Odonatologica 5 (4): 313-321 *December 1, 1976*

AESCHNA CHARPENTIERI KOLENATI, 1846, A SYNONYM OF *CORDULEGASTER INSIGNIS* SCHNEIDER, 1845, AND ON THE CORRECT STATUS OF *CORDULEGASTER CHARPENTIERI* AUCTORUM (ANISOPTERA: *CORDULEGASTERIDAE*)

H.J. DUMONT

Institute of Zoology, University of Ghent, Ledeganckstraat 35, B-9000 Ghent, Belgium

Received July 20, 1976

The original descriptions of *Aeschna charpentieri* Kolenati, 1846 and *Cordulegaster insignis* Schneider, 1845 are analysed. It is found that both refer to the same species and that, therefore, the former name is a junior synonym of the latter. Later, the name *C. charpentieri* was applied erroneously to a taxon that should correctly be named *C. pictus* Sélys, 1854. E. de Sélys Longchamps himself was largely responsible for this nomenclatorial confusion, wanting to preserve as many names as possible. An examination of the *Cordulegaster*-fauna of the type locality area of *A. charpentieri* shows that the local form of *C. insignis*, *C.i. lagodechicus* Barteneff, 1930, is subspecifically distinct from *C.i. insignis*. This subspecies seems to extend from the Caucasus along the Pontic Alps to the Bulgarian and Roumanian Black Sea coasts. It is the same insect as *C.i. montandoni* St. Quentin, 1971. The correct name for this taxon is *C. insignis charpentieri* (Kolenati, 1846).

INTRODUCTION

In part of the Caucasus mountains, the Transcaucasian Republics of the U.S.S.R., Anatolia, the Balkan countries up to Austria, and perhaps part of Italy, there occurs a *Cordulegaster*-species, closely related to *C. boltoni* (Donovan), and usually referred to as *Cordulegaster charpentieri* (Kolenati) or *Cordulegaster boltoni charpentieri* (Kolenati). We shall show hereafter that this is an error and that the correct name for the taxon in question is *Cordulegaster pictus* Sélys, 1854.

ORIGINAL DESCRIPTIONS OF THE TAXA INVOLVED AND THEIR SUBSEQUENT INTERPRETATIONS

THE ORIGINAL DESCRIPTION OF *AESCHNA CHARPENTIERI*, MALE

KOLENATI's (1846) brief description, in Latin, reads as follows:

"Magna, atra, alitrunco vittis luteis, abdomine maculis magnis flavissimis. – Long.: corporis 0,07; lat.: alis expansis: 0,1.

Caput transverso-globosum, oculis tantum angulo connatis, fronte latiuscula, valde prominente, flava, vertice excavato. Labium labrumque flavum, mandibulae nigro-piceae ad labri latera paululum exstantes, margine antico labri obsolete exciso, margine laterali labii profunde exciso, flavido-ciliato. Rhinarium nigrum. Frons prominens, per lineam elevatam fuscam a vertice separata, flava, vertex excavatus, flavus. Oculi viridi-fusci. Cuneus flavus, pilosus. Tempora flava, glabra. Truncus, alae et pedes uti in Aeschna lunulata Charp. Libell. Europ. p. 118. 30. t. 26. Abdominis autem segmentum primum magna ex parte flavum, ad margines fuscum, secundum flavum, margine antico et fascia ante-marginali postica fuscis, segmentum tertium et sequentia usque ad octavum habent cingulum magnum medium et ante marginem posticum tenuissimum flavum carina dorsali non interruptum, nonum et decimum cingulo simplici flavo est instructum. Venter fusco-niger. Appendices atri, basi latiores, versus apicem sensim angustati."

Four years after its description, SÉLYS & HAGEN (1850: 298) discussed the status of this animal. A French translation of the original description was given. This has been the base of all further debate:

"La lèvre inférieure et la supérieure sont jaunes; les mandibules d'un noir brun, le bord antérieur échancré de la lèvre supérieure est cilié de jaunâtre, le rhinarium noir. Le front assez large, très-proéminent, jaune, est séparé par une ligne élevée brune du devant du vertex qui est jaune; le triangle de l'occiput jaune, poilu, les yeux d'un vert brun, les tempes jaunes, glabres; le thorax, les pieds et les ailes comme chez l'annulatus. L'abdomen est différent: le 1er segment est en grande partie jaune, brun sur les bords; le 2e jaune avec le bord antérieur et une bande postérieure avec le bord brun; les 3e, 4e, 5e, 6e, 7e et 8e ont un large anneau jaune au milieu, et un très-étroit de même couleur avant le bord postérieur, non interrompu par la carène dorsale; le 9e et le 10e sont marqués d'un anneau jaune simple. Le dessous de l'abdomen est d'un brun noir. Les appendices anals supérieurs noirs, plus larges à la base, sensiblement rétrécis vers leur pointe."

This translation is fair. It gave rise to much subsequent confusion by a number of accompanying statements such as: "d'après la description incomplète donnée par M. Kolenati, il (*A. charpentieri*) ressemblerait beaucoup au *Cordulegaster annulatus*". This is evidently wrong. What Kolenati did was comparing his animal with Charpentier's *annulatus* (apparently the only related species known to him, hence his decision to name this species: "in honorem Dni. T. Charpentier"). He was struck by the general resemblance of both species, a correct conclusion ("truncus, alae et pedes uti in A. lunulata") that, in more modern terms, should read: "both *annulatus* and *charpentieri* belong to the same genus". The state-

ment that the description is incomplete has also proved to be misleading, since it seems to have been interpreted later as "inadequate", which it is not. In fact, it is no more incomplete than SCHNEIDER'S (1845) description of *C. insignis*, female (see below). The difference is that Schneider's type has remained available to revisors. The first revisor was H.A. Hagen, who associated a male with Schneider's type, and communicated an elaborate description to Sélys. This was included in SÉLYS & HAGEN (1850). Most of the writing of this treatise was done by Sélys, who uses "je" and not "nous" in the text. Among other things, he ("je") states that he has seen neither *charpentieri* nor *insignis* himself. Kolenati's type, however, has not been re-examined. It is not in the Vienna museum and, since Dr. L. Zhyltova assures us that it is not in the Leningrad Museum either, it must be considered lost. Before continuing our reasoning, it is necessary to consider the descriptions of *C. insignis* by SCHNEIDER (1845) and by SELYS & HAGEN (1950).

THE ORIGINAL DESCRIPTION OF *CORDULEGASTER INSIGNIS*, FEMALE

"Niger: facie flava, labro undique nigro-marginato, margine anteriore vix exciso; vertice supra plano, postico paululum nigro; thorace aterrimo, griseo pubescente supra fasciis duabus lateralibus latis obliquis flavis punctoque medio prope alas; alis attenuatis, costa flava pterostigmate elongato lineari fusco-nigro, membranula accessoria albida; pedibus nigris; abdomine basi modico inflato, dein attenuato, nigro, segmento primo fusco utrinque macula laterali majore flava, secundo cingulis duobus flavis, tertio quarto, quinto sexto et septimo fasci latissima angulosa medio subinterrupta flava, segmentis tribus ultimis macula utrinque lateraliflava: appendicibus elongatis peracutis ensiformibus subrectis. Vagina basi nigra. Long. corp. append. except. 2" 101/2"' expans. alas 3"8"'."

Schneider adds: "dem *C. lunulatus* Charp. sehr ähnlich". It is further amusing, in view of our present knowledge of the proportions of black and yellow in various *Cordulegaster*, that Schneider stresses the dark colours in *insignis* ("niger"), while Kolenati was more struck by the yellow colour in *charpentieri*.

SÉLYS' INTERPRETATION OF HAGEN'S REDESCRIPTION OF *C. INSIGNIS* (SÉLYS & HAGEN, 1850: 296-298)

H.A. Hagen re-examined the type and associated a male from "Asia" (Museum Berlin) with it. He transmitted his notes to Sélys who wrote the final text, without having seen the specimens. The diagnosis of *C. insignis* in SELYS & HAGEN (1850) is a mixture of Schneider's description and Hagen's remarks on the male:

"Noir; front jaune, avec une tache transverse noire très courte ou sans tache. Les 8 premiers segments de l'abdomen avec une tache dorsale très-large en anneau, jaune, et quelques lignes transverses de même couleur. Ptérostigma long, mince. 18 nervules antécubitales environ aux ailes supérieures. Occiput formant entre les yeux une sorte de verrue jaune,

très renflée. Appendices anals supérieurs du mâle éloignés à leur base, offrant deux fortes dents, vu de profil. Lèvre supérieure de la femelle notablement bordée de noir inférieurement. Nervure costale jaune."

There follows a differential diagnosis with Charpentier's *annulatus*, and, on p. 299, a comparison of *insignis* with *charpentieri*. Here, either some coincidental differences of Hagen's male with typical *insignis*, or unclear statements in Hagen's description, or too rigid interpretations of Sélys (who had not seen specimens of either "species" at that time), or a combination of all, made Sélys write down a number of statements that are the roots of the later *charpentieri*-problem. Indeed, while Sélys realises that "la grande extension de la couleur jaune ... établit une ressemblance marquée chez les deux espèces", he then stresses a number of "differences", almost all based on the relative extent of colours again, as indicated in the original descriptions, but in part erroneously interpreted by him, e.g.:

(1) front pas excavé (*insignis*); excavé (*charpentieri*): the frons is always at least a little excavated.

(2) *insignis* has two lateral yellow patches on S_1; *charpentieri* has a broad yellow ring: evidently incorrect! Kolenati writes: "segmentum primum magna ex parte flavum" but the term "cingulum" applies to the following segments only.

(3) *insignis* has a "second" (basal) yellow stripe on S_3-S_4 only; *charpentieri* has a "cingulum tenuissimum flavum" on S_3-S_8: a matter of the condition of preservation of the specimens concerned! What Hagen exactly wrote to Sélys is unknown, but it is known that all forms of *insignis* have a pair of small yellow lunules at the base of S_3-S_8, sometimes confluent into a basal yellow band. Thus, in this character, Sélys describes *charpentieri* as more typically *insignis*-like than his description of *insignis* itself.

(4) S_9-S_{10} in *insignis* have lateral yellow spots, not a circle like in *charpentieri*, uninterrupted by the mid-dorsal black: a matter of words! Kolenati's cingulum should not be rigourously considered as a circle, but rather as a patch, and it is not stated that this patch holds a mid-dorsal position. The "cingulo flavo simplici" probably means a "simple" yellow spot, not an "unpair" one.

There remains the question of the "linea elevata fusca" on the frons, a condition not so typical of *insignis*, although the type (a female) had such a brown stripe. We shall return to this problem later. It is important that SÉLYS, in 1850, had found a strong similarity between *insignis* and *charpentieri*, but had not thought they might be identical. In his later writings, this possibility has never been explored, and without any other justification that the fact that the first *Cordulegaster* he ever received from Asia Minor (Trabson) was a dark, *boltoni*-like animal, he later invariably considered *charpentieri* as a "dark" species.

THE LATER FATE OF THE NAME *CHARPENTIERI*

Charpentieri is not mentioned in the Synopsis des Gomphines (1854). In the Monographie des Gomphines (SÉLYS & HAGEN, 1857), it is set as a synonym to *C. annulatus*, on evidence of the Trabzon male which Sélys could not separate from Belgian examples and: "*C. charpentieri* doit être seulement un exemplaire un peu plus jeune, chez lequel l'extension de la couleur jaune sur plusieurs segments est assez grande". This statement, which has no factual background, is perhaps Sélys' most serious error in his treatment of *Cordulegaster*. HAGEN (1863) follows the Monographie.

The taxon *charpentieri* is restored in SELYS (1887), accompanied by a redescription which has nothing to do with the original: "occiput black, frons without black stripe, etc. . . ." Specimens cited stem from Lagocechi (Caucasus) and the Kura valley (Transcaucasia) and Sélys' argument has again been in the nearness of the type locality. Although, in fact, the confusion around the *C. boltoni*-like *Cordulegaster* from Asia Minor and Transcaucasia is maximal in the "Odonates de l'Asie Mineure", later authors have been greatly influenced by this important paper, and not only in the subsequent use of the name *charpentieri*. MORTON's (1916) description, in the line of Sélys' thinking, summarises the present-day (erroneous) opinion about this animal: frons with a fine traverse black line, labrum surrounded by black with a black virgule, occiput black with two yellow patches, abdomen black-and-yellow as in *C. boltoni*, but the yellow markings slightly more expanded than in typical *boltoni*. He was followed herein by FRASER (1929) and by BARTENEFF (1930), although it is clear that their idea is not at all consistent with the original description. The situation which has come into being is, when properly unraveled, a quite improbable one. No author, except SÉLYS in 1850 has ever studied the original description of *charpentieri*, and SÉLYS himself has continued overemphasising some errors of judgement he made in 1850.

THE *CORDULEGASTER*-SPECIES OF THE KURA VALLEY

The type locality of *Aeschna charpentieri* is vague: "habitat in paludosis ad flavium Cyrum, Transcaucasiae". No *Cordulegaster* lives in swamps, but the habit of these animals to hunt over small swampy areas along swift brooklets in woodlands is well-known. Thus, Kolenati may have meant this type of environment. But where on the Kura river? The problem is that there are enormous physical and climatological differences in different parts of the basin of this stream. The Eastern part of its basin has a subtropical climate, while the upper part has a temperate climate. In the latter, complications occur due to the nearness of the Black Sea and the Caucasus, resulting in a larger amount of precipitation than e.g. in Central Anatolia. It is probable that Kolenati's speci-

men came from somewhere along the upper Kura, since all other dragonfly species mentioned in his paper came from the "lacum alpinum sic dictum Bollochgöl territorii Airum, provinciae Transcaucasiae Elisabethopol, in monte Kaepesdagh". This is the present Balik Göl, in the Province of Agri, East Anatolia, Turkey. From the area between Balik Göl and Kirovabad only *C. insignis nobilis* Morton, 1915 is known (AKRAMOWSKI, 1948 and later observations). When, however, one travels North-West to Georgia, two other taxa are met: *Cordulegaster insignis lagodechicus* Barteneff, 1930 and *Cordulegaster charpentieri auctorum* (BARTENEFF, 1930; SCHENGELIA, 1975). Neither *C. insignis nobilis* nor *C. charpentieri* auct. fit the original description. What about *C.i. lagodechicus*? According to Barteneff's description, the tergites 4-6 have a yellow band of about 1/3 of their length; the yellow band on tergite 2 occupies the middle third of that segment; the tergites 8-10 have extensive yellow markings. Importantly, the frons may have a black stripe. This taxon is known from Lagodechi and from Mocheta near Tbilisi (SHENGELIA, 1975). It nicely corresponds to *C. charpentieri* Kolenati. What is the distribution of this subspecies? BESHOVSKI (1964) reports *C. insignis* from Western Bulgaria (Strouma Valley). His figures of the male show a finest black stripe on the frons and a rudiment of a virgule on the labrum. KEMPNY (1905) had reported *C. insignis* from Comana near Bucarest, Roumania. The male specimen, still in existence, has been studied anew by ST. QUENTIN (1971), who arrives at the conclusion that the specimen comes "nearest to *C.i. lagodechicus*", but describes it as a new subspecies, *C.i. montandoni*. It has a short black stripe on the frons and a rudiment of a virgule. St. Quentin's main argument to separate *montandoni* from *lagodechicus* is that in the former S_{9-10} are black, while they are largely yellow in the latter. The variability of the extension of the yellow spots on these segments is, however, enormous in all subspecies of *C. insignis* (vide e.g. the extensive illustrations in FRASER, 1929). Further, Beshovski's male from Bulgaria has yellow on S9 (BESHOVSKI, 1964: 124). The latter publication seems to have escaped St. Quentin's attention. It is hardly possible that the Bulgarian populations would, again, be a different taxon. It is our conviction that the coastal area of Thracia, the Pontus, and up to Georgia, forms a natural unity, differing from the adjacent territories in being more humid (more precipitation), hilly or mountainous woodland areas. Here occurs a peculiar subspecies of *C. insignis*, that should be named *C. insignis charpentieri* (Kolenati, 1846). In the same area, but extending further North and West (see further) also lives a member of the *C. boltoni*-complex, which has long been mistaken for the preceding taxon.

CORDULEGASTER PICTUS SÉLYS, 1854, THE CORRECT NAME FOR *CORDULEGASTER CHARPENTIERI* AUCTORUM

The series of descriptions of *C. charpentieri* by MORTON (1915, 1916), FRASER (1929) and BARTENEFF (1930) refer to *Cordulegaster pictus* Sélys, 1854. The holotype, a female of unknown origin, is in the Sélys collection, Brussels. It agrees with females from Lagodechi, Caucasus. The male from Trabzon, said to be identical to *C. annulatus* (Sélys & Hagen, 1857) was never described in detail and is now lost. It can therefore not be associated with the above cited females. As male allotypes should be considered: a series of four males from the environs of Elisabethopol, Kakhetia (SÉLYS, 1873). Two among these we have re-examined, found in perfect agreement with their description, and impossible to confuse with *C. charpentieri* Kolenati (occiput black, labrum broadly rounded with black, yellow rings on abdomen rather narrow). More material became available to MORTON (1915) from Istanbul and Lagodechi, to BARTENEFF (1930) from Lagodechi and Elisabethopol (now Kirovabad). The specimens from Trabzon, from Bursa and Dalmatia (SÉLYS, 1854; SÉLYS & HAGEN 1857; SÉLYS, 1887) also belong here. The specimens of *C. annulatus* reported from Serbia and Banat by ADAMOVIC (1948, 1949) are also *pictus*, but BUCHHOLZ (1963) was in error when assigning specimens of *C. bidentatus* from Macedonia to a so-called *C. bidentatus pictus*, which is a non-existent taxon. He seems to have been followed only by ADAMOVIĆ (1967). ST. QUENTIN (1952), STARK (1971) and KIAUTA (1961) finally established the presence of *C. pictus* in several places in Austria and Slovenia respectively, the western limit of its distribution. The latter should therefore be described as: from the Southwestern flanks of the Caucasus, Georgia, along the Pontic coast of Anatolia to Thracia, Western Anatolia, Greece, Yugoslavia, the Bulgarian Black Sea area (at least), Roumania (Dumont, unpublished), Austria. The *Cordulegaster* of Italy probably also belong here, but there is probably more than one component of the *boltoni*-group living here, and the *Cordulegaster* of Italy are in need of a detailed revision.

CONCLUSION

The following basic synonymy is established:

Cordulegaster insignis SCHNEIDER, 1845
Syn.: *Aeschna charpentieri* KOLENATI, 1846.

Cordulegaster insignis charpentieri (KOLENATI, 1846)
Syn.: *Cordulegaster insignis lagodechicus* BARTENEFF, 1930.

Cordulegaster insignis insignis, apud BESHOVSKI, 1964.
Cordulegaster insignis montandoni ST. QUENTIN, 1971.

Cordulegaster pictus SELYS, 1854
Syn.: *Cordulegaster charpentieri*; SELYS, 1887; MORTON, 1915, 1916; FRASER, 1929; BARTENEFF, 1930.
Cordulegaster boltoni charpentieri: ST. QUENTIN, 1952, 1956, 1959; STARK, 1971.
Cordulegaster annulatus: SÉLYS, 1887; ADAMOVIĆ, 1947, 1948.

ACKNOWLEDGEMENTS

I am indebted to Dr. N.N. AKRAMOWSKI (Erevan), with whom there was a long correspondence on *Cordulegaster* and to Prof. Dr. S.G. KIRIAKOFF (Gent) who provided useful information on the taxonomical and nomenclatorial aspects of this paper.

ADDENDUM

After this paper was completed, a useful article by A.R. WATERSTON (1976) appeared: "On the Genus *Cordulegaster* Leach, 1815 (Odonata) with special reference to the Sicilian species". A beginning is made with the unraveling of the Italian subspecies of the *C. boltoni*-species group and the pertainance of *C. bidentatus anatolicus* Sélys, 1873 to *C. pictus* (in the sense of my paper) is established. Unfortunately, Waterston uses the name *charpentieri* in the traditional, i.e. erroneous sense, and even a neotype for *Cordulegaster charpentieri* auctorum is designated. The latter is, of course, not needed any more, since the type material of *C. pictus* is in the Brussels museum, and the type of *C. insignis lagodechicus* Barteneff may be used as a substitute for the lost type of *Aeschna charpentieri* Kolenati.

REFERENCES

ADAMOVIC, Z.R., 1948. Liste des demoiselles (Odonata Fabr.) de l'Institut biologique à Sarajevo. *Annu. Inst. biol. Sarajevo* 1: 79-84.

ADAMOVIC, Z.R., 1949. La liste des Odonates du Muséum d'Histoire Naturelle du Pays Serbe. *Bull. Mus. Hist. nat. Pays Serbe* (B) 1-2: 275-293.

ADAMOVIĆ, Z.R., 1967. Odonata collected in Dubrovnik district, Jugoslavia. *Dt. ent. Z.* (N.F.) 14: 285-302.

AKRAMOWSKI, N.N., 1948. [Dragonfly fauna of Soviet Armenia]. *Zool. Sb., Erevan* 5: 117-188. (Russian).

BARTENEFF, A.N., 1930. Die paläarktischen Arten der Untergattung Cordulegaster Leach. *Trav. Stn. biol. Caucase Nord* 3: 1-32.

BESHOVSKI, V., 1964. Odonata from the Bulgarian Black Sea coast. *Izv. zool. Inst., Sof.* 15: 115-129.

BUCHHOLZ, K.F., 1963. Odonaten aus Macedonien. *Opusc. zool.* 70: 1-16.

FRASER, F.C., 1929. A revision of the Fissilabioidea (Cordulegasteridae, Petaliidae and Petaluridae) (Order Odonata). Part 1. Cordulegasteridae. *Mem. Indian Mus.* 9: 69-167.

HAGEN, H.A., 1863. Die Odonaten- und Neuropteren-Fauna Syriens und Kleinasiens. *Wien ent. Monatsch.* 7: 193-199.

KEMPNY, P., 1905. Beitrag zur Neuropteroidenfauna Rumäniens. *Bull. Soc. St. Bucuresti* 15: 665-674.

KIAUTA, B., 1961. Beitrag zur Kenntnis der Odonaten-Fauna Sloweniens. *Biol. Vest.* 8: 31-40.

KOLENATI, F.A., 1846. Meletemata Entomologica V. Imp. Acad. Sci. Petropoli. VIII + 170 pp., 3 pls. (Odonata: pp. 113-115).

MORTON, K.J., 1915. Notes on Odonata from the environs of Constantinople. *Entomologist* 48: 129-134.

MORTON, K.J., 1916. Some Palaearctic species of Cordulegaster. *Trans. R. ent. Soc. Lond.* 1915: 273-290.

SCHNEIDER, W.G., 1845. Verzeichniss der von Herrn Prof. Dr. Loew im Sommer 1842 in der Türkei und Kleinasien gesammelten Neuroptera, nebst kurzer Beschreibung der neuen Arten. *Stett. ent. Z.* 6: 110-116.

SELYS LONGCHAMPS, E. de, 1854. Synopsis des Gomphines. *Bull. Acad. r. Belg.* (2) 7: 23-112 (3-93 sep.).

SÉLYS-LONGCHAMPS, E. de, 1873. Troisièmes additions au Synopsis des Gomphines. *Bull. Acad. r. Belg.* (2) 35: 732-774; 36: 492-531 (4-87 sep.).

SELYS-LONGCHAMPS, E. de, 1887. Odonates de l'Asie mineure et révision de ceux des autres parties de la faune dite européenne. *Ann. Soc. ent. Belg.* 31: 1-85.

SELYS-LONGCHAMPS, E. de & H.A. HAGEN, 1850. Revue des Odonates ou Libellules d'Europe. *Mém. Soc. r. Sci. Liège* 6: XXII + 408 pp.

SELYS-LONGCHAMPS, E. de & H.A. HAGEN, 1857. Monographie des Gomphines. *Mém. Soc. r. Sci. Liège* 11: VIII + 460 pp.

SHENGELIA, E.S., 1975. [Georgian dragonflies]. *Materialy faune Gruzii* 5: 61-81. (Russian).

STARK, W., 1971. Faunistische Nachrichten aus Steiermark (XVI/8): Bemerkenswerte Libellenfunde (Insecta, Odonata). *Mitt. naturw. Ver. Steierm.* 100: 450-453.

ST. QUENTIN, D., 1952. Der Rassenkreis Cordulegaster boltoni (Donovan) (Odonata). *Ent. Nachr Bl., Wien* 4: 73-75.

ST. QUENTIN, D., 1957. Zwei bemerkenswerte Cordulegaster-Formen (Odonata) aus der Sammlung des Naturhistorischen Museums in Wien. *Annln naturh. Mus. Wien* 61: 295-296.

ST. QUENTIN, D., 1959. Odonata. *Catalogus Faunae Austriae* 12 (c): 1-11.

ST. QUENTIN, D., 1971. Zum Vorkommen von Cordulegaster insignis Schneider in Rumänien. *Stud. Comm. Muz. Brukenthal* 16: 205-208.

WATERSTON, A.R., 1976. On the genus Cordulegaster Leach, 1815 (Odonata) with special reference to the Sicilian species. *Trans. R. Soc. Edinb.* 69: 457-466.