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First confirmed occurrences of Notonecta maculata and N. meridionalis (Heteroptera: Notonectidae) in Hungary with notes, maps, and a key to the Notonecta species of Hungary

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Abstract – First records of *Notonecta maculata* FABRICIUS, 1794, first confirmed record of *N. meridionalis* POISSON, 1926 and new records of *N. obliqua* THUNBERG, 1787 (Heteroptera: Notonectidae) are presented from Hungary. An identification key to *Notonecta* species of Hungary is given. All Hungarian locality data of *Notonecta* species are summarized on UTM gridmaps. With 25 figures.

Key words – *Notonecta* species, Hungary, new records, identification key, UTM gridmaps.

INTRODUCTION

The backswimmers (genus *Notonecta* LINNAEUS, 1758) are represented in Europe with 9 species and 2 subspecies. KONDOROSY (1999) listed all Heteroptera species known from Hungary, including 5 species of the family Notonectidae: *Notonecta lutea* MÜLLER, 1776, *N. viridis* DELCOURT, 1909, *N. obliqua* THUNBERG, 1787, *N. glauca* LINNAEUS, 1758 and *N. meridionalis* POISSON, 1926.

So far, the Hungarian occurrence of *N. meridionalis* was questionable; there are no voucher specimens in Hungarian collections, and no reliable literature data of this species were available. Occurrence of *N. meridionalis*

in Hungary was first mentioned by POLHEMUS (1996) in his Palaearctic Catalogue, but without locality information. This was taken over by KONDOROSY (1999) for his Hungarian checklist. The origin of this record is unknown, probably came from old monographs dealing with the fauna of the whole Carpathian Basin, or from old specimens with insufficient labelling.

Presence of *N. maculata* FABRICIUS, 1794 in Hungary was expected since a long time. SOÓS (1963) mentioned it as a species expected to occur in the Hungarian fauna. In neighbouring countries, mainly along the northern borders of Hungary, *N. reuteri* HUNGERFORD, 1928 also occurs, therefore this species is to be taken into consideration as well.

MATERIALS AND METHODS

During the preparation of this manuscript, all available published records were reviewed and all *Notonecta* specimens of our materials and in the Hemiptera collection of the Hungarian Natural History Museum, Budapest (HNHM) were revised.

Figures of the identification key were prepared on the basis of specimens from our material (*N. lutea* (female): det. BODA; *N. glauca* (male, female): det. SOÓS; *N. viridis* (male, female): det. SOÓS; *N. maculata* (male, female): det. SOÓS; *N. obliqua* (male): det. SOÓS, (female): det. BODA) and from the HNHM (*N. lutea* (male): det. HORVÁTH; *N. reuteri* (male, female): det. HEISS; *N. meridionalis* (male, female): det. HORVÁTH). Genitalia were dissected, photographed under stereomicroscope, and redrawn by using light emitting trestle-board. Last abdominal sternites of females were flattened between microscope slides, in order to get a unified view for characterising its shape. Both of the parameres and the last abdominal sternites were figured without setation, because it has no role in the identification procedure.

In the cases of new records, the names of collectors are given by abbreviations as follows: CsB = BALÁZS CSER, CsZ = ZOLTÁN CSABAI, HV = VALÉR HORVAI, KA = ANDRÁS KÁLMÁN, KTZ = TAMÁS ZOLTÁN KOVÁCS, KZ = ZOLTÁN KÁLMÁN, MA = ARNOLD MÓRA, PZs = ZSUZSANNA PILISZKY, SN = NÁNDOR SOÓS.

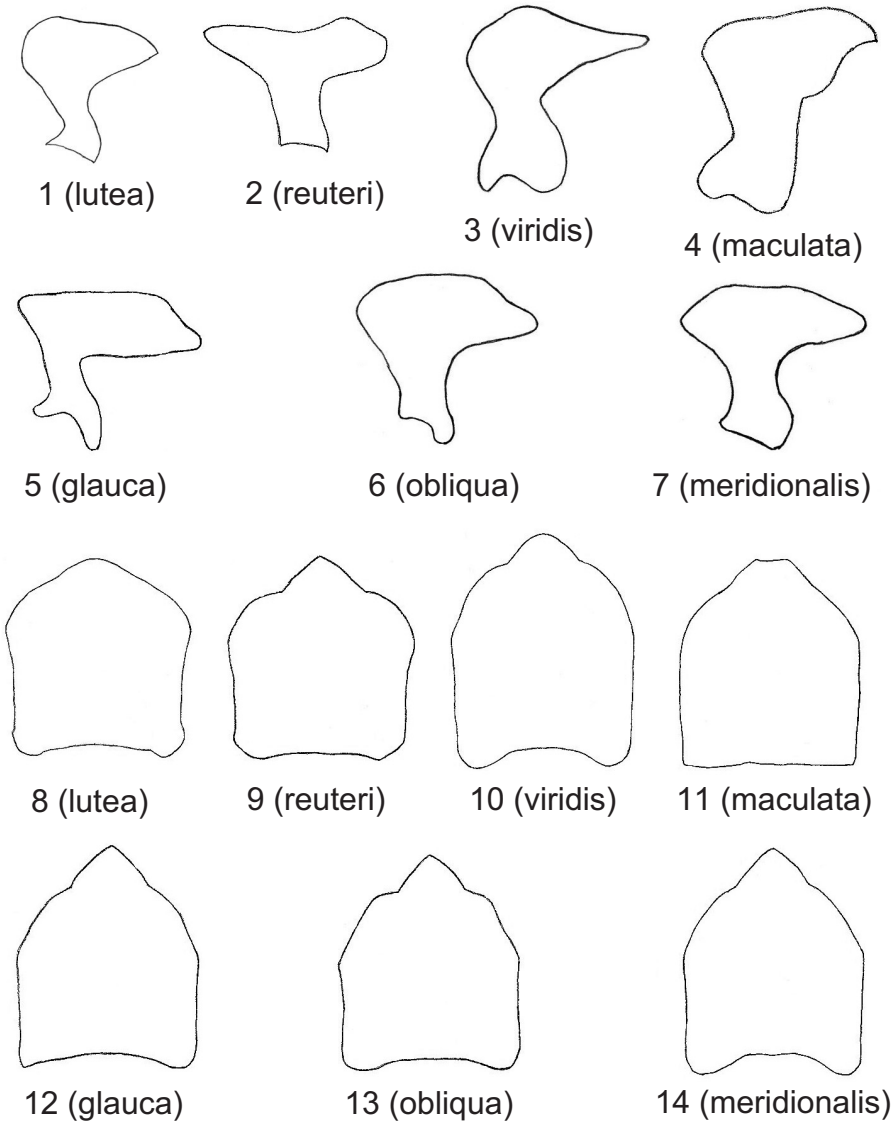
RESULTS

Examination of *Notonecta* material of our recent samplings resulted in new records of three species, which deserve special attention. So far, occurrence of *N. obliqua* in Hungary was known on the basis of some old specimens collected in or before the 1930's. Recently this species was found at

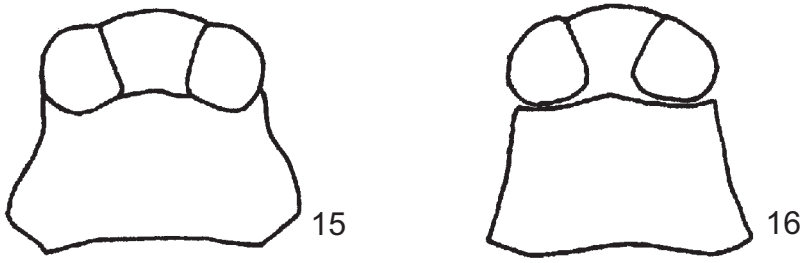
two localities in the catchment area of River Zala and a stream locality south to Lake Balaton (see below and in MÓRA *et al.* 2008). *N. maculata* is new for the Hungarian fauna; the first records are presented below from four sampling sites (catchment area of River Zala and Bakony Mountains). Our new record of *N. meridionalis* from the Bakony Mountains is the first confirmed occurrence of the species in Hungary (*cf.* Introduction).

Our morphological studies on *Notonecta* specimens led to the conclusion that examination of external morphological characters is not enough for safe species level identification. Based on external features, only three of the six Hungarian *Notonecta* species could be identified more or less safely. *N. lutea* is recognisable by its light scutellum, but checking the genital organs is strongly recommended because it could be confused with specimens of *N. reuteri*. The latter species is expected to occur especially in the northern parts of Hungary. *N. viridis* could be easily identified on the basis of the projecting, pointed anterolateral angle of the pronotum (Fig. 15). *N. maculata* also could be easily separated from other species by the characteristic colour pattern of the metanotum and abdominal tergites (Fig. 17). This colour pattern is not to be confused with colours of immature specimens of other species, which have light brown or yellow colour on metanotum and all of the tergites. *N. obliqua* and *N. meridionalis* have a distinctive colour pattern of hemielytron (Fig. 19), but they cannot be separated safely from each other by using external features. Moreover, these species can be confused with *N. glauca* and *N. viridis*, which sometimes have very similarly coloured hemielytra.

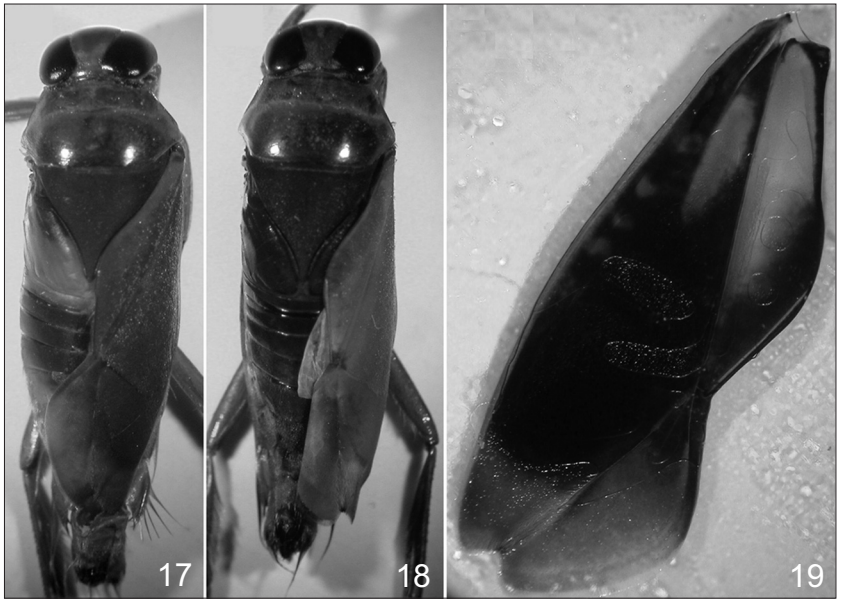
Because of the above mentioned phenotypic plasticity, *Notonecta* species can only be safely distinguished by checking genital organs, parameres of males (Figs 1–7) and last abdominal sternites of females (Figs 8–14). Consequently, a new key is needed for the identification of Hungarian *Notonecta* species, which is presented below.



Figs 1–7. Parameres of males of *Nototecta* species, lateral view, without setation, 1 = *N. lutea* MÜLLER, 1776, 2 = *N. reuteri* HUNGERFORD, 1928, 3 = *N. viridis* DELCOURT, 1909, 4 = *N. maculata* FABRICIUS, 1794, 5 = *N. glauca* LINNAEUS, 1758, 6 = *N. obliqua* THUNBERG, 1787, 7 = *N. meridionalis* POISSON, 1926. **Figs 8–14.** Last abdominal sternites of females *Nototecta* species, without setation, dorsal view, flattened between slides, 8 = *N. lutea* MÜLLER, 1776, 9 = *N. reuteri* HUNGERFORD, 1928, 10 = *N. viridis* DELCOURT, 1909, 11 = *N. maculata* FABRICIUS, 1794, 12 = *N. glauca* LINNAEUS, 1758, 13 = *N. obliqua* THUNBERG, 1787, 14 = *N. meridionalis* POISSON, 1926



Figs 15–16. Head and pronotum in dorsal view: 15 = *Notonecta viridis* DELCOURT, 1909, 16 = *N. glauca* LINNAEUS, 1758



Figs 17–18. Habitus in dorsal view, left hemielytron removed, 17 = *Notonecta maculata* FABRICIUS, 1794, 18 = *N. glauca* LINNAEUS, 1758. – **Fig. 19.** Hemielytron of *N. obliqua* THUNBERG, 1787 in ventral view

Key to the Hungarian *Notonecta* species

1 Scutellum yellow or light brown 2

– Scutellum black 3

2 Male: paramere with slightly elongated, evenly tapered, pointed apex and broadly rounded hind part (Fig. 1). Female: last abdominal sternite rounded, anal edge without a well-defined tip (Fig. 8)
N. lutea MÜLLER, 1776

– Male: paramere mushroom-shaped, extended to both sides, apically rounded, with concave front edge (Fig. 2). Female: last abdominal sternite shouldered, anal edge widely acuminated (Fig. 9)
[*N. reuteri* HUNGERFORD, 1928]

3 Anterolateral angle of pronotum pointed to a tip anteriorly, following the edge of the eyes (Fig. 15). Male: paramere with broadly rounded hind part, strongly but evenly tapering pointed apex and concave front edge (Fig. 3). Female: last abdominal sternite rounded, anal edge shortly conical (Fig. 10) *N. viridis* DELCOURT, 1909

– Anterolateral angle of pronotum without anterior tip (Fig. 16) 4

4 Metanotum orange under wings (except anterior and lateral parts). Abdominal tergites II–IV(V) black, the others orange. There is a well-defined contrast between orange metanotum and black tergites (Fig. 17). Male: paramere with broadly pointed, claw-like apex (Fig. 4). Female: last abdominal sternite with nipped anal edge (Fig. 11)
N. maculata FABRICIUS, 1794

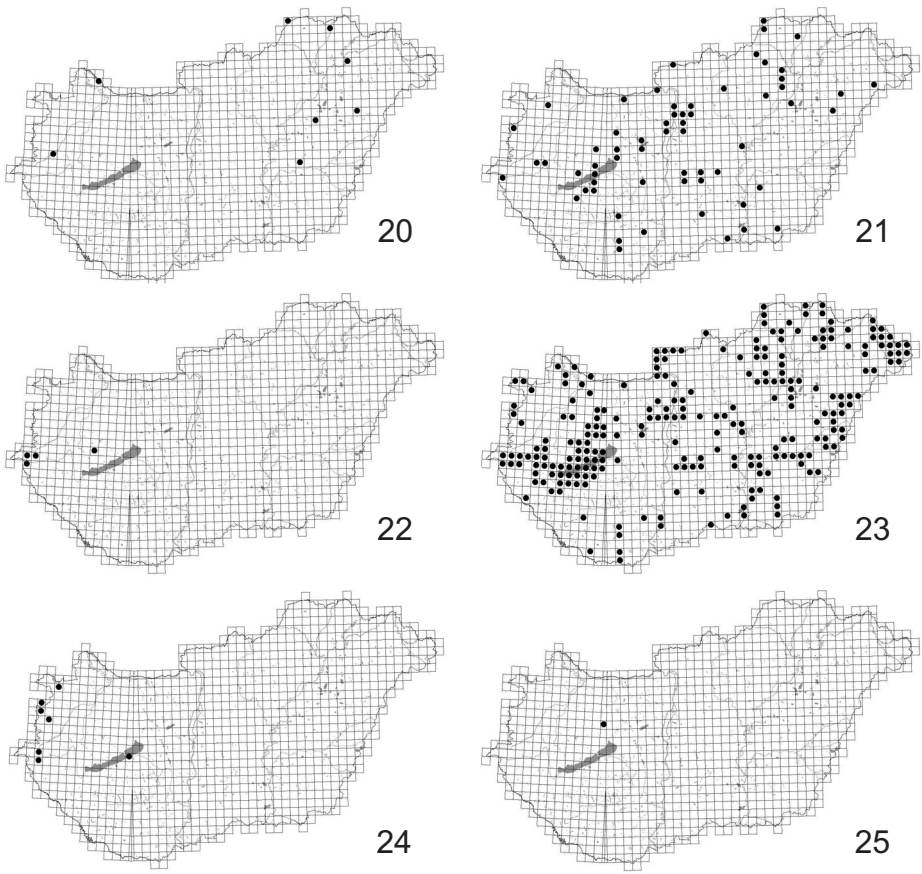
– Metanotum and abdominal tergites uniformly dark (Fig. 18) 5

5 Male: paramere with pointed, angular hind part and straight front edge (Fig. 5). Female: anal edge of last abdominal sternite more or less rounded, not strongly shouldered (Fig. 12) *and* hemielytron with brownish-reddish basic colour decorated with variously shaped and sized black spots. Colouration of hemielytron various but *not* as shown in Figure 19. *N. glauca* LINNAEUS, 1758

– Male: paramere with rounded (Fig. 6) or conical (Fig. 7) hind part. Female: last abdominal sternite with more or less rounded (Fig. 13) or strongly shouldered (Fig. 14) anal edge. Basic colour of hemielytron black in both sexes, with 1–1 yellow band on basis of clavus and corium parallel to anal angle (Fig. 19) 6

6 Male: paramere with convex front edge, apex snipped from top, hind part widely rounded (Fig. 6). Female: last abdominal sternite definitely shouldered (Fig. 13.) *N. obliqua* THUNBERG, 1787

– Male: paramere with straight or concave front edge, apex and hind parts evenly conical (Fig. 7). Female: last abdominal sternite more or less rounded, not shouldered (Fig. 14). Wing patterns as shown in Figure 19, sometimes can occur in *N. glauca* too, which have a quite similar last abdominal sternite, so safe separation of females of these two species requires adequate routine *N. meridionalis* POISSON, 1926



Figs 20–25. Known distribution in Hungary, 20 = *Notonecta lutea* MÜLLER, 1776, 21 = *N. viridis* DELCOURT, 1909, 22 = *N. maculata* FABRICIUS, 1794, 23 = *N. glauca* LINNAEUS, 1758, 24 = *N. obliqua* THUNBERG, 1787, 25 = *N. meridionalis* POISSON, 1926

NEW RECORDS, PUBLISHED AND COLLECTION DATA OF *NOTONECTA* SPECIES

Notonecta lutea MÜLLER, 1776 (Fig. 20) – Published data: Ásványráró (KISS *et al.* 2008), Balaton, without closer locality (VÁSÁRHELYI & BAKONYI 1988), Debrecen (SOÓS 1963), Jósvafő (CSABAI *et al.* 2003*c*), Kunmadaras (MOLDOVÁNYI 1977, BAKONYI & VÁSÁRHELYI 1981), Mezőtúr, Tiszaeszlár (KISS *et al.* 2006), Vizsoly (CSABAI *et al.* 2003*c*). – Collection data in HNHM: Nagyiván, 03–04.VII.1976, leg. MOLDOVÁNYI (1 specimen); Vasvár, leg. NÉMETH (1 specimen).

Notonecta viridis DELCOURT, 1909 (Fig. 21) – Published records can be found in BAKONYI (1979), BAKONYI & VÁSÁRHELYI (1981, 1993), BODA (2006), CSABAI *et al.* (2005), FÖLDESSY (2000), HORVÁTH (1931), HUFNAGEL (1998), KÁLMÁN *et al.* (2006), KISS (2000), KISS *et al.* (1999, 2006, 2008), MÓRA *et al.* (2007, 2008), P. HOLLÓ *et al.* (2008), VÁSÁRHELYI & BAKONYI (1988), VÁSÁRHELYI *et al.* (1990), more specimens can be found in the HNHM.

Notonecta maculata FABRICIUS, 1794 (Fig. 22) – New records: Őriszentpéter, Zala, 23.VII.2007, N 46°50'21.80", E 16°25'19.52", UTM: XM 08, CsZ, KTZ, KZ, MA & SN (2 specimens). Szaknyér, Szentjakabi-patak, 24.VII.2007, N 46°51'38.85", E 16°31'08.91", UTM XM19, CsZ, KTZ, KZ, MA & SN (1 specimen). Szalafő, Felsőszeri-patak, 29.X. 2007, N 46°51'56.29", E 16°20'44.16", UTM XM09, CsZ, KTZ, KZ, MA & SN – (3 specimens). Szőc, Kígyós-patak, 16.IX.2005, N 47°00'53", E 17°28'12", UTM XN80, CsZ & KA (1 specimen). — New to the fauna of Hungary.

Notonecta glauca LINNAEUS, 1758 (Fig. 23) – Published records can be found in ANDRIKOVICS (1979), BAKONYI (1979), BAKONYI *et al.* (2002), BAKONYI & VÁSÁRHELYI (1981, 1993), BÍRÓ (2003), BÍRÓ & HUFNAGEL (2001), BODA (2006), BODA *et al.* (2004), CZIROK *et al.* (2008), CSABAI *et al.* (2003*a*, *b*, *c*, 2004, 2005), CSONGOR (1956), CSÖRGITS & HUFNAGEL (2000), DOSZTÁL (1974), FÖLDESSY (2000), FÖLDESSY & VARGA (1994), HORVÁTH (1931), HUFNAGEL (1994, 1998), KÁLMÁN *et al.* (2006, 2008*a, b*), KISS (2000, 2006), KISS *et al.* (1999, 2006, 2008), MOLDOVÁNYI (1977), MÓRA *et al.* (2005, 2007, 2008), P. HOLLÓ *et al.* (2008), SOÓS *et al.* (2008), SZABÓ (1950), VÁSÁRHELYI & BAKONYI (1988), VÁSÁRHELYI *et al.* (1990), more specimens can be found in the HNHM.

Notonecta obliqua THUNBERG, 1787 (Fig. 24) – New records: Kőröshegy, Kőröshegyi-séd, 04.IX.2006, N 46°49'53", E 17°53'41", UTM YM29, HV & PZs (1 specimen). Nagyrákos, Nagyrákosi-patak, 23.VII.2007, N 46°49'50.04", E 16°27'29.55", UTM XM18, CsZ, KTZ, KZ, MA & SN (1 specimen). Published data: Szaknyér (MÓRA *et al.* 2008), Kőszeg (VISNYA 1938) – Collection data in HNHM: Pinnye, leg STREDA (2 specimens); Szombathely, leg. FÁBIÁN (1 specimen); Velem, leg. VISNYA (1 specimen).

Notonecta meridionalis POISSON, 1926 (Fig. 25) – New record: Bakonynána, Gaja, 23.IX.2004, N 47°16'03.07", E 17°58'10.93", UTM YN23, CsZ & CsB (1 specimen).

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