NW. Lámbou Míli (Lésvos, Greece) (250 m), 28.V.1987, leg. et coll. A. OLIVIER, gen. 2588 [W.O. DE PRINS].

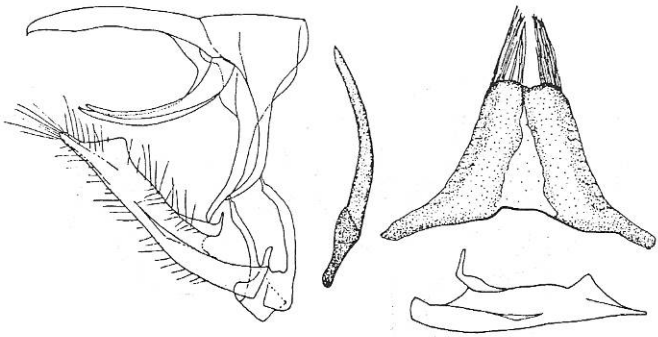


Fig. 48 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♂, Ágra (Lésvos, Greece) (450 m), 22.VI.1987, leg. et coll. A. OLIVIER, gen 2622 [W.O. DE PRINS].

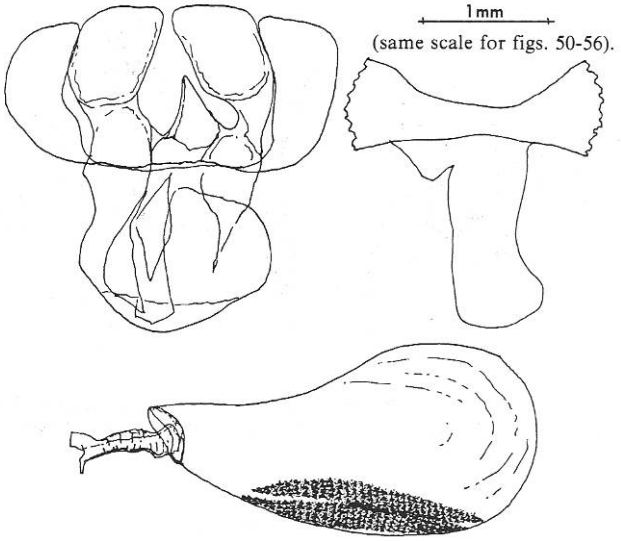


Fig. 49 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♀, Ormani, W. Gaziantep (Prov. Gaziantep, Turkey) (800-1000 m), st. 157, 30.V.1984, leg. H. VAN OORSCHOT & H. VAN DEN BRINK, in coll. ITZ, gen. 2612 [W.O. DE PRINS].

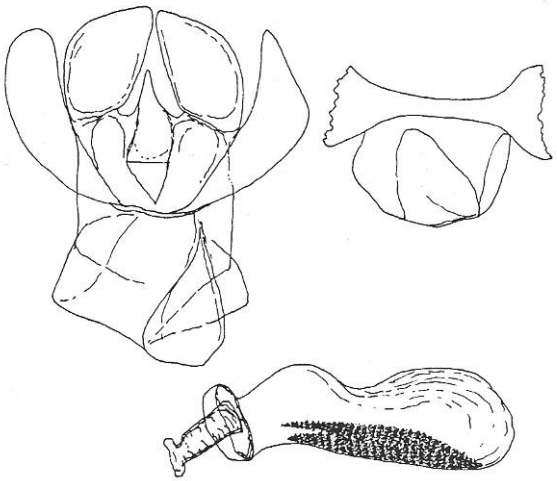


Fig. 50 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♀, 10 km N. Mut (Prov. Içel, Turkey) (400-600 m), st. 77, 10.V.1983, leg. H. & Th. VAN OORSCHOT, in coll. ITZ, gen. 2604 [W.O. DE PRINS].

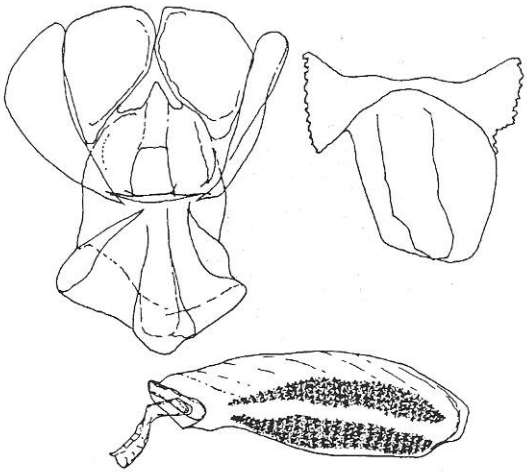


Fig. 51 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♀, 10 km N. Mut (Prov. Içel, Turkey) (400-600 m), st. 77, 10.V.1983, leg. H. & Th. VAN OORSCHOT, in coll. ITZ, gen 2602 [W.O. DE PRINS].

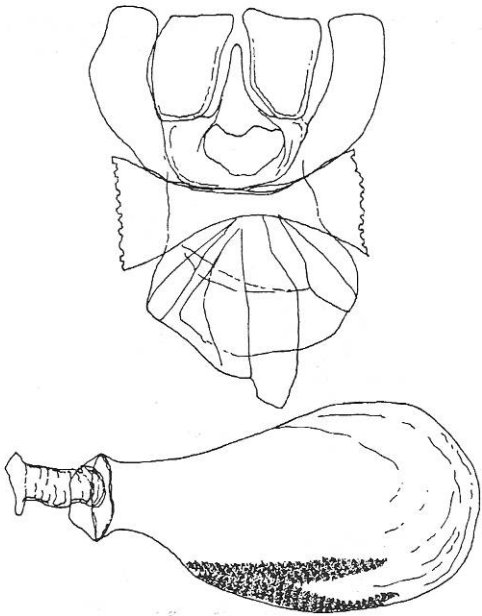


Fig. 52 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♀, Çubuk Boğazı, 40 km N. Antalya (Prov. Antalya, Turkey) (950 m), 6.VI.1981, leg. B. VAN OORSCHOT, in coll. ITZ, gen. 2524 [W.O. DE PRINS].

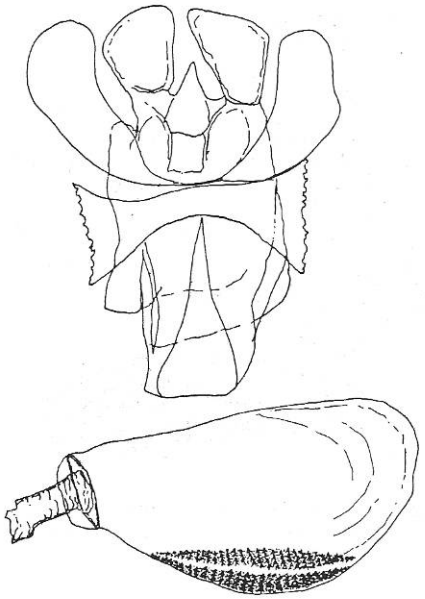


Fig. 53 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♀, 5 km SW Vathí (Sámos, Greece) (300 m), 18.V.1986, leg. et coll. A. OLIVIER, gen 2371 [W.O. DE PRINS].

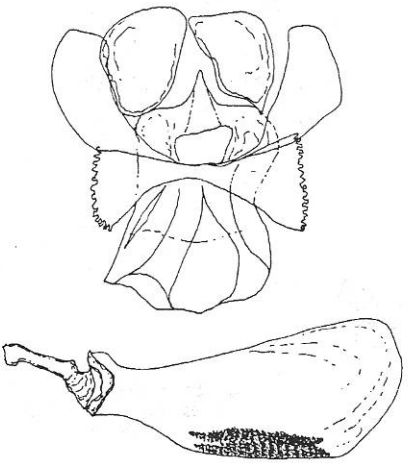


Fig. 54 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♀, 2 km SE. Plátanos (Sámos, Greece) (600 m), 24.V.1986, leg. et coll. A. OLIVIER, gen. 2412 [W.O. DE PRINS].

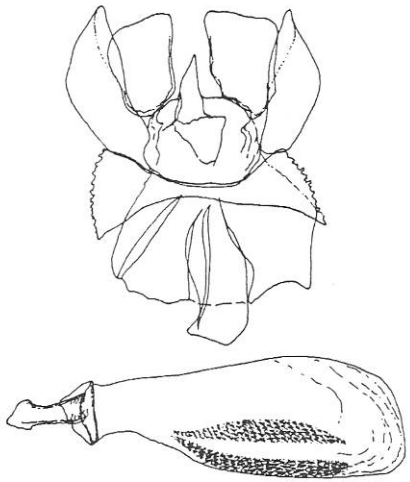


Fig. 55 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♀, Ágra (Lésvos, Greece) (450 m), 23.VI.1987, leg. et coll. A. OLIVIER, gen. 2471 [W.O. DE PRINS].

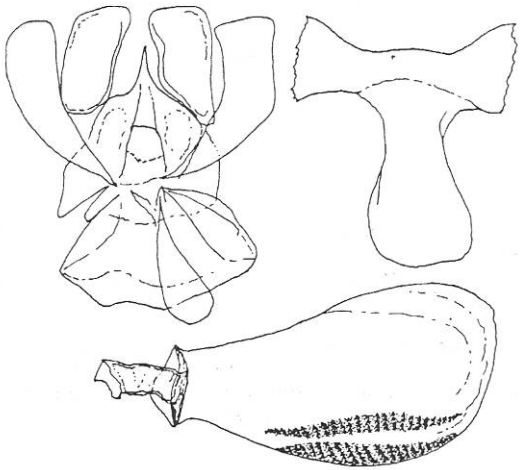


Fig. 56 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♀, Ágra (Lésvos, Greece) (450 m), 30.V.1987, leg. et coll. A. OLIVIER, gen. 2541 [W.O. DE PRINS].

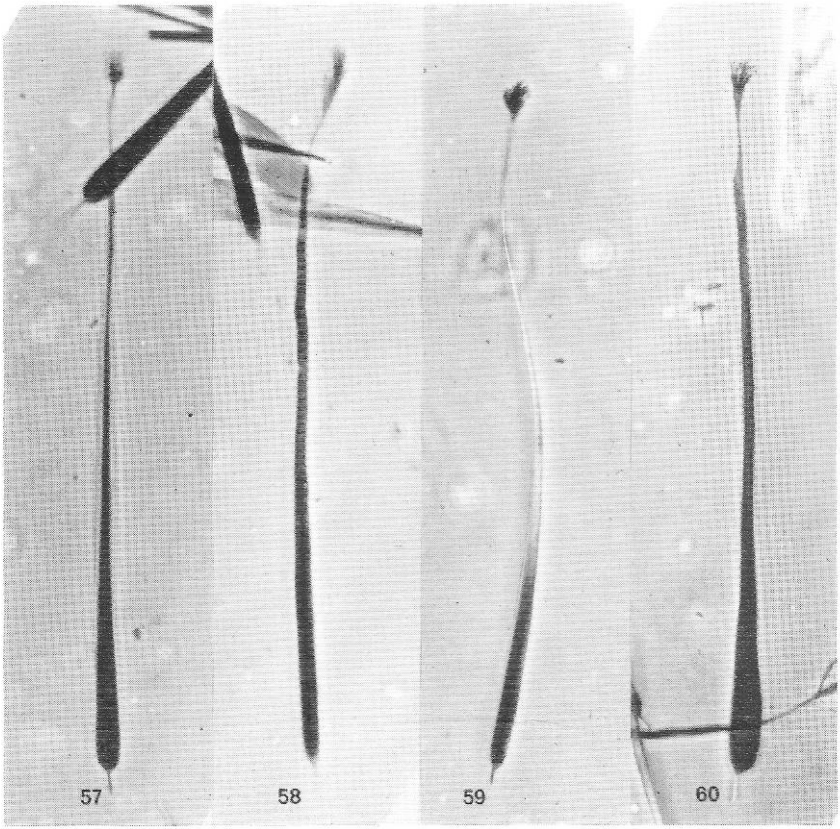


Fig. 57 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♂, Fevsipaşa (Prov. Gaziantep, Turkey) (550 m), st. 211, 27.V.1985, leg. H. VAN OORSCHOT & H. VAN DEN BRINK, in coll. ITZ. [Androconium 100x]

Fig. 58 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♂, 10 km N. Pozantı (Prov. Adana, Turkey) (1050 m), st. 37, 27.VI.1982, leg. H. VAN OORSCHOT & H. VAN DEN BRINK, in coll. ITZ. [Androconium 100x]

Fig. 59 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♂, 15 km W. Silifke (Prov. Içel, Turkey) (700 m), st. 82, 12/13.V.1983, leg. H. & Th. VAN OORSCHOT, in coll. ITZ [Androconium 100x].

Fig. 60 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♂, Çubuk Boğazi, 40 km N. Antalya (Prov. Antalya, Turkey) (950 m), 6.VI.1981, leg. B. VAN OORSCHOT, in coll. ITZ. [Androconium 100x].

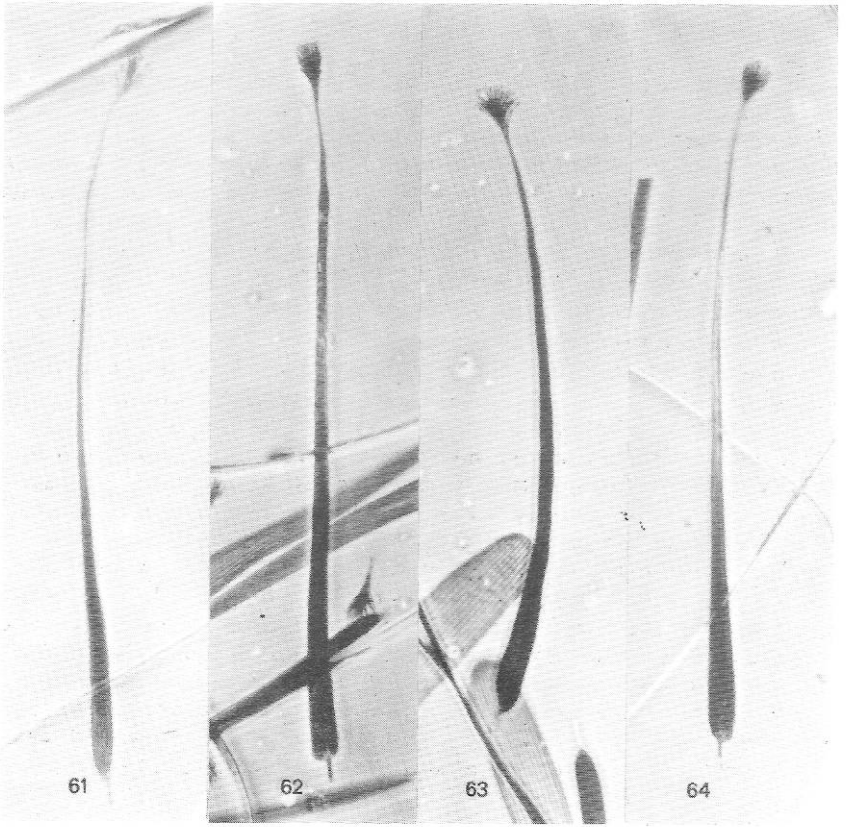


Fig. 61 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♂, Çamlik (Prov. Aydin, Turkey) (200 m), 2.VI.1988, leg. et coll. A. OLIVIER [Androconium 100x].
Fig. 62 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♂, Pándrosso (Sámos, Greece) (700 m), 20.V.1986, leg. et coll. A. OLIVIER [Androconium 100x].
Fig. 63 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♂, 4 km NW Agiásos (Lésvos, Greece) (400 m), 6.VI.1986, leg. et coll. A. OLIVIER [Androconium 100x].
Fig. 64 : *Hipparchia mersina mersina* (STAUDINGER, 1871) ♂, Ágra (Lésvos, Greece) (450 m), 27.V.1987, leg. et coll. A. OLIVIER [Androconium 100x].

4. Ecology and phenology

Before we turn to the analysis of the geographical variation of *H. mersina* we give a survey of its ecology and phenology. *H. mersina* is roughly restricted to the areas in Turkey bordering the Mediterranean and Aegean coast, northwards until Sámos and Lésvos. It is also found inland in the province of Bursa, not very far from the Sea of Marmara. The data given under the heading «Material and methods» and presented on map 1 (simplified) give a good picture of its geographical distribution. A fully detailed account on its distribution in Turkey will be given in HESSELBARTH, VAN OORSCHOT & WAGENER (in prep.). *H. mersina* is found in warm and dry localities, mostly *Pinus* forest with open, rocky and grassy spots. More rarely the species also occurs in areas with deciduous trees or bushes and in orchards.

The males are mostly found on the edge of the forest or on the open spots, where they sit either on the ground, on rocks or on tree trunks, from where they fly to every passing butterfly or other insect (perching behaviour), much alike e.g. *Hipparchia semele* (LINNAEUS, 1758) (TINBERGEN et al. 1942), a habit that is probably most common in this genus. The females are less mobile, sitting on tree trunks, in bushes or on the ground (especially when there is much wind). Both sexes often sit feeding on trunks of pines from where resin is coming out. In some localities females proved very hard to find (e.g. Lésvos, 4 km NW Agiásos; Sámos, 2 km SE. Plátanos), while in other areas they were found in great numbers on tree trunks (e.g. Lésvos, Ágra). This might indicate some local differences in behaviour of the females, but we know nothing on this subject. Single males were sometimes found in bare open garrigue (e.g. Lésvos, M. Ipsiloú) or flying around a single almond tree (Lésvos, 3 km NW. Mesótopos). A female stray was observed only on two occasions (Sámos, 5 km SW. Vathí; Sámos, flanks of Mt. Karvoúni). Such strays could be looking for feeding sites (see also TINBERGEN et al. l.c. : 186-187). Mostly however, *H. mersina* is found in localized colonies of sometimes less than 100 m x 50 m, while in adjacent areas that seem very suitable no single butterfly is seen.

The description of localities in Turkey by H. VAN OORSCHOT (pers. comm.) agrees well with the observations on Sámos and Lésvos and at Çamlik (Prov. Aydin). Sometimes *H. mersina* is found in dry riverbeds (e.g. Prov. Adana, S. of Tekir) or in coastal garrigue (e.g. Prov. Içel, Taşucu, 10 km SW. Silifke).

H. mersina has not been observed sitting on flowers. It apparently feeds on resin from tree trunks, mud, dung, dry soil (e.g. on hot days in July 1988 at Agiásos (Lésvos) where congregations of *H. mersina, H. pellucida, H. syriaca* (STAUDINGER, 1871), *H. fatua* (FREYER, 1845), *Libythea celtis* (LAICHARTING, 1782), *Kirinia roxelana* (CRAMER, 1777), *Quercusia quercus* (LINNAEUS, 1758) and other insects (wasps etc.) were feeding together). Once *H. mersina* was observed feeding on fallen fruit of carob trees. One anecdote is worth reporting. A few males at Ágra (Lésvos) were much attracted by the blue shirt the first author was wearing. TINBERGEN et al. (l.c.) found that the related *H. semele* in Holland is most attracted to blue flowers. They found experimental-

ly that colour alone does not attract butterflies, but a combination of scent and colour does. It could be that the *H. mersina* specimens were stimulated by the odour of sweat in combination with the blue colour of the shirt.

The available data suggest that the flight period of *H. mersina* is very long (earliest record : 10.IV, latest record : 12.X, see under «Material and methods»). Most records however are from the second half of May and from the first three weeks of June. The time of appearence probably varies somewhat with the locality, but generally *H. mersina* is the first *Hipparchia* on the wing in Turkey and on Sámos and Lésvos. On Sámos and Lésvos the flight period probably starts at the middle of May (fresh males and the first few females on Sámos on 18-24.V.1986). Repeated observations at different times in May, June and July 1986, 1987 and 1988 on Lésvos (5 visits in total) give a good impression on the phenology of *H. mersina* on Lésvos and its possible role as a reproductively isolating mechanism to the sympatric and (partly) synchronic *H. pellucida pellucida* and *H. aristaeus senthes*. In 1986 (1-8.VI) *H. mersina* was common, many males already worn and most females with a sphragis (indicating that they had already mated : the females probably mate only once as in *H. semele* (TINBERGEN et al. l.c.)), while *H. pellucida* was also found but much scarcer and very fresh.

In May 1987 (27-30.V) *H. mersina* was very common and mostly fresh, at Ágra the females were already common and many of them with a sphragis. No other *Hipparchia* species was recorded from Lésvos at that time. In June 1987 (17-23.VI) *H. mersina* was still very common, most males being worn and most females having a sphragis. At Ágra, *H. pellucida* (less common) and *H. aristaeus senthes* (rare) were also found. In June 1988 (16-18.VI) *H. mersina* was much scarcer than in the two preceding years. Single specimens of *H. pellucida* and *H. aristaeus senthes* were found (Ágra). In July 1988 (13-20.VII) *H. mersina* was common but worn, especially the males (very worn). *H. pellucida* was rather common at Ágra and Agiásos and single females of *H. aristaeus senthes* were captured at both same localities.

These observations show that, by the time of emergence of *H. pellucida* and *H. aristaeus senthes* on Lésvos - about 3 weeks later than *H. mersina* - most of the females of *H. mersina* have already mated, as can be seen by their sphragis, the earlier emergence of *H. mersina* thus apparently functioning as an effective reproductively isolating barrier. The interesting case of sympatry of these three *Hipparchia* species on Lésvos (plus *H. syriaca* and *H. fatua*) will be discussed at length in a separate paper.

It is worth mentioning that on the nearby island of Híos (Greece), where only *H. aristaeus senthes* (and also *H. syriaca* and *H. fatua*) seems to occur (GASKIN & LITTLER 1986, 1988; OLIVIER 1987 and unpublished observations), this species is abundant and, in 1987, was already common (only males) on 18.V. Whether this early emergence and abundance of *H. aristaeus senthes* on Híos is due to local conditions, genetic differences between populations of this species, or to the absence of competing *H. mersina* (and *H. pellucida*) is not known.

Southern and western Turkey, as well as Sámos and Lésvos, have a mediterranean-type climate with a long, hot and dry summer (May-September) and a rather humid and mildy winter and spring (KÜNDIG-STEINER 1977, THANOS et al. 1989). Long summer drought inhibits the growth of grasses on which larval feeding depends as long as the drought lasts. Therefore, many of the satyrids in this area that emerge in late spring and early summer undergo an aestivation period in midsummer, known to be coupled with a mechanism of delayed ovarian maturation in *Maniola jurtina* (LINNAEUS, 1758) and in *Hipparchia semele* (see GARCÍA-BARROS 1987a, 1988). It is very likely that *H. mersina*, that emerges already in May (and sometimes in April), living in a more extreme mediterranean climate than *H. semele* in central peninsular Spain (Prov. Guadalajara) and that mates early after emergence, must have an even longer period of delayed ovarian maturation than *H. semele*. If we take into account the facts that the autumn rains in the distribution area of *H. mersina* start in September but begin to be of some importance only in October (KÜNDIG-STEINER l.c., THANOS et al. l.c.), that the duration of the egg stadium is of about 7-25 days in *H. semele*, and that the larvae do not feed within the first 15-30 days after hatching in that species (GARCÍA-BAROSS 1988) we may extrapolate this situation to that of *H. mersina* and predict that oviposition must take place in the period from late August to early October. Contrary to the situation in *Maniola*, where only the females are observed in autumn (e.g. GASKIN & LITTLER 1988, GARCÍA-BARROS 1987a, THOMSON pers. comm.) in *Hipparchia* at least some males seem to survive until autumn. During summer, the activity of the butterflies seems to be reduced with no courtship behaviour observed but both sexes continuing to feed (A. OLIVIER pers. obs.).

Unfortunately nothing is known about the early stages of *H. mersina* and it would be interesting to undertake a comparative study of the 5 *Hipparchia* species that occur on Lésvos, to see how each one of these copes with the dry and hot climatic conditions in midsummer. It could also be interesting to compare the morphology of the early stages of these species, although a comparative study of the morphology and chaetotaxy of the first larval stages of various taxa of different subgenera of *Hipparchia* (including *H. semele*) and of related genera (the first-instar larva often shows the most clear-cut diagnostic morphological features, see e.g. IGARASHI 1984, BOILLAT 1986) revealed only very slight differences between species in this group (GARCÍA-BARROS 1987b).

5. Geographical variation

In our description of the adult we have already paid attention to the geographic variability of the phenotype of *H. mersina*. We will discuss some of these points in more detail here and we'll try to analyze the possible causes of variation. Some characters appear not to be clinal :

5.1. size (tables 1 and 2)

Size is probably the result of a multitude of factors, like the duration of the

larval stages (induced by climatic factors or by genotypic differences between demes) or the side-effect of genes affecting fitness. The large size of specimens from the population from Prov. Antalya could thus be influenced by the average yearly rainfall in this province (1000-1500 m, locally op to 2000 mm) (KÜNDIG-STEINER 1977), that is higher than in any other known part of the distribution range of *H. mersina*, with relatively higher values in the months of October till March than in the other areas. This might result in a longer suitability of fresh grass, inducing a longer larval feeding period and thus superior growth of the larvae as compared to other areas. Populations from Prov. Içel are also relatively large. To the contrary the area around Konya is very dry (KÜNDIG-STEINER l.c.), probably inducing a very short larval duration, this possibly resulting in the remarkably small size of the specimens from Prov. Konya.

The smallest population known is that from the island of Lésvos. Here the climate is certainly drier than in Prov. Antalya and Içel, but we believe that other (genetic) factors also play a role, as the population from the nearby island of Sámos (with a similar climate to Lésvos) is significantly larger than the Lésvos population. It is maybe only coincidence but it is interesting to note that also *Maniola telmessia* (ZELLER, 1847) is very small on Lésvos (THOMSON 1987 : 18), as well as *Maniola megala* (OBERTHÜR, 1909) (OLIVIER, unpublished data).

5.2. presence vs. absence of submarginal ocellus in s2 on underside forewing ♂ (table 4)

We have investigated this character state in all available males (the spot is always present in the female) but were unable to find any correlation between relative absence of this ocellus and any environmental variable. BRAKEFIELD (1984) gives some evidence for the selective advantage of some trends in spot development in *Maniola jurtina* and related taxa and TINBERGEN et al. (1942) have demonstrated that the exposing of the apical ocellus in s5 is a defensive mechanism. We have no evidence regarding the possibility of any selective role of the presence or absence of the s2 ocellus in *H. mersina*. It is possible that this character state is the result of the pleiotropic effect of genes affecting other mechanisms, the presence or absence of the ocellus in s2 in itself being neither advantageous nor disadvantageous for the butterfly.

Some characters show clinal variation from the east to the west of the distribution range :

5.3. expression of the whitish postdiscal band on underside hindwing ♂ (table 3)

We see that in the eastern part of the distribution range of *H. mersina* (Prov. Gaziantep, Maraş, Adana) classes A and B are largely dominating over classes C and D, this tendency changing towards the west to be completely reversed in e.g. Prov. Antalya and on Sámos and Lésvos. If we leave the small samples (Prov. Gaziantep, Muğla, Aydin) aside, we see a continuous and gradual accentuation of the expression of the postdiscal band from Prov. Adana westwards; only between Prov. Adana and Maraş to the east is there a

Table 3 : *Hipparchia mersina* (STAUDINGER, 1871) : expression of the whitish postdiscal band on underside hindwing ♂.

Province or island	Number of specimens examined (100%)	Class A	Class B	Class A+B	Class C	Class D	Class C+D
Gaziantep	9	0 (0%)	6 (66,7%)	6 (66,7%)	3 (33,3%)	0 (0%)	3 (33,3%)
Maraş	52	6 (11,5%)	29 (55,8%)	35 (67,3%)	16 (30,8%)	1 (1,9%)	17 (32,7%)
Adana	84	9 (10,7%)	50 (59,5%)	59 (70,2%)	25 (29,8%)	0 (0%)	25 (29,8%)
Içel	77	3 (3,9%)	36 (46,7%)	39 (50,6%)	35 (45,5%)	3 (3,9%)	38 (49,4%)
Konya	16	1 (6,25%)	6 (37,5%)	7 (43,75%)	8 (50,0%)	1 (6,25%)	9 (56,25%)
Antalya	78	5 (6,4%)	10 (12,8%)	15 (19,2%)	51 (65,4%)	12 (15,4%)	63 (80,8%)
Muğla	7	0 (0%)	2 (28,6%)	2 (28,6%)	5 (71,4%)	0 (0%)	5 (71,4%)
Aydin	6	0 (0%)	0 (0%)	0 (0%)	4 (66,7%)	2 (33,3%)	6 (100,0%)
Sámos	150	8 (5,33%)	17 (11,33%)	25 (16,66%)	113 (75,33%)	12 (8,0%)	125 (83,33%)
Lésvos	150	1 (0,7%)	6 (4,0%)	7 (4,7%)	108 (72,0%)	35 (23,3%)	143 (95,3%)

Class A : postdiscal band absent
Class B : postdiscal band vestigial (cf. figs. 2 and 4)
Class C : postdiscal band rather well to well developed (usually 2-3 mm wide, cf. figs. 6, 8, 10 and 12).
Class D : postdiscal band very well developed and sharply contrasting with groundcolour (usually 3-4 mm wide, cf. fig. 14)

Table 4 : *Hipparchia mersina* (STAUDINGER, 1871) : presence vs. absence of submarginal ocellus in s2 underside forewing ♂.

Province or island	Number of specimens examined (100%)	Present	Absent
Gaziantep	9	7 (77,8%)	2 (22,2%)
Maraş	52	47 (90,4%)	5 (9,6%)
Adana	84	66 (78,6%)	18 (21,4%)
Içel	77	67 (87,0%)	10 (13,0%)
Konya	16	15 (93,75%)	1 (6,25%)
Isparta	1	1 (100,0%)	0 (0%)
Antalya	78	72 (92,3%)	6 (7,7%)
Muğla	7	5 (71,4%)	2 (28,6%)
Aydin	6	4 (66,7%)	2 (33,3%)
Izmir	0	-	-
Manisa	1	0 (0%)	1 (100,0%)
Sámos	150	137 (91,3%)	13 (8,7)%
Lésvos	150	127 (84,7%)	23 (15,3%)
Bursa	2	2 (100,0%)	0 (0,0%)

slight reverse tendency. This pattern of variation does not seem to be correlated with any climatic variable (temperature, rainfall, relative humidity). Continuous variation differs from discontinuous variation only in the number of genetic factors affecting the particular aspect of the phenotype. Both kinds of variation obey the same laws of particulate inheritance. Quantitative characters are controlled by multiple genetic factors, some with larger, some with smaller contributions to the phenotype, and are thus, by definition, polygenic (MAYR 1963). The antagonistic interaction of environmental selection and gene flow is probably responsible for the gradual

change in frequencies of polygenes affecting this character, but probably also other features that are more important for the organism but not observable in the phenotype. As already stated in the description of the adult (see above), there is also a tendency to the development of a postdiscal band in females from Prov. Antalya westwards.

5.4. contrast between basal-discal and postdiscal area on underside forewing ♀ (table 5)

We see that the contrast between both areas is weakly to moderately developed in specimens from the area east of Prov. Antalya (the Prov. Gaziantep sample is too small). It is very regrettable that we had only 9 females from Prov. Antalya and none from Prov. Muğla at our disposition : the small sample from Prov. Antalya, however, allows us to predict that a gradual increase of class 3 and a decrease of classes 1 and 2 occurs in the west of Prov. Antalya (near Termessos, compare also figs. 22 and 24) and in Prov. Muğla. At the Aegean coast (Prov. Aydin, Sámos, Lésvos) classes 1 and 2 have almost totally disappeared in favor of class 3. Here again climatic factors do not offer an entirely satisfactory explanation (yearly average rainfall 500-1000 mm in the area from Prov. Aydin northwards) (KÜNDIG-STEINER l.c., THANOS et al. l.c.). The differences in mean temperature during the months of March and April (supposed to correspond to the late larval and

Table 5 : *Hipparchia mersina* (STAUDINGER, 1871) : contrast between basal-discal and postdiscal area on underside forewing ♀.

Province or island	Number of specimens examined (100%)	Class 1	Class 2	Class 1+2	Class 3
Gaziantep	4	0 (0,0%)	3 (75,0%)	3 (75,0%)	1 (25,0%)
Maraş	6	0 (0,0%)	6 (100,0%)	6 (100,0%)	0 (0,0%)
Adana	30	8 (26,7%)	22 (73,3%)	30 (100,0%)	0 (0,0%)
Içel	10	5 (50,0%)	5 (50,0%)	10 (100,0%)	0 (0,0%)
Konya	0	-	-	-	-
Isparta	0	-	-	-	-
Antalya	9	3 (33,3%)	5 (55,6%)	8 (88,9%)	1 (11,1%)
Muğla	0	-	-	-	-
Aydin	7	0 (0,0%)	0 (0,0%)	0 (0,0%)	7 (100,0%)
Izmir	1	0 (0,0%)	0 (0,0%)	0 (0,0%)	1 (100,0%)
Manisa	0	-	-	-	-
Sámos	19	0 (0,0%)	2 (10,5%)	2 (10,5%)	17 (89,5%)
Lésvos	100	1 (1,0%)	0 (0,0%)	1 (1,0%)	99 (99,0%)
Bursa	2	0 (0,0%)	0 (0,0%)	0 (0,0%)	2 (100,0%)

Class 1 : basal-discal area orange-ochreous, this colour extending well into postdiscal area; discal line absent or weakly developed (cf. figs. 18, 20, 22 and 32)

Class 2 : basal-discal area orange-ochreous, this colour extending to a lesser extent into the postdiscal area; blackish brown discal line rather well to well-developed, so clearly separating both areas (cf. fig. 24)

Class 3 : basal-discal area ochreous brown to dark coffee brown; blackish brown discal line well developed and sometimes rather broad; postdiscal area light creamy yellow, sharply contrasting with basal-discal area (cf. figs. 16, 26, 28, 30, 34 and 36)

pupal stages of *H. mersina*) between Adana, Antalya, Izmir and Sámos (KÜNDIG-STEINER l.c., THANOS et al. l.c.) are too small to account for the pronounced differences observed in the phenotypes of the females from the respective areas. The phenotypic effect in the adult of temperature experiments on late larval and early pupal stages in *Maniola jurtina* has been investigated by THOMSON (1973). In that species the influence of high temperature seems to affect to some extent the upperside fulvous markings of the wings (suffusion of dark scales, encroachment of ground colour along the nervures reducing the width of the fulvous band, usually by an increase in the width of the outer margin), size (reduction), increase in size of the apical ocellus, increase of intensity of the dark medial line and of the width of the outer margin on underside forewing. Results are however somewhat contradictory : high temperature reduces melanin production in *Aglais urticae* (LINNAEUS, 1758) but, apparently, enhances it in *Maniola jurtina*. In *Pararge aegeria* (LINNAEUS, 1758) low temperatures in the pupal stage result in an extension of the fulvous markings in the adult (all data from THOMSON l.c.). However, in *Lasiommata maera* (LINNAEUS, 1758), the extension of the fulvous area is the greatest in hot and dry localities (f. *adrasta*) and the lightest phenotypes of *Pseudochazara mniszechii* (HERRICH-SCHÄFFER, 1851) also occur in hot and dry areas (OLIVIER & DE PRINS, pers. obs.).

As in the expression of the postdiscal band on male hindwing underside, the origin of the observed variation we discuss here is supposedly due to clinal differences in frequencies of several polygenic complexes. Here there is an interesting field for research on this subject through breeding experiments (including the experimental study of temperature effects).

5.5. reduction in length of the uncus towards the west (table 6)

As noted by MAYR (1963: 104) «mechanical isolation plays a very minor role as an isolating mechanism in most groups of animals. The true significance of the differences in the genitalia is presumably the following. The genitalic apparatus is a highly complicated structure, the pleiotropic by-product of very many genes of the species. Any change in the genetic constitution of the species may result in an incidental change in the structure of the genitalia. As internal structures they are less subject to the corrective influences of natural selection than are components of the external phenotype, ...». Experimental study of the functional value of the various structures of the male genitalia in various butterfly species (LORKOVIĆ 1955) agrees well with MAYR's statement. LORKOVIĆ (l.c.) accords an important function to the uncus as an organ for holding the female body, because it enters into the sinus conjunctionis [=ostium bursae] (see also DE JONG 1978). The role of the valves is far less important, as demonstrated by deformation of these structures as well as cutting away of parts of various sizes of the valves of several butterfly species without this having influence on the course of the artificial copulation (LORKOVIĆ l.c.). This means that the opinion of an exact adaptability of the male and female genital armatures in insects (key-lock) is not quite correct (LORKOVIĆ l.c., COUTSIS 1984 : 167). Our study shows that

the length of the uncus is quite variable geographically, but also individually. The uncus is the largest in specimens from Prov. Gaziantep, Maraş and Adana, becoming gradually shorter westwards, being on average - but not constantly - the shortest on the island of Lésvos. There seems to be a correlation with the geographical variation of the length of the ductus bursae, but the available number of females from the eastern part of the distribution range of *H. mersina* is too small to be conclusive. We fail to see what could be the adaptive significance of a shorter uncus in western populations than in eastern populations of *H. mersina* and we think that the change in the length of the uncus (and possibly of the ductus bursae) is the result of a change in the genetic constitution of the different populations from east to west.

5.6. reduction in height of the tegumen (plus pedunculus and appendix angularis) (table 6)

Similar remarks as for the uncus length probably apply. When one looks at the remarkable difference between e.g. the specimens on figs. 41 and 47, more than one typologist could believe that two different «morphospecies» are involved, were these not connected by a continuous series of intermediary stadia.

We list here 6 further characters or character states that are possibly also subject to clinal variation :

-marbled appearence of underside hindwing in specimens from western part of the distribution range.

-expression of the blackish brown zig-zag lines bordering distally resp. the basal and discal areas becoming more and more apparent as one goes to the west.

-colour of the patches on the upperside of the wings in the female : fulvous from Prov. Gaziantep westwards till Prov. Antalya, creamy yellow on Lésvos, Sámos and in the provinces of Bursa, Izmir and Aydin, with intermediary specimens in the province of Antalya (Yenice-Termessos).

-gnathos becoming shorter in specimens from the western part of the distribution range (table 6).

-signum becoming shorter towards the west of the distribution range (table 7): we predict that more material from the eastern part of the distribution range (Prov. Gaziantep westwards to Prov. Antalya) would substantiate this unequivocally.

Table 6 : *Hipparchia mersina* (STAUDINGER, 1871) : geographical and individual variation in the size and proportions of several parts of the male genitalia (see fig. 39)

U : length of uncus
UW1 : uncus width 1
UW2 : uncus width 2
T : length of tegumen
G : length of gnathos ($\alpha + \beta$)
TH : height of tegumen + pedunculus + appendix angularis
VS : length of vinculum + saccus
P : length of penis (a + b)
VL : length of valve
VH1 : height of valve 1
VH2 : height of valve 2
VH3 : height of valve 3

Table 6 : *Hipparchia mersina* (STAUDINGER, 1871) : geographical and individual variation in the size and proportions of several parts of the male genitalia (see fig. 39). (All measurements are given in mm).

Prep. nr.	Province or island	U	UW1	UW2	UW1/ UW2	T	U/T	G	TH	VS	TH/VS	P	VL	VH1	VH2	VH1/ VH2	VH3	(U+T)/ VL	(U+T)/ G	(U+T/ P
2611	Gaziantep	2,43	0,23	0,19	1,21	1,27	1,91	2,30	2,78	1,81	1,54	3,14	2,84	0,49	0,39	1,26	0,35	1,30	1,61	1,18
2406	Gaziantep	2,35	0,31	0,15	2,06	1,38	1,70	2,22	2,68	1,97	1,36	3,27	3,03	0,43	0,32	1,34	0,39	1,23	1,68	1,14
2407	Gaziantep	2,70	0,30	0,16	1,88	1,30	2,08	2,43	2,81	1,46	1,92	3,11	3,00	0,43	0,30	1,43	0,43	1,33	1,65	1,29
2482	Maraş	2,59	0,31	0,16	1,94	1,30	1,99	2,49	2,95	1,58	1,87	3,05	2,97	0,46	0,38	1,21	0,41	1,31	1,56	1,28
2404	Maraş	2,57	0,26	0,18	1,44	1,26	2,04	2,41	3,27	1,68	1,95	3,19	3,19	0,49	0,38	1,29	0,46	1,20	1,59	1,20
2405	Maraş	2,57	0,28	0,18	1,56	1,32	1,95	2,43	3,14	1,35	2,33	-	3,05	0,49	0,34	1,44	0,43	1,28	1,60	-
2607	Adana	2,59	0,36	0,20	1,80	1,59	1,63	2,51	3,24	1,65	1,96	3,76	3,19	0,50	0,38	1,32	0,43	1,31	1,67	1,11
2606	Adana	2,51	0,27	0,22	1,23	1,38	1,82	2,51	2,64	1,49	1,77	3,43	3,22	0,46	0,32	1,44	0,41	1,21	1,55	1,13
2605	Adana	2,84	0,26	0,24	1,08	1,38	2,06	2,38	3,20	1,68	1,90	3,57	3,03	0,54	0,38	1,42	0,38	1,39	1,77	1,18
2484	Adana	2,46	0,24	0,19	1,26	1,30	1,89	2,24	2,96	1,49	1,99	3,38	2,81	0,49	0,38	1,29	0,41	1,34	1,68	1,11
2403	Adana	2,73	0,24	0,14	1,71	1,30	2,10	2,43	3,00	1,35	2,22	3,22	3,03	0,51	0,39	1,31	0,41	1,33	1,66	1,25
2402	Adana	2,70	0,31	0,23	1,35	1,38	1,96	2.08	3,19	1,76	1,81	3,35	3,03	0,46	0,39	1,18	0,39	1,35	1,96	1,22
2601	Içel	2,62	0,21	0,14	1,50	1,45	1,80	2,62	2,81	1,81	1,55	3,27	3,00	0,43	0,36	1,19	0,36	1,36	1,55	1,24
2600	Içel	2,65	0,36	0,20	1,80	1,31	2,02	2,19	2,61	1,14	2,29	2,88	3,03	0,45	0,38	1,18	0,39	1,31	1,81	1,38
2599	Içel	2,57	0,30	0,20	1,50	1,32	1,95	2,54	2,78	-	-	-	2,89	0,49	0,36	1,36	0,36	1,35	1,53	-
2401	Içel	2,65	0,32	0,23	1,39	1,38	1,92	2,32	3,22	1,70	1,89	3,32	3,00	0,51	0,43	1,19	0,49	1,34	1,74	1,21
2400	Içel	2,38	0,24	0,14	1,71	1,30	1,83	2,16	2,72	1,30	2,09	3,24	2,89	0,49	0,40	1,23	0,46	1,27	1,70	1,14
2695	Konya	2,74	0,24	0,14	1,71	1,41	1,94	2,86	2,97	1,59	1,87	2,95	2,99	0,45	0,32	1,41	0,46	1,39	1,45	1,41
2694	Konya	2,53	0,26	0,19	1,37	1,51	1,68	2,43	3,19	1,43	2,23	3,14	2,92	0,47	0,32	1,47	0,49	1,38	1,73	1,29
2693	Konya	2,59	0,31	0,19	1,63	1,39	1,86	2,81	3,00	1,41	2,13	3,30	2,86	0,54	0,45	1,20	0,46	1,39	1,42	1,21
2481	Antalya	2,49	0,32	0,23	1,39	1,27	1,96	2,70	2,81	1,50	1,80	3.03	2,76	0,49	0,39	1,26	0,36	1,36	1,39	1,24
2399	Antalya	2,41	0,28	0,20	1,40	1,35	1,79	2,68	3,00	1,43	2,10	3,16	2,92	0,51	0,38	1,34	0,41	1,29	1,40	1,19
2480	Antalya	2,46	0,26	0,23	1,13	1,26	1,95	2,22	2,59	1,30	1,99	3,05	2,86	0,45	0,31	1,45	0,38	1,30	1,68	1,22
2479	Antalya	2,35	0,27	0,16	1,69	1,36	1,73	2,84	3,00	1,54	1,95	3,30	3,03	0,43	0,30	1,43	-	1,22	1,31	1,12
2874	Muğla	2,30	0,31	0,18	1,72	1,30	1,77	2,42	2,89	1,54	1,88	3,16	2,96	0,50	0,41	1,22	0,45	1,22	1,49	1,14
2873	Muğla	2,14	0,27	0,19	1,42	1,39	1,54	2,20	2,45	1,41	1,74	2,99	2,68	0,45	0,30	1,50	0,38	1,32	1,60	1,18
2872	Muğla	2,22	0,32	0,23	1,39	1,46	1,52	2,68	2,89	1,46	1,98	3,08	2,92	0,49	0,36	1,36	0,46	1,26	1,37	1,19
2871	Muğla	2,46	0,22	0,11	2,00	1,22	2,02	2,22	2,50	1,53	1,63	3,11	2,92	0,54	0,42	1,29	0,38	1,26	1,66	1,18
2870	Muğla	2,24	0,23	0,15	1,53	1,38	1,62	1,97	2,62	1,11	2,36	2,99	2,69	0,46	0,38	1,21	0,43	1,35	1,84	1,21
2699	Aydin	2,26	0,27	0,20	1,35	1,23	1,84	2,38	2,95	1,53	1,93	2,80	2,70	0,51	0,38	1,34	0,36	1,29	1,47	1,25
2698	Aydin	2,38	0,32	0,19	1,68	1,57	1,52	2,62	2,68	1,51	1,77	3,27	3,04	0,51	0,39	1,31	0,43	1,30	1,51	1,21
2697	Aydin	2,15	0,24	0,16	1,50	1,34	1,60	2.03	2,59	1,43	1,81	3,03	2,70	0,43	0,36	1,19	0,41	1,29	1,72	1,15

2696	Aydin	2,16	0,34	0,19	1,79	1,31	1,65	2,05	2,68	1,16	2,31	2,45	2,59	0,43	0,30	1,43	0,36	1,34	1,69	1,42
2747	Sámos	2,05	0,15	0,15	1,00	1,30	1,58	2,23	2,30	1,62	1,42	2,74	2,62	0,43	0,30	1,43	0,36	1,28	1,50	1,22
2758	Sámos	2,16	0,30	0,16	1,88	1,31	1,65	2,05	2,62	1,41	1,86	2,86	2,84	0,42	0,32	1,31	-	1,22	1,69	1,21
2746	Sámos	1,95	0,22	0,19	1,16	1,24	1,57	1,95	2,84	1,55	1,83	3,00	2,62	0,45	0,34	1,32	0,38	1,22	1,64	1,06
2631	Sámos	2,14	0,20	0,16	1,25	1,46	1,47	2,43	2,54	1,59	1,60	2,97	2,81	0,43	0,35	1,23	0,36	1,28	1,48	1,21
2636	Sámos	2,32	0,30	0,26	1,15	1,47	1,58	2,03	2,66	1,41	1,89	3,11	2,81	0,46	0,36	1,28	0,38	1,35	1,87	1,22
2632	Sámos	2,38	0,28	0,23	1,22	1,34	1,78	2,05	2,84	1,43	1,99	3,16	3,05	0,47	0,36	1,31	0,46	1,22	1,81	1,18
2630	Sámos	2,30	0,27	0,19	1,42	1,41	1,63	2,19	2,81	1,30	2,16	3,19	2,95	0,45	0,32	1,41	0,36	1,26	1,69	1,16
2618	Sámos	2,24	0,23	0,14	1,64	1,15	1,95	2,38	2,65	1,41	1,88	3,11	2,76	0,46	0,38	1,21	0,36	1,23	1,42	1,09
2397	Sámos	2,19	0,28	0,27	1,04	1,45	1,51	2,49	2,35	1,43	1,64	3,05	2,86	0,49	0,41	1,20	0,35	1,27	1,46	1,19
2395	Sámos	2,08	0,28	0,18	1,56	1,26	1,65	2,11	2,54	1,30	1,95	2,86	2,59	0,43	0,30	1,43	0,36	1,29	1,58	1,17
2588	Lésvos	1,92	0,20	0,19	1,05	1,22	1,57	1,73	2,27	1,24	1,83	2,88	2,65	0,41	0,27	1,52	0,41	1,18	1,82	1,09
2587	Lésvos	2,11	0,27	0,20	1,35	1,36	1,55	2,30	2,51	1,43	1,76	3,15	2,76	0,42	0,31	1,35	0,43	1,26	1,51	1,10
2589	Lésvos	2,11	0,23	0,20	1,15	1,41	1,50	2,41	2,64	1,46	1,81	3,00	2,78	0,41	0,27	1,52	0,35	1,27	1,46	1,17
2590	Lésvos	2,22	0,26	0,16	1,63	1,22	1,82	2,27	2,62	1,54	1,70	2,82	2,65	0,41	0,32	1,28	0,35	1,30	1,52	1,22
2585	Lésvos	2,04	0,28	0,20	1,40	1,22	1,67	2,32	2,39	1,22	1,96	3,03	2,73	0,41	0,31	1,32	0,38	1,19	1,41	1,08
2583	Lésvos	1,95	0,28	0,19	1,47	1,34	1,46	1,62	2,35	1,38	1,70	2,74	2,61	0,41	0,31	1,32	0,35	1,26	2,03	1,20
2586	Lésvos	2,01	0,28	0,19	1,47	1,30	1,55	2,01	2,38	1,31	1,82	3,08	2,70	0,45	0,27	1,67	0,34	1,23	1,65	1,07
2584	Lésvos	2,00	0,26	0,20	1,30	1,32	1,52	2,08	2,74	1,45	1,89	2,95	2,77	0,49	0,39	1,26	0,32	1,20	1,60	1,13
2396	Lésvos	2,05	0,26	0,20	1,30	1,32	1,55	1,91	2,51	1,32	1,90	2,92	2,65	0,43	0,39	1,10	0,35	1,27	1,76	1,15
2614	Lésvos	2,04	0,24	0,19	1,26	1,34	1,52	1,93	2,45	1,23	1,99	2,77	2,73	0,46	0,34	1,35	0,35	1,24	1,75	1,22
2615	Lésvos	2,14	0,27	0,22	1,23	1,22	1,75	2,49	2,70	1,50	1,80	3,01	2,72	0,50	0,41	1,22	0,41	1,24	1,35	1,12
2616	Lésvos	1,97	0,27	0,18	1,50	1,49	1,32	2,38	2,38	1,27	1,87	2,89	2,66	0,42	0,30	1,40	0,38	1,30	1,45	1,20
2620	Lésvos	2,12	0,27	0,20	1,35	1,27	1,67	2,11	2,46	1,27	1,94	-	2,76	0,46	0,35	1,31	0,34	1,23	1,61	-
2621	Lésvos	2,30	0,28	0,20	1,40	1,41	1,63	2,41	2,58	1,19	2,17	2,92	2,81	0,49	0,41	1,20	0,47	1,32	1,54	1,27
2622	Lésvos	1,82	0,22	0,18	1,22	1,18	1,54	1,84	2,24	1,22	1,84	2,66	2,49	0,46	0,35	1,31	0,41	1,20	1,63	1,13
2623	Lésvos	2,27	0,35	0,23	1,52	1,22	1,86	2,43	2,84	1,46	1,95	3,59	2,89	0,49	0,38	1,29	0,41	1,21	1,44	0,97
2624	Lésvos	1,96	0,22	0,19	1,16	1,31	1,50	2,39	2,50	1,39	1,80	2,85	2,68	0,49	0,41	1,20	0,39	1,22	1,37	1,15
2626	Lésvos	2,08	0,27	0,19	1,42	1,30	1,60	2,41	2,62	1,30	2,02	2,84	2,73	0,42	0,28	1,50	-	1,24	1,40	1,19
2613	Lésvos	2,11	0,22	0,14	1,57	1,09	1,94	1,76	2,62	1,32	1,98	2,86	2,69	0,41	0,28	1,46	0,31	1,19	1,82	1,12
2627	Lésvos	1,97	0,28	0,20	1,40	1,41	1,40	2,24	2,69	1,62	1,66	3,04	2,74	0,41	0,32	1,28	0,36	1,23	1,51	1,11
2628	Lésvos	2,11	0,31	0,23	1,35	1,41	1,50	2,54	2,54	1,41	1,80	3,22	2,80	0,46	0,35	1,31	0,36	1,26	1,39	1,09
2629	Lésvos	2,03	0,27	0,19	1,42	1,28	1,59	2,00	2,36	1,22	1,93	2,81	2,65	0,49	0,36	1,36	0,35	1,25	1,66	1,18
2716	Lésvos	2,08	0,27	0,20	1,35	1,24	1,68	2,19	2,43	1,27	1,91	2,82	2,66	0,45	0,35	1,29	0,45	1,25	1,52	1,18
2685	Lésvos	1,92	0,27	0,18	1,50	1,50	1,28	1,86	2,51	1,22	2,06	2,97	2,59	0,46	0,35	1,31	0,36	1,32	1,84	1,15

-sphragis small in the populations along the Aegean coast, better developed in S. Turkey (from Prov. Antalya eastwards).

From all the points we have mentioned in our analysis of the geographical variation of *H. mersina* it seems that the evidence for climatic factors playing a role in the expression of the characters analysed is not very great. Much to the contrary, we found that at least 4 features (and possibly 6 other ones too) show a similar pattern of a gradual east-west clinal variation, that we could not correlate with any parallel environmental gradient. As noted already for each feature this variation is probably due to the differences in genetic constitution between the populations due to natural selection. Which selective factors are involved is, however, not clear as we must admit. When one compares a series from Lésvos or Sámos with one from Prov. Içel or Prov. Adana one could think that two species (or at least two subspecies) are involved; in fact most of the characters analysed appear to change gradually from the east to the west. As we have seen, *H. mersina* seems to form localized demes, but strays can reach an adjacent population. There does not seem to be a single insurmountable gap in the whole distribution range of this species and all demes of this species are, at least potentially, capable of gene flow with the neighbouring ones, even the island populations (specimens from the island of Sámos do not differ significantly from specimens from Prov. Aydin : Çamlik; the same situation applies when one compares specimens from Prov. Bursa with specimens from the island of Lésvos). We believe that the compromise between the diversifying effect of natural selection on the different populations and the cohesive effect of gene flow between populations is responsible for the pattern of gradual geographical variation that we have in this species.

As already stated in the introduction, KUDRNA (1977) described the population of *H. mersina* from the island of Lésvos as a separate subspecies (and subsequently elevated it to species rank, cf. KUDRNA 1986). Our investigations have shown that none of the characters advanced by KUDRNA (1977) to differentiate *H. mersina malickyi* from the other populations of *H. mersina* (see «Introduction») appear to be constant. We therefore sink it in synonymy here :

Satyrus Semele L. v. *Mersina* STAUDINGER 1871, Catalog der Lepidopteren des Europaeischen Faunengebietes, p. 28.
=*Hipparchia mersina malickyi* KUDRNA 1977, A Revision of the Genus *Hipparchia* Fabricius. E.W. Classey, Faringdon, p. 89-90, **n. syn.**

6. The type of *Hipparchia mersina* (STAUDINGER, 1871)

The name of the taxon itself as well as the notes in STAUDINGER (1871, 1878) (see «Introduction») unambiguously point to the conclusion that the type locality of *Hipparchia mersina* (STAUDINGER, 1871) should be Mersin. HOLIK (1949) mentions 2 males and 2 females in the STAUDINGER collection as originating from Mardin and he designates them as cotypes. As far as we know, before 1871 nobody had collected near Mardin, while only

KINDERMANN and LEDERER had collected in the Taurus Mts. near Mersin and only KRÜPER near Izmir (S. WAGENER pers. comm.). The record of «Mardin» (HOLIK l.c. : 99) is based on a misinterpretation of the labels «Mersin».

It is incomprehensible that KUDRNA (1977 : 88) has designated a male lectotype from Izmir while he also had 2 males and 1 female from the STAUDINGER collection originating from Mersin at his disposition.

The material of *H. mersina* from the STAUDINGER collection consists of the following four specimens :

1) 1 ♂ bearing the following labels (figs. 65-66) :
   -small white label with handwritten «Mersin», possibly in the handwriting of STAUDINGER
   -small pink label printed «Origin.»
   -small white label printed «61.»
   -small white label printed «Coll. Led.»
   -larger pink label with handwritten «*Hipparchia mersina* Staudinger» and printed «Holotypus»
   -white label written «Phot. Nr I 7 u 12 Dr. de Lattin»

This specimen was probably labelled as «Holotype» by DE LATTIN. However this designation was never published, nor did DE LATTIN ever publish a figure of this specimen. The butterfly lacks the abdomen. There is no reference whatever to a possible genitalic slide and we assume that the abdomen has been lost. As this specimen apparently comes from the collection of LEDERER, originated from Mersin (see discussion above) and also bears a label «Holotypus», we here designate it as the **Lectotype** of *Hipparchia mersina mersina* (STAUDINGER, 1871). The specimen has been labelled by us accordingly.

Table 7 : *Hipparchia mersina* (STAUDINGER, 1871) : geographical and individual variation in the size, proportions and form of several parts of the female genitalia (see fig. 40)

HST : height sterigma
WST : width sterigma
LDL : length dorso-lateral lobe
WDL : width dorso-lateral-lobe
LL : length dorsal lamella
WL : width dorsal lamella
LDB : length ductus bursae
WDB : width ductus bursae
LCB : length corpus bursae
WCB1 : width corpus bursae 1 (=width cervix bursae)
WCB2 : width corpus bursae 2
LS : length of signum

DBS : degree of sclerotization of ductus bursae
  MB = membranous
  SC = sclerotized
  WSC = weakly sclerotized
DBF : form of ductus bursae
  ST = straight
  C = curved
  SL = slender
  B = broad
CBS : degree of sclerotization of cervix bursae
  x = normal (relatively sclerotized)
  xx = strongly sclerotized
MDP : form of mid dorsal process
  SP = slender and pointed
  BT = broad and triangular

Table 7 : *Hipparchia mersina* (STAUDINGER, 1871) : geographical and individual variation in the size, proportions and form of several parts of the female genitalia (see fig. 40). (All measurements are given in mm).

Prep. nr.	Province or island	HST	WST	LDL	WDL	LL	WL	LDB	WDB	LCB	WCB1	WCB2	LS	LCB/ LS	DBS	DBF	CBS	MDP
2612	Gaziantep	2,58	2,76	1,22	0,51	0,99	0,62	0,76	0,12	3,16	0,54	1,46	1,89	1,67	WSC	ST,SL	x	-
2417	Adana	2,92	2,43	1,32	0,51	1,03	0,81	0,47	0,16	3,19	0,54	1,68	1,97	1,62	MB	ST,B	x	BT
2525	Adana	2,92	2,36	1,19	0,42	1,09	0,41	0,76	0,16	2,76	0,43	1,49	1,57	1,76	WSC	ST,SL	x	SP
2526	Adana	2,81	2,42	1,11	0,53	1,11	0,74	0,70	0,14	2,76	0,59	1,07	1,60	1,73	MB	C,SL	x	SP
2533	Adana	2,92	2,78	1,51	0,62	0,92	0,63	0,57	0,19	2,81	0,64	1,35	2,03	1,38	MB	ST,B	x	SP
2418	Adana	2,69	2,34	1,19	0,41	0,81	0,62	0,50	0,11	2,38	0,54	0,75	1,73	1,38	SC	ST,SL	x	SP
2608	Adana	2,65	2,46	1,35	0,46	0,89	0,59	0,51	0,14	2,76	0,73	0,95	1,84	1,50	MB	ST,SL	x	SP
2609	Adana	2,54	2,46	1,22	0,50	0,97	0,47	0,62	0,24	3,05	0,64	1,15	1,82	1,68	MB	ST,B	x	SP
2610	Adana	2,68	2,34	1,43	0,38	0,88	0,59	0,43	0,27	3,00	0,54	0,86	1,84	1,63	MB	ST,B	x	SP
2602	Içel	2,64	2,19	1,41	0,53	0,85	0,70	0,62	0,14	2,50	0,46	0,81	1,68	1,49	MB	C,SL	x	BT
2603	Içel	2,86	2,32	1,31	0,50	0,91	0,72	0,51	0,11	2,91	0,62	1,05	1,95	1,49	WSC	ST,SL	x	SP
2604	Içel	2,73	2,49	1,35	0,45	0,92	0,65	0,41	0,23	2,68	0,62	0,85	1,62	1,65	MB	ST,B	x	SP
2415	Içel	2,41	2,70	1,19	0,41	1,03	0,62	0,68	0,11	2,76	0,59	1,05	1,73	1,60	SC	C,SL	xx	-
2414	Antalya	2,76	-	1,43	0,51	0,89	0,50	0,54	0,22	3,11	0,62	1,57	1,35	2,30	MB	ST,B	x	SP
2524	Antalya	3,19	2,34	1,66	0,49	0,81	0,68	0,61	0,27	2,97	0,68	1,49	1,65	1,80	MB	ST,B	x	SP
2700	Aydin	2,41	2.03	1,43	0,38	0,78	0,58	0,58	0,19	3,19	0,46	1,28	1,73	1,84	WSC	ST,B	x	SP
2701	Aydin	2,57	2,54	1,22	0,62	0,81	0,65	0,43	0,22	3,15	0,51	1,58	1,41	2,23	MB	ST,B	x	SP
2702	Aydin	2,51	2,53	1,19	0,53	0,81	0,62	0,36	0,11	3,14	0,43	1,30	1,34	2,34	MB	ST,SL	x	SP
2703	Aydin	2,70	2,38	1,22	0,45	0,76	0,43	0,46	0,18	3,30	0,54	1,46	1,43	2,31	MB	ST,B	x	SP
2371	Sámos	3,15	2,57	1,27	0,59	0,89	0,59	0,43	0,26	2,93	0,59	1,43	1,54	1,90	MB	ST,B	x	SP
2412	Sámos	2,41	2,36	1,03	0,62	1,03	0,62	0,73	0,15	2,57	0,50	1,41	1,04	2,47	MB	C,SL	x	SP
2413	Sámos	2,57	2,68	1,14	0,47	0,72	0,57	0,73	0,11	2,70	0,54	1,32	1,51	1,79	MB	C,SL	x	-
2523	Sámos	2,92	2,70	1,43	0,46	0,92	0,62	0,62	0,22	2,97	0,54	1,35	1,43	2,08	MB	ST,B	x	SP
2638	Sámos	2,86	2,70	1,39	0,64	0,96	0,65	0,54	0,27	2,97	0,47	1,43	1,24	2,40	MB	ST,B	x	SP
2347	Lésvos	2,59	2,27	1,30	0,50	0,78	0,51	0,54	0,23	2,84	0,54	1,49	1,73	1,64	MB	ST,B	x	SP
2348	Lésvos	2,41	2,54	1,28	0,45	0,86	0,59	0,54	0,23	2,99	0,54	1,22	1,49	2,01	MB	ST,B	x	SP
2349	Lésvos	2,47	2,38	1,22	0,54	0,80	0,65	0,59	0,30	2,86	0,54	1,49	1,68	1,70	MB	ST,B	x	SP
2352	Lésvos	2,49	2,49	1,09	0,53	0,81	0,53	0,45	0,26	2,84	0,57	1,31	1,57	1,81	MB	ST,B	x	SP
2353	Lésvos	2,19	2,22	1,46	0,47	0,68	0,51	0,49	0,30	2,69	0,54	1,15	1,54	1,75	MB	ST,B	x	BT
2356	Lésvos	2,32	2,23	1,22	0,49	0,84	0,55	0,49	0,23	2,32	0,53	1,09	1,54	1,51	WSC	ST,B	x	SP

2410	Lésvos	2,42	2,46	1,30	0,49	0,86	0,68	0,62	0,14	2,97	0,46	1,08	1,68	1,77	SC	ST,SL	x	SP
2411	Lésvos	2,74	2,14	1,32	0,47	0,85	0,59	0,50	0,18	2,78	0,49	1,03	1,46	1,90	WSC	ST,B	x	SP
2457	Lésvos	2,45	2,57	1,16	0,57	0,82	0,62	0,49	0,24	2,55	0,53	1,31	1,38	1,85	MB	ST,B	x	SP
2464	Lésvos	2,51	2,50	1,16	0,53	0,76	0,50	0,59	0,14	2,86	0,49	1,42	1,49	1,92	WSC	ST,SL	x	SP
2465	Lésvos	2,41	2,26	1,18	0,55	0,73	0,55	0,38	0,27	-	0,54	1,38	1,19	-	MB	ST,B	x	SP
2468	Lésvos	2,51	2,22	0,99	0,38	0,85	0,50	0,53	0,24	2,95	0,51	1,18	1,69	1,75	MB	ST,B	x	BT
2469	Lésvos	2,70	2,57	1,31	0,68	1,00	0,59	0,57	0,19	2,78	0,50	1,39	1,93	1,44	WSC	C,B	x	SP
2470	Lésvos	2,89	2,34	1,30	0,43	0,88	0,58	0,54	0,24	2,80	0,62	1,32	1,65	1,70	MB	ST,B	x	SP
2471	Lésvos	2,46	2,35	1,38	0,51	1,01	0,70	0,59	0,22	2,80	0,57	1,31	1,61	1,74	MB	ST,B	x	SP
2522	Lésvos	2,26	2,43	1,36	0,62	0,86	0,57	0,46	0,23	2,89	0,38	1,45	1,68	1,72	MB	ST,B	x	SP
2537	Lésvos	2,07	2,09	1,11	0,42	0,85	0,45	0,59	0,23	2,57	0,45	1,51	1,53	1,68	MB	ST,B	x	SP
2538	Lésvos	2,24	1,97	1,08	0,32	0,82	0,51	0,22	0,23	2,51	0,49	1,27	1,43	1,75	WSC	ST,B	x	BT
2539	Lésvos	1,97	2,42	1,23	0,47	0,73	0,54	0,54	0,24	2,68	0,54	1,24	1,24	2,16	MB	ST,B	x	SP
2540	Lésvos	2,70	2,43	1,36	0,54	0,92	0,54	0,47	0,14	2,82	0,43	1,46	1,55	1,82	WSC	ST,SL	x	SP
2541	Lésvos	2,45	2,27	1,46	0,46	0,80	0,54	0,50	0,19	2,89	0,54	1,36	1,51	1,91	WSC	ST,B	x	SP
2548	Lésvos	2,55	2,27	1,22	0,43	0,91	0,61	0,46	0,27	2,77	0,41	1,38	1,54	1,80	MB	ST,B	x	SP
2549	Lésvos	2,38	2,18	1,32	0,49	0,92	0,50	0,36	0,24	2,78	0,54	1,16	1,58	1,76	MB	ST,B	x	SP
2553	Lésvos	2,49	2,27	1,46	0,46	0,76	0,65	0,46	0,23	2,65	0,47	1,27	1,57	1,69	MB	ST,B	x	-
2555	Lésvos	2,38	-	1,22	0,35	0,85	0,59	0,66	0,19	2,43	0,58	1,08	1,78	1,37	MB	ST,B	x	SP
2346	Lésvos	2,41	2,34	1,12	0,32	0,86	0,58	0,57	0,14	3,20	0,50	1,35	1,41	2,27	SC	C,SL	x	SP
2558	Lésvos	2,45	-	1,32	0,47	0,80	0,54	0,62	0,16	2,55	0,57	1,11	1,39	1,83	MB	ST,SL	xx	SP
2565	Lésvos	2,41	2,24	1,28	0,41	0,92	0,61	0,41	0,15	2,45	0,49	0,93	1,16	2,11	WSC	ST,SL	x	SP
2568	Lésvos	2,24	2,38	1,22	0,46	0,76	0,59	0,54	0,22	2,80	0,41	1,19	1,58	1,77	MB	ST,B	x	SP
2570	Lésvos	2,51	2,28	1,30	0,50	0,81	0,54	0,54	0,18	2,57	0,50	1,68	1,41	1,82	WSC	ST,B	x	SP
2571	Lésvos	2,68	2,68	1,35	0,59	0,92	0,68	0,65	0,22	2,61	0,49	1,41	1,30	2,01	MB	ST,B	x	SP
2743	Lésvos	2,46	2,50	1,20	0,51	0,78	0,64	0,57	0,18	2,78	0,50	1,19	1,65	1,68	MB	ST,B	x	SP
2744	Lésvos	2,61	2,43	1,46	0,58	0,97	0,53	0,49	0,16	2,58	0,49	1,22	1,51	1,71	MB	ST,SL	x	-
2745	Lésvos	2,84	2,20	1,36	0,42	0,85	0,59	0,65	0,18	3,47	0,54	1,27	1,70	2,04	SC	ST,B	xx	SP
2782	Lésvos	2,68	2,26	1,27	0,43	0,92	0,54	0,46	0,12	2,59	0,43	1,15	1,27	2,04	MB	ST,SL	x	SP

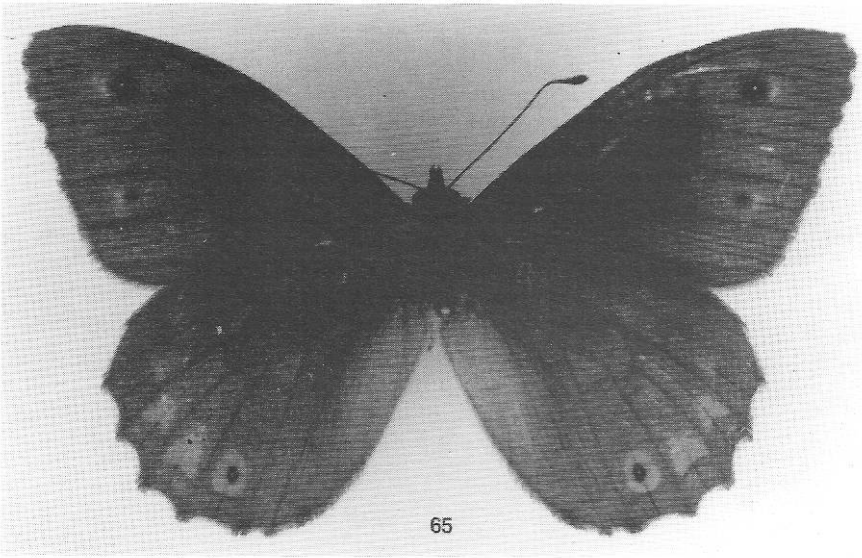


Fig. 65 : *Hipparchia mersina mersina* (STAUDINGER, 1871), **Lectotype**, ♂.
(Figs. 65-69 2x natural size)

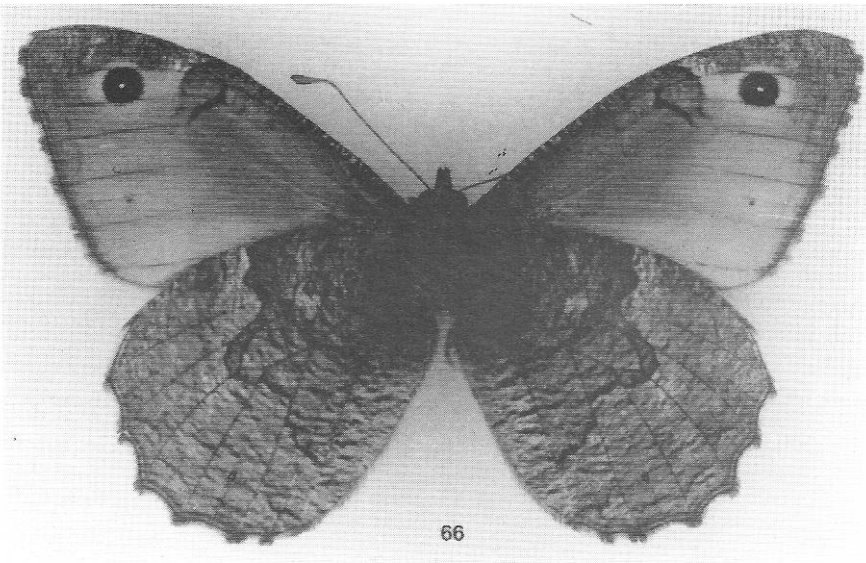


Fig. 66 : as fig. 65 (underside).

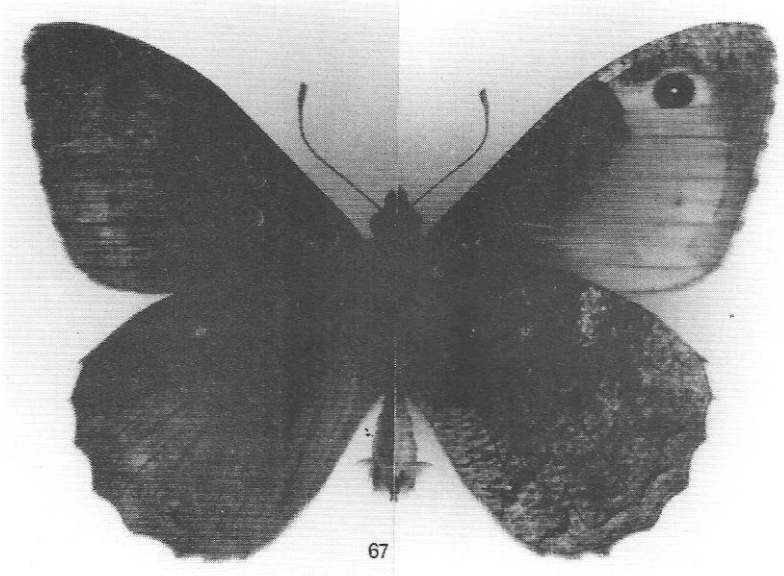


Fig. 67 : *Hipparchia mersina mersina* (STAUDINGER, 1871), **Paralectotype**, ♂, left : upperside, right : underside.

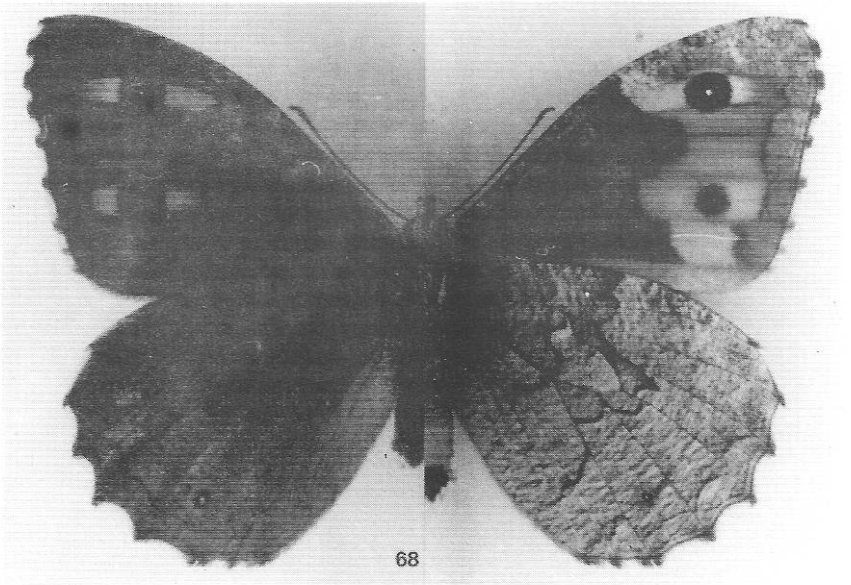


Fig. 68 : *Hipparchia mersina mersina* (STAUDINGER, 1871), **Paralectotype**, ♀, left : upperside, right : underside.

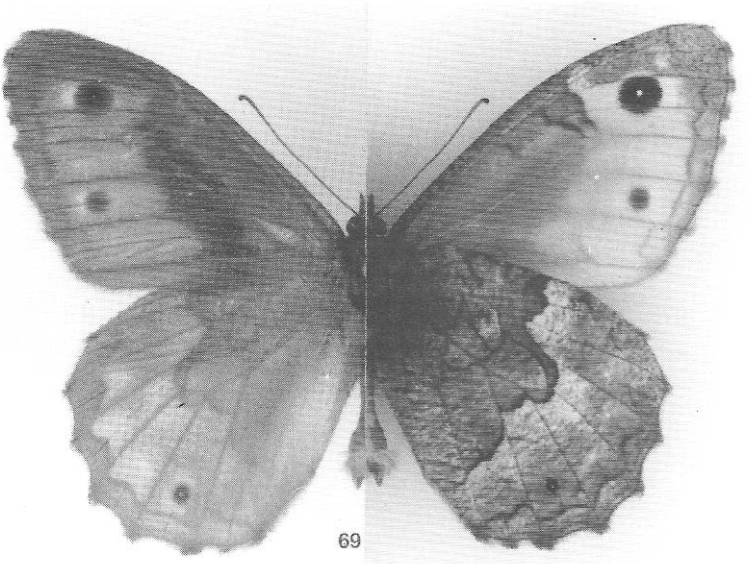


Fig. 69 : *Hipparchia mersina mersina* (STAUDINGER, 1871), ♂, Smijrna [Izmir, Turkey], **not included in type series.**

2) 1 ♂ bearing the following labels (fig. 67) :
-small white label with handwritten «Mersin» (same handwriting as the lectotype)
-small pink label printed «Origin.»
-small white label printed «Coll. Led.»

This specimen lacks the right antenna. We designate it here as **Paralectotype** of *Hipparchia mersina mersina* (STAUDINGER, 1871). The specimen has been labelled by us accordingly.

3) 1 ♀ bearing the following labels (fig. 68) :
-small white label with handwritten «Mersin» (same handwriting as the lectotype and the male paralectotype)
-small pink label printed «Origin.»
-small white label printed «62.»
-small white label printed «Coll. Led.»
-larger pink label with handwritten «*Hipparchia mersina* Staudinger» and printed «Allotypus»
-white label written «Phot. Nr. II 8 u 13 Dr. de Lattin»

Here also DE LATTIN apparently never published anything about this specimen : we designate it here as **Paralectotype** of *Hipparchia mersina mersina* (STAUDINGER, 1871). The specimen has been labelled by us accordingly.

4) 1 ♂ bearing the following labels (fig. 69) :
-small green label handwritten «Smijrna Kr.»
-small green label printed «65.»
-white label printed «Zool. Mus. Berlin»
-larger pink label handwritten «Para [Co]type» and «*Hipparchia mersina* Stgr. *dubia* n. ssp.» and printed «Paratype Dr. de Lattin»
-one white label handwritten «*Sat. semele mersina* Stgr.»

This is the specimen that KUDRNA (1977 : 88) designated as male lectotype. However, it lacks any label with this designation! For reasons discussed at length above this specimen cannot be taken into consideration as belonging to the type series. We therefore explicitely exclude this specimen from the type series of *Hipparchia mersina mersina* (STAUDINGER, 1871), which is thus restricted to 1 male lectotype and 1 male and 1 female paralectotypes from Mersin, all three deposited in the STAUDINGER collection housed in the Zoologisches Museum (Humboldt-Universität), Berlin. As the name «*dubia* n. ssp.» indicated on one of the labels of the specimen from Izmir was never published it is unavailable in nomenclatural sense.

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Boekbesprekingen

Rösler, M. & S. : *Aktionsbuch Naturschutz. Leitfaden für die Jugendarbeit.*
16 x 21 cm, 159 p., 94 cartoons, Franckh'sche Verlagshandlung, W. Keller & Co., Postfach 10 60 11, D-7000 Stuttgart 1, paperback, 1989, DM 19,80 (ISBN 3-440-05919-7).

Het is zonder meer duidelijk dat er steeds meer en meer te doen is rond natuurbescherming. Er is geen gemeente, bos of weiland over of er bestaat wel een groep die zich inzet om het weinige dat er nog aan natuur rest, te behouden. Het oprichten van zulke groepen, die meestal uit jongeren bestaan, en de middelen en werkwijzen waarmee het beste kan gewerkt worden, vormen de onderwerpen van dit boek.

In het eerste hoofdstuk worden tips gegeven voor het opstarten vaneen natuurbeschermingsgroep. Deze tips zijn erg praktisch en het sukses lijkt dan ook verzekerd. Andere hoofdstukken behandelen het financiële beheer, de verzekering en het samenstellen van een werkingsprogramma. Vooral dit laatste onderwerp is in detail behandeld omdat het het welslagen of falen van de groep als dusdanig rechtstreeks beïnvloedt.

Een volgend hoofdstuk behandelt de kontakten met de media, vooral met de geschreven pers. Daarna worden de eigen uitgaven besproken, gaande van zelfklevers, een jaarboek tot een regelmatig tijdschrift. Andere middelen om in de openbaarheid te treden worden aangehaald, zoals : uithangborden in scholen, infostanden, straattheater, akties, voordrachten, tentoonstellingen. Voor ruimere akties wordt het samenwerken met andere organisaties niet uit het oog verloren en in dit verband wordt de «jungle» van de officiële instanties enigszins ontrafeld. Achteraan volgt nog een uitgebreide adressenlijst en een alfabetisch register.

Het boek is zeer vlot leesbaar en luchtig samengesteld. De talrijke tips bieden uitstekende ideeën bij alle behandelde punten. De 94 cartoons van P. RUGE dragen er nog meer toe bij steeds de glimlach te behouden, ook al gaat het om saaiere onderwerpen. Het boek is zeer aan te bevelen aan al wie zich aktief inzet in een of andere natuurbeschermingsorganisatie.

W.O. De Prins