ZOOLOGISCHE MEDEDELINGEN

UITGEGEVEN DOOR HET

RIJKSMUSEUM VAN NATUURLIJKE HISTORIE TE LEIDEN

(MINISTERIE VAN CULTUUR, RECREATIE EN MAATSCHAPPELIJK WERK)

Deel 48 no. 1 10 april 1974

# NOTES ON THE GENUS *CARCHARODUS* (LEPIDOPTERA, HESPERIIDAE)

by

R. DE JONG

Rijksmuseum van Natuurlijke Historie, Leiden

With 7 text-figures

## 1. Geographic variation in the male genitalia of *Carcharodus alceae* (Esper)

*Carcharodus alceae* is widespread in the Palaearctic region: it occurs from the Sahara to Northern Germany and from Portugal to the Altai, Turkestan and Kashmir, from where it penetrates the Oriental region along the south-side of the Himalayas to Mussoree; isolated from its main range it occurs in Southwestern Arabia.

Although it is a species of dry and warm localities, such as steppes, sunny slopes, dry meadows, etc., even flying in the semidesert in Morocco, it ascends to 1600 m in the Alps (Kauffmann, 1951). The large range of temperatures thus covered by *alceae* is reflected by the variation in number of broods per year. In the mountains and north of the Alps there are one or two broods, south of the Alps three or four. In the Near East *alceae* is on the wing from the beginning of February to the end of November (Ellison & Wiltshire, 1939; Wiltshire, 1957). But *alceae* does not react to ecological differences by varying in the number of broods per year only, it is also variable in size and colouring. As ecological factors such as temperature and humidity are largely geographically distributed, there appears to be a marked geographic variation. This has led to the description of many "subspecies" that are actually climatic or seasonal forms. As undoubtedly a part of the geographic variation of *alceae* in size and colour is due to geographic isolations during the Ice Age, the study of the geographic variation of this species is very complex.

As far as known the genitalia usually do not react to ecological changes to the same extent as size and colour; normally there is no reaction at all. If there

is a geographic variation in the genitalia, this can usually be explained as a result of geographic isolation.

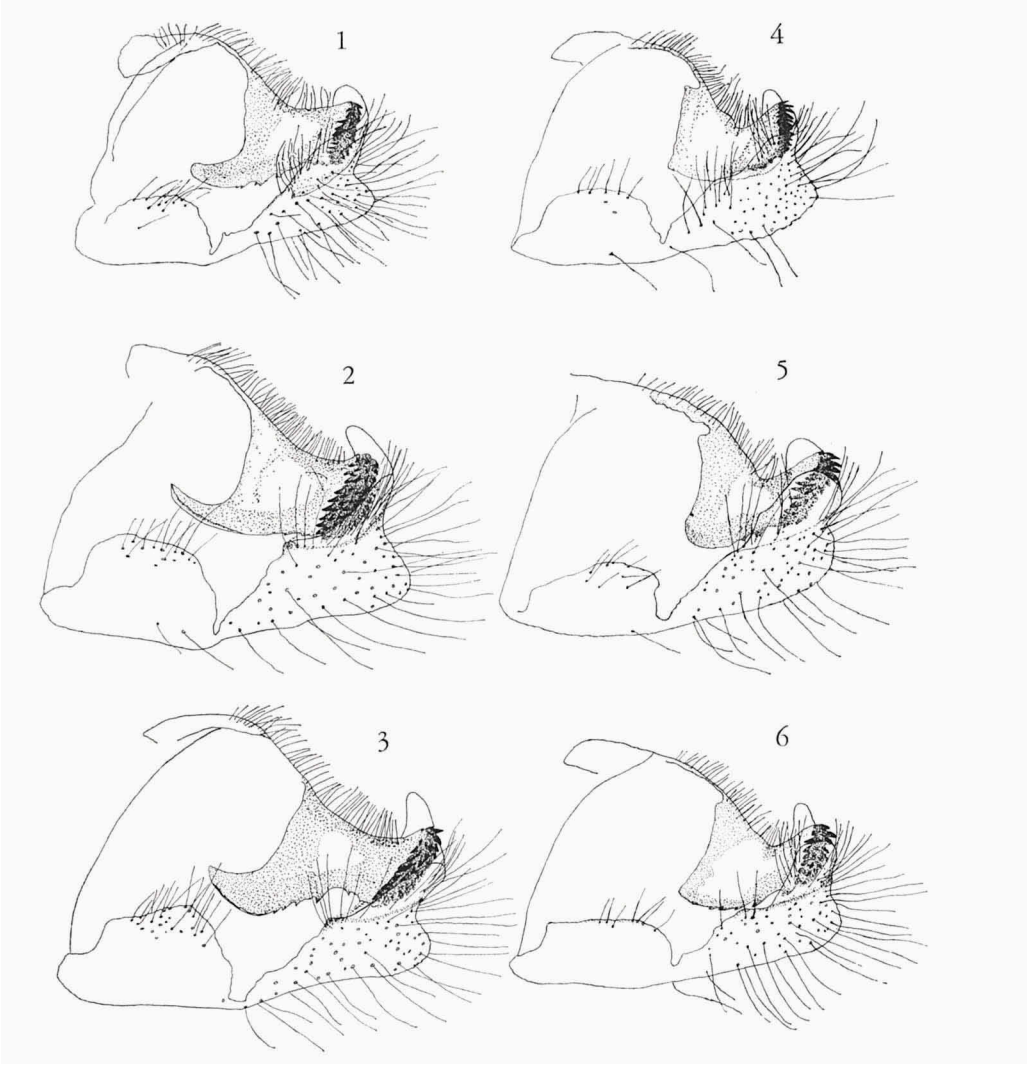
Heydemann (1954) stated that the eastern populations of *alceae* (Afghanistan, SW. Arabia) differ from the European *alceae* in the following characters of the male genitalia: tegumen and uncus straighter, less curved, longer; dorso-distal end of valve wider and blunt; aedeagus almost straight and widely open at the distal end. His concept that therefore these populations constitute a separate species (*swinhoei*) is out of date. Moreover, Heydemann apparently examined very few specimens. I examined the genitalia of 119 males from many parts of the range of *alceae* (see below) and can only state that the differences mentioned by Heydemann are due partly to individual variation, partly to a different angle of vision. It is not impossible that there are differences in the genitalia between the eastern and western populations, but I have not yet found them. There is hardly a flat part in the male genitalia of *alceae* and therefore it is difficult to establish a variation in the shape of various structures.

Of course a variation concerning the presence or absence of a structure is much easier to find. Such a variation appears to be present in the western part of the range of *alceae*. Probably it has been overlooked by previous authors, because *alceae* is a common insect: the rarer the species, the better known the genitalia. The variation concerns the costa (dorsal part) of the valve. In all populations the distal end of the costa is broadened and strongly spined (partly covered by a variable fold of the cucullus) and there is a proximad directed process (figs. 1-3). This process is wanting in the populations of Portugal, S. Spain and NW. Africa which are known under the name *tripolinus* Verity, 1925, though usually only the NW. African populations are indicated by this name. It looks as if the process has been broken by dissection (figs. 4-6). I found this type of process in all males of which I examined the genitalia, from Estoril (Portugal) (8), Cadiz (Spain) (2), Morocco (6), Algeria (11), and Tunisia (1). It is regrettable that the material available from Portugal and S. Spain is insufficient to establish the contact zone of the *tripolinus* and the *alceae* types of genitalia. However, it is rather surprising that I found only the *alceae* type in the dissected specimens from Malaga and Granada (8), while the external characters of these specimens did not allow for distinguishing them from Portuguese and NW. African *tripolinus*. Also all other Spanish specimens (Central and N. Spain) dissected (20) showed the *alceae* type, as did the specimens examined from the rest of Europe (30), Turkey (10), Israel (3), Iraq to N. India (15) and Yemen (5).

A further differentiating character appears to be the angle at which the

distal, spined part of the costa bends upwards. In the *tripolinus* type this angle is about 90 degrees, while in the *alceae* type it is usually much more obtuse. However, this character may be slightly influenced by the way of mounting the genitalia.

I am convinced that the populations with the *tripolinus* type of genitalia originate from a common ancestor population that has been isolated geo-




Figs. 1-6. Right valve (inside) of *Carcharodus alceae*. 1-3. *alceae* type. 1, N. Spain, Tarragona; 2, Netherlands, Dordrecht; 3, Afghanistan, Kabul. 4-6. *tripolinus* type. 4, Portugal, Estoril; 5, S. Spain, Cadiz; 6, Algeria, Oran.

graphically, probably during the Ice Age, in a W. Mediterranean refugium. Of course this does not mean that all other populations of *alceae* originated from one other refugial population, but the distributional history of these populations is still obscure, notwithstanding the many subspecies described.

## 2. Nomenclature of *Carcharodus flocciferus* (Zeller)

There exists some confusion about the name of this species. Apart from *flocciferus* the names *alchymillae* and *altheae* are in use. Hübner (1803) described the species as *Papilio altheae*. Hemming (1934) showed this name to be a junior homonym of *Papilio althaeae* Esper, 1783, a junior synonym of *Pyrgus malvae* (Linnaeus). As a replacement Hemming proposed the name *imperator*, overlooking the fact that the name *floccifera* Zeller, 1847, was available. However, Hemming (1936) found a still older name, viz., *alchymillae* given by Hübner [1790]-[1793] in "Der Schmetterlinge. Lepidoptera Linnei, Europäisches Heer". Evans (1947) pointed out that all available data indicate that the work of Hübner concerned was never published. Therefore, the name *alchymillae* (for inexplicable reasons Evans (1947, 1949) spelled this name "*alchmillae*") should be attributed to Hemming (1936).

Another name surrounded by confusion, viz., *gemina* Lederer, 1852, has been dealt with by Alberti (1955) who made it a synonym of *flocciferus* by the designation of two lectotypes ("cotypes") from Palermo in the Lederer Collection.

Zeller placed the species in the genus *Hesperia* and he spelled the name "*floccifera*". This name clearly indicates the hair tuft at the base of the underside of the fore wing in the male. However, the spelling "*floccifera*" is not correct in Latin, it should have been "*floccifer*", a masculine substantive. As an adjective "*floccifera*" is a Latin-Greek combination and should correctly be spelled "*flocciphera*". The International Code of Zoological Nomenclature does not recognize improper latinization as clear evidence of an inadvertent error (Article 32) and, therefore, "*floccifera*" must be retained as the "correct original spelling". As the gender of *Carcharodus* is masculine, we must spell the name "*flocciferus*".

Summarizing, for this species the following names are available (in the sense of the International Code of Zoological Nomenclature):

*flocciferus* Zeller, 1847 (type-locality: Sicily)
*geminus* Lederer, 1852 (type-locality: Palermo, Sicily)
*imperator* Hemming, 1934 (type-locality: Germany)
*alchymillae* Hemming, 1936 (type-locality: Hanau-Münzenberg, Germany).

Consequently, *flocciferus* is the valid name. If one wishes to make a subspecific distinction between the Central European and Sicilian populations, the names "*flocciferus imperator*" and "*flocciferus flocciferus*" should be used, respectively.

## 3. Distributional overlap of *Carcharodus orientalis* Reverdin and *flocciferus* (Zeller) in Europe

Alberti (1955, 1964) was the first to recognize the geographic overlap of *orientalis* and *flocciferus,* thus giving the specific separation of both forms a sound basis. As far as I know no new data on this subject have been published since. Therefore, the following notes may be of interest.

Moucha & Novak (1960) reported the capture of a single specimen of *orientalis* near Brno, far within the distribution area of *flocciferus.* Such a single specimen may have been transported from elsewhere. However, by examining all Hungarian *flocciferus* specimens in the Hungarian Natural History Museum (Budapest), the British Museum (Natural History) (London) and the Rijksmuseum van Natuurlijke Historie (Leiden), a total of 37 ♂ and 15 ♀, I found two *orientalis* specimens, viz., a male from Gödöllö (Leiden Museum) and a female from Csolnok (Budapest Museum). As Brno and the Hungarian localities are within the limits of the Central European steppe region, it seems possible that *orientalis,* which is mainly found in steppe-like areas, is indigenous there.

While *orientalis* occurs far to the north, *flocciferus* is flying far to the south, in the Macedonian mountains and even in the Peloponnesus, according to a male labelled "Chelmos" in the British Museum (*orientalis* is also known from Chelmos).

According to Thurner (1964) both *orientalis* and *flocciferus* occur in Yugoslavian Macedonia from the lowlands up to the tree line, but this observation is undoubtedly based on a misidentification, not supported by the material of Thurner in the Zoologische Sammlung des Bayerischen Staates (Munich), from which collection I have seen all the Yugoslavian *flocciferus* and *orientalis* material.

I collected *flocciferus* near Mavrovo (75 km SW. of Skopje) only above the tree line at 2000 m and all other Macedonian *flocciferus* specimens examined (14) with records on the altitude were captured between 1400 and 2000 m, except two specimens from 1100 m. However, the 32 Macedonian *orientalis* specimens examined were captured below 1100 m, except two specimens from 1600 m. This observation supports the idea of Alberti (1964: 102): "Offensichtlich bevorzugt *orientalis* trockenwarmes Kontinentalklima, *altheae* eher feuchtes oder kühleres und somit auch Höhen-

klima". The ecological differentiation makes it understandable that *orientalis* and *flocciferus* have never been found flying together.

In fig. 7 I have marked the localities from which I have seen material or reliable literature records of *orientalis* and *flocciferus*, in the countries Czechoslovakia, Hungary, Rumania, Bulgary, Yugoslavia, Albania and Greece. The material belongs to the museums in Budapest, Munich, London and Leiden, the literature records are from Alberti (1965) and Moucha & Novak (1960).

### 4. On the distribution of *Carcharodus dravira* (Moore)

New captures of *dravira* show that this species is apparently widespread and not rare in NE. Iran. From this region Alberti (1955) mentioned the Shah Kuh and Kuh i Mirabi as localities of *dravira*. I can add the following localities from the captures of Blom (Groningen, Netherlands): Khush Yaïlaq, 2000-2500 m (about 70 km NE. of Shahrud), 5 ♂, and Bojnurd, 1000-1100 m, 5 ♂.

Unfortunately it is unknown whether and where *dravira* comes into contact with *orientalis*. The latter flies in the Elburz Mountains. I have seen specimens from Qazvin (4 ♂, captured by Blom) and Alberti (1955) mentioned a locality still further east, viz., Keredj (near Teheran). The westernmost locality of *dravira*, viz., Shah Kuh, is 300 km further to the east. There are no records of the occurrence of *orientalis* and *dravira* in the intermediate area.

Alberti (1955) mentioned the record of Yakhontov about the harmful mass occurrence of the larvae of "*Carch. altheae* ssp. *baeticus* Rmb." on *Abutilon avicennae* and *Althaea officinalis* in Uzbekistan. Ondoubtedly Alberti is correct in stating that the identification is certainly wrong, but his conclusion that the record concerns *dravira* does not seem very credible. As far as known *alceae* is the only *Carcharodus* species that feeds on Malvaceae (to this family both *Abutilon* and *Althaea* belong). The food plants of *orientalis* and *dravira* are unknown, but their closest relatives *flocciferus* and *marrubii* (with *stauderi*) feed on Labiatae, just like *lavatherae*, the remaining species of the genus. Therefore, I assume that the record of Yakhontov does not relate to *dravira* but to *alceae*. The occurrence of *alceae* in Uzbekistan has been known since long(e.g. Evans, 1949). Of course, this does not rule out a possible occurrence of *dravira* in Uzbekistan.

### 5. Flight period of *Carcharodus marrubii octodurensis* Oberthür

According to Kauffmann (1954) the rare Swiss subspecies *octodurensis* of *Carcharodus marrubii* (only occurring in Valais) has certainly two generations

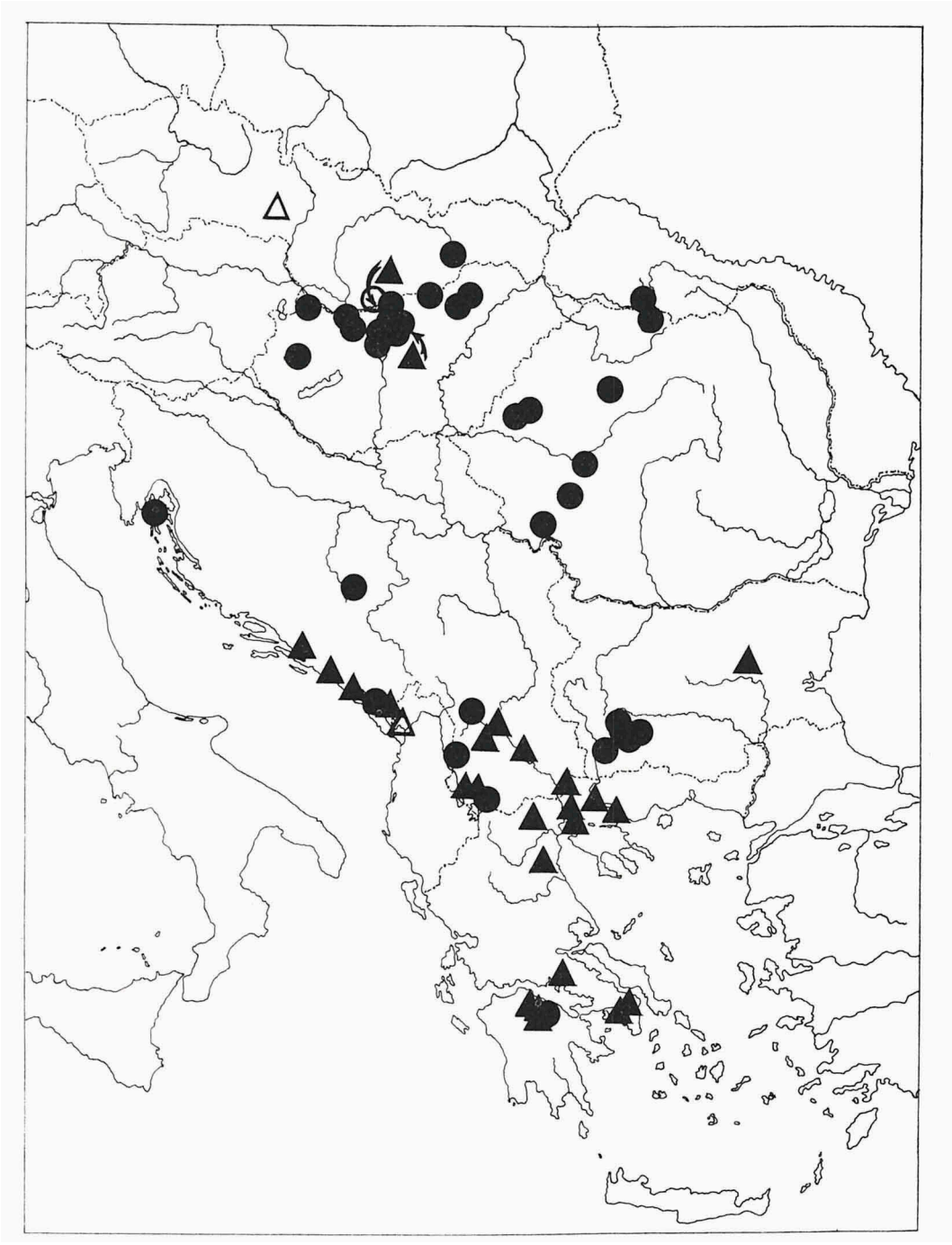


Fig. 7. Distributions of *Carcharodus flocciferus* and *orientalis* in Central and Eastern Europe. ● = *flocciferus,* material examined; ○ = *flocciferus,* literature record; ▲ = *orientalis,* material examined; △ = *orientalis,* literature record.

per year. He had only seen specimens captured in the period from the end of May till July, but he referred to Evans (1949) who stated that there are in the British Museum "11 ♂ 8 ♀ Valais (Oct.)". Although Kauffmann thought it queer that no other October specimens had become known, there was no apparent reason to mistrust the record of Evans.

Virtually Evans was quite incorrect. In the British Museum I found the following labels attached to the Swiss specimens (number of specimens in brackets):

— Martigny, Fruhstorfer (2)
— Saillon, Valais, July 1909 (1)
— Martigny, Valais, A. Wullschlegel 1908 (7)
— Reçu de Wullschlegel de Martigny (Valais) en Octobre 1909 (9).

Except the two specimens of Fruhstorfer, all specimens originate from the Oberthür collection.

Consequently, there are no dates of capture except with the specimen from Saillon. October is only the date Oberthür received a part of the specimens and of course, this has little to do with the date of capture. So there are no indications about a second generation of ssp. *octodurensis*.

## Acknowledgements

For giving me the opportunity of studying material I am greatly indebted to Mr. W. L. Blom (Groningen), Dr. W. Forster (Zoologische Sammlung des Bayerischen Staates, Munich), Dr. L. Gozmany (Hungarian Natural History Museum, Budapest) and Mr. T. G. Howarth (British Museum (Natural History), London).

## References

Alberti, B., 1955. Zur Kenntnis der Gattung Carcharodus Hbn. (Hesperiidae) mit einer Betrachtung zum Art- und Gattungsbegriff. — Zeitschr. Lepidopt., 3: 105-142.

——, 1964. Über Verbreitungsbild und systematische Wertung von Carcharodus orientalis Rev. und altheae Hbn. (Lep. Hesperiidae). — Zeitschr. Wiener Ent. Ges., 49: 99-103.

——, 1965. Ergebnisse der Albanien-Expedition 1961 des Deutschen Entomologischen Institutes. 34. Beitrag. Lepidoptera: Hesperiidae. — Beitr. Ent., 15: 649-660.

Ellison, R. E., & E. P. Wiltshire, 1939. The Lepidoptera of the Libanon. — Trans. R. ent. Soc. London, 88: 1-56.

Evans, W. H., 1947. The correct name for Spialia sertorius Hoffmansegg (Lep. Hesperiidae). — Entomologist, 80: 167.

——, 1949. A Catalogue of the Hesperiidae of Europe, Asia and Australia in the British Museum (Nat. Hist.). — British Museum (Nat. Hist.), London.

Hemming, F., 1934. Some notes on the nomenclature of palaearctic and african Rhopalocera. — Stylops, 3: 97-99.

——. 1936. On the identity and systematic position of eight species of Rhopalocera described by Jacob Hübner in his Der Schmetterlinge Lepidoptera Linnei, [1790]-[1793]. — Proc. R. ent. Soc. London, ser. B, 5: 121-125.

HEYDEMANN, F., 1954. Beitrag zur Lepidopteren-Fauna Afghanistans. — Zeitschr. Wiener Ent. Ges., 39: 385-396, 412-428.

HÜBNER, J., 1803. Sammlung Europäischer Schmettlinge, 1, pl. 90 figs. 452, 453. — Augsburg.

KAUFFMANN, G., 1951. Die Hesperiidae der Schweiz. — Mitt. Schweiz. Ent. Ges., 24: 329-376.

——, 1954. Reverdinus marrubii ssp. octodurensis Oberthür, eine im Aussterben begriffene Walliser Hesperiide. — Mitt. Schweiz. Ent. Ges., 27: 167-172.

MOUCHA, J., & J. NOVAK, 1960. Ergebnisse der Erforschung der Lepidopteren-Fauna der Slowakei (1946-1960). — Acta faun. ent. Musei Nat. Pragae, 6: 45-90.

THURNER, J., 1964. Die Lepidopterenfauna Jugoslavisch Mazedoniens. I. Rhopalocera, Grypocera und Noctuidae. — Posebno Izdanie (Skopje), nr. 1.

WILTSHIRE, E. P., 1957. The Lepidoptera of Iraq. — Nic. Kaye Ltd., London.