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# The Distribution and Forms of the Gnophos-Group (Lepidoptera, Geometridae) in Hungary. I.

By A. Vojnits, Budapest

Our earlier home literature presents a rather imperfect picture on the occurrence in Hungary of the species belonging to the genus *Gnophos*. From the years preceding World War I, literature data are available of no more than four species (*O. dumetata* Tr., *G. furvata* Schiff., *obscurata* Schiff., and *variegata* Dup.), and they are mentioned from a few localities only. Those who were interested in these species had primarily searched for them in the Carpathians, mainly in the High Tatras and the Retyezat Range. It can be ascribed to these aspirations that we knew more about the *Gnophos* species living there than about those occurring within our present boundaries.

Even so, a *Gnophos* species, as yet unobserved, had been found within our borders in the 'tens of the present century, namely *G. intermedia*. However, it was at that time regarded as *G. glaucinaria* Hbn., and thus escaped closer attention. It was only after Wehrli separated intermedia from *glaucinaria* that nearer inspection revealed the specific alliance of also our limestone form to the new species.

The discovery of further *Gnophos* species in Hungary happened only in the last one and a half decades. One of them concerned *G. pullata* Schiff., found for the first time in the Mts. Bükk, the other *G. ambiguata* Dup., detected at the foothills of the Alps, in Szentgotthárd, Western Hungary.

The appearance of the two latter species had focused the attention of collectors on the mountainous ranges near our western and northern borders. In the past ten years —despite intensive explorations—no further *Gnophos* species had been discovered, merely some new localities of those already known. It were thus justified to submit a detailed account of the data concerning the distribution and forms of the group in Hungary, partly to inform those interested and partly to offer points of vantage for future investigations.

The present paper proposes to discuss three species (*Odontognophos dumetata* Tr., *Gnophos pullata* Schiff., and *G. ambiguata* Dup.).

The basic material of investigation was that of the Hungarian Natural History Museum. Beyond that, the materials of most of the largest private collections had also been made available (mainly those of I. Balogh, L. Kovács, M. Nattán, L. Rézbányai, and Z. Varga), with all their *Gnophos* data, in addition to my own collection and notes. The light trap network, now operating for more than 15 years, submitted a wealth of data, especially with respect to the distribution of the species. I have also drawn upon the collecting notes and other lepidopterological observations, running to several decades, of L. Kovács, as well as the files and registers of the light traps extending to the entire Macrolepidoptera. Grateful thanks are due to all who had helped my work by putting materials and data at my disposal.

## Odontognophos dumetata Tr.

A Submediterranan species (Varga, 1964), ranging from Spain (Catalonia and Aragonia) and NW Africa to Armenia, Daghestan, and the Southwestern Soviet Union. It was collected in a few localities only in Central Europe: Switzerland (Wehrli, 1953), Slovakia (Hruby, 1954), Southern Bavaria and North Tirol (Wehrli, 1953), etc. It was found also in Transylvania (Popescu—Gorj, 1964); its northernmost occurrence is in

Poland (BLESZYNSKI, 1966). The authenticity of the single Bohemian datum (Prague), from 1865, was repeatedly disputed (STERNECK, 1929).

In Hungary, the species is one of the best distributed member of the group, occurring, however, in rather low individual numbers. Most of the localities lie in the Central Range. It was collected here from the Mts. Bakony to the Eperjes—Tokaj range (Mts. Zemplén); the majority of sites are in the Dunazug range. South of the Balaton, it is known from Vörs and the Mts. Mecsek; the richest populations are between the Danube and the Tisza; and a specimen was recently captured in the area beyond the Tisza (Gerla).

It can be established from the above data that most of the localities lie in the central section of the country, or rather that these more densely located populations are widely separated from the southeastern population. Thus, Gerla is removed by 130—140 km from the nearest localities (Kunfehértó, Ágasegyháza) in the Great Plains between the Danube and the Tisza, and even further away from the montane sites.

Contrarily to the majority of its allies, *O. dumetata* TR. is rather independent of the rocky, montane habitats. It occurs chiefly on the clearings of karst woods and shrubberies (in general, of dry oakwoods) (Fót, Hársbokorhegy), on slopes of dolomite rubble and sparsely grassy rocky inclines (Mts. Csiki) and on meadows of loose sand substrate (the Plains between the Danube and the Tisza).

With respect to the time of flight, it is probably our latest *Gnophos* species. More than 90 per cent of the respective data derive from the period 25 August—15 September. Individual numbers culminate in the beginning of September. Its activity graph reaches acme very steeply, descending in almost the same manner. From the periods 15—25 August and 15—25 September, we have but few data. The earliest authentic datum is 20 July (Budaörs, Mts. Csiki, leg. UHRIK), the latest 2 October (light trap, Gerla).

*O. dumetata* TR. shows a strong tendency toward producing local races; this was pointed out already by WEHRLI. The Hungarian population was described by FUCHS in 1902 under the name var. *saturata*. According to him, the nominate form flies in Vienna, of which our home specimens rather strongly differ. While the former one is a violet or bluish grey, with a brownish marginal area, in the latter "all wings have a definite chocolate brown suffusion from the base outwards." He also mentions that there extends a continuous, dark shadow, indicated by the postmedian line of dots, almost to the costa of the fore wing.

WEHRLI refused FUCHS's statements (1953). He substantiated his own by contending that TREITSCHKE described the species based not on Viennese but on Dalmatian specimens. TREITSCHKE's account of the basic colour of the species runs as follows: "The entire upper side is a light chocolate brown. The head and the back has the same hue, the body is more grey". No mention was anywhere made, as WEHRLI had also pointed out, of a violet or bluish grey tinge.

The shadow decurrent on the wings, characteristic of saturata according to FUCHS, is not constant as stated by WEHRLI; he found specimens which are transitional towards the shadowless exemplars.

WEHRLI did not close the question: for a final solution further investigations were needed.

The fact that the Hungarian Natural History Museum possesses TREITSCHKE's original type-specimens, and the circumstance that we have a great number of home specimens and also a smaller series from Austria at our disposal, allowed a thorough systematical examination of the populations concerned.

### Odontognophos dumetata dumetata TR.

There are three *O. dumetata* specimens in the TREITSCHKE Collection: 1 male and 2 females. There are no type labels on them. For an exact definition of the systematical position of the populations constituting the Formenkreis of *O. dumetata* TR., the designation of the lectotype of *Odontognophos dumetata dumetata* TR. is indispensable.

The lectotype hereby designated is the male specimen of the original series (Plate, fig. 1). It is labelled as follows: "TREITS. 2597".

A short characterization of the lectotype is as follows:

Dimensions and shape. Length of costa of fore wing: 20.5 mm, termen: 13.5 mm, dorsum: 15 mm. Longest ray of hind wing: 16.6 mm. Outer margins of both fore and hind wings arcuately sinuous.

Colour and pattern. Light chocolate-brown colour of upper side of wings slightly tending to yellow. Outer marginal area darker brown, wider on fore wings and with hardly any transition into basic colour, hence rather distinct. Dark colour of marginal area of hind wing gradually changing into basic colour. At inner third of dark brown marginal area, an indistinct submarginal stripe, decurrent parallel with termen, hence sinuous, and more expressed on fore wings. Apex concolorous with basic colour. Median field of fore wing delimited by two blackish brown striae broken into dots and spots. A third stripe bisecting median field by approximately halving distance between antemedian and postmedian stripes. All three connecting costa and dorsum; strongest line postmediana, well discernible also on hind wing, within it only indistinct spots towards base. On both fore and hind wings postmediana covered by a strong stripe, a "shadow", approaching but not reaching costa of fore wing. Discal spots hardly discernible on fore wing, well visible on hind wings.

Head and thorax concolorous with basic colour of wings, abdomen slightly greyish.

Underside of wings greyish yellow, with a yellowish sheen. Basic colour irrorated with minute, brown dots. Irroration a slightly darker narrow zone along termen, blending hardly discernibly into basic colour. Postmediana well visible on fore wing, but merely as a suffusion on hind wing. Discal spots distinct on both fore and hind wings.

The two female specimens are hereby designated as Paralectotypes. Both bear the label "TREITS. 2597". The females are slightly bigger than the male. They display no essential difference as to colour and pattern (Plate, fig. 2).

The lectotype and the two paralectotypes are deposited in the TREITSCHKE Collection in the Zoological Department of the Hungarian Natural History Museum.

*Hungarian populations*

Having examined about 120 home specimens, I found only one on which the dark shadow had disappeared. This specimen is, however, an individual aberration. All other exemplars show this shadow, rather strongly developed in most of them. The basic colour is generally darker than that of the TREITSCHKE specimens. The circumstance, however, that these originate without exception from recent collectings and that even those captured in the 'thirties do not differ at all from the nominate form, implies that the deviation mentioned above is nothing more than the fading of the original colour evolved in more than 140 years (Plate, figs. 3, 4).

With due respect to these considerations, I have concluded that our home

populations, with the possible exception of the one in Gerla, belong to the nominate form. Accordingly, the variety *saturata* FUCHS becomes its junior synonym.

The Gerla specimen was collected by a light trap. Gerla beyond the Tisza is the sole locality of the species, far removed from either those between the Danube and the Tisza or those situated in the mountains. The specimen is strikingly dark, and the date of its capture, as related to that of the other Hungarian specimens, very late (2 October). Any further study would need complementing exemplars.

### **Gnophos dumetata vindobonica** ssp. n.

Dimensions. Alar expanse: 37.5 mm ±1.5 mm. On the basis of the available specimens, the fluctuation in size of the individuals belonging to the Lower Austrian population is smaller than that of the Hungarian exemplars.

Colour and pattern. Basic colour of upperside of fore wing sand grey, outer marginal area brown. Entire wing surface with an olive suffusion, especially conspicuous on brown marginal area. Basic colour with a sparse irroration of black dots: rather sporadic in some exemplars, and slightly denser in others. Apex concolorous with basic colour. Submarginal line narrow, sharply delimited, contiguous between costa and dorsum. Brown terminal field sharply distinct from basic colour on both fore and hind wings; transition negligible.

Punctate line constituting antemedian and postmedian lines sharply distinct on fore wing; stripe dividing median field considerably more indistinct. Postmedian line without any darker stripe or "shadow". Postmedian present also on hind wing, "shadow" absent also here. Basally of punctate line constituting postmedian line only some few spots present.

Discal spots rather weak on hind wings, hardly or not discernible on fore wings.

In their totality, the Austrian specimens are more strikingly marked, owing to the uniformly pale basic colour and the sharply delimited dark terminal field and punctate lines, than those belonging to the nominate form.

Basic colour of underside a pale dirty yellowish. Brown irroration sparser and paler than in nominate form. Discal spots and postmedian line more or less well discernible; more distinct on fore than on hind wings.

Head and thorax concolorous with basic colour (sand grey), abdomen slightly lighter than outer marginal field of wings, with a yellowish sheen.

On the basis of the above differences, the Lower Austrian population is to be regarded as a geographical race distinct of the Dalmatian and Hungarian populations; I introduce it, with respect to its typical locality, under the name *Gnophos dumetata vindobonica* ssp. n. (Plate, figs. 5, 6).

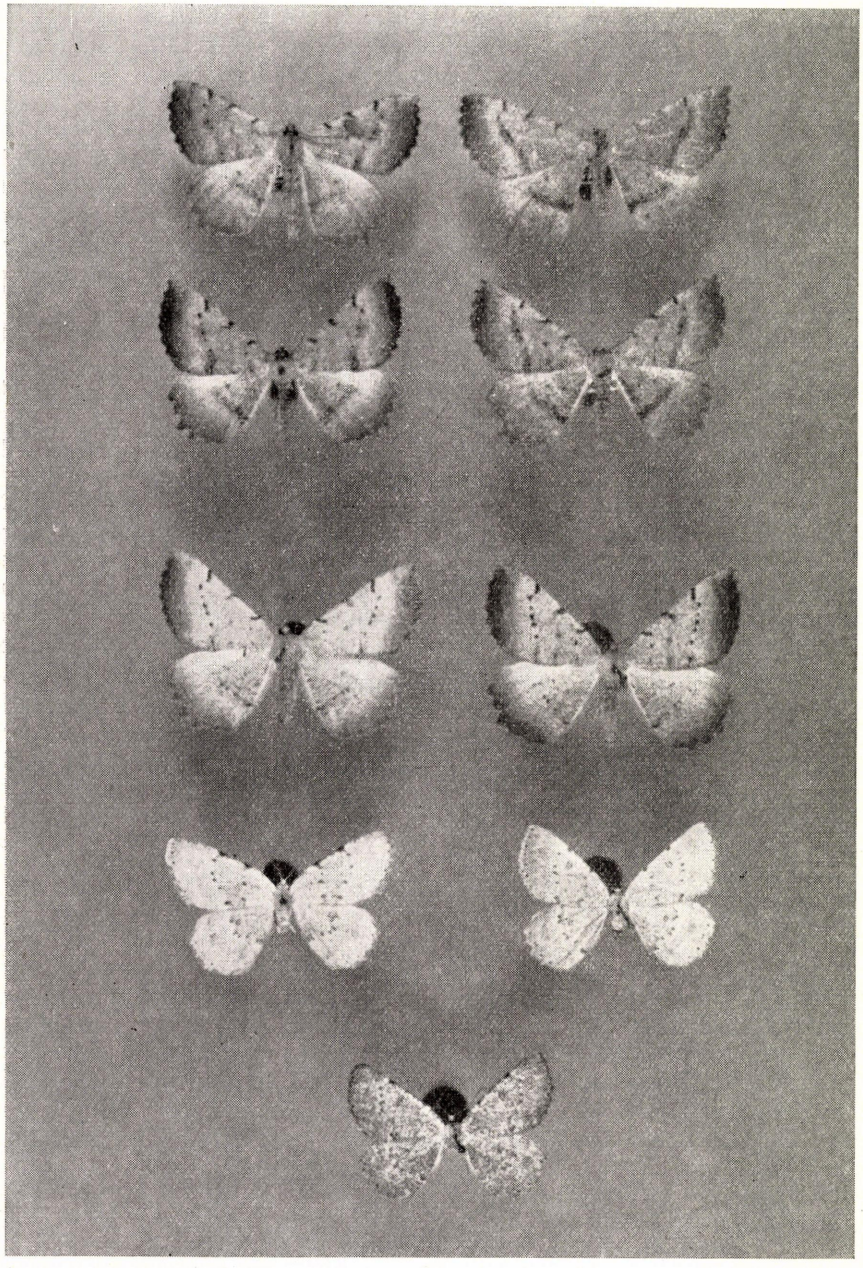
Holotype male: "♂ Wien, Dornbach, VIII. 18. e.l. HIRSCHKE". Paratypes: "Wien, VIII. e.l. BAHR; ♂, Wien, Schafberg, 1911. IX. 2; 2 ♂, Austr. inf., Dornbach, 29.8.6, Dr. SCHAWERDA, Wien".

The Holotype and the Paratypes are deposited in the Zoological Department of the Hungarian Natural History Museum.

### **Gnophos pullata** SCHIFF.

A European—Central European, montane, subalpine—alpine species (VARGA, 1964). In Central Europe, it occurs everywhere in the chain of the Alps, and it was collected in numerous localities also in Slovakia and Poland (HRUBY, 1964; BLESZYNSKI, 1966).

**Plate**



**Figs. 1—2.:** *Odontognophos dumetata dumetata* TR. ex Dalmatia (lectotype and paralectotype); **3—4** = *Odontognophos dumetata dumetata* TR. ex Hungary; 5—6 = *Odontognophos dumetata vindobonica* ssp.n. (holo- and paratype); 7 = *Gnophos pullata* SCHIFF., ex Mts. Bükk; 8 = *Gnophos pullata* SCHIFF., ex Herkulesfürdő; 9 = *Gnophos pullata kovacsi* ssp.n.

The first home specimen of this montane species was captured in the Mts. Bükk in 1952. The other known localities lie also in the central range: Mts. Börzsöny (Pogányvár, leg. VOJNITS), Mts. Mátra (Mátraháza, leg. NATTÁN), Mts. Bükk (Hármaskút, leg. RESKOVITS; Szentlélek, leg. I. KOVÁCS; Bánkút, leg. JABLONKAY; Felsőtárkány, light trap; Répáshuta, light trap), and the North Borsod Karst (Jósvafő, leg. VARGA).

The home populations are separated by a considerable distance from the Slovakian populations. This holds primarily for the Börzsöny population, removed by some 75 km from the nearest locality in Slovakia (Selmecbánya). There are literature data also for its occurrence in Sturovo (HRUBY, 1964), but the species is probably not indigenous to this locality, the capture may probably referto a specimen carried away by the wind. On the other hand, the pouplation in Jósvafő is contiguously extending to the Slovakian side of the karst area.

*G. pullata* SCHIFF. is characteristic of rocky habitats. All known localities are rocky sites, cliffs, or their immediate vicinity. In Hungary, it inhabits both the andezite cliffs of volcanic mountains (Mts, Börzsöny, Mátra) and the limestone regions of the central range (Mts. Bükk, North Borsod Karst).

According to WARNECKE, the basic colour of the wings of *G. pullata* SCHIFF. is greatly dependent on the colour of the basic substrate. This assumption is corroborated by the observation that the light-coloured greyish-white form flies on the light limestone rocks, whereas the animals inhabiting dark, rocky sites are dark grey. The former was described by GUENÉE as var. *impectinata*, the latter by FUCHS as var. *nubilata*. An intermediate form is also known, var. *confertata* STAUDINGER, in which the dark base of the wings is ornamented by a light suffusion and a wide, white band. The taxonomic validity of these forms seems to be impugned by STERNECK's paper (1929), who reported the breeding of *confertata*-type imagos from the eggs of a *nubilata*-type female.

There are both dark and light specimens among the home exemplars. Animals living on the andezite of the Mts. Börzsöny and Mátra are dark grey, those inhabiting the white limestone rocks are quite light whitish-grey ones (Plate, fig. 7). These latter rather resemble, within the Carpathian Basin, specimens originating from Herkulesfürdő (Plate, fig. 8). For a decision on the taxonomical position of both this latter and the Mátra population, further exemplars are needed.

### **Gnophos pullata kovacsi** ssp. n.

During the detailed analysis of the morphological characteristics of the specimens collected in the Mts. Börzsöny, it was found that they differ in a number of constant features from both the Viennese and the other populations examined by me (Hungary: Mts. Bükk, Mts. Mátra, North Borsod Karst; Slovakia: Trencsén, Szádelő; Rumania: Herkulesfürdő, the Retyezát Massif; S. France: Venancon; Western Slovenia: the Juli Alps; Macedonia: Ochrid).

The Börzsöny population can be characterized as follows:

Dimensions. Alar expanse: $28.5 \pm 1.5$ mm.

Colour and pattern. Upperside of wings iron grey, with a very slight bluish suffusion. Discal spots dark, small, even smaller on hind wings, well discernible. Postmedian line decurrent relatively near termen on both wings. Wings of a rather uniform aspect: pattern elements, though distinct, not conspicuous against base. Dark scales black or dark grey under microscope, not brown. Underside of wings a paler grey, rather uniform; postmedian stripe conspicuous, decurrent strikingly near

termen, bisecting distance between base and termen at 68.35%. Discal spots not or hardly visible (Figs. 1, 2).

Head, thorax, and abdomen dark grey, antennae shiny grey palpi dark grey, porrect.

Genital organ. The male genital organ essentially agrees with that of the nominate form, except for the furca. The entire apparatus is strongly sclerotized (Fig. 3a).

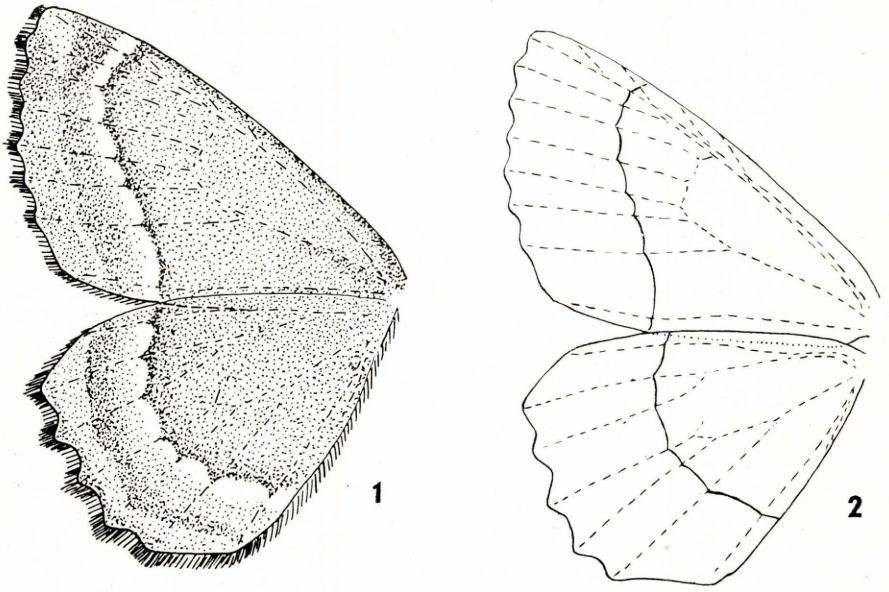



Fig. 1.: Underside of *Gnophos pullata kovacsi* ssp.n., Fig. 2.: Underside of *Gnophos pullata pullata* SCHIFF., ex Vienna

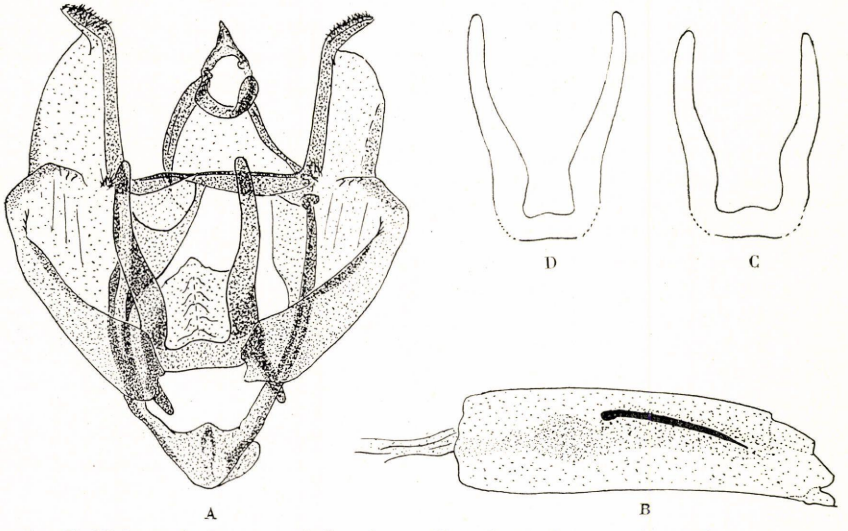



Fig. 3.: A—C. Male genital organ of *Gnophos pullata kovacsi* ssp.n., A = entire organ ventrally (slide 24), B = aedoeagus (slide 24), C = furca (slide 201); D = furca of *Gnophos pullata pullata* SCHIFF. (slide 6)

Aedoeagus large, thick, cylindrical, about 3.5 times as long as wide, nearly as long as valva; with a dark, pointed, evenly arcuate spine, about two-fifths of aedoeagal length (Fig. 3b).

Valvae moderately wide, with a slight excision, costa spinose ("pecten"), sacculus strong; uncus short, robust, concave; furca rather stout, shorter and stouter than in nominate form, basally connected and incrassate (Fig. 3c, d); saccus thick.

On the basis of the above considerations, there is no doubt that the population of the Mts. Börzsöny belongs to the Formenkreis of *G. pullata* SCHIFF., but represents a distinct geographical subspecies. I dedicate the new taxon, by the name *Gnophos pullata kovacsi* ssp. n., to Dr. L. KOVÁCS, for his substantial support of my investigations (Plate, fig. 9).

The main differences of *G. pullata pullata* SCHIFF. and *G. pullata kovacsi* ssp. n., might be summarized as follows:

| | Discal spot | Distance of post-median line from base | Male genital organ |
|---|---|---|---|
| *G. pullata kovacsi* ssp. n. | not or hardly discernible on underside of wings | 68.35% | furca stout |
| *G. pullata pullata* SCHIFF. | well discernible on underside of wings | 60.88% | furca slender |

Holotype male: "Börzsöny hegys., Pogányvár, 450—550 m, 1965. VII. 17, VOJNITS (slide No. 24, VOJNITS)".

Paratypes: 2 males: "Börzsöny hegys., Pogányvár, 450—500 m, 1965, VII. 17, VOJNITS (slides No. 8 and 201, VOJNITS)".

The Holotype is deposited in the collection of the Zoological Department of the Hungarian Natural History Museum, the Paratypes in that of the author.

## Gnophos ambiguata DUP.

A European—Central Asian, montane—subalpine species (BERGMANN, 1955). The western border of its range is the Pyrenées. It is absent from a number of northern countries, e.g. England, Scandinavia, North France, Lithuania, and Esthonia, but it was found in Poland (BLESZYNSKI, 1966), and North Germany (URBAHN, 1939). Numerous localities are known in the region of the Jura and the Alps (VORBRODT, 1914), in the Pfalz (DE LATTIN, JÖST, HEUSER, 1957), in Czechoslovakia (STERNECK, 1929), and Slovakia (HRUBY, 1964). It was collected also in the Balkan (DANIEL, FORSTER, OSTHELDER, 1951).

Its first and sole known locality in Hungary is Szakonyfalu, where P. TALLÓS collected 5 male specimens in 1952. Szakonyfalu lies in the western confines of the country, near Szentgotthárd; the area is in essentials at the foothills of the Alps.

In the Alps, *G. ambiguata* advances over 2600 m a.s.l. (VORBRODT, 1914), but in the Steiermark it was captured also at a height of 600 m (HOFFMANN, KLOSS, 1914). The home locality is a hilly region, not higher than 2—300 m. This also proves that the so-called "montane" species do not insist everywhere on a given altitude above the sea level, but may thrive, in habitats of similar ecological conditions, also at elevations of merely a few hundred meters. The Szakonyfalu specimens have been collected in the plant associations Luzulo—Fagetum and Dicrano—Pinetum callunetosum respectively (TALLÓS, 1958).

According to literature data, *G. ambiguata* is on the wing from June to August (VORBRODT, 1914; DE LATTIN, JÖST, HEUSER, 1957, etc). As PROUT (1915) and REBEL (1903) state, the highest individual density within this period is in July. On the other hand, HOFFMAN and KLOS (1914) place the main period of flight to June, and remark that the imagos may appear in warm years already at the end of May. The Szakonyfalu specimens have been collected in the middle of June (14—17 June). Since all specimens had been already rather worn, one may imply an earlier appearance in June also in Hungary.

The specimens had been listed in literature under the name *Gnophos dilucidaria* SCHIFF. (KOVÁCS, 1958; TALLÓS, 1958). It was during the reexamination of the rather worn specimens and the preparation of the genital slides that their specific relegation became clear. The respective data should therefore be corrected in the above sense.

## Summary

The above discussion might be summarized as follows:

1. The type locality of *Odontognophos dumetata dumetata* TR. is Dalmatia. The specimens of the TREITSCHKE collection, one lectotype and two paralectotypes, deposited in the Zoological Department of the Hungarian Natural History Museum, agree with TREITSCHKE's original description (1827). The basic colour of the fore wings is chocolate brown, with a dark stripe (a "shadow") on the postmedian line.

2. The Hungarian specimens—with the exception of the single exemplar from Gerla—show a high grade of similarity with TREITSCHKE's *dumetata* types. The brown wings and the presence of the dark stripe on the submedian line are characteristics of general validity for them. The home populations are therefore regarded as belonging to the nominate form, hence var. *saturata* FUCHS becomes its junior synonym.

3. The basic colour of the Lower Austrian population is not brown but sand grey with an olive hue. The dark "shadow" is absent. The animals have a more pregnant overall pattern than the nominate form. I consider this form as a distinct geographical subspecies and name it *Gnophos dumetata vindobonica* ssp. n.

4. *G. pullata* SCHIFF. is represented in Hungary by regionally distinct populations. The specimens from the Mts. Börzsöny essentially differ from the nominate form: the discal spot is usually not discernible on the underside of the wings, the distance of the postmedian line from the base exceeds 68 per cent of the distance between the base and the termen, whereas in all other populations this value is around 60%. The male genital organ also shows some dissimilarities against the nominate form. The new subspecies is introduced under the name *Gnophos pullata kovacsi* ssp. n.

5. *Gnophos ambiguata* DUP., ranging usually in higher altitudes, had been shown from Western Hungary. This occurrence is a new proof for the zoogeographical connection of the above area and the Eastern Alps.

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