

A NOTE ON THE VARIABILITY OF A POPULATION OF *ERYTHROMMA VIRIDULUM* (CHARP.) FROM EASTERN FRANCE, WITH SPECIAL REFERENCE TO *E. VIRIDULUM ORIENTALE* SCHMIDT (ZYGOPTERA: COENAGRIONIDAE)

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Abstract — The variability of a random sample (28 ♂ of *E. v. viridulum* (Dept Moselle) was studied. This population clearly resembles the Syrian population of *E. v. orientale* in coloration. A difference in hindwing venation seems to be the only distinctive feature between the nominate ssp. (Europe, Turkey) and *E. v. orientale*. Specimens from Morocco are also referable to the nominate ssp.

Introduction

Erythromma viridulum is a holomediterranean species, ranging from Morocco (DUMONT, 1972) and Spain to Turkestan (ST. QUENTIN, 1960). It is now recorded from all climatic areas in Europe (SCHMIDT, 1978). Northwards, it reaches the western and northern departments of France (DOMMANGET, 1987), the Benelux countries, western and eastern Germany

(BEUTLER, 1984) and Poland (MIELEWCZYK, 1972). The northern limit probably consists of a fluctuating area, about 200 km wide, in which temporary populations settle according to small-scale climatic variations (BEUTLER, 1984).

The regional variations of this polymorphic species are not well understood. Thus far, two subspecies have been discerned, the nominate form occurring throughout Europe, and *E. v. orientale* SCHMIDT, 1960 was described from Syria. Turkish populations might be intermediate between these two. Specimens from the Balkan seem to be larger than those from western and northern Europe and from Syria (SCHNEIDER, 1985).

The diagnostical characters considered typical of *E. v. orientale* were originally supported by a small series of 6 males and 7 females, poorly described by Er. SCHMIDT (1960). Thoracic antehumeral stripes were said in this subspecies to be mostly continuous along the whole synthorax and uninterrupted, whereas they were said to be interrupted or more or less shortened in the nominate form. The former often exhibited small pale markings before the posterior ocelli, which were lacking in the latter.

Recently, BEUTLER (1984) observed that populations of *E. v. viridulum* from East Germany often exhibit both continuous antehumeral stripes (36.7 +/- 6.2%) and pale spots before the ocelli (15 +/- 4.6%), and emphasized the necessity of statistical considerations to validate the status of the different subspecies.

SCHNEIDER (1985) tentatively redescribed *E. v. orientale* more precisely. Special attention was paid to its "small" size (but errors occurred relative to transcriptions of Aguesse's data), whereas coloration features were assumed to agree with Schmidt's original description (antecellar spots always present, 12 males among 13 with continuous antehumeral stripes). Moreover, he emphasized that at most two divided cells occur in the hindwings, distally from the pterostigma, in the Syrian populations. Such cells were considered to occur in greater number in the nominate subspecies. No statistical comparison, however, was made.

Out of the published evidence on these two taxa, only a few characters can be used for sta-

tistical calculations, even in recent works. Coloration features referred to by SCHMIDT (1960), BEUTLER (1984), and SCHNEIDER (1985) could be efficiently treated with the corrected χ^2 -test. With respect to the allometry only the extreme sizes, (incl. means and statements on sample size) are available. The standard deviation was always omitted, therefore further statistical comparisons are impossible.

The present paper deals with the variability in a random sample of 28 males of *E. v. viridulum*, collected in eastern France from a population of more than 200 individuals, in which some characters clearly correspond to *E. v. orientale*. No females were taken. The locality is a breeding site in the departement of Moselle, in which this species cohabits with *Crocothemis erythraea* (Brullé) and other taxa of quite different geographical range and ecological requirements, such as *Epiteca bimaculata* (Charp.) and *Sympetrum vulgatum* (L.).

Main features of the studied specimens

Coloration

Twenty (71.4%) of the 28 studied males had small ochreous spots on the head, before the posterior ocelli. While very significantly different from what was reported by BEUTLER (1984) from Eastern Germany (15%, $\chi^2 = 25.02$), this proportion is by no means significantly different from that reported by SCHNEIDER (1985) from Syria (100%, $\chi^2 = 2.975$). As for thoracic coloration, 19 males (67.9%) exhibited continuous antehumeral stripes. This does not differ significantly from the corresponding proportion in Syrian material, as evidenced by the data of Schmidt, Beutler and Schneider (89.5% $\chi^2 = 1.87$), nor from that in the Turkish series reported by Schneider (50%, $\chi^2 = 0.13$). On the other hand, stronger differences appear by comparison with Beutler's German populations, where only 36.7% of the specimens had such ochreous spots ($\chi^2 = 6.26$), and also with some Austrian ones (11.6%, $\chi^2 = 21.51$; STARK, 1979).

Venation

Distally from the hindwing pterostigma, two cells or more are divided in all but two of our specimens (92.9%). This is significantly different from the situation reported by

SCHNEIDER (1985) for Syrian material, where never more than two divided cells occur ($\chi^2 = 29.11$), while the difference is not significant in Turkish populations (83.3%, $\chi^2 = 0.002$), evidenced by the same worker.

Allometry

Abdominal length (excluding appendices) of our specimens (acetone dried) varies between 21.75 and 24.5 mm (mean \pm SD = 22.96 \pm 0.69). Statistical comparisons with other data are impossible, but these values seem lower than in other European localities, where they show a great variability with a maximum length in Yugoslavia (22.4-26.8 mm, mean = 24.6 to 25.14, depending on the locality; (ADAMOVIĆ, 1967), Greece (27 mm; SCHMIDT, 1960), Bulgaria (24-26.5 mm; BESHOVSKY 1965), Rumania (25.5-28.5 mm; SCHNEIDER, 1985). Actually our data closely approach those reported for *E. v. orientale* by Schneider (21.6-25.6 mm), and for the nominate subspecies in Eastern Germany by Beutler (22-26 mm, mean = 23.7). The available values from Austria (22.8-26 mm, mean = 24.5) and Turkey (22.5-25.3 mm, mean = 24.2) indicate intermediately sized populations (STARK, 1979; SCHNEIDER, 1985).

The length of hindwings ranges from 15.5 to 18 mm (16.85 \pm 0.57) which falls inside the variation range reported for Syrian and other European populations. This cannot be used without statistical considerations.

Conclusion.

In coloration the population of *E. v. viridulum* from this breeding site in eastern France closely resembles the Syrian populations of *E. v. orientale*. This does not seem to be an exception, since other specimens from Lorraine also exhibit similar features. Obviously, the European populations are more variable in this

respect than hitherto known; therefore the coloration does not provide any help for the definition of infraspecific taxa in this species. Similar considerations could probably result from studies on specimens from northern Africa, for among 4 males from Morocco now at hand, 3 have ochreous spots before the posterior ocelli, and one has continuous antehumeral stripes.

The only character that could perhaps remain valid is the number of divided cells in the hindwing distally from the pterostigma: two or more divided cells in *E. v. viridulum* in Europe and Turkey, and up to two divided cells in *E. v. orientale* in Syria (SCHNEIDER, 1985). In this respect our specimens from Morocco also belong to the nominate subspecies. However, more careful examination of many populations from the whole range of the species is needed before conclusions can be drawn.

References — ADAMOVIĆ, Z.R., 1967, *Dt. ent. Z.* (N.F.) 16(3/4): 285-302; BESHOVSKY, V., 1965, *Bull. Inst. Mus. Zool., Sofia* 18: 159-168; — BEUTLER, H., *Ent. Nachr. Ber.* 28(6): 273-275; — DOMMANGET, J.-L., 1987, *Etude faunistique et bibliographique des odonates de France*, Mus. natn. Hist. nat., Paris; — DUMONT, H.J., 1972, *Bull. Soc. Sci. nat. phys. Maroc* 52: 149-179; — MIELEWCZYK, S., 1972, *Frag. faun.* 18(8): 141-162; — SCHMIDT, Eb., 1978, in: J. Illies, *Limnofauna europaea*, pp. 274-279, Fischer, Stuttgart; — SCHMIDT, Er., 1960, *Gewässer Abwässer* 27: 19-26; — SCHNEIDER, W., 1985, *Senckenbergiana biol.* 66(1/3): 89-95; — ST. QUENTIN, D., 1960, *Zool. Jb. Syst.* 87: 301-316; — STARK, W., 1979, *Ber. Arb. Gem. ökol. Ent. Graz.* 9: 13-18.

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