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A study on *Hydrochus* Leach, 1817, species from Tunisia (Coleoptera, Hydrochidae)

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Summary. – In this study, *Hydrochus* species known from Tunisia are presented with their distribution in Tunisia and in the rest of the world. Of these, *Hydrochus smaragdineus* Faimaire, 1879, is recorded in Tunisia for the first time and all species were identified according to our specimens captured in some streams located in the north of Tunisia. A key of species and some ecological data are included.

Résumé. – **Etude des *Hydrochus* Leach, 1817, de Tunisie (Coleoptera, Hydrochidae).** Dans cette étude, les espèces d'*Hydrochus* connues de Tunisie sont présentées avec leur distribution en Tunisie et dans le reste du monde. De celles-ci, *Hydrochus smaragdineus* Faimaire, 1879, est signalée de Tunisie pour la première fois. L'ensemble des espèces a été capturé dans certains ruisseaux situés dans le nord de la Tunisie. Une clé des espèces et certaines données écologiques sont incluses.

Resúmen. – **Estudio sobre las especies de *Hydrochus* Leach, 1817, de Túnez (Coleoptera, Hydrochidae).** En este estudio, se presentan las especies de *Hydrochus* conocidas de Túnez, con su distribución en Túnez y en el resto del mundo. De ellas, *Hydrochus smaragdineus* Faimaire, 1879, se registra por primera vez, en Túnez y todas las especies fueron identificadas a partir de ejemplares capturados en arroyos ubicados en el norte de Túnez. Una clave de especies y algunos datos ecológicos son incluidos.

Keywords. – Coleoptera, Hydrochidae, *Hydrochus*, diagnosis, distribution, Tunisia.

The taxonomic study of the genus *Hydrochus* Leach, 1817, is problematic due to the great inter-specific homology of the morphological characters and the intra-specific variability of some species (CASTRO & DELGADO, 1999). The Hydrochidae family comprises the single genus *Hydrochus* with about 180 species (164 according to HANSEN, 1999); hydrochids occur on all zoogeographical areas. All species are truly aquatic, living in well-vegetated stagnant water and/or at the edges of very slowly flowing water (JÄCH & BALKE, 2008). ANGUS (1976) reviewed some European species of *Hydrochus* with their synonymy and distribution.

Hydrochids were sampled monthly over the course of a year (from May 2005 to April 2006). The examination of 259 specimens (105 ♂ and 154 ♀) allowed the identification of three species. The area of study covers the main streams located in the northern Tunisia. The fig. 1 and the table I indicate coordinates and altitudes of the different prospected sites. Synonymy of species is established by following the "*Catalogue of Palearctic Coleoptera vol. 2*" edited by LÖBL & SMETANA (2004).

TAXONOMIC, BIOGEOGRAPHICAL AND ECOLOGICAL ASPECTS

Hydrochus Leach, 1817

Adult palicornia with elongate body, pronoto-elytral contour interrupted. Head about as wide as the pronotum, eyes protruding and globular, and fronto-clypeal furrow more or less distinct, V-shaped. Maxillary palpi moderately long, with the apical segment slightly longer and thicker than the precedent one. Pronotum rather uneven, with large though rather

shallow impressions arranged in two transverse rows and distinctly narrowed posteriorly. Scutellum distinct. Last metatarsi segment elongate. Aedeagus of the trilobed type, often asymmetrical (HANSEN, 1987).

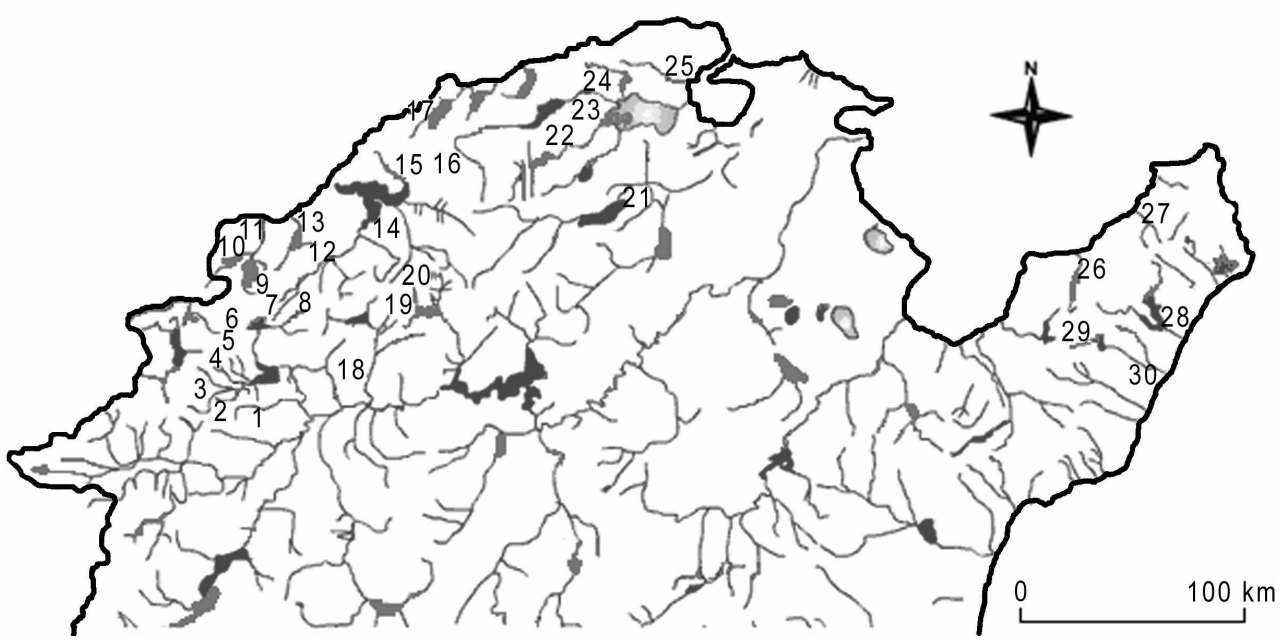

Fig. 1. – Map of the study area showing the different prospected sites.

KEY TO TUNISIAN SPECIES OF *HYDROCHUS*

1. Elytra with raised tubercles on some interstices; aedeagophore with the parameres similar to one another and the tube with a short flagellum ..... ***H. grandicollis*** Kiesenwetter
– Elytra interstices without raised tubercles; aedeagophore with dissimilar parameres, apical section of left paramere always expanded **2**
2. Tube of aedeagophore ended by a very long flagellum ..... ***H. smaragdineus*** Fairmaire
– Tube of aedeagophore without flagellum ..... ***H. flavipennis*** Küster

Hydrochus grandicollis Kiesenwetter, 1870

Material examined. – Amor amont, 29.X.2005, 1♂; Lasfer, 31.III.2006, 1♂; Kesseb, 29.VII.2005, 3♀, 31.VIII.2005, 1♂, 3♀; Beja, 16.II.2006, 1♂; Abid, 25.VII.2005, 1♂, 29.VIII.2005, 1♀, 27.XI.2005, 1♂; Lebna, 24.IX.2005, 1♀.

Diagnosis. – Length 2.7-2.9 mm, body color black with metallic reflects. Head sprinkled by deep and sparse double punctuation, one is large and sparse letting between it small developed irregular areas in the inter-ocular space, the other small and dense particularly at the fronto-clypeus margins. Maxillary palpi light purple with last article darken. Pronotum enlarged, contracted toward the base, with lateral margins weakly convex. Elytra large and short, with elliptic contour and maximum width situated toward the half of its length. Elytral striae marked and elytral margins wide, some interstices showing widen and raised tubercles. Orifices of elytral apex great and enlarged. Legs purple with femurs and tibias uncolored. Aedeagophore very similar to the *H. nitidicollis* one, parameres wide, sinuate and moderately widen toward the apex, showing in lateral view a dorsal excavation near the base, median lobe long and ended by a short perpendicular flagellum (fig. 2a).

Distribution. – Species with occidental Mediterranean distribution, known from the Iberian Peninsula and Baleares isles (CASTRO & DELGADO, 1998). It was recorded from Tunisia by NORMAND (1933) in two localities in the north-west (Fernana and El Feidja).

Habitat. – According to CASTRO & DELGADO (1998), the species was captured in localities situated at an altitude between 450 and 1000 m, characterized by a limpid water and vegetation

but not in ponds with different level of eutrophisation or in the permanent ones at the bed of some streams. The species was sampled in running water attached to the edging vegetation but at an altitude ranging between 4 and 482 m.

Table I. – Different sites (fig. 1) occupied by Hydrochids with their coordinates and altitudes.

Nº	Sites	Coordinates	Alt. (m)	*H. flavipennis*	*H. nitidicollis*	*H. smaragdineus*
1	Aïn Gnaâa	36°33´53.33´´N 08°47´25.26´´E	137			+
2	Ghrib	36°36´57.42´´N 08°41´06.94´´E	255	+		
3	Ghézala	36°38´35.27´´N 08°41´54.69´´E	229	+		+
4	Saboun	36°39´50.12´´N 08°41´33.67´´E	260	+		
5	Edmen	36°43´24.58´´N 08°41´28.58´´E	631	+		
6	Lebgaâ	36°44´58.27´´N 08°41´49.20´´E	563	+		
7	Bransia	36°46´51.78´´N 08°45´06.31´´E	588	+		+
8	Lasfer	36°46´22.59´´N 08°46´19.39´´E	484	+	+	+
9	Rennagha	36°51´35.67´´N 08°43´15.49´´E	58	+		
10	Amor amont	36°55´18.38´´N 08°44´25.87´´E	12	+	+	
11	Amor aval	36°55´42.41´´N 08°45´20.79´´E	3	+		
12	Bouterfes	36°57´12.05´´N 08°54´45.52´´E	100	+		
13	Zouaraâ	36°57´50.08´´N 08°58´11.53´´E	68	+		
14	Maâden	36°58´12.22´´N 09°05´06.11´´E	32	+		+
15	Tamra	37°02´36.42´´N 09°06´24.51´´E	54	+		
16	Magsbaya	37°03´25.28´´N 09°13´48.61´´E	136	+		
17	Ziatine	37°11´53.11´´N 09°13´31.81´´E	7	+		
18	Kesseb	36°36´36.37´´N 09°01´14.34´´E	122	+	+	
19	Béja	36°45´39.00´´N 09°11´39.82´´E	176	+	+	
20	K. Mezouar	36°46´58.34´´N 09°20´11.98´´E	236	+		
21	Joumine aval	37°01´48.30´´N 09°39´47.84´´E	16	+		
22	Melah	37°06´22.66´´N 09°32´24.93´´E	16	+		
23	Sedjenane	37°11´36.83´´N 09°34´45.02´´E	6			+
24	Kloufi	37°11´46.37´´N 09°35´07.36´´E	2	+		
25	Douimis	37°12´03.51´´N 09°37´26.59´´E	6	+		+
26	Abid	36°52´02.12´´N 10°43´29.20´´E	2	+	+	
27	Z. Magaiez	36°56´39.76´´N 10°53´15.33´´E	16	+		
28	Lebna	36°44´19.28´´N 10°55´22.62´´E	7	+	+	
29	Chiba aval	36°39´16.09´´N 10°54´31.78´´E	3	+		
30	Chiba amont	36°43´11.76´´N 10°44´04.79´´E	94	+		

Hydrochus smaragdineus Fairmaire, 1879

Material examined. – Ain Gnaâa, 31.VIII.2005, 1♂; Ghezala, 28.VII.2005, 2♂, 28.IX.2005, 1♂; Bransia, 28.VII.2005, 1♂, 31.VIII.2005, 1♂, 1♀, 30.X.2005, 3♂, 1♀; Lasfer, 28.VII.2005, 1♂, 4♀; Maâden, 29.IX.2005, 2♂, 29.X.2005, 1♂, 2♀; Sedjenane, 18.VII.2005, 1♂; Douimis, 28.VIII.2005, 1♂.

Diagnosis. – Length 2.4-2.8 mm, color bronze-blackish more or less intense with occasionally metallic greenish reflects; head with antenna and maxillary palpi dark brown. Head with deep and variable sized punctuation, more dense at the frontal area delimiting four more or less irregular elliptic protrusions in the inter-ocular space. Pronotal dimples well distinct delimiting small depressions with wide, deep and sparse punctuation. Elytra with interstices slightly careened and without raised tubercles. Legs dark brown, tarsi with the last article apically black and about as long as the others together.

The species is very confused with its congener *H. flavipennis* and differs from it by the wider elytra, the basely more contracted pronotum and the morphology of aedeagophores (VALLADARES, 1988). The pronotal punctuation is more reduced than in *H. flavipennis*, letting between it wide spaces. The male of *H. smaragdineus* can be easily recognized by

the aedeagophore showing a very long flagellum. Orifices at elytral apex are intermediate in size between those of *H. angustatus* and *H. flavipennis*. These morphological characters should not be regarded as diagnostic in themselves, but merely suggestive (ANGUS, 1976).

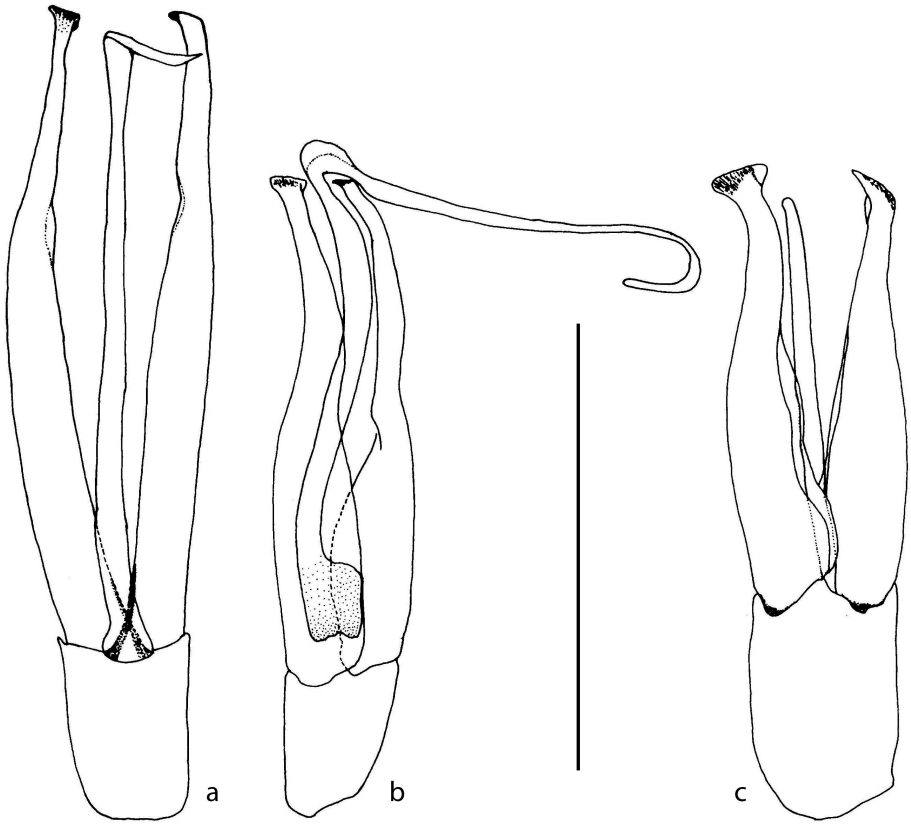

Fig. 2. – Aedeagus of *Hydrochus grandicollis* (a), *Hydrochus smaragdineus* (b) and *Hydrochus flavipennis* (c). Scale : 0.5 mm.

Aedeagophore is very characteristic of the species because of its median lobe showing a long and curved apical flagellum winding around the aedeagophore, letting the median lobe exceeds nearly the double of every paramere; the parameres are asymmetrical, the right is spatulate and the left curved toward the interior following an obtus angle (fig. 2b).

CASTRO & DELGADO (1999) considered that examination of the aedeagophore structure, particularly its median lobe ended by a short and curved flagellum, lets thinking that *H. smaragdineus* is fundamentally similar to *H. aljibensis*. The aedeagophore is easily recognizable by the flagellum proportionally shorter than the *H. aljibensis* flagellum which lets its apex in a lateral position while it surrounds the aedeagophore situating its apex behind in the case of *H. smaragdineus*.

Distribution. – South-west of Europe (southern Spain, Portugal, Corsica and South of France) and northern Africa (Morocco, Algeria) (ANGUS, 1976). It was recorded in Morocco (Rif) (BENNAS, 2002).

Habitat. – The species is encountered in the edge of small brooks with substrates formed by mud and gravel linked to vegetation (moss) (VALLADARES, 1988). The species was captured in the edges of streams and in a source brooklet with abundant submerged vegetation.

Hydrochus flavipennis Küster, 1852

Material examined. – Saboun, 28.VI.2005, 1♂, 2♀; Ghrib, 31.VIII.2005, 1♂; Ghezala, 31.VIII.2005, 1♀; Edmen, 25.V.2005, 1♀; Lebgaâ, 31.VIII.2005, 1♀; Bransia, 31.VIII.2005, 1♀, 30.IX.2005, 1♀, 30.X.2005, 1♀; Lasfer, 28.VII.2005, 1♀; Rennagha, 27.VII.2005, 1♀; Amor aval, 24.V.2005, 1♀, 27.VI.2005, 2♂, 1♀, 30.VIII.2005, 2♂, 3♀, 30.IV.2006, 1♀, 29.XI.2005, 1♂, 1♀; Amor amont, 27.VII.2005, 2♂, 1♀, 30.VIII.2005, 1♂, 29.IX.2005, 16♂, 18♀, 29.X.2005, 10♂, 21♀, 30.IV.2006,

1♂; Bouterfes, 27.VII.2005, 1♀, 30.VIII.2005, 1♀, 11.IX.2005, 1♂; Zouaraâ, 27.VI.2005, 1♀, 27.VII.2005, 1♀; Maâden, 27.VI.2005, 1♀, 27.VII.2005, 1♀, 29.IX.2005, 1♂, 2♀, 29.X.2005, 3♂, 6♀; Tamra, 24.V.2005, 1♂, 5♀, 26.VII.2005, 6♂, 14♀, 29.XI.2005, 2♂, 1♀; Magsbaya, 24.V.2005, 1♂, 1♀; Ziatine, 24.V.2005, 1♂, 1♀, 29.IX.2005, 1♂, 3♀, 30.IV.2006, 1♀; Kasseb, 29.VII.2005, 1♀; Beja, 18.VII.2005, 1♂, 12♀, 26.IX.2005, 2♂, 3♀, 24.X.2005, 2♀, 10.XII.2005, 9♂, 12♀; Ksar el Mezouar, 18.VII.2005, 1♂, 24.X.2005, 1♀, 10.XII.2005, 2♂; Joumine aval, 18.VII.2005, 1♀, 28.VIII.2005, 1♂, 24.X.2005, 1♂; Maleh, 18.VII.2005, 1♀; Kloufi, 10.XII.2005, 1♀; Douimis, 28.VIII.2005, 1♂, 26.IX.2005, 1♀; Zaouit el Magaiez, 27.XI.2005, 1♂; Lebna, 29.VIII.2005, 3♀, 23.X.2005, 1♂; Chiba aval, 26.VI.2006, 1♀ ; Chiba amont, 19.I.2006, 8♂, 1♀, 26.III.2006, 1♂, 3♀.

Diagnosis. – Length 3-3.6 mm, elongate shape, coloration varied of brown bronze and purple; head and pronotum bronze greenish shining, with deep, sparse and irregular double punctuation, not letting between it remarkable elliptic spaces, antenna and maxillary palpi brown dark; pronotum basely less contracted than in *H. smaragdineus*, with pronotal dimples slightly distinct differently to the two precedent species for the area between the depressions which is also punctuated.

Elytra dark brown with bronze reflects, interstices finely punctuated and not careened; apical orifices of elytra very narrowed. Legs dark brown with femur finely punctuated and the last tarsal segment elongate and gradually dilated toward the apex which is black and bearing fine hairs.

The aedeagophore is similar to *H. angustatus*; median lobe tubular, shorter than the parameres and without apical flagellum; parameres dissimilar, left one with spatulate apex while the right is curved toward the median lobe (fig. 2c).

Distribution. – Palaearctic; Siberia, Mediterranean lands including islands, common in Tunisia, Algeria and Morocco (ANGUS, 1976). It was recorded in Tunisia by NORMAND (1933) and BOUMAIZA (1994).

Habitat. – The species occurs in ponds with submerged vegetation, vegetated plain streams with low current. It appears in autumn and in the beginning of the summer; its disappearance can be due to the dry out of these environments (VALLADARES, 1988). The presence of the species in the studied sites is associated to the existence of a substrates comprising silt covered by sand, gravel and pebble.

DISCUSSION

This paper can be used as a reference for further works and apprehensive about the impacts of the anthropogenic activities affecting aquatic ecosystems, allowing the orientation of protection projects. Among the 51 studied sites, 30 (58.82%) contain Hydrochids with a variable frequency of distribution according to the species; *H. flavipennis* is well-spread (28 sites) differently to the two others species which are considered lowly represented in the northern Tunisia (captured in 11.7% and 13.7% of total sites). This can explain their absence in the precedent catalogues. The spatio-temporal emergence of the *Hydrochus* species shows inter-specific variability; *H. flavipennis* was captured over the year except in February and its distribution area covers all the studied area whereas *H. smaragdineus* was sampled only during four months (from July to October) and occurs essentially in the north-west part, *H. grandicollis* appears over the course of eight months (from July to February) and its distribution is locally sparse over the studied area. The habitat of *H. flavipennis* and *H. smaragdineus* is ranged "1" (running and stagnant water) whereas *H. grandicollis* occurs only in running water (type 0) as noticed by RIBERA *et al.* (2003).

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