Bulletin de la Société royale belge d'Entomologie/Bulletin van de Koninklijke Belgische Vereniging voor Entomologie, 153 (2017): 54–58

Agabus didymus (Olivier, 1795) and *A. dilatatus* (Brullé, 1832), two species new to the fauna of Croatia with notes on the ecology and distribution of both species (Coleoptera: Dytiscidae)

Kevin SCHEERS[1] & Silvy THANT[2]

[1] Research Institute for Nature and Forest (INBO), Kliniekstraat 25, B-1070 Brussels, Belgium
(e-mail: aquatic.adephaga@gmail.com)
[2] Antea Group Belgium, Buchtenstraat 9, B-9051 Ghent, Belgium

Abstract

Agabus didymus (Olivier, 1795) and *A. dilatatus* (Brullé, 1832) are newly recorded for Croatia. The new records are given and the ecology and overall distribution of both species is mapped and discussed. With the addition of these two species, the number of species of Dytiscidae known from Croatia increases to 122.

Keywords: Hydradephaga, former Yugoslavia, Balkan Peninsula, water beetles

Samenvatting

Agabus didymus (Olivier, 1795) en *A. dilatatus* (Brullé, 1832) worden voor het eerst gemeld voor Kroatië. In dit artikel worden ecologie en verspreiding van beide soorten in kaart gebracht en bediscussieerd. De toevoeging van deze twee soorten brengt het totaal aantal soorten Dytiscidae in Kroatië op 122.

Résumé

Agabus didymus (Olivier, 1795) et *A. dilatatus* (Brullé, 1832), deux espèces nouvelles pour la Croatie sont rapportées. Pour chacune, nous discutons l'écologie et la distribution et les cartes de répartition sont commentées. Ces deux espèces portent le nombre de Dytiscidae de la faune Croate à 122.

Introduction

GUEORGUIEV (1971) published the first checklist to the water beetles of Yugoslavia and recorded 112 species of Dytiscidae from Croatia. According to the latest version of the catalogue of the Palearctic Dytiscidae (NILSSON & HÁJEK, 2016), the number of species of Dytiscidae known from Croatia has increased to 117. Furthermore TEMUNOVIĆ *et al.* (2007) mentioned *Hydroporus striola* (C.R. Sahlberg, 1826) and more recently SCHEERS (2015) recorded *Herophydrus musicus* (Klug, 1834) from Croatia. HÁJEK *et al.* (2014) gave the first record of *Eretes sticticus* (Linnaeus, 1767). In August 2014 nine localities (one spring, two intermittent streams, five permanent streams and one temporary pond) were sampled by the authors. Two additional species for the Croatian fauna were found among the collected material: *Agabus didymus* (Olivier, 1795) and *A. dilatatus* (Brullé, 1832). With the addition of these species, the number of known species of Dytiscidae from Croatia increases to 122.

Material and methods

Collecting was done by the means of a handnet and a sieve. The collected material was sorted out in the field and preserved in ethylalcohol (Norvanol D). After determination the material was mounted and deposited in the collection of the first author.

Distribution maps were compiled using data from the collection of the first author, The Global Biodiversity Information Facility (GBIF) and the following literature: BEDEL (1895), FERENCA & TAMUTIS (2015), FOSTER & TAYLOR (2006), FRANSISCOLO (1979), GABRIŠ (2011), İNCEKARA *et al.* (2009), KARAMAN *et al.* (2008), KIYAK *et al.* (2007), LAMRI *et al.* (2016), PEDERZANI & SCHIZZEROTTO (1998), PRZEWOŹNY *et al.* (2009), RYNDEVICH *et al.* (2014), SALAH & RÉGIL CUETO (2014) and VAFEI *et al.* (2009). The records on the maps are not exhaustive and only intended as indicative for the overall distribution of both species. Furthermore, the presence in different countries is given based on NILSSON & HÁJEK (2016).

Results

Family **Dytiscidae**
Subfamily **Agabinae**
Tribe **Agabini**
***Agabus didymus* (Olivier, 1795)**

= *Agabus chalybaeus* J. Sahlberg, 1903
= *Dytiscus vitreus* Paykull, 1798

MATERIAL EXAMINED. 11 ex.: Croatia, Dubrovačko-Neretvanska, Pridvorje (42°32,64'N; 18°20,46E), 10.VIII.2014, leg. Scheers K. & Thant S.

COLLECTING CIRCUMSTANCES. The specimens were taken among grasses at the edge of a rather small, clear, slowly flowing, permanent stream with a loamy substrate. At the sampling locality the stream runs through vineyards and other extensively used agricultural fields. Co-occurring species were *Graptodytes flavipes* (Olivier 1795), *Hydroporus pubescens* (Gyllenhal 1808), *Scarodytes savanensis savanensis* (Zimmermann, 1933), *Agabus bipustulatus* (Linnaeus 1767), *Ilybius fuliginosus fuliginosus* (Fabricius 1792) and *Laccophilus hyalinus* (De Geer, 1774).

DISTRIBUTION. **Europe:** Austria, Belgium, Bosnia-Herzegovina, Bulgaria, Belarus, Czech Republic, Denmark, France, Great Britain, Germany, Greece, Italy, Lithuania, Luxembourg, Montenegro, The Netherlands, Poland, Portugal, Slovenia, Spain, Sweden, Switzerland, Ukraine. **North Africa:** Algeria, Morocco, Tunisia. **Asia:** Israel, Lebanon, Syria, Turkey (NILSSON & HÁJEK, 2016). This species has its main distribution in Southwestern Europe where it is common in Portugal, Spain, France and Italy. Its distribution becomes more scattered to the northeast and the species reaches southern Sweden, Lithuania and western Belarus in the north and the mountain ranges along the African Mediterranean coast in the south. In the east *A. didymus* is known from Israel and Lebanon and seems to be absent in many countries in Central Europe (Fig. 1).

ECOLOGY. *Agabus didymus* is a typical species of streams and small rivers in the lowlands and lower elevations in more mountainous regions. In some cases it is found at higher elevations up to 1700m (FRANCISCOLO, 1979). In the north of its range, it occurs in sun exposed, slowly flowing streams and drains between submerse vegetation or grasses near the edge and only very rarely occurs in shaded, vegetation free streams. It is found both on sandy and a more clayish or loamy substrate. In the Mediterranean basin it occurs in the same habitat and as well in vegetation free, faster running streams and small rivers between the gravel where it often co-occurs with *Agabus brunneus* (Fabricius, 1798). Infrequently this species can also been found in small gravel pits in the direct vicinity of streams (Scheers, unpublished data).

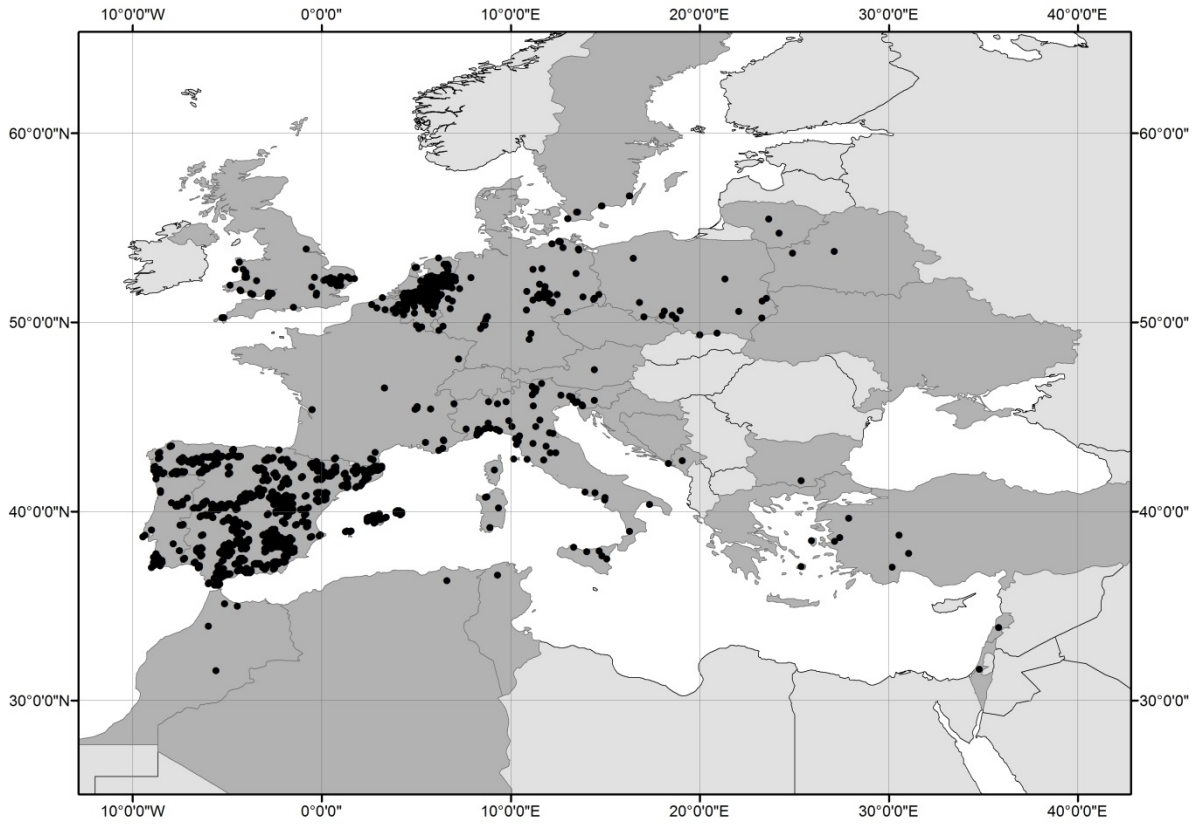

Fig. 1. Distribution of *Agabus didymus* (Olivier, 1795). Countries given by NILSSON & HÁJEK (2016) and Croatia are shaded in dark grey, black dots indicate records from literature and collection of the first author.

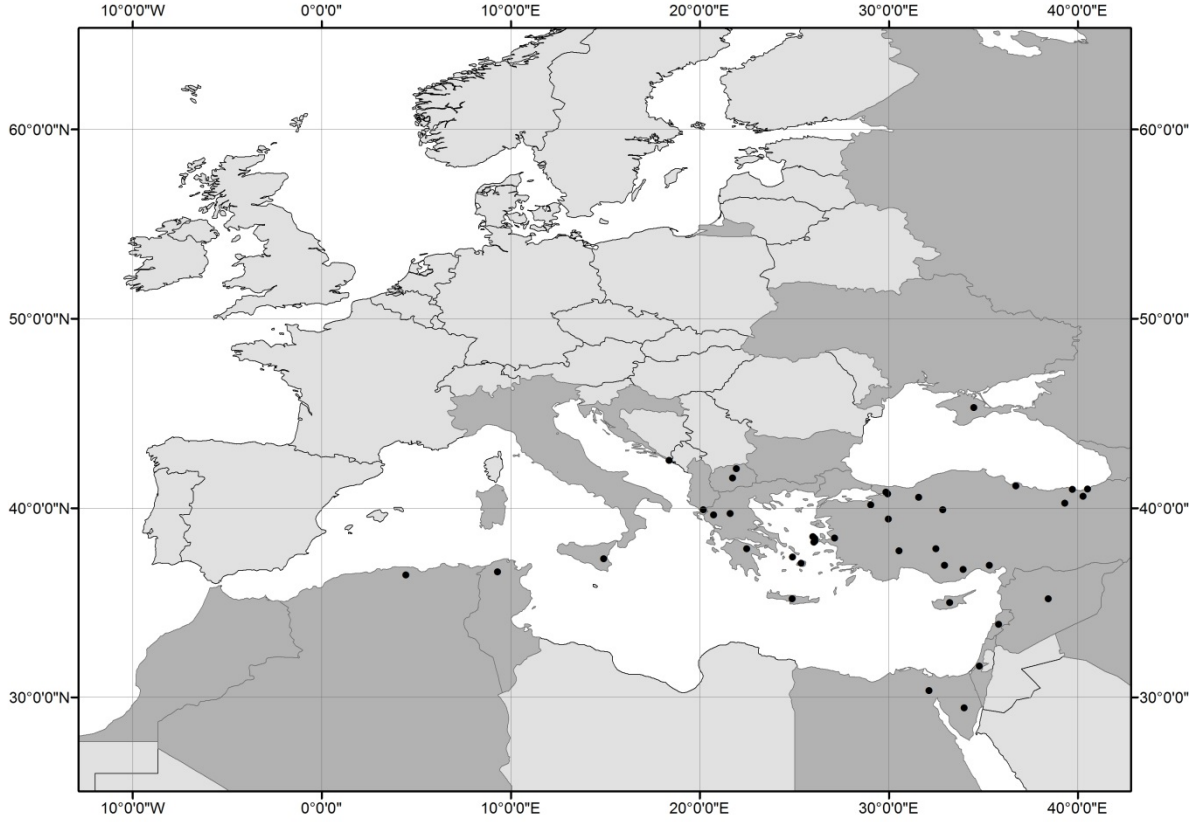

Fig. 2. Distribution of *Agabus dilatatus* (Brullé, 1832). Countries given by NILSSON & HÁJEK (2016) and Croatia are shaded in dark grey, black dots indicate records from literature and collection of the first author.

Agabus dilatatus (Brullé, 1832)

= *Agabus balcanicus* Hlisnikovský, 1955
= *Agabus castaneus* Sharp, 1882
= *Agabus gory* Aubé, 1837

MATERIAL EXAMINED. 8 ex.: Croatia, Dubrovačko-Neretvanska, Ljuta (42°32,04N; 18°22,62'E), 10.VIII. 2014, leg. Scheers K. & Thant S.; 3 ex.: Croatia, Dubrovačko-Neretvanska, Ljuta (same locality), 18.VIII.2014, leg. Scheers K. & Thant S.

COLLECTING CIRCUMSTANCES. The species was present in a small, shallow, partly shaded, clear stream next to the road with a substrate of gravel and sand with lot of grasses and lesser water-parsnip (*Berula erecta*) in the water. In this section of the stream no other Hydradephaga were found.
DISTRIBUTION. **Europe:** Albania, Bulgaria, Georgia, Greece, Italy, Macedonia, Russia (South Territory), Turkey, Ukraine. **North Africa:** Algeria, Egypt, Morocco, Tunisia. **Asia:** Cyprus, Iran, Iraq, Israel, Kyrgyzstan, Lebanon, Sinai, Syria, Turkey, Uzbekistan (NILSSON & HÁJEK, 2016). The distribution of *Agabus dilatatus* runs from northern Morocco, Algeria and Tunisia over Italy and the southern part of the Balkan Peninsula after which it continues along the coastal regions of the Black Sea and the Caspian Sea to Uzbekistan and Kyrgyzstan in the east and along the eastern Mediterranean coast to northeastern Egypt in the south (Fig. 2).

ECOLOGY. *Agabus dilatatus* is, like most other species in the *Agabus guttatus* group, restricted to springs, seepages and small streams (FOSTER & TAYLOR, 2006; FRANSISCOLO, 1979). According to GUIGNOT (1959), this species ascents only to low elevations in the mountains but FRANSISCOLO (1979) mentions that the species has been found in Macedonia at elevations of 600m and 1480m a.s.l. In North Africa (Morocco, Algeria and Tunisia) this species occurs in mountain streams in forested areas (BEDEL, 1895).

Discussion

Although only 13 species of Dytiscidae were found at the nine sampled locations, it is striking that three of these species were new to Croatia (including the record of *Herophydrus musicus* (Klug, 1834), see SCHEERS (2015)). For the southern species *H. musicus* and *A. dilatatus,* this could be related to the sampled locations, which are situated in the extreme southern tip of the country, an area that probably has not been well surveyed in the past. This new record of *A. dilatatus* expands the known distribution in the Balkan Peninsula to the north and its presence in the extreme south of Croatia indicates that this species most probably also occurs in Montenegro.

Agabus didymus is a widespread species ranging from the Iberian peninsula and England in the west to the Netherlands, Denmark, Lithuania and Belarus in the North. It occurs in nearly all countries surrounding the Mediterranean Sea, and reaches Ukraine in the east. It is remarkable that the species is not known from Albania, Bulgaria, Hungary, Moldavia, Serbia and Slovakia. Especially the absence in Hungary, a country where water beetles are relatively well sampled, and Slovakia, with multiple records of *A. didymus* just north of the border with Poland, is noteworthy. The new record in Croatia fills the gap between Slovenia and Montenegro and nearly completes distribution around the European Mediterranean coast with only Albania missing from the list.

The species list of Croatia is presumably not yet complete and there are still some species to be expected. *Hydaticus leander* (Rossi, 1790) is present in Montenegro not far from the border with southern Croatia (SCHEERS, 2016). Furthermore, the recently described *Agabus lotti* Turner, Toledo & Mazzoldi, 2015 which is known from Italy, Austria, Czech Republic, Slovakia and Hungary (TURNER *et al.,* 2015) could be expected to occur in Croatia. *Agabus lotti* is externally very similar to *A. uliginosus* (Linnaeus, 1761) and can only be distinguished with certainty by examination of the male genitalia. Based on the confirmed distribution of both species by TURNER *et al.* (2015) it is well possible that the historic records of *A. uliginosus* in Croatia mentioned by GUEORGUIEV (1971) and NILSSON & HÁJEK (2016) actually refer to the new *A. lotti*.

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