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A new species of *Herophydrus* (Coleoptera: Dytiscidae) from Madagascar and notes on some poorly known species of the genus

Nový druh rodu *Herophydrus* (Coleoptera: Dytiscidae) z Madagaskaru a poznámky k několika málo známým druhům tohoto rodu

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Abstract. *Herophydrus travniceki* sp. nov., from the south-eastern part of the Itremo mountain range in the central Madagascar, is described. Its relevant diagnostic characters are illustrated. The new species is characterized by a unique combination of morphological characters: the male metafemur lacks a posterior expansion and the median lobe has posterior lateral ridges and a broadly dilated apspec. Moreover, an annotated species list of the genus *Herophydrus* Sharp, 1882 from Madagascar is presented. To date 11 species of *Herophydrus* are known from Madagascar. In addition, *Herophydrus variabilis secundus* Guignot, 1954 is recorded from Cameroon for the first time and its important diagnostic morphological characters are illustrated, and the following first national records are given: *Herophydrus sudanensis* Guignot, 1952 from Benin, *Herophydrus ignoratus* Gschwendtner, 1933 from Malawi and *Herophydrus pallidus* Omer-Cooper, 1931 from Zimbabwe. The occurrence of *Herophydrus gigas* Régimbart, 1895 in Malawi and Zambia is confirmed.

INTRODUCTION

The hydroporine genus *Herophydrus* Sharp, 1882 is most diverse in Africa south of the Sahara but several members of the genus also occur in southern parts of the Palaearctic and Oriental regions (Nilsson 2001, 2003). The African species of the genus *Herophydrus* were revised by Biström & Nilsson (2002), who recognised 30 species occurring in continental Africa and eight in Madagascar. Subsequently, Pederzani & Rocchi (2008) described two new species from Madagascar, raising the number of species known from the island to 10. All Madagascan species of *Herophydrus* are endemic and no continental African species are found in Madagascar.

The aim of this paper is to describe a new species of the genus, provide new distributional notes for some species occurring in Madagascar, and add new information on several poorly known species from continental Africa.

MATERIAL AND METHODS

The specimens examined during this study are deposited in the following collections:

JSCL – Collection of Jaroslav Šťastný, Liberec, Czech Republic
NMPC – Národní Muzeum, Praha, Czech Republic (J. Hájek)
NHMW – Naturhistorisches Museum Wien, Austria, Austria (M. Jäch)
MRAC – Musée Royal de L′Afrique Centrale, Tervuren, Belgium (M. de Meyer)

Label data of type material are cited in quotation marks; separate labels are indicated by double slashes (//). Label data of other material are listed in a standardized form. Comments on label data are enclosed in square brackets.

Male median lobe and parameres are illustrated in wet condition. They were studied and illustrated in temporary glycerine mounts using a Leica transmitted light microscope at magnifications of up to 40–180 ×; the genitalia were subsequently washed in distilled water and mounted in DMHF on the same card as the beetle.

Photographs of specimens were taken with a Canon EOS 550D digital camera with Canon MP-E 65 mm objective. Images of the same specimen at different focal planes were combined using Helicon Focus 5.1.19 software.

The maps of distribution (Figs 9, 14) were downloaded from Wikimedia under "creative commons" licence (Adams 2012, Bamse 2012) and adapted using Adobe Photoshop CS2.

The following abbreviations are used in the text: TL (total length), MW (maximum width) and hw (hand writing). The terminology to denote the orientation of the genitalia follows Miller & Nilsson (2003). Geographical coordinates are given in decimal notation unless cited verbatim from labels.

SYSTEMATICAL PART

Herophydrus travniceki sp. nov.
(Figs 1, 2–5, 14–16)

Type locality. Madagascar, Zafimaniry region, Itremo mountain range, cca 30 km south of Ambositra, 20°46′19.76″S 47°10′56.33″E, 1703 m a.s.l.

Type material. Holotype ♂ labelled: "MADAGASCAR, 1. 12. 2005, 30 km S of Ambositra, 20°46′19.76″S 47°10′56.33″E, 1703 m a.s.l., J. Šťastný lgt. [printed]". Paratypes Nos. 1–5 ♂♂ and 6–13 ♀♀: the same data as holotype. All specimens are provided with a red, black-framed label with the following printed text: HOLOTYPUS, or PARATYPUS [with No. and symbols for male or female], Herophydrus travniceki sp. nov., J. Šťastný det. 2009. The specimens are deposited in the following collections: Holotype and Paratype No. 6 (NMPC); paratypes Nos 1–5, 7–13 (JSCL).

Diagnosis. *Herophydrus travniceki* sp. nov. is a distinct species characterized by the following combination of characters: head frontal margin complete; male metafemur lacks posterior expansion; median lobe with posterior lateral ridges and with apex broadly dilated. Due to the unique combination of morphological characters this species does not fit into the most recent key to the African *Herophydrus* (Biström & Nilsson 2002). Externally, the new species is most similar to *H. assimilis* Régimbart, 1895 and *H. verticalis* Sharp, 1882, from which it can be separated mainly by the shape of the aedeagus and the absence of the posterior expansion of the metafemur.

Description. Body shape as in Fig. 1, oval, somewhat globular. Angle between pronotum and elytra inconspicuous but visible. Dorsal colour pattern very indistinct; paler areas indistinctly delimited and vague, somewhat variable.

Measurements (n = 14): TL 4.4–4.8 mm (holotype 4.6 mm), MW 2.5–2.7 mm (holotype 2.6 mm).

Male. Head blackish to brownish, frontally with vague ferruginous area, medioposteriorly slightly paler, dark ferruginous to pale ferruginous. Frontal outline rounded, medially slightly concave. Frontal margin quite distinct, medially fine, unbroken Fig. 5. Frontal depressions clearly visible, rather indistinctly delimited. Punctation sometimes slightly sparse on vertex, close to pronotum obliterated, somewhat irregularly distributed. Furrow provided with dense punctures presents at inner margin of each eye. Integument quite shiny, without reticulation, frons medially with irregularly shaped, very finely reticulated area. Antennae pale ferrugineous with antennomeres 5–11 apically darkened, labial and maxillary palpi pale ferruginous.



Fig. 1: *Herophydrus travniceki* sp. nov., holotype, habitus, dorsal view.
Obr. 1: *Herophydrus travniceki* sp. nov.; holotypus, habitus, svrchní pohled.

Pronotum blackish to dark ferruginous, with somewhat vaguely delimited, paler mediotransverse testaceous area. Sides slightly rounded and markedly rimmed. Punctures of almost regular size, fine to rather fine, densest basally and anteriorly. Base coarsely punctate, laterally spaces between punctures sometimes forming longitudinal ridges; mediolateral punctures sparse. Interstices shiny, without microsculpture.

Elytra black to dark ferrugineous, sometimes with minute, vague, pale ferruginous areas, forming longitudinal spots (Fig. 1). Punctation fine to rather fine, size of punctures slightly irregular but not divided into different size categories or with negligible differences between possible size categories. Discal row of punctures clearly discernible, apically disappearing; lateral and dorsolateral rows of punctures generally visible, although rather indistinct and mixed with ordinary punctation. Integument shiny, microsculpture lacking, lateral margin in apical third with very fine golden bristles in each puncture. Epipleura ferruginous to dark ferruginous, with darkened apical third, distinctly but finely and somewhat sparsely punctate, shiny and not microsculptured.

Ventral aspect. Black to dark ferruginous, genae and prosternal process pale ferruginous. Ventrites 4–6 posteriorly pale. Punctation coarse on sides of metaventrite, metacoxae and ventrites 2–4, fine to fairly coarse elsewhere; ventrite 6 fairly densely punctured. Metaventrite on each side of midline medially and metacoxal plates posteriorly impunctate. Integument shiny

and not microsculptured except vaguely delimited areas on genae and (medioposteriorly) on metacoxal plates. Prosternum setose basomedially. Posterior margins of metacoxal processes strongly sinuate and medially protruded backwards. Lateral lines of metacoxal processes very distinct, carinate, diverging anteriorly, ending far before posterior margin of metaventrite; inside metacoxal lines with strongly impressed grooves. Midline of metacoxal processes very deeply impressed over its entire length. Ventrite 6 with shallow transverse depression.

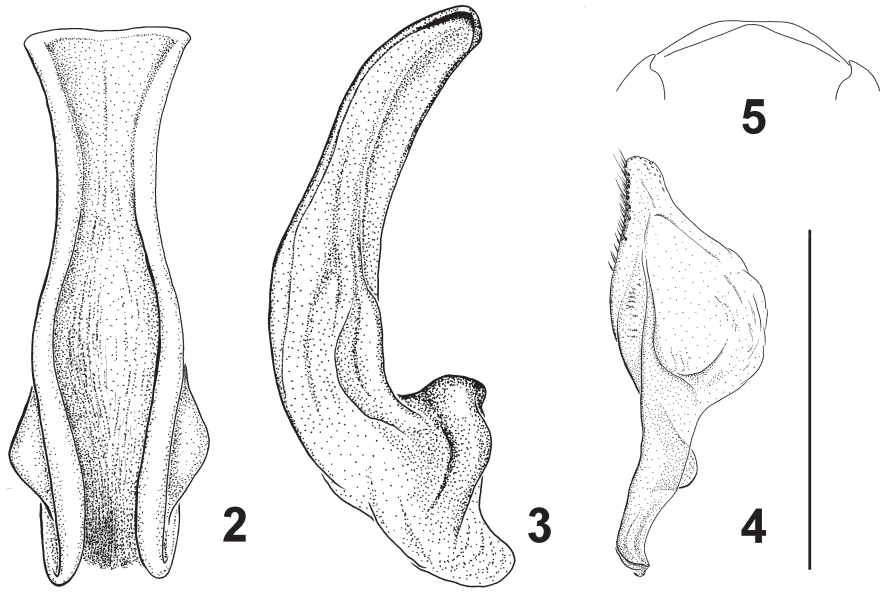
Legs pale ferruginous to ferruginous, hind legs darker. Tarsomeres and tibiae pale, femora medially darkened.

Male genitalia. Shape as in Figs 2–4. Median lobe with posterior lateral ridges and with apex broadly dilated.

Sexual dimorphism. Female externally similar to male but differing in following characters: pro- and mesotarsi more slender than in male; ventral surface mainly pale ferruginous, without darkened areas; ventrites appearing less shiny, integument finely microsculptured.

Variability. The specimens of the type series vary slightly in body size and the extent of the dorsal pale colour pattern, which can be more or less reduced.

Collection circumstances. The Itremo range, where the road No 7 runs through a mountain pass, is covered by a narrow belt of pastures and paddy fields and belongs to sparse inhabited areas of the highlands. The surrounding hilly terrain is covered by remnants of primary forest or is deforested. All specimens were collected in a small mountain valley with a pasture in shallow muddy pools connected with a slowly flowing meadow streams (see Figs 15, 16). The



Figs 2–5: *H. travniceki* sp. nov.; 2 – median lobe in ventral view; 3 – median lobe in lateral view; 4 – left paramere in external view; 5 – head, frontal outline and frontal margin (not to scale). Scale bar (0.5 mm): Figs 2–4.
Obr. 2–5: *H. travniceki* sp. nov.; 2 – penis ventralní pohled; 3 – penis boční pohled; 4 – levá paramera vnější pohled; 5 – hlava, čelní obrys a čelní obruba (bez měřítka). Měřítko (0,5 mm): Obr. 2–4.

beetles were hidden mainly in dense macrophytes in the littoral zone. They were collected together with *Hyphydrus cuppeni* Biström, 1984 (representing the second known locality of the species) and *Herophydrus verticalis* Sharp, 1882.
Name derivation. Patronymic, in honour of Dušan Trávníček, a notable specialist of aquatic beetles and my fellow traveller. The specific epithet is a noun in the genitive case.
Distribution. Only known from the type locality (Fig. 14).

Additional faunistic records of *Herophydrus* from Africa

Below, I present in alphabetical order new records and additional information on the biology of several species.

***Herophydrus gigas* Régimbart, 1895**
Material examined. Malawi: 30 km S of Mzimba, Luwawa, 30.–31.xii.2001, J. Bezděk lgt., 1 ♂ in NMPC. **Zambia**: 35 km S of Kasama, Norther, 10°30.04′S, 31°11.64′E, 1250 m, 12.–13. xii. 2009, F. Kantner lgt., 1 ♂, 2 ♀♀ in JSCL.
Note. The present records verify the occurrence of *H. gigas* in Malawi and Zambia (see Biström & Nilsson 2002).

***Herophydrus heros* Sharp, 1882**
Material examined. Madagascar: 17 km NE of Morondava, Baobabs alley, pond, 26.xi.2005, J. Šťastný lgt., 4 exs in JSCL; Fianarantsoa – Maromby, 17.xi.2005, J. Šťastný lgt., 1 spec. in JSCL; Tsiribihina river between Miandrivazo – Antsiraraka, 22.–24.xi.2005, J. Šťastný lgt., 1 spec. in JSCL; Ampamoho near Andilamena, 1200–1300 m a.s.l., 18.–20.i.1995, G. Dunay and J. Janák. lgt., 4 spec. in NHMW; Andasibe-Mantadia NP, Analamazaotra forest, 2.–14.ii.2007, M. Trýzna lgt., 1 spec. in NMPC.
Note. Additional records from Madagascar.

***Herophydrus ignoratus* Gschwendtner, 1933**
Material examined. Malawi: 30 km S of Mzimba, Luwawa, 30. –31.xii,2001, J. Bezděk lgt., 1 ♂ in NMPC.
Note. The first record from Malawi.

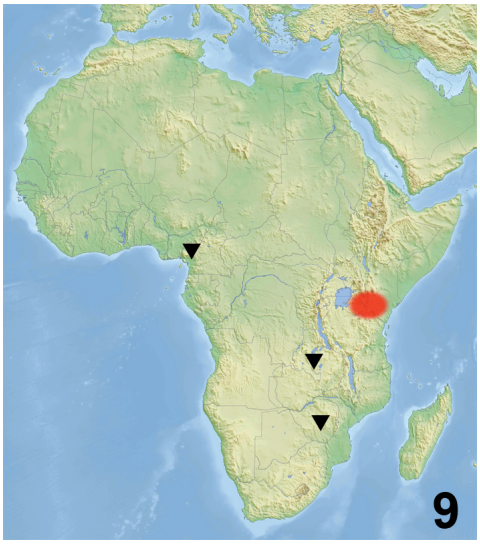
***Herophydrus pallidus* Omer-Cooper, 1931**
Material examined. Zimbabwe: 50 km E of Bindura, Nyagui riv. vall., F. Kantner lgt., 1 ♂ in JSCL.
Note. The first record from Zimbabwe.

***Herophydrus spadiceus* Sharp, 1882**
Material examined. Madagascar: 15 km SW of Ambalavao, Anja reserve, 15.xi.2005, J. Šťastný lgt., 5 exs, in JSCL; Fianarantsoa – Maromby, 17.xi.2005, J. Šťastný lgt., 1 spec. in JSCL; Andasibe (Périnet) NP, 27.x.2005, J. Šťastný lgt., 1 spec. in JSCL; Ampamoho near Andilamena, 1200–1300 m a.s.l., 18.–20.i.1995, G. Dunay and J. Janák. lgt., 1 spec. in NHMW; Toamasina Distr., Ambatoloana env., 14.–15.xi.2002, Z. Mráček lgt., 1 spec. in NMPC.
Note. Additional records from Madagascar.

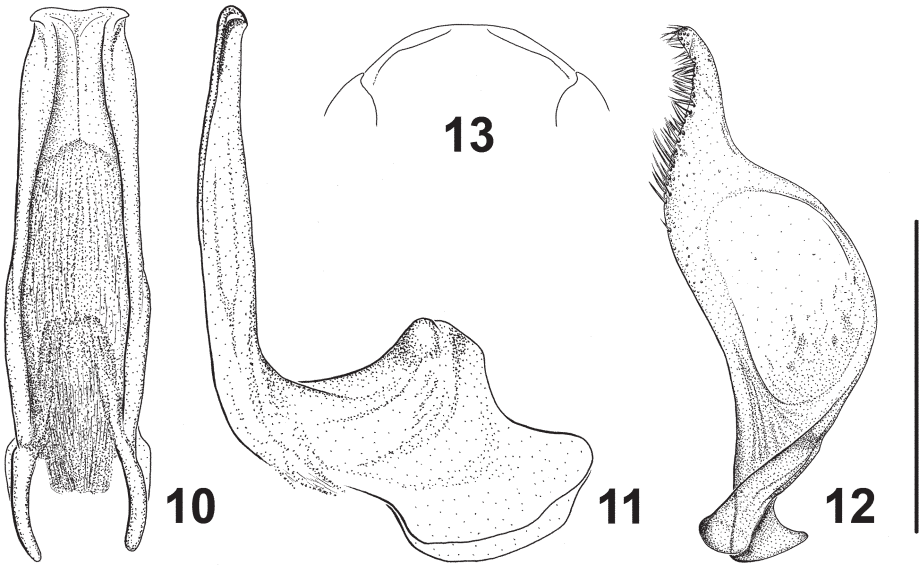








Figs 6–9: *Herophydrus variabilis secundus* Guignot, 1954; 6 – holotype; 7 – labels; 8 – specimen from Cameroon (male); 9 – map of Africa indicating known localities of *H. variabilis secundus* (triangles) and known distribution of *H. variabilis variabilis* Régimbart, 1906 (red area).
Obr. 6–9: *Herophydrus variabilis secundus* Guignot, 1954; 6 – holotypus; 7 – štítky; 8 – jedinec z Kamerunu (samec); 9 – mapa Afriky se známými lokalitami *H. variabilis secundus* (trojúhelníky) a známé rozšíření *H. variabilis variabilis* Régimbart, 1906 (červená oblast).



Figs 10–13: *H. variabilis secundus* Guignot, 1954; 10 – median lobe in ventral view; 11 – median lobe in lateral view; 12 – left paramere in external view; 13 – head, frontal outline and frontal margin (not to scale). Scale (0.5 mm): Figs 10–12.
Obr. 10–13: *H. variabilis secundus* Guignot, 1954; 10 – penis ventrální pohled; 11 – penis laterální pohled; 12 – levá paramera vnější pohled; 13 – hlava, čelní obrys a čelní obruba (bez měřítka). Měřítko (0,5 mm): Obr. 10–12.

***Herophydrus sudanensis* Guignot, 1952**
Material examined. Benin: 3 km W of Sontou, Ndali, 4.–5.vii. 2001, A. Kudrna jr. lgt., 2 ♂♂ in JSCL.
Note. The first record from Benin.

***Herophydrus variabilis secundus* Guignot, 1954** (Figs 6–9, 10–13)
Type material examined. Holotype, ♂ (MRAC): "Holotypus [pink label] // Congo belge: P.N.U. / R. Dipwa (1.900 m.) / 17-I-1948 / Mis. G. F. de Witte 1242a // coll. Mus. Congo (spec. coll. I. P. N. C. B.) // Type [red label and hw] // Dr. F. Guignot det., 1953 [53 hw] / Herophydrus variabilis ssp. secundus Guign. Type [hw]". Paratypes 2 ♂♂ (MRAC): "PARATYPUS [pink label]// Congo belge: P.N.U. / Katongo affl. Mubale / (1750 m) 12-IV-1948 / Mis. G. F. de Witte 1522a // coll. Mus. Congo (spec. coll. I. P. N. C. B.) // Dr. F. Guignot det., 1953 [53 hw] / Herophydrus variabilis ssp. secundus n. sp. [hw]"; 1 ♀ "ALLOTYPUS // Congo belge: P.N.U. / Katongo affl. Mubale / (1750 m) 12-IV-1948 / Mis. G. F. de Witte 1522a // coll. Mus. Congo (spec. coll. I. P. N. C. B.) // Dr. F. Guignot det., 1953 [53 hw] / Herophydrus variabilis ssp. secundus Guign. Allotype [female symbol] [hw]".
Additional material examined. **Cameroon**: Lake Oku, 06°12′09.1″N, 10°27′30.9″E, 2250 m a.s.l., shallow water, decaying tree leaves on bottom, 17.xi.–2.xii.2008, Martin Mikeš lgt., 2 ♂♂, 4 ♀♀ in JSCL.
Notes. The nominotypical subspecies *Herophydrus variabilis variabilis* Régimbart, 1906 was redescribed and illustrated in detail by Biström & Nilsson (2002), while the subspecies *H. v. secundus* was only briefly described and the male genitalia were not illustrated. The differences

between the two subspecies are based on external morphology of females (totally submatt and finely microsculptured in *H. v. secundus*, only entire pronotum and four apical ventrites submatt in the nominotypical subspecies), but the males are difficult to separate externally and their correct identification requires examination of the male genitalia. They differ by the shape of the median lobe viewed in lateral aspect: it is evenly but moderately curved in *H. v. variabilis* (see Biström & Nilsson 2002) and straight and narrow *H. v. secundus* (Figs 10–12). Thus the male genitalia and head frontal margin have been illustrated in this work.

I have also compared the type specimens of *H. v. secundus* with specimens recently collected in Cameroon and consider them conspecific. The species has been known from the Democratic Republic of Congo (formerly Zaire) and Zimbabwe. This first record from Cameroon extends its distribution by several thousand kilometres in the northwestern direction (Fig. 9).

***Herophydrus verticalis* Sharp, 1882**
Material examined. **Madagascar**: 30 km S of Ambositra, 1703 m a.s.l., 1.xii.2005, J. Šťastný lgt., 10 spec in (JSCL).
Note. Additional records from Madagascar.

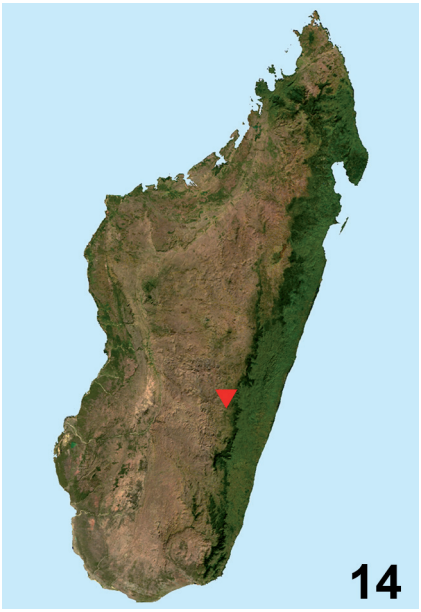
Updated Madagascan check list of the *Herophydrus*

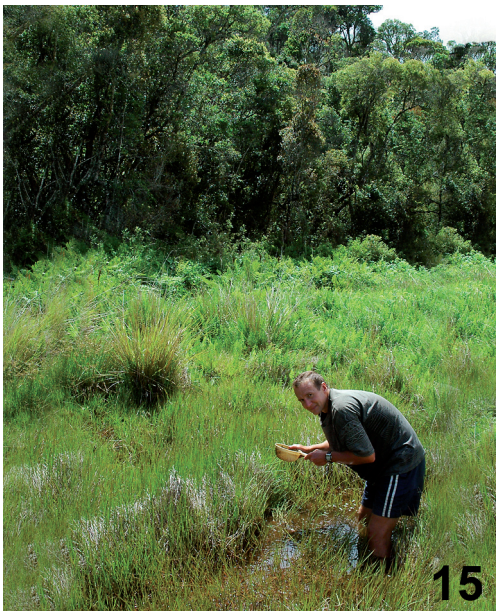
Herophydrus assimilis Régimbart, 1895
Herophydrus confusus Régimbart, 1895
Herophydrus heros Sharp, 1882
Herophydrus hyphoporoides Régimbart, 1895
Herophydrus goldschmidti Pederzani et Rocchi, 2008
Herophydrus obsoletus Régimbart, 1895
Herophydrus pauliani Guignot, 1950
Herophydrus reticulatus Pederzani et Rocchi, 2008
Herophydrus spadiceus Sharp, 1882
Herophydrus travniceki **sp. nov.**
Herophydrus verticalis Sharp, 1882

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Figs 14–16: Locality of *H. travniceki* sp. nov.; 14 – map of Madagascar indicating type locality of *H. travniceki* (triangle); 15 – habitat (showing J. Šťastný collecting the specimens); 16 – type locality.
Obr. 14–16: Lokalita *H. travniceki* sp. nov.; 14 – mapa Madagaskaru s vyznačenou typovou lokalitou *H. travniceki* (trojúhelník); 15 – habitat (J. Šťastný při sběru druhu); 16 – typová lokalita.

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SOUHRN

V práci je popsán nový druh potápníka *Herophydrus travniceki* sp. nov. z jihovýchodní části pohoří Itremo v centrálním Madagaskaru. Potápník zde obývá hustě zarostlé tůně, částečně napojené na pomalu tekoucí potok. V blízkosti typové lokality jsou zbytky primárního horského lesa.

Herophydrus travniceki sp. nov. je charakteristický druh s unikátní kombinací morfologických znaků, která jej neumožňuje začlenit do recentního druhového klíče (Biström & Nilsson 2002) sestaveného pro samce. Od ostatních madagaskarských druhů se liší kombinací následujících znaků: zadní kyčle nemají na zadním okraji zřetelný výběžek; penis má před bází přítomný postranní val a na apikálním konci je široce rozšířený.

Z Madagaskaru je nyní známo 11 druhů rodu *Herophydrus* z nichž sedm je dosud hlášeno pouze z typové lokality. Aktuální seznam všech madagaskarských druhů je součástí této práce.

V článku jsou uvedeny i další nové údaje o málo známých druzích rodu *Herophydrus*. *H. variabilis secundus* Guignot, 1954 je poprvé hlášen z Kamerunu a jsou vyobrazeny některé morfologické znaky, důležité pro jeho rozpoznání. *H. sudanensis* Guignot, 1952 je poprvé hlášen z Beninu, *H. ignoratus* Gschwendtner, 1933 z Malawi a *H. pallidus* Omer-Cooper, 1931 ze Zimbabwe. Je potvrzeno rozšíření *H. gigas* Régimbart, 1895 v Malawi a Zambii.