The water mites of the genus *Hydrodroma* (Acari, Hydrachnidia, Hydrodromidae) in Europe and Africa

REINHARD GERECKE

Institut de Systématique, Évolution, Biodiversité (ISYEB), UMR 7205 CNRS, MNHN, UPMC, EPHE, Muséum national d’Histoire naturelle, Sorbonne Universités, 57 rue Cuvier, CP 53, 75005 Paris (France)

and

University of Tübingen, Department of Evolution and Ecology, Auf der Morgenstelle 28E, D-72076 Tübingen (Germany) (current address)

e-mail: reinhard.gerecke@uni-tuebingen.de

Received 6 September 2017 | Accepted by V. Pešić: 7 October 2017 | Published online 10 October 2017.

Abstract

Neotypes are designated for *Hydrodroma despiciens* (Müller, 1776) and *H. pilosa* Besseling, 1940, lectotypes for *H. torrenticola* (Walter, 1908) and *H. capensis* (K. Viets, 1914). Diagnostic features and morphological variability of these two species, as well as of *H. torrenticola* and *H. perreptans*, are discussed. New morphological details are presented for *H. trigonometrica* Walter, 1928, *H. ocellata* Walter & Bader, 1952 (here considered a species incerta), *H. liberiensis* Cook, 1966 and *H. reinhardi* Pešić, 2002. After revision of museum collections, numerous older identifications are corrected. Concerning material from Europe, a high degree of confusion is found between *H. despiciens*, *H. torrenticola* and *H. pilosa*. For *H. despiciens*, all records from Africa, as well as species identifications from Wisconsin (U.S.A) and Argentina are rejected. This species, formerly considered cosmopolitan, is actually ascertained only from the European continent. *Hydrodroma pilosa* is recorded for the first time from Africa (Algeria). Most published records of *H. capensis* refer to other, in several cases probably undescribed species; recognized material derives exclusively from the *terra typica* in the African Cape Province. An identification key is given for the species known from Europe and Africa.

Key words: Water mites, Hydrachnidia, Hydrodroma, taxonomy, Africa, Europe, identification key, neotype, lectotype

Introduction

During early times of acarology, many species of the genus *Hydrodroma* (for a long time under the name of *Diplodontus*) or subspecies of the type species *Hydrodroma despiciens* (Müller, 1776) were described (see Wiles 1985). Later on, the opinion established that most of these were junior synonyms of *H. despiciens*. Without taking much care of character patterns and their expression in different populations, 20th century authors tended to attribute *Hydrodroma* from stagnant waters to *H. despiciens*, from running waters to *H. torrenticola* (Walter, 1908). An exception was made by Besseling (1940) who was the first to detect in European stagnant waters the existence (often coexistence) of two morphological types characterized by clearly different swimming setae patterns. However, for a long time no attention was paid to his description.
of the subspecies *H. d. pilosa* Besseling, 1940. Wiles (1985) was the first to undertake a thorough revision of the European species of the genus, based on populations from the British islands. In view of the rather similar degree of differentiation between the three taxa in question, Gerecke (1991) proposed to rank *H. pilosa* at species level. Interesting information on the biology of all three species was provided by Wiles (1982, 1985, 1987), and (for *H. pilosa*, under the old name *H. despiciens*) by Meyer (1985) and Smukalla & Meyer (1987). Finally, two further *Hydrodroma* species were detected in Europe, namely *H. reinhardi* Pešić, 2002 from Balkan and the Tyrrhenian islands (recently detected also in Russia, Yaroslavl province and Caucasus: Tuzovskij 2015) and *H. cf. rheophila* Cook, 1967 from the Greek island Lesbos (Pešić et al. 2010). From Africa, in addition to numerous records of *H. despiciens* from all parts of the continent, the following species were reported: *Hydrodroma perreptans* (K. Viets, 1913) (Cameroon, Liberia, East Africa); *H. capensis* (K. Viets, 1914) (South Africa, reported northwards as far as the Sahara and also from Madagascar); *H. trigonometrica* Walter, 1928 (Cameroon, Algeria), *H. ocellata* (Walter & Bader 1952) (East Africa), *H. liberiensis* Cook, 1966 (Liberia) and *H. zokhzovi* Tuzovskij, 2014 from Ethiopia.

In the course of a taxonomic study on Hydrodromidae from Madagascar, I came across with several basic questions concerning species definitions and determinations of former authors. During the attempt to redescribe *Hydrodroma capensis*, it became clear that numerous additional taxonomic uncertainties required a revision. The results of these studies are presented in this paper. A brief presentation of the family and genus is followed by a treatment of the European and African species, in the sequence of their description year.

**Material and Methods**

For morphological verifications and measurements, selected specimens were slide-mounted, partly in glycerine jelly, partly in Koenike fluid. However, during the work process it became clear that important character states such as integument structure and leg setation in *Hydrodroma* can easily be verified in undissected specimens. Even, possibly important features such as shape and distance of lateral eye lenses is best observed in fresh material while these characters are frequently lost in mounted specimens.

The following abbreviations are used:

- Ac – acetabulum
- Cx-I-IV – coxae I to IV
- FMC – Field Museum Chicago
- H – height
- I-IV-L-1-6 – legs I to IV, segments 1-6
- L – length
- NHMB – Naturhistorisches Museum Basel
- P-1-5 – palp segments 1-5
- SMF – Senckenberg Museum Frankfurt
- SMNH – Swedish Museum of Natural History
- W – width

**Results**

**Family Hydrodromidae**

The family Hydrodromidae is an isolated clade in the Hydryphantoidea. In addition to the doubtful genus *Oxopsis* Nordenskiöld, 1905, known from a single specimen collected in Sudan (see Cook 1974), representatives, recorded from all continents except for Antarctica, are very similar in general idiosoma shape and attributed to one single genus, *Hydrodroma*.

Concerning many features of idiosoma and gnathosoma, hydrodromids are characterized by a high degree of homogeneity. In the following, important character complexes are briefly surveyed - for a diagnosis of the family, see Di Sabatino et al. (2010):
1. Idiosoma integument completely soft. Except for appendages, gnathosoma, sclerotized coxal and genital plates and the unpaired excretory pore, no external sclerotization (e.g., muscle insertions, dorsal or ventral plates, secondary sclerite borders) is developed (Figs 1 A-B). The lateral eye lenses lie free under the integument and are not enclosed in capsules (Fig. 1 A) - in contrast to most other water mites families.

2. The uppermost layer of the integument is characterized by dense papillosity. In a deeper stratum, a fine net of meshes is formed (Schmidt 1935): in top view, six finely sclerotized bars extend from the base of each papilla to form a network of equilateral triangles. Each meeting point of these lines is positioned below the tip of one of six surrounding papillae (Fig. 1 D). Formation of the integument provides important information for species distinction: Papillae may differ in shape species-specifically, and they can be homoiomorphic (of one type) or heteromorphic (forming a pattern of two different types). In species with heteromorphic papillae, every large papilla is surrounded by six small papilla-like elevations, resulting in a honeycomb-like structure in top view (Fig. 2 B).
3. The genital field is rather uniform and without distinct sexual differences. Paired, movable halfmoon-shaped plates bear a rather high number of undifferentiated, small and round acetabula and medially several rows of fine setae (Fig. 1 B). In general, females tend to have larger genital plates and higher numbers of acetabula, but with a broad overlap in variability range (Wiles 1985). Fine sexual differences in setation were found by Meyer (1983) in *H. pilosa* (sub nom. *H. despiciens*: male with > 45 pairs, seta L generally > 100 µm; females with < 45 pairs, setae generally < 100 µm) and by Wiles (1985) in *H. despiciens* (male: all setae hollow; females: posterior as in males, anterior setae solid, flat, best visible under phase contrast).

4. Legs are rather uniform and, except for differences in segment size, without sexual characteristics. All leg claws are rather simple, sickle shaped, with a fine dorsal clawlet, but without denticulation or a claw blade. Differences between species may be found in the absolute and relative size of claws (larger in stream dwelling species), proportions of legs segments (stouter in stream dwelling species) and, in surprisingly stable species-specific patterns, number and arrangement of long, fine swimming setae. In addition, arrangement and shape of other leg setae, in particular those at distal margins of leg segments 3-5, may provide character states useful for species recognition.

5. Morphology of mouthparts, in particular setation of palps, have often been highlighted in earlier species descriptions, but such characters are often difficult to verify. A very distinct character state of all *Hydrodroma* species is the very long dorsodistal extension of P-4 (Fig. 1 C). The fact that palp segments are weakly sclerotized, with P-2-4 often strongly movable against each other, results in a considerably wide range of measurement values. In the case of the European species, the shape of gnathosoma and its appendages is of limited value for species discrimination (Wiles 1985).

**Hydrodroma despiciens** (Müller, 1776)
(Figs 2 A-F)

**Type series:** Neotype, here designated: ♂, SMNH, Denmark, Coll. Lundblad, NHRS-GULI 000046050, Själland, Gribsø, 19.04.1919 in Koenike fluid. Paraneotypes: Same site and date, 1 ♀ in Koenike fluid; 1 ♂, 1 ♀ slide mounted in Hoyers medium.

**Material examined:** NHMB 1339, unclear origin, "I E 2.d XXX/29" 1 ♂, 1 ♀; SMNH, Denmark, Coll. Lundblad, NHRS-GULI 000046050, Själland, Funkedamm, 25.04.1919 1 ♂, 2 ♀, slide mounted Gerecke 2017; GULI 000046049, Själland, torygrav v. Arresö, 23.05.1919, 5 ♀, slide mounted Gerecke 2017 (together with 1 ♂, 3 ♀ *H. pilosa* in the same tube, undissected in Koenike fluid). SMF, Germany, 43905, Holstein, Trammer See, 9.8.1918, Viets leg. 2519; "Puppe; Type", 1 dn; 51136, Vehne-Bach an Querung Küstenkanal bei Feddeloh II, Oldenburg-Land, 20.7.1946, 225, 1 ♂; 51137, ditto, 226, 1 ♂, 1 dn; 51138, Oberneuland bei Bremen, Karl Viets leg. 10.6.1907, 342, 1 ♀; Spain, 43902, Ibiza, Rio S. Eulalia, Margalef coll. 7102, 1 ♂ [bad state of conservation].

Rejected identifications (labelled as "*Hydrodroma despiciens*":)

A) *Hydrodroma pilosa* (see there): Specimens from NHMB (Algeria, Turkey, Switzerland); SMF (Germany, Spain, Sweden) and SMNH (Denmark).

B) *Hydrodroma cf. americana* Marshall, 1926 [characteristic in elevated posterior swimming setae number on II-L-5, see data for *H. americana* in Wiles 1986] FMNH, U.S.A., Wisconsin, Mirror Lake, Delton. Mis, 8-28-19 Young, numerous specimens - 1 ♂ slide mounted Gerecke; Wisconsin, Green Lake, Delton. Mis, near Concrete bridge, July 23-24 1921; "1-1, 1; 7-11, 8, 7-2.21 (& on slide)" "Aug 1921 (Juday, Baker)" "Bartmouch Bay 2 Juday", numerous specimens - 1 ♂ slide mounted Gerecke.

C) *Hydrodroma torrenticola* (see there): SMF Spain, 43891, ♀; N Germany, 51136-37, 2 ♂; S Germany, 51139, ♂.

D) Uncertain, possibly undescribed species: FMNH, Liberia, DC 80, ♀ [generally lower swimming setae numbers on all leg segments, larger leg claws]. SMF, Kamerun, 43888, ♀; Madagascar, 51146, ♀; SMNH, Uganda, 43339-40, 2 ♀ [higher Ac numbers (85-105 pairs, 7-9 per transect)].
Figure 2. A-D: Hydrodroma despiciens, neotypes, Denmark. A. male, integument papillae near lateral eye in tangential view; B. male, integument in top view; C. male, anterior coxal plate with medial setal tubercles on Cx-I; D. female, genital field; E. female, integument in tangential view; F. male, chelicera.
Diagnosis: Integument papillae of two types: Main papillae longish, apically rounded, each surrounded by six very flat elevations in top view forming a hexagonal pattern (Figs 2 A-B). Coxal setation: Cx-I medial setae in a curved line on elevated projections, in anterior part directed ventrally, in posterior part medially (and therefore visible as prominent elevations in ventral view, Fig. 2 C, lower part); groups of 4 (3-5) distal tip setae at Cx-I and Cx-II, a group of densely arranged posteralateral setae at Cx-II. Coxal plate Cx-III+IV with strong, elongated anterior and posterior apodemes parallel to the median axis. Genital plates enlarged, with 45-65 pairs of Ac, maximum number per transversal transect 4-7 (males 4-5) and 30-50 pairs of medial setae (Fig. 2 D). Legs with relatively short claws (mean L in males 27-29, in females 29-30, ratio claw L/segment 5 L 8-12 %). Leg segments relatively slender (e.g., L/H I-L, 3.2-3.6; I-L, 5.2-6; II-L, 4.3-4.9; III-L, 4.2-5.2; III-I, 5.9-7.3; IV-I, 5.4-6.7; IV-I, 6.8-8.9; swimming setation (anterior/posterior): II-L (5/1); III-I-L (0/7-13); III-L (0/6-11); IV-I-L (9/14-18); IV-I-L (0/6-10).

Description:
Both sexes: Colour red, rarely orange. On each side, lateral eye lenses far distanced (> 100 μm), anterior lens round (diameter 40-50), posterior lens oval (length 40-50, width 30-45). Shape of mouthparts, coxae and excretory pore, and setation of palps as typical in most species of the genus, sexual differences very weakly developed (in general, smallest males and females similar in measurements, largest females distinctly larger than largest males, but sexes similar in proportions range); chelicera with little curved claw (Fig. 2 F). L ratio P-2/P-4, 0.4, P-4/P-5, 2.1-2.4. No sexual differences in total setae numbers: Cx-I, 20-28; Cx-II, 17-25; Cx-III, 15-22; Cx-IV, 19-22; swimming setae II-L, 1; III-L, 7-13; III-I-L, 6-11; IV-I-L, 19-26; IV-I-L, 7-10.

Measurements [where informative, mean values in angular parentheses]: Males: Idiosoma L/W 1170-1230/100-1100; L/W Cx-I+II, 270-320/160-216, Cx-III+IV, 270-305/280-325; genital plate 189-250/100-112 [230/104], Ac pairs n 45-65, genital setae pairs n 30-50; ejaculatory complex L/proximal chamber W 190-210/58-63, anterior arms W 160; gnathosoma L/W 210-230/140-150; chelicera L 319-337, basal segment/claw ratio 3.2-4.1 [3.6], L/H ratio 4.3-5.0; palp total L 429-456, L/H ratio (relative L %) P-1, 0.77-0.8 (10-11); P-2, 1.32-1.38 (17); P-3, 0.83-0.95 (10-11); P-4, 4.13-4.20 (41-43); P-5, 4.05-5.00 (19-20). L/H (ratio in parentheses) I-L, 4, 171-195/51-60 (3.3-3.4); I-L, 5, 238-270/45-50 (5.2-5.7); II-L, 4, 247-300/56-63 (4.4-4.8); II-L, 5, 305-350/45-55 (6.4-6.9); III-L, 4, 233-285/49-55 (4.6-5.2); III-L, 5, 292-330/45-53 (6.0-7.0); IV-I-L, 314-370/54-60 (5.7-6.2); IV-I-L, 132-380/40-50 (7.5-8.3).

Females: Idiosoma L/W 1000-1600/1000-1400; L/W Cx-I+II, 275-337/170-250, Cx-III+IV, 280-337/290-364; genital plate 198-265/100-117 [227/109], Ac pairs n 50-70, genital setae pairs n 30-38; egg diameter 120-180; gnathosoma L/W 225-260/139-170; chelicera L 314-409, basal segment/claw ratio 4.1-6.1 [4.7 - claw relatively shorter than in males!]. L/H ratio 3.9-5.5; palp total L 431-468, L/H ratio (relative L %) P-1, 0.73-0.92 (10-12); P-2, 1.24-1.43 (17-19); P-3, 0.63-0.91 (9-11); P-4, 3.84-4.33 (42-44); P-5, 3.86-4.50 (18-20), L/H (ratio in parentheses) I-L, 4, 170-235/54-65 (3.2-3.6); I-L, 5, 238-320/40-58 (5.5-6.0); II-L, 4; 265-355/54-75 (4.3-4.9); II-L, 5, 319-420/47-63 (5.6-7.6); III-L, 4, 251-330/54-68 (4.2-4.9); III-L, 5, 292-400/40-58 (6.3-7.3); IV-I-L, 3, 320-435/54-60 (5.4-6.7); IV-I-L, 4, 377-410/38-60 (6.8-8.9).

Discussion: Hydrodroma despiciens was first described by Müller (1776) from Denmark under the genus name Hydrachna and has been often misunderstood since then. The designation and detailed description of a neotype is the precondition to give taxonomic stability to Hydrodroma despiciens. The original description does not provide information on a potential type locality and I decided to select the neotype from the material collected by O. Lundblad in 1919 in the terra typica. Denmark. As typical for the consideration of this species at his time, as an ubiquist ("eurythermal, cosmopolitan"), Lundblad (1920) restricted locality information in his paper on the material in question to "generally present at all investigated sites". No collecting site list is given in Lundblad (1920), and the locality records had to be copied from his handwritten labels. From the list of studied material above it becomes obvious that K. and K.O. Viets, as well as Lundblad did not take care of Besseling's taxonomic work and confused frequently H. despiciens and H. pilosa, K. Viets misunderstood occasionally also H. torrenticola.

In their revisional work on Australian Hydrodroma, Pešić & Smit (2007a, b, 2011) demonstrated the absence of H. despiciens from this continent and described populations previously attributed to this species
as *H. cooki* Pešić & Smit, 2007. From a comparison between measurements taken from populations collected in Argentina attributed to *H. despiciens* by Cook (1980), and the data presented here and elsewhere for European populations (e.g. Wiles 1985, Tuzovskij 2015) results that also the Latin American records require revision: Specimens from Argentina represent probably an undescribed species different from *H. despiciens* in distinctly shorter palp and leg segments and lower numbers of swimming setae.

In addition to *H. capensis*, in the covered area three further species are characterized by IV-L-5 lacking anterior swimming setae, namely *H. liberiensis*, *H. reinhardi* and *H. zhokzovi* (see below).

**Biology and distribution:** On the base of the set of diagnostic character states listed above, *H. despiciens* is defined as a stenotopic stagnant water species, characterized by leg claws relatively reduced in size (as compared with the rheophilic *H. torrenticola*), but clearly differing from *H. pilosa* with its generally higher swimming setae numbers.

For a long time, *H. despiciens* was considered a rare example of a water mite species with a nearly cosmopolite distribution, but its actual geographical distribution is unclear. The revision of available material shows that it is widely distributed in Central and Northern Europe, probably more scattered in the Mediterranean area. It is highly probable that it is completely absent from the African continent – as also Walter confused *H. despiciens* with *H. pilosa* (see there for data from Algeria), a record from Burkina Faso (Walter 1935) is highly improbable and not documented by collection material. As the attribution to *H. despiciens* was found erroneous for revised material from North America, as well as for the records published from Argentina, the presence of *H. despiciens* in the New World is at all questionable. All American populations, partly attributed to *H. despiciens*, partly described as 5 subspecies of that species, require taxonomic revision. The same is true for all records from Asia – Walter (1929) and later Wiles (1986) defined *H. monticola* Piersig, 1896, first published from Indonesia as a subspecies of *H. despiciens*, as a separate species, and no record of *H. despiciens* is ascertained from this continent.

**Hydrodroma torrenticola** (Walter, 1908)
(Figs 3 A-D)

**Type series:** Lecotype ♂, here designated, NHMB, on two slides: "*Diplodonthus torrenticolas* ♂ Walter Neapel 10.9.1907 Coll. Steinmann" "1355 TYPUS leg. Steinmann [overpasted: Quelle bei Sarno, Neapel, 10.9.1907] V/24" [idiosoma]; same inscription, but "1356, V/25" [gnathosoma]; paralecotype ♂, same inscription, but "1354, V/13" [only idiosoma].

**Material examined:** NHMB, Switzerland, 1357 ♀ Walter, leg. Wacker Vierwaldstättersee b. Vitznau, 10-7 m tief, 16.2.13; 1358-1359 Emmenborn, Vierwaldstättersee coll. Rohrer 1973, ♂, ♀, on two slides; SMF, Germany, HEsta Heiligenrode, Klosterbach (DS), Staubereich, 52°58’55’’N 08°42’25’’E, 15 m, Gerecke & Wohltmann 15.08.2010, DFG-Projekt K.Viets, 6 ♂♂, 2 ♀♀; SMF 51136-37, "*H. despiciens*", Oldenburg-Land, Vehme, 20.07.1946, 226, 2 ♂ ♀; 51139, "*H. despiciens*", Pegnitz bei Düsselbach, Pegnitztal, Nordbayern, H.-J. Stammer leg. 16.9.1949, 1035, 1 ♂; Spain, "*H. despiciens*", 43891, 1 ♀.

**Diagnosis:** Integument papillae of two types: Main papillae longish, apically rounded, shorter than in *H. despiciens*, upright or slightly curved in posterior direction (Fig. 3 B), each surrounded by six flat elevations in top view forming a hexagonal pattern (Fig. 3 A, C), in tangential view surrounding elevations pointed (Fig. 3 A, lower part). Coxal setation: Cx-I medial setae not inserted on elevated projections (thus medial margin of Cx-I smooth, Fig. 3 D); groups of 4-6 distal tip setae at Cx-I and Cx-II, a group of densely arranged posterolateral setae at Cx-II. Coxal plate Cx-III+IV with blunt posterior apodemes at 45° to median axis. Genital plates rather slender, with 45-70 pairs of Ac, maximum number per transversal transect 4-6, and 32-53 pairs of medial setae. Legs with relatively long claws (mean L in males 45-53, in females 33-60, ratio claw L/segment 5 L 11-18 %). Leg segments relatively stout (e.g., L/H I-L-4, 2.9-3.3; I-L-5, 4.5-4.8; II-L-4, 3.8-4.2; III-L-4, 3.9-4.2; III-L-5, 5.5-6.0; IV-L-4, 5.3-5.7; IV-L-5, 6.5-7.3; swimming setation (anterior/posterior): II-L-5 (0/1); III-L-4 (0/5-9); III-L-5 (0/4-7); IV-L-4 (7/10-7/11); IV-L-5 (3-4/4-8).

**Description:** Both sexes: Colour orange to brown, rarely red. On each side, lateral eye lenses far distanced (> 100 µm), anterior lens rounded (diameter 50-70), posterior lens oval (length 60-70, width 40-55). Shape of mouthparts,
coxae and excretory pore, and setation of palps as typical in all species of the genus, sexual differences very weakly developed. L ratio P-2/P-4, 0.38-0.44, P-4/P-5, 2.2-2.5. No sexual differences in total setae numbers: Cx-I, 20-30; Cx-II, 22-34; Cx-III, 14-23; Cx-IV, 14-26; swimming setae II-L-2, 1; III-L-4, 5-9; III-L-5, 4-7; IV-L-4, 15-20; IV-L-5, 7-11.

Measurements: Males: Idiosoma L/W 1340-1450/1000-1350; L/W Cx-I+II, 315-347/180-252, Cx-III+IV, 293-338/315-356; genital plate 239-266/90-153, Ac pairs n 45-58, genital setae pairs n 32-53; ejaculatory complex L/proximal chamber W 225-234/72-77, anterior arms W 225; gnathosoma L 225-248; chelicera L 302-342, basal segment/claw ratio 3.9-4.6, L/H ratio 5.6-6.3; palp total L 428-459, L/H ratio (relative L %) P-1, 0.89-1.08 (11-14); P-2, 1.21-1.48 (16-18); P-3, 0.80-1.00 (10-12); P-4, 4.21-4.47 (40-44); P-5, 3.89-4.50 (17-18). L/H (ratio in parentheses) I-L-4, 194-225/68-77 (2.8-3.3); I-L-5, 261-288/56-63 (4.5-4.7); II-L-4, 266-315/68-81 (3.7-4.5); II-L-5, 320-360/59-63 (5.5-5.9); III-L-4, 261-297/63-72 (3.9-4.1); III-L-5, 320-347/54-63 (5.5-6.0); IV-L-4, 380-453/70-80 (5.3-5.5); IV-L-5, 405-450/60-68 (6.7-7.2).

Females: Idiosoma L/W 1460-1570/1340; L/W Cx-I+II, 369-383/266-279, Cx-III+IV, 374/369-383; genital plate 225-261/90-117, Ac pairs n 54-70, genital setae pairs n 25-40; egg diameter 115-180; gnathosoma L 292; chelicera L 387, basal segment/claw ratio 4.1, L/H ratio 5.4; palp total L 466-500, L/H ratio (relative L %) P-1, 0.83-0.93 (12-13); P-2, 1.25-1.29 (16-17); P-3, 0.85-1.00 (10-12); P-4, 4.13-4.57 (41-43); P-5, 4.00-4.78 (17-19). L/H (ratio in parentheses) I-L-4, 175-239/58-81 (2.9-3.0); I-L-5, 240-315/50-68 (4.6-4.8); II-L-4, 240-342/58-86 (3.8-4.2); II-L-5, 300-405/50-72 (5.6-6.0); III-L-4, 230-333/55-81 (3.9-4.2); III-L-5, 285-392/48-68 (5.7-6.0); IV-L-4, 315-505/55-90 (5.4-5.7); IV-L-5, 330-500/45-75 (6.5-7.3).

Figure 3. Hydrodroma torrenticola, Germany, Heiligenrode. A-C. male, integument papillae; A, C, in top view, B in tangential view; D. male, anterior coxal plate.

Discussion: The original description was based on several specimens ("einige Exemplare"), obviously of both sexes. Only the above mentioned two specimens are found in the slide collection of NHMB, but the
existence of further tube material with syntypes cannot be excluded. The lectotype male 1355/56, most probably used for the species description, is designated here in order to give taxonomic stability for the species. Walter (1908) gave a very detailed discussion of the character states of this species in comparison with *H. despiciens*. In agreement with his interpretation, important diagnostic features are: (1) rounded, less extended integument papillae (the presence of two types of papillae is well visible in the paralectotype, the integument of the lectotype is poorly visible due to desiccation); (2) medial setae on Cx-I not inserted on projections; (3) leg segments stouter (as documented in many L/H ratio data listed above); (4) leg claws relatively stronger (as documented by the claw L/segment 5 L ratio data above). A further characteristic feature mentioned by Walter is the reduced number of swimming setae. However, if the variability of larger numbers of specimens is considered, swimming setae numbers may overlap. As first stated by Wiles (1985), the most important difference in this regard is not a reduction, but an increase: The anterior face of IV-L-5 bears 3-4 swimming setae in *H. torrenticola*, but it is completely lacking such setae in *H. despiciens*. If variability ranges in populations of both species are considered, several measurements in the original description retained important for recognizing *H. torrenticolus* become insignificant: The two species overlap in size of chelicera and palp segments as well as genital plates, and they agree also widely in the number of acetabula.

**Biology and distribution:** First described from a spring near Naples, *H. torrenticola* is obviously widely distributed in Mediterranean streams (e.g. Gerecke 1991). The morphological variability of populations from Central Europe (data above and Wiles 1985), the British Isles (Wiles 1985) and Russia (Tuzovskij 2015) show no remarkable deviations from the original description and other mediterranean material. The species is thus widely distributed in Europe, but does not extend to Fennoscandia.

**Hydrodroma perreptans** (K. Viets, 1913)

((Figs 4 A, C-E)

**Type series:** Holotype (sex not defined, palp measurements suggesting ♀) Cameroon, SMF 43924, "Joh. Albrechts-Höhe, Bach b Mundame Kumba 24.9.1911 Damköhler leg. 1175", "Hydrodroma perreptans Viets. Type". State: Specimen widely lost, only one palp and one terminal leg segment left.

**Material examined:** SMF Zimbabwe, 51185 "Chimaninani Mountain Nt. Park. East South Rhodesia. Stream from Mt. Binga, Sign. S.R.E. 19 C. Harrison leg. 13.5.1963 3896", 1 ♀; SMNH Kenia, 43334, "Mt. Elgon, Kaptega River", 1 ♂; 43335, Kenia, "Nyeri, Chania River", 1 ♂; FMNH Liberia, DC 87, no label, 1 ♀.

**Diagnosis** (widely based on the female specimen from Liberia): Integument papillae heterogeneous: bluntly pointed larger papillae surrounded by six small, little prominent elevations (Figs 4 D-E). Coxal setation: Cx-I medial setae not inserted on elevated projections, medial margin of Cx-I smooth; groups of 6-7 long distal tip setae at Cx-I and Cx-II, 8 densely arranged posterolateral setae at Cx-II and –III each. Coxal plate Cx-III+IV with blunt, medially directed anterior and posterior apodemes. Genital plates with 45-70 pairs of Ac, maximum number per transversal transect 5-6, and 25-30 pairs of medial setae. Legs with long claws (L > 40, ratio claw L/segment 5 about 20 %), segments relatively stout (e.g., L/H III-I, 4.1-4.7; III-L-5, 5.4-6.6; IV-L-4, 4.7-6.0; IV-L-5, 7.0-7.3); swimming setation extremely reduced (anterior/posterior): II-L-5 (0/0); III-L-4 (0/1-2); III-L-5 (0/1); IV-L-4 (0/1); IV-L-5 (0/1).

**Description:**

Both sexes: Colour undescribed. Lateral eyes with posterior lens distinctly smaller than anterior one (Fig. 4 A). Palp: Fig. 4 C; L ratio P-2/P-4, 0.4, P-4/P-5, 2.3-2.5. Total setae numbers Cx-I, 19; Cx-II, 25; Cx-III, 18; Cx-IV, 17.

**Measurements:** Male (SMNH 43334 [palp of type]): Idiosoma L/W 950/750; lateral eye anterior lens diameter 45, posterior lens L/W 45/20; L/W Cx-I+II, 240/170, Cx-III+IV, 270/245; genital plate L 210, Ac pairs n 70, genital setae pairs n 30; ejaculatory complex L/proximal chamber W 155/50; gnathosoma L 165; chelicera L 213, basal segment/claw ratio 3.4, L/H ratio 4.3; palp total L 358, L/H ratio (relative L %) P-1

Ecologica Montenegrina, 13, 2017, 1-24
WATER MITES OF THE GENUS HYDRODROMA IN EUROPE AND AFRICA

0.84 (11) [lacking in type]; P-2, 1.39 (17) [1.25 (17)]; P-3, 1.19 (13) [1.07 (13)]; P-4, 4.46 (41) [4.45 (41)]; P-5, 3.57 (17) [4.00 (17)]. L/H (ratio in parentheses) I-L-4, 170/50 (3.4); I-L-5, 200/40 (5.0); II-L-4, 205/53 (3.9); II-L-5, 235/40 (5.9); III-L-4, 200/48 (4.2); III-L-5, 230/40 (5.8); IV-L-4, 255/50 (5.1); IV-L-5, 265/40 (6.6).

Females (FMNH DC 87, SMF 51185, SMNH 43335): Idiosoma L/W 900-1100/750-900; lateral eye anterior lens diameter 52-55, posterior lens L/W 50/30; L/W Cx-I+II, 240-290/160-210, Cx-III+IV, 240-310/210-290; genital plate 185-220/210-220, Ac pairs n 45-60, genital setae pairs n 25-28; egg diameter 100; gnathosoma L 175-185; chelicera L 225, basal segment/claw ratio 3.5-4.0, L/H ratio 5.0-5.6; palp total L 335-425, L/H ratio (relative L %) P-1, 0.81-1.00 (11-13); P-2, 1.25-1.39 (17-18); P-3, 0.91-1.12 (12-13); P-4, 3.89-4.50 (40-41); P-5, 3.33-4.40 (16-18). L/H (ratio in parentheses) I-L-4, 170-240/50-70 (3.4); I-L-5, 223-300/45-55 (4.9-5.5); II-L-4, 210-325/50-68 (4.2-4.8); II-L-5, 250-358/30-55 (6.5-8.3); III-L-4, 185-305/45-65 (4.1-4.7); III-L-5, 215-345/40-53 (5.4-6.6); IV-L-4, 215-390/45-65 (4.7-6.0); IV-L-5, 280-400/40-55 (7.0-7.3).

Figure 4. A. Hydrodroma perreptans, Liberia, female, lateral eye; B. H. ocellata, holotype male lateral eye; C-E. Hydrodroma perreptans, Liberia, female; C. Combined after original description and various slides, palp; D. integument in top view; E. integument in tangential view; F. H. ocellata, holotype male, integument in top view.
Discussion: This species was described after a single specimen of uncertain sex which is now widely lost, and there is no other material authorized by K. Viets. Most of the few specimens available from museum collections derive from areas far distant from the type locality – in a geographical sense the closest specimen comes from Liberia (FMNH). *Hydrodroma perreptans* is extremely characteristic and cannot be confused with any species of the genus due to the widely reduced swimming setation. The specimens brought here together are surprisingly similar in important characters states and, as far as can be judged from the original description, in good agreement with the lost type specimen. Strong size differences between the small specimen from Liberia and the rather large one from Zimbabwe could result from intraspecific variability (observed to a similar degree in *H. pilosa* by Roy Wiles, pers. comm.), or indicate cryptic diversity.

Biology and distribution: As almost suggested by K. Viets (1914), the particular morphology of this species can be interpreted as an adaptation to life in running waters. The scattered records suggest a rather wide distribution in West, East and South Africa.

*Hydrodroma capensis* (K. Viets, 1914)

(Figs 5 A-E)

**Type series:** Lectotype, here designated: ♂, SMF, South Africa, Coll. K. Viets, 43904, "*Hydrodroma despiciens capensis* (Viets) TYPE"; "Kapland, Vley b. Lakeside, 28.7.1903. D. Südpolar-Expedit. 1687". Status: Idiosoma undissected, partly damaged and folded, containing several eggs; legs *in situ*; gnathosoma separate, palps and chelicerae detached, one palp lateral, the other lacking, one chelicera lateral, one visible dorsoventrally. Parallectotype: ♂, SMF, 43903, label as for lectotype, "1686". Status: Idiosoma dissected (dorsal integument separated), no eggs conserved; left I-L-2-6 and IV-L-4-6 detached, other legs *in situ*; gnathosoma separate, gnathosomal base destroyed, palps and chelicerae detached, under a separate cover slide, in partly dried mounting medium with precipitated droplets.

**Material examined:** SMF, coll. Viets, S Africa 43882, Cape Town, Firgrove, 8.1.57, 2 ♂♂; 43883, Firgrove 1. River Estuary, 13.1.57 Harrison 8034, 1 ♂, 1 ♀.

Rejected identifications (all labelled "*Hydrodroma capensis*"):

(A) populations from Congo similar in integument papillosity and II-L-5 setation, but distinctly major in size and with higher Ac number: NHMB, Rwanda, 28.11.1985 Coll. Kongo 8, 1330-1336, 1338, 6 ♂♂, 2 ♂♀ {1337: *Limnesia* sp. 1 ♀ with wrong label "*Hydrodroma capensis*", same site and date; SMF, Congo, 51154-55, Lake Kivu, 27.2.1972, 1 ♂, 1 ♀; SMNH, coll. Lundblad, Congo, 43337-38, Voithshumbi, 2 ♂♂; 44002-03, Congo, "315", 1 ♂, 2 ♂♀ Madagascar, 51141, 1 ♀.

(B) populations differing also in integument structure and II-L-5 setation: SMF, coll. Viets, Madagascar 51126, 51140-41, 1 ♂, 2 ♀♀; S Africa, 51142-45, 2 ♂♂, 2 ♀♀; Central Sahara, 43876, 1 ♂; Zimbabwe, 51153, 1 ♀; SMNH, coll. Lundblad, Congo, 44003, Congo, 3 ♂♂; 44000-01, 44003-04, 9 ♂♀; Madagascar, 43329, 1 ♀.

**Diagnosis:** Integument papillae uniform, longish, apically rounded, slightly curved in posterior direction, at light microscope no surrounding elevations visible (Figs 5 C-D). Coxal setation: Cx-I medial setae on only slightly elevated projections, in a weakly curved line, in anterior part directed ventrally, in posterior part medially (and thus visible as obtuse angled projections in ventral view); groups of 3-4 distal tip setae at Cx-I and Cx-II, a group of densely arranged posterolateral setae at Cx-II (Fig. 5 A). Coxal plate Cx-III+IV with strong, elongated anterior and posterior apodemes. Genital plates slightly enlarged, with 40-60 pairs of Ac, maximum number per transversal transect 5-6 and 25-30 pairs of medial setae. Legs with relatively short claws (mean L in males 25-35, in females 30-33, ratio claw L/segment 4 different in legs: I-L: 13-15 %, II-IV-L: 9-12 %); segments relatively stout (e.g., L/H I-L-4, 2.8-3.2; I-L-5, 4.2-4.6; II-L-4, 3.7-4.4; III-L-4, 3.8-4.3; III-L-5, 5.2-5.7; IV-L-4, 4.8-6.2; IV-L-5, 6.6-7.7); swimming setation (anterior/posterior): II-L-5 (0/2); III-L-4 (0/9-13); III-L-5 (0/8-10); IV-L-4 (9-11/7-13); IV-L-5 (0/7-8). Chelicera with curved claw (Fig. 5 E).

Description (based on specimens from South Africa):
Both sexes: Colour undescribed. Lateral eyes far distanced (90-140 µm), anterior lens rounded (diameter 40-50), posterior lens oval (length 40-50, width 30-45). L ratio P-2/P-4, 0.3-0.4, P-4/P-5, 1.9-2.7. Shape of mouthparts, coxae and excretory pore, and setation of palps as typical in all species of the genus, sexual
differences very weakly developed. No sexual differences in total setae numbers: Cx-I, 14-21; Cx-II, 17-21; Cx-III, 13-19; Cx-IV, 16-22; swimming setae II-L-5, 2; III-L-4, 9-12; III-L-5, 7-10; IV-L-4, 16-22; IV-L-5, 7-8.

Figure 5. A-E. Hydrodroma capensis, male, SMF 43882. A. anterior coxal plate; B. integument papillae in tangential view; C. integument papillae in top view (magnification as in B.); D. ejaculatory complex, anterior view; E. chelicera; F-G. H. trigonometrica; F. Male from Algeria, integument tangential; G. female holotype, genital field.

Measurements: Males: Idiosoma L/W 1000-1500/800-1000; L/W Cx-I+II, 235-260/150-155, Cx-III+IV, 250-260/240-270; genital plate 190-200/75, Ac pairs n 38-50, genital setae pairs n 30; ejaculatory complex: Fig. 5 D, L/proximal chamber W 180-200/55; gnathosoma L 180-185; chelicera L 285-290, basal segment/claw ratio 3.5-3.8, L/H ratio 4.8; palp total L 416-420, L/H ratio (relative L %) P-1, 0.73-0.83 (11); P-2, 1.17 (16-17); P-3, 0.80-0.86 (11); P-4, 3.9-4.0 (42-43); P-5, 3.9-4.0 (16-18). L/H (ratio in parentheses) I-
L-4, 155-160/55 (2.8-2.9); I-L-5, 195-200/45-48 (4.2-4.3); II-L-4, 223-230/60 (3.7-3.8); II-L-5, 263-270/48-50 (5.3-5.7); III-L-4, 210-215/55 (3.8-3.9); III-L-5, 253-260/45-50 (5.2-5.6); IV-L-4, 265-335/55 (4.8-6.1); IV-L-5, 295-345/45 (6.6-7.7).

Females: Idiosoma L/W 1100-1500/900-1200; L/W Cx-I+II, 260/170, Cx-III+IV, 270-280/260-280; genital plate 190-240/80-100, Ac pairs n 50-60, genital setae pairs n 24-30; egg diameter 85-140; gnathosoma L 220-230; chelicera L 320-330, basal segment/claw ratio 4.1-4.3, L/H ratio 5.1-5.3; palp total L 440-445, L/H ratio (relative L %) P-1, 0.71-0.85 (11-13); P-2, 1.15-1.25 (17); P-3, 0.82-1.00 (11-14); P-4, 3.55-3.58 (39-44); P-5, 3.56-4.11 (18-21). L/H (ratio in parentheses) I-L-4, 185-190/63-65 (2.9-3.0); I-L-5, 225-230/50 (4.5-4.6); II-L-4, 265-280/60-65 (4.1-4.4); II-L-5, 315-320/53-55 (5.7-6.1); III-L-4, 255-260/60-65 (4.0-4.3); III-L-5, 305-315/55-58 (5.4-5.7); IV-L-4, 340-350/55-63 (5.6-6.2); IV-L-5, 350-360/48-50 (7.0-7.4).

**Discussion:** The significance of K. Viets' comparison between *H. capensis* and *H. despiciens* (in the following set in quotation marks) is devaluated by the fact that the author did not differentiate between *H. despiciens* and *H. pilosa*. In fact, most of his considerations suggest that he compared character states of *H. capensis* and *H. pilosa* (for the latter species, see below).

1) papillae "less elevated, less pointed-conical, more dense": Integument papillae of *H. capensis* and *H. despiciens* are similar in shape, long and apically rounded, in contrast to the pointed papillae of *H. pilosa*. As a difference to both other species, papillae of *H. capensis* are in fact more densely arranged, *H. capensis* differs from *H. despiciens* in the absence of small, hexagonally arranged secondary papillae.

2) "gnathosomal rostrum shorter and stouter, oral disk relatively larger": It is doubtful if this character is generally suitable for species discrimination in the genus. The investigated specimens differ from typical *H. pilosa* in fact as described by K. Viets, but, in contrast, in the investigated *H. despiciens* the gnathosomal rostrum is still more stouter and the mouth disk relatively larger. From this point of view *H. capensis* has an intermediate position between *H. despiciens* and *H. pilosa*, probably with an overlap with both species in intraspecific variability.

3) "cheliceral claw more strongly curved, proximal end of the basal segment more straight": The first observation is confirmed by the investigated material (compare Figs 2 F and 5 E) – both, *H. despiciens* and *H. pilosa* have a straighter cheliceral claw; with regard to the shape of the proximal end of the basal segment, considerable variability is observed in the compared species – this part of the segment is possibly more turned up in juvenile adults.

4) "palp segments stouter": If measurements are compared with *H. despiciens*, this statement finds little support, with differences in sexes (L/H P-2 male < 1.2, *H. despiciens* > 1.3, female no differences; L/H P-4 female < 3.6, *H. despiciens* > 3.8, male no differences). My measurements suggest much intraspecific variability in proportions of palp segments.

5) "medial margin of Cx-I only slightly characterized by elevated setal bases": In this regard, *H. capensis* differs strongly from *H. pilosa*, a species with very distinct tubercles at Cx-I medial margin (see Fig. 6 A), but the difference in comparison to *H. despiciens* is less distinct. The latter is intermediate between *H. pilosa* and *H. capensis* from this point of view.

6) "Legs not in the same way provided with long and slender setae as Müller's species": This statement suggests in particular that Viets compared *H. capensis* with *H. pilosa*. Swimming setae numbers are clearly higher in *H. pilosa*, while in *H. capensis* and *H. despiciens* (in parentheses) ranges of total numbers are widely identical: III-L-4, 9-12 (7-13); III-L-5, 6-10 (7-11); IV-L-4, 16-24 (19-26); IV-L-5, 7-9 (7-10). The crucial difference between the two species concerns the setation of II-L-5: *Hydrodromia capensis* differs from *H. despiciens* in the presence of an additional, proximal swimming seta on the posterior surface, about 30 µm away from the distal seta.

7) A rather strange detail is the small idiosoma size mentioned by K. Viets (L/W 870/770). Unfortunately he did not give account of the material on which his species description was based. As the two female syntypes
available are distinctly larger in size, the existence of a further, now lost, smaller specimen on which the original description was based, is necessary. As in this study the idiosoma of all specimens of *H. despiciens*, as well as most *H. capensis*, is longer than 1000 µm, idiosoma size is surely not a character suitable for species discrimination in these taxonomic surroundings.

In summary, the combination of diagnostic features most suitable for recognizing *Hydrodroma capensis* is as follows: (1) Integument papillae of one type only, long, apically rounded; (2) chelical claws curved (Fig. 5 E); (3) II-L-5 with two swimming setae on posterior surface. The following additional character states could be helpful for recognizing the species: (4) Leg segments relatively stout (e.g., L/H I-L-4, 2.8-3.2; III-L-4, 3.7-4.4; III-L-4, 3.8-4.5; IV-L-4, 4.8-6.2); (5) Leg claws generally short (L 25-30 µm), but I-L claws (L ratio claw/I-L-5, 14-15 %) relatively longer than II-IV-L claws (9-12 %).

In measurements and proportions, the specimens from the surroundings of Cape Town (SMF 43882-83) agree well with the original description and data taken from the syntypes. In contrast, specimens from Congo and Madagascar which agree in simple idiosoma papillosity and II-L-5 with two swimming setae (see above, "rejected identifications (1")), differ in a generally larger size (e.g. measurements of coxae, genital field and gnathosoma), more slender leg segments, and higher numbers of acetabula and IV-L-4 swimming setae. They are similar to *Hydrodroma zhokhovi* Tuzovskij, 2014, described from Lake Tana in Ethiopia. For a definitive attribution, further investigations on the variability of these populations and of *H. zhokhovi* are necessary. Further specimens published under the name of *H. capensis* (see above, "rejected determinations (B") do not show the character combination typical for *H. capensis* and represent other, probably undescribed species of the genus.

**Distribution**: For the moment ascertained only from S Africa, its presence in Madagascar is not documented by collection material.

*Hydrodroma trigonometrica* (Walter, 1928)
(Figs 5 F-G)

**Type series**: Holotype ♀ NHMB "*Diplodontus trigonometricus* Walter, Typ. 1361 TYPUS Th. Monod Cameroun. Lac Nfou XXVI/72". State: specimen before slide-mounting obviously treated with clearing agent, partly dried, appendages possibly squeezed.

**Material examined**: NHMB "*Diplodontus trigonometricus* Walter ♂ Algerien 5.3.1926 Coll. Gauthier"; "1360 TYPUS leg. Gauthier Algérie. Oued Medjerala km 6 south Afras-Sédrata 5.3.1926 XXVI/70" [err., not part of the type series].

**Diagnosis**: Small in dimensions (e.g., L/W Cx-I+II, 160/123, Cx-III+IV, 208/168, genital plate L 157). Integument with closely arranged, flat and round papillae, hardly visible (Fig. 5 F), Cx-I medial setae not associated with tubercles; Cx-III+IV posterior apodemes long, parallel to body axis. Genital field with ca. 25 pairs of Ac, maximum number per transversal transect 3, and about 35 pairs of medial setae. Legs with relatively long claws (L ratio claw/segment 5, 10-15 %); II-L-5 with one posterior swimming seta, numerous swimming setae on III-L-4/5 restricted to posterior surface, on IV-L-4/5 on both surfaces.

**Description**: Colour not reported ("probablement rouge"). Integument structure no more visible, following Walter with closely arranged, flat and round papillae, in deeper integument strata a triangular pattern as described in the family diagnosis (Fig. 1 D). Coxal setation: Cx-I medial margin smooth, setae not associated with projections; groups of 4-5 long distal tip setae at Cx-I and Cx-II, 8 posterolateral setae at Cx-II, 13 at Cx-III; total setae number of Cx-IV, 13. Coxal plate Cx-III+IV with long posterior apodemes directed parallel to body axis. Genital plates slender, with 22-28 pairs of Ac, maximum number per transversal transect 3 (Fig. 5 G). Legs with relatively short claws (L I-III-L 25, IV-L 22, L ratio claw/segment 5, 12-15, IV-L 10 %). Leg segments rather normal in proportions (e.g., L/H ratio III-L-4, 3.3; III-L-5, 5.7; IV-L-4, 5.7; IV-L-5, 6.2; swimming setation not very rich (anterior/posterior): II-L-5 (0/1); III-L-4 (0/8); III-L-5 (0/4); IV-L-4 (7/6); IV-L-5 (8/5).
Measurements: Female holotype [if deviations remarkable, data from original description in brackets]: Idiosoma L/W 680/450 [930/825, obviously shrunk during slide mounting]; L/W Cx-I+II, 260/123, Cx-III+IV, 208/168; genital plate 157/63[80], Ac pairs n 25 [20-27], genital setae pairs n = 34; gnathosoma L/W [175/130]; chelicera L 214 [240], basal segment/claw ratio 3.1 [3.6], L/H ratio 4.8 [5.3] (differences difficult to explain by damage, figure of original description in agreement with Walter's data); palp total L 334, L/H ratio (relative L %) P-1, 0.95 (11); P-2, 1.26 (16); P-3, 0.9 (11); P-4, 4.48 (42); P-5, 4.50 (20). L/H (ratio in parentheses) I-L-4, 119/40 (3.0); I-L-5, 168/34 (4.9); II-L-4, 168/42 (4.0); II-L-5, 208/33 (6.3); III-L-4, 153/46 (3.3); III-L-5, 193/34 (5.7); IV-L-4, 193/34 (5.7); IV-L-5, 224/36 (6.2).

Male from Algeria (see below for species identity): Idiosoma L/W 760/670; L/W Cx-I-II, 233/157, Cx-III+IV, 256/238; genital plate 184/94. Ac pairs n 27, genital setae pairs n 33; gnathosoma L 180; chelicera L 229, basal segment/claw ratio 4.1, L/H ratio 4.2; palp total L 336, L/H ratio (relative L %) P-1, 0.74 (13); P-2, 1.1 (18); P-3, 0.6 (10); P-4, 3.0 (41); P-5, 3.4 (18). L/H (ratio in parentheses) I-L-4, 139/63 (2.2); I-L-5, 198/54 (3.7); II-L-4, 198/67 (3.0); II-L-5, 247/50 (4.9); III-L-4, 190/61 (3.1); III-L-5, 240/51 (4.7); IV-L-4, 240/51 (4.7); IV-L-5, 280/52 (5.4).

Discussion: The original description of this species was based on a single female collected by T. Monod in a crater lake in Cameroon on 22.08.1926. For the moment it remains unclear if the author was correct when he later attributed a male from Algeria to this species. It shares with the holotype several important character states (rather small in dimensions, low number of acetabula and genital setae, well developed swimming setation comprising a group of anterior setae on IV-L-5), but differs in by far stouter leg segments. As these proportions could result from squeezing of the only available male specimen, the taxonomic weight of this difference remains unclear. I decide to accept the locality record with a question mark, but not to consider the specimen for the species diagnosis.

In the original description, Walter compared *H. trigonometrica* with the two other *Hydrodroma* species recorded at that time from Cameroon, *H. despiciens* and *H. perreptans*. *Hydrodroma despiciens* (my revision did not confirm any African record of this species) differs, among others, in distinctly higher number of acetabula (> 50 pairs), the absence of anterior swimming setae from IV-L-5 and relatively smaller leg claws (L ratio claw/segment 5 < 10 %). As already observed by Walter, *H. perreptans* (and also *H. ocellata*) differs from *H. trigonometrica* among others in the morphology of legs with rather large claws (L ratio claw/segment 5 > 14, in I-L 20 %) and an extremely reduced swimming setation (not more than one seta per segment). In general, Walter stated correctly that *H. trigonometrica* is a rather small species. From both compared species it differs in distinctly minor dimensions, e.g. of the coxal and genital plates, but also of palp and leg segments.

*Hydrodroma trigonometrica* differs also from *H. capensis* (and from the similar *H. zhokovi*) in minor dimensions and a distinctly lower acetabula number, in addition in the presence of only one posterior swimming seta on II-L-5 and the presence of a group of anterior swimming setae on IV-L-5. *Hydrodroma liberiensis* agrees widely with *H. trigonometrica* in rather reduced dimensions and a low number of acetabula, but is well distinguished by its reduced swimming setation (in total, only 10 setae, IV-L-4/5 anteriorly without swimming setae).

All things considered, *H trigonometrica* is obviously a valid species, but additional investigation is required for understanding its diagnostic features and their variability. The name-giving character state, the inferior integument made up of a net with triangular meshes, is obviously typically found in many, if not all, *Hydrodroma* species (see introduction and Fig. 1 D).

Distribution: Cameroon, Algeria (?).

*Hydrodroma pilosa* Besseling, 1940
(Figs 1 B-C, 6 A-E)

Type series: SMF, Neotype (here designated), The Netherlands, 43930 "Hydrodroma despiciens pilosa ♀, Bess., Cotype" "Voorst. Appensche Kolk, Juni 1940 Besseling coll. 5985" (slide mounted K. Viets); Paraneotypes: 43931, same data, but "5986" (slide mounted Viets). 43931a-b, same collecting site and date, from liquid collection K. Viets, slide mounted Gerecke, 1 ♂, 2 ♀♀.
Material examined: Coll. Gerecke, Tübingen: Germany, D 516, Mindelsee Südufer, 31.07.2005, 12 ♂, 1 ♀. Italy, I 351, Sardinia, Nurra (SS), Lago Baratz, Westufer, 60 m, U.Z.M. ML 34 04, 11.05.1986, 1 ♂, 1 ♀. Coll. Moreno, Albaceite: Spain, ramblas salinas de Murcia, leg. Moreno, Rambla Moreras (vertido), UTM 30SXG461617, 14.06.1991, 1005 µS/cm, 1 ♀; Rambla Moreras (Majada), UTM 30SXG462631, 18.07.1991, 5600 µS/cm, 2 ♀; Rambla Rincones, UTM 30SXG512656, 18.07.1991, 3000 µS/cm, 1 ♂, 2 ♀; Rambla Majada, UTM 30SXG460635, 18.07.1991, 7600 µS/cm, 1 dn; Rambla Pantano, UTM 30SXG410732, 01.09.1992, 6200 µS/cm, 4 ♂, 8 ♀, 1 dn; Laguna Ojos de Villaverde, UTM 30SWH5495, 23.05.1998, 470 µS/cm, 1 ♀; Laguna Sanguijuela, UTM 30SWH4186, 31.10.1998, 700 µS/cm, 1 ♀; Laguna Salobreja, UTM 30TXK0487, 25.07.2007, 1330 µS/cm, 12 ♀; Laguna Cifuentes, UTM 30TWL3112, 26.07.2007, 321 µS/cm, 7 ♂, 2 ♀, 9 dn.

Specimens erroneously labelled as Hydrodroma despiciens (see there): NHMB Switzerland, 1340/1341, Wallis, leg. Gams, Charrat Okt. 1917, 1 ♂ on two slides [idiomsa/gnathosoma]; Algeria, 1342, Oued Kherma, 6.11.1923, Coll. Gauthier, XII/97, 1 ♂; 1343, Agouline, km 166 Azazga-Bougie, 13.9.1925, XIV/69, 1 ♂; 1345, Sahara, Imarera, 24.3.1928 coll. Seurat, XXV/95, 1 ♂; Turkey, 1346, Tatvan Bitlis, 24.7.1981 Coll. Özkan 1 ♀; SMF, Germany, 43884, Bremen, Waller Feld, 22.5.1906, Viets leg. 80, 1 ♂; 43886, Bremen, Kattenturm, 26.7.1906, Viets leg. 161, 1 ♂; Spain, 43872, Zaragoza, Raya, 16.4.1918, 3732, 1 ♂; 43873, Zaragoza, Condesa, 25.4.1919, 3753, 1 ♂; 43889, Zaragoza, Burago de Ebro, 26.6.1918, 3840, 1 ♂; 43892, Madrid, Granjilla, 27.5.1919, 3926, 1 ♀; Sweden, 51172, Angeranland, River Ångerån, Drift, 28.-29.4. 1978 K. Müller leg. 6804, 1 ♀. SMNH Denmark GULI 000046049, Själland, torvgrav v. Arresö, 23.05.1919, 1 ♂, 3 ♀, undissected in Koenikes fluid.
Diagnosis (following Wiles 1985, completed after the material examined): Integument papillae of one type, distinctly separate, slender and sharply pointed, at transmitted light microscope no surrounding elevations visible. Coxal setation: Cx-I medial setae on strongly elevated projections (Fig. 6 A); groups of 4-5 long distal tip setae at Cx-I and Cx-II, 6-9 densely arranged posterolateral setae at Cx-II and –I-III each; total setae number of Cx-IV 22-30. Coxal plate Cx-III+IV with long posterior apodemes directed parallel to body axis. Genital plates with 38-87 pairs of Ac, maximum number per transversal transect 6-8 (Fig. 6 B). Legs with relatively short claws (L 28-36, ratio claw L/segment 5, 7-11 %). Leg segments relatively stout (e.g., L/H III-L-4, 4.1-4.6; III-L-5, 6.1-6.7; IV-L-4, 5.3-6.1; IV-L-5, 7.7-8.1; swimming setation rich (anterior/posterior): II-L-5 (0/8-10); III-L-4 (0/15-19); III-L-5 (0/10-16); IV-L-4 (14-18/15-20); IV-L-5 (5-9/11-16).

Description: Both sexes: Colour orange to red. L ratio P-2/P-4, 0.4; P-4/P-5, 2.3-2.4. Total setae numbers Cx-I, 18-23; Cx-II, 19-29; Cx-III, 21-27; Cx-IV, 21-30; swimming setae II-L-5, 6-10; III-L-4, 11-17; III-L-5, 10-15; IV-L-4, 25-34; IV-L-5, 14-21.

Measurements: Males [n=5, mouth parts 1]: Idiosoma L/W 1290-1900/1180-1700; L/W Cx-I+II, 274-337/202-238, Cx-III+IV, 337-386/287-350; genital plate 296-323/130-144, Ac pairs n 76-95, genital setae pairs n 42-65; ejaculatory complex L 292 (Fig. 6 C); gnathosoma L/W 260-270/157-171; chelicera L 287, basal segment/claw ratio 4.6, L/H ratio 4.6; palp total L 493, L/H ratio (relative L %) P-1, 0.79 (12); P-2, 1.23 (17); P-3, 0.69 (10); P-4, 3.9 (43); P-5, 4.44 (18). L/H (ratio in parentheses) I-L-4, 198-213/61-72 (3.0-3.3); I-L-5, 274-283/49-54 (5.2-5.6); II-L-4, 301-323/67-72 (4.3-4.6); II-L-5, 355-373/54-58 (6.2-6.7); III-L-4, 301-315/63-67 (4.5-4.8); III-L-5, 355-373/54-60 (6.1-6.7); IV-L-4, 359-404/63-70 (5.3-6.1); IV-L-5, 395-413/50-54 (7.5-8.1).

Females [n = 3, palp 1]: Idiosoma L/W 1450-1900/1230-1740; L/W Cx-I+II, 332-337/229-247, Cx-III+IV, 386-427/337-382; genital plate 247-314/117-162, Ac pairs n 56-110, genital setae pairs n 30-35; egg diameter 157; gnathosoma L/W 256-278/170-180; chelicera L 355, basal segment/claw ratio 4.3-4.6, L/H ratio 4.7-4.9; palp total L 522, L/H ratio (relative L %) P-1, 0.78 (12); P-2, 1.08 (17); P-3, 0.63 (10); P-4, 3.33 (43); P-5, 4.20 (18). L/H (ratio in parentheses) I-L-4, 198-226/68-76 (2.6-3.3); I-L-5, 269-305/54-63 (4.3-5.5); II-L-4, 314-350/78-85 (3.7-4.3); II-L-5, 368-404/58-67 (5.9-6.7); III-L-4, 314-346/72-85 (4.1-4.6); III-L-5, 377-409/58-76 (4.9-6.7); IV-L-4, 404-454/72-85 (5.3-5.9); IV-L-5, 418-465/56-63 (6.6-7.8).

Discussion: Based on the original description, data presented by Wiles (1985) and Tuzovskij (2015), and a revision of material from various collections, *H. pilosa* differs from *H. despiciens* as follows: (1) Integument papillae of one type, distinctly away from each other, slender and sharply pointed; (2) II-L-5 with numerous (> 4) posterior swimming setae; IV-L-5 with swimming setae on both sides (anteriorly 5-9, posteriorly more than 10). In addition, *H. pilosa* differs from *H. despiciens* following Wiles (1985) in the serrulate setae at the distal margins of leg segments 4 and 5, which are higher in number and longer. A sexual dimorphism in numbers of medial genital setae reported by Meyer (1983) is supported also by data published by Tuzovskij (2015), but with a broader overlap.

The presence of numerous anterior swimming setae on IV-L-5 is also found in *H. trigonometrica*. This species (in parentheses) differs from *H. pilosa* in many features such as lower numbers of acetabula (25-30 pairs), relatively larger leg claws (L ratio claw/segment 5, 12-17 %), and minor dimensions of all parts of idiosoma and appendages. (e.g., genital plate L 155, 184). Pešić & Smit (2007a) a careful description of three species from Australia similar to *H. pilosa* in a high number of swimming setae. They found diagnostic differences in character states such as shape of genital plates, palp and leg segments, numbers of acetabula and genital setae, but also number and arrangement of swimming setae. An investigation on the formation of the integument papillae of the Australian species could give a hint on an eventual closer relationship between *H. pilosa* and the latter.

Locality records now available from bibliography and the revision of material from many collections suggest that *H. pilosa* is actually more frequent in Europe than *H. despiciens* and many ecological data published for the latter in reality refer to *H. pilosa* (see Di Sabatino et al. 2009). The pointed shape of papillae in Schmidt (1935, Figs 1-2) suggests that also that detailed anatomical treatment published under the name of *H. despiciens*, in reality deals with *H. pilosa*.

*Ecologica Montenergrina, 13, 2017, 1-24*
Biology and distribution: Detailed data on the life cycle of this species were published by Meyer (1985) and Smukalla & Meyer (1987) (both under the name H. despiciens) and by Wiles (1987). Interestingly, larvae in German populations strongly preferred chaoborid hosts while populations of the British isles were also frequently found parasitizing chironomid midges. Parasitism on tipulid midges and Trichoptera was also observed. Meanwhile, the presence of this species is ascertained from nearly all parts of Europe. Concerning the tolerance of H. pilosa against electrolyte concentrations, the new records published here from nine sites in Southern Spain with a mean conductivity of nearly 3 mS/cm (for characteristics of these interesting sites see Moreno et al. 1995), support data from the Mediterranean (Gerecke 1991) and Eastern Central Europe (Kowalik 2002). In contrast, H. despiciens is more sensitive against water pollution and increased electrolyte contents and shows a preference for lower pH values (Wiles 1985). Not surprisingly, the revision of collection material shows that records under the name of H. despiciens published from (semi)arid areas in Algeria by Walter (1925, 1928, 1931) obviously refer to H. pilosa (here recorded for the first time from Africa). Vice versa, no records document the presence of H. despiciens on the African continent.

Hydrodroma ocellata (Walter & Bader, 1952)

(Figs 4 B, F)

Species incerta

Type series: NHMB, holotype ♂ on two slides: "Diplodontus ocellatus Walter Koptawelil 20.12.32 Coll. Chappuis 2" "1352 TYPUS XXII/42" [idiosoma]; Diplodontus ocellatus Walter Mundgliedm. Koptawelil 20.12.32 Coll. Chappuis 2″ "1353 TYPUS XXII/43". Both slides in bad state of conservation (dried, squeezed).

Discussion: Considering the extremely reduced leg swimming setation (in total only 4 short setae, located anterior on III-L-4/5 resp. posterior on IV-L-4/5), this species is obviously close to H. perreptans, not taken in consideration in the discussion of the original description. Also the integument papillosity (Fig. 4 F), as well as most measurements and the numbers of idiosoma setae and acetabula, are close to the few data available for that species. In general, the holotype of H. ocellata is a little larger in dimensions (e.g., L/W Cx-I+II, 278/193, C-III+IV, 270/245, genital plate L 225 µm). Stouter proportions of leg and palp segments are possibly due to squeezing, a proportionally large size of leg claws (ratio claw L/segment 5 L about 20 %) is found as in H. perreptans.

The name-giving condition of the lateral eyes (anterior lens bay far larger than posterior one) is difficult to observe in the holotype preparation (Fig. 4 B). Also in some of the investigated specimens of H. perreptans, both lenses differ remarkably in size (Fig. 4 A), but this character state is not easy observed in slide mounted material: In general, the anterior lens has the shape of a football, the posterior one of a baseball, with the result that measurements may vary due to its inclination. A judgement about the shape of the integument papillae is impossible due to the bad state of conservation of the holotype.

With our present knowledge, a decision on the taxonomic state of H. ocellata is impossible. The closely related H. perreptans appears distributed over many parts of Africa, much more material is necessary in order to understand its intraspecific variability (e.g. concerning the shape of lateral eye lenses) and/or the existence of cryptic sister species.

Hydrodroma liberiensis Cook, 1966

(Figs 7 A-B)

Type series: FMC, holotype ♂ and paratype ♀, slide mounted; locality information "DC 36" incised on the slide [Cook 1966: Stream at bridge 19 on Bomi Hills Road, Jan. 23, 1957].

Discussion: This species is highly distinct in its generally reduced size (e.g. idiosoma L ♂ 550, ♀ 700; Cx-I+II ♂ 150, ♀ 160; genital plate ♂ 120, ♀ 140) and a low acetabula number (♂ 25, ♀ 33 pairs). Also segments of mouthparts and legs are by far shorter than in all compared species (e.g., L I-L-4, ♂ 105, ♀ 115; IV-L-5, ♂ 200, ♀ 210; P-4, ♂ 93, ♀ 110). Obviously, H. liberiensis is a typical inhabitant of lotic habitats.
characterized by relatively strong leg claws (leg claw L 16-22 % segment 5 L), and strongly reduced swimming setation (total number 10-11, no segment with anterior setae, posterior setae numbers: II-L-5, 0-1; III-L-4, 2-3; III-L-5, 2-3; IV-L-4, 2-3; IV-L-5, 2-3). The integument structure is rather characteristic, with a distinct, two-type papillosity: each of the very flat, slightly posterior directed principal papillae is surrounded by six well visible secondary minor papillae (Figs 7 A-B).

**Distribution:** Only known from the type locality and four further sites in Liberia (Cook 1966)

**Hydrodroma rheophila** Cook, 1967  
(Figs 7 C-H)

**Type series** (not examined): India, Maharashtra state, coll. Cook, FMC. Holotype ♀, small stream five miles west of Wai, gravel bar, 13.03.1963, Collection 90; paratypes: same site as holotype, 2 ♂♂; 2 ♀♀; headwaters of Krishna river near Wai, Collection 22, 29.11.1962, 3 ♂♂; 2 ♀♀, 15.12 1962, 1 ♂; Ghod river 42 miles northeast of Poona, Collection 30, 1 ♂; 14 miles north of Ahmadnager, small spring, Collection 67, 04.02.1962 1 ♂; 1 ♀; 15 miles south of Poona, small stream, gravel bar, 05.03.1963, Collection 87, 1 ♂; 2 ♀♀.

**Material examined:** Greece, Lesbos, stream Mylopotamos. 06.05.2000 coll. Smit, 3 ♀♀.

**Discussion:** As observed by Cook (1967), this species is very similar to the African *H. perreptans* in the widely reduced swimming setation (Figs 8 F-H). The females from Lesbos resemble *H. perreptans* also in the rather large leg claws (L about 50 μm, L ratio claw/segment 5, 20-27 %), and in the heterogeneous integument structure, with larger papillae surrounded by six small, little prominent elevations. However, in the investigated specimens, the large papillae (Figs 7 C-D) are more flattened and rounded and less densely arranged than in *H. perreptans*. The key difference to *H. perreptans* is found in the stouter palp, in particular segment P-4 – L/H measurements of a lesbian specimen are: P-1, 0.8; P-2, 1.4; P-3, 0.9; P-4, 3.7; P-5, 3.7 (compare Fig. 7 E with Fig. 2 F).

**Biology and distribution:** As in the African *H. perreptans*, leg morphology and setation is an obvious adaptation to life in running waters. After the original description from India recorded also from Iran, Oman, Taiwan (with a question mark) and the island of Lesbos in the Aegean Sea (the outpost population discussed here).

**Hydrodroma reinhardi** Pešić, 2002  
(Figs 8 A-D)

**Type series** (not examined): NHMB, holotype ♂, river Cijevna near Dinoša, 45 m asl., 01.07.2000 Pešić; same site and date, paratypes: 2 ♂♂, 2 ♀♀; further paratypes, University of Podgorica, collection Pešić: same site and date, 2 ♂♂, 8 ♀♀ same site, 01.10.2000, 6 ♂♂, 7 ♀♀.

**Material examined:** Coll. Gerecke, all slide mounted: Paratypes: Montenegro, River Cijevna near Dinoša, 45 m asl., 01.07.2000, Pešić, 1 ♂; same site, 01.10.2000, 2 ♂♂, 1 ♀. Further material: France, Corse F 23 Corse Sarténe (2A), Roccapina, F. Ortolo near Pont de l’Ortolo, 20 m asl., 8°51E,41°33N, 26.09.1991 Gerecke, 1 ♀; F 92 Galéra (2B), Rau. de Tavulaghiu NE Pinzu di Corbi, 150 m asl., 11.06.1993 Gerecke, 1 ♀; Italy, Lazio, I 883, Sorinano nel Cimino, spring in castagneto exp. NW, 1000 m asl., 01.08.2000 Di Sabatino, Gerecke, Goldschmidt, 1 deutonymph; Sardinia I 365, Gennargentu (NU). Fonni, R. Mattalle, 950 m, NK 23 32, 18.05.1986, Gerecke, 2 ♂♂; I 380, Alghero (SS), R. Serra S Cantoniera Rudas, 20 m, MK 47 96, 26.05.1986, Gerecke, 1 ♀, 4 deutonymphs; I 386, Monte Linas (CA), Villacidro, stream 2 near P. S. Miali, 600 m, MJ 74 67, 30.05.1986 Gerecke, 1 ♀ Barbágia Seúlo (NU), W Seúlo, Contrada Tornolù, 650 m, NK 17 14, 18.09.1991 Gerecke, 1 ♂.
Figure 7. A-B. *Hydrodroma liberiensis*, integument papillae in tangential and top view. A. holotype male; B. paratype female. C.-H. *H. rheophil*a, female from Lesbos (photographs and drawings: Vladimir Pešić). C. integument in tangential view; D. integument in top view (magnification as in C.); E. palp; F. II-L-4-5; G. III-L-4-6; H. IV-L-4-6.
Discussion: The detailed original description does not leave important questions open, some additional morphological features could be verified from the material authorized by Pešić listed above. *Hydrodroma reinhardi* is similar to *H. despiciens* in the range of acetabula numbers (genital field: Fig. 8 B), but differs in a smooth medial margin of Cx-I (Fig. 8 A), lower swimming setae numbers (only on IV-L-4, 2 anterior setae, posterior setae numbers II-L-5, 1; III-L-4, 2-4; IV-L-5, 3-4; IV-L-4, 4-5; IV-L-5, 3-4) and relatively larger leg claws (L 15-16 % segment 5). Further differences concern generally minor measurements of palp and leg segments (e.g., P-4 L 143-187 vs. 184-190 in *H. despiciens*; IV-L-5 L 239-311 vs. 332-410) and the shape of the integument: the papillosity consists of two different types as in *H. despiciens*, but the larger central papillae are not rounded, apically forming blunt tips (Figs 8 C-D).

The deutonymph has not been described previously. The examined specimens show the characteristic integument papillosity as in adults and the diagnostic low swimming setae number: II-L-5, posterior, 1; III-L-4, posterior, 2 III-L-5, posterior, 2; IV-L-4, anterior 1, posterior 2; IV-L-5, posterior, 2.

**Figure 8.** *Hydrodroma reinhardi*, paratype male. A. Cx-I+II; B. genital field; C. folded integument area; D. integument in top view.
Biology and distribution: A running water species frequently found in springs. Central Mediterranean, recently reported also from Russia (area of Yaroslavl, Caucasus: Tuzovskij 2015); here recorded for the first time from continental Italy (Lazio).

Hydrodroma zhokovi Tuzovskij, 2014

Type series (not examined): Institute for Biology of Inland Waters (Borok, Russia); Holotype: ♂️, 1 ♂️, slide 9653, Ethiopia, Tana lake, 15.11.2007 (coll. A.E. Zhokhov). Paratypes: Same site and date, 8 ♂♂, 2 ♀♀ and 5 deutonymphs.

Diagnosis (adults, after Tuzovskij 2014, modified from original description): Integument papillae short, distally rounded; genital field with sexual dimorphism, bearing 65-120 pairs of acetabula (females: 65-75, males 70-120) and numerous subequal medial setae (females: 45-65, males: 75-140); P-3 with two long unequal dorsodistal setae; swimming setation rather rich (anterior/posterior): II-L-5 (0/2); III-L-4 (0/10-14); III-L-5 (0/8-10); IV-L-4 (11-14/8-15); IV-L-5 (0/8-11); ejaculatory complex with two well developed accessory glands.

Discussion: The detailed original description does not leave important questions open, and no material had to be studied for comparison. Tuzovskij (2014) placed H. zhokovi correctly near H. capensis (important common character combination: presence of two posterior swimming setae on II-L-5, absence of anterior swimming setae from IV-L-5). New morphological data provided here for H. capensis confirm differences from H. zhokovi in (1) more elongate integument papillae, and (2) the genital field without remarkable sexual dimorphism, bearing lower numbers of acetabula (35-60) and medial setae (25-30). Instead, there is an overlap of the genital plate length measurement ranges, and both species agree also in the swimming setae numbers of IV-L.

Distribution: Only known from the type locality in Ethiopia.

Key to the European and African Hydrodroma species.

1. Swimming setation strongly reduced (one single, short seta each on II-L-5, III-L-4/5, and IV-L-4/5, Figs 7 F-H)............................................. 2
   - Legs with more numerous swimming setae, at least on IV-L-4/5 located in rows. .......................... 3

2 (1) Palp stout (L/H ratio P-4, 3.7, Fig. 7 E)................................................................. H. rheophilica
   - Palp slender (L/H ratio P-4, > 3.8, Fig. 4 C)............................................................. H. perreptans

3 (2) IV-L-5 without swimming setae on the anterior surface......................................................... 4
   - IV-L-5 with swimming setae on both surfaces ............................................................................. 8

4 (3) Genital field with less than 35 acetabula per plate; body reduced in size (L idiosoma ♂️ 550, ♀️ 700; Cx-I+II ♂️ 150, ♀️ 160; genital plate ♂️ 120, ♀️ 140). ............................................................... H. liberiensis
   - Genital field with more than 35 pairs of acetabula per plate; idiosoma and its plates larger. ................ 5

5 (4) II-L-5 with two posterior swimming setae................................................................. 6
   - II-L-5 with one posterior swimming seta..................................................................................... 7

6 (5) Integument papillae elongate (Fig. 5 B); genital field (Fig. 5 G) with fewer than 65 acetabula and 30 pairs of medial setae per plate................................................................. H. capensis
   - Integument papillae more flattened; genital field with 65-120 acetabula and 45-140 medial setae per plate. ................................................................. H. zhokovi

7 (5) Number of swimming setae: III-L-4 posterior 2-5, IV-L-4 anterior 2-6................................ H. reinhardi
   - Number of swimming setae: III-L-4 posterior > 9, IV-L-4 anterior > 9. ................................. H. despiciens
GERECKE

Number of swimming setae: II-L-5 posterior > 4, IV-L-5 posterior > 10; leg claws relatively small (L ratio claw/segment 5, 7-12 %); integument papillae of one type, distinctly separate, slender and sharply pointed (Fig. 6 D-E). ................................................................. H. pilosa

- Number of swimming setae: II-L-5 posterior 1, IV-L-5 posterior < 10; leg claws relatively large (L ratio claw/segment 5, 11-18 %); integument papillae heterogenous (for H. trigonometrica not well described), not pointed (Figs 3 C-B, 5 F). ................................................................. H. torrenticola

9 (8) Genital field with less than 30 acetabula per plate, genital plates short (L < 200) (Fig. 5 G); body size small (idiosoma L < 1000). ........................................................................................................ H. trigonometrica

- Genital field with more than 45 acetabula per plate, genital plates longer (L > 220), body larger in size (idiosoma L > 1200). ......................................................................................................... H. torrenticola

Acknowledgements
This work was initiated during my stay as an invited researcher at Muséum national d'Histoire naturelle, Paris, in 2016. The study found manifold technical support from Julia Altmann (SMF) - during the authors stays at Frankfurt, by loan of specimens and providing information on collection material. I found further help by loan of material from Crystal Maier (FMC), Gunvi Lindberg (SMNH) and Ambros Hänggi and Urs Wüest (NHMB). José-Luis Moreno (Albacete) made available valuable data from his field work in the area of Murcia. Vladimir Pešić (Podgorica) kindly provided excellent figures of Hydrodroma theophila from Lesbos and helped with useful informations. Harry Smit (Leiden) and Roy Wiles (Glyntaff) improved this paper with useful comments on a former draft.

References
Besseling, A.J. (1940) Iets over de variabiliteit bij Hydrodroma-soorten. Ent. Ber. Amst., 234 (10): 245-247
Cook, D.R. (1966) The water mites of Liberia. Mem. Amer. Ent. Inst., 6: III+1-418.
Cook, D.R. (1967) Water mites from India. Mem. Amer. Ent. Inst., 9: III+1-411.
Cook, D.R. (1974) Water mite genera and subgenera. Mem. Amer. Ent. Inst., 21: VII + 1-860.
Cook, D.R. (1980) Studies on neotropical water mites. Mem. Amer. Ent. Inst., 31: V+1-645.
Kowalik, W. (2002) The occurrence of water mites (Hydrachnidia, Acari) in saline waters from a stone coalmine in Bogdanka (South-Eastern Poland). In: Bernini, F., Nannelli, R., Nuzzaci, G. & De Lillo, E. (eds): Acarid Phylogeny and Evolution: Adaptations in Mites and Ticks. Kluwer Academic Publ., Dordrecht, Boston, London: 119-124
Di Sabatino, A., Gerecke, R., Gledhill, T. & Smit, H. (2009) On the taxonomy of water mites (Acari: Hydrachnidia) described from the Palaearctic, part 2: Hydryphantoidea and Lebertioidea. Zootaxa 2266: 1-34.
Di Sabatino, A., Gerecke, R., Gledhill, T. & Smit, H. (2010) Hydrachnidia, Hydryphantoidea and Lebertioidea. In: Gerecke, R. (ed.): Süßwasserfauna von Mitteleuropa 7/2-2: Chelicerata: Acari II. Springer: 1-234.
Gerecke, R. (1991) Taxonomische, faunistische und ökologische Untersuchungen an Wassermilben aus Sizilien, unter Berücksichtigung anderer aquatischer Invertebraten. Lauterbornia, 7: 1-303 (Dinkelscherben)
Lundblad, O. (1920) Süßwasseracarinen aus Dänemark. Mém. Acad. Sci. lettr. Danemark, Copenhagen, sect. sci., s.6, 8 (2): 133-258.
Marshall, R. (1926) Water mites from the Okoboji Region. Univ. Iowa Stud. natur. Hist., 11 (9): 28-35.
Meyer, E. (1983) Über die Möglichkeit der Geschlechterunterscheidung bei Hydrodroma despiciens (O. F. M. 1776). Arch. Hydrobiol., 96 (3): 384-390.
Meyer, E. (1985) Der Entwicklungszyklus von Hydrodroma despiciens (O. F. MÜLLER 1776)(Acari, Hydrodromidae). Arch. Hydrobiol. (Suppl. 66), 3: 321-453.
Moreno, J.L., Suárez, M.L. & Vidal-Abarca, M.R. 1995. Hidroquímica de las ramblas litorales de la Región de Murcia: variaciones espacio-temporales. Limnetica, 11(1): 1-13.
Müller, O.F. (1776) Zoologiae Danicae prodromus, seu animalium Daniae et Norvegiae indigenarum characteres, nomina, et synonyma imprimis popularium. Havniae, 32 + 282 pp.
Pešić, V. (2002) Hydrodroma reinhardi sp. n., a New Species of Water Mites (Acari, Actinedida, Hydrodromidae) from the Mediterranean Area. Aquatic Insects, 24 (4): 317-323.
Pešić, V. & Smit, H. (2007a) Water mite species of the genus *Hydromora* Koch (Acari: Hydrachnidia, Hydrodromidae) from Australasia. Part I. Zootaxa, 1389: 31-44.
Pešić, V. & Smit, H. (2007b) Water mite species of the genus *Hydromora* Koch (Acari: Hydrachnidia, Hydrodromidae) from Australia. Part II. Zootaxa, 1509: 41-50.
Pešić, V. & Smit, H. (2011) A new species of the genus *Hydromora* Koch, 1837 (Acari: Hydrachnidia, Hydrodromidae) with a key to the hitherto known six species of the genus in Australia. Zookeys, 143: 13-22.
Pešić, V., Smit, H., Gerecke, R. & Di Sabatino, A. (2010) The water mites (Acari: Hydrachnidia) of the Balkan peninsula, a revised survey with new records and descriptions of five new taxa. Zootaxa, 2586: 1-100.
Schmidt, U. (1935) Beiträge zur Anatomie und Histologie der Hydracarinen, besonders von *Diplodonto despiciens* O. F. Müller. Zeitschrift Morphol. Ökol. Tiere, 30: 99-176.
Smukalla, R. & Meyer, E. (1988) Insect emergence from a shallow southern West German lake, with special reference to the parasitic host-associated water mite larvae. Hydrobiologia, 169: 149-166.
Tuzovskij, P.V. (2014) Description of a new Water mite species of the genus *Hydromora* Koch (Acari: Hydrachnidia, Hydrodromidae) from Ethiopia. Acarina, 22 (2): 117-121.
Tuzovskij, P.V. (2015) Water mites of the genus *Hydromora* Koch, 1837 (Acari: Hydrachnidia, Hydrodromidae) in Russia. Acarina, 23 (1): 25-39.
Viets, K. (1913) Die Hydracarinen-Fauna von Kamerun [in zwei Teilen, Teil 1 1913]. Arch. Hydrobiol., 8 (1): 1-52.
Viets, K. (1914) Hydracarinen aus dem Kaplande. Gesammelt von der Deutschen Südpolar-Expedition. Zool. Jbch. Syst., 37 (4): 550-578.
Walter, C. (1908) Neue Hydracarinen. Arch. Hydrobiol., 4: 1-16.
Walter, C. (1925) Hydracariens de l’Algerie et de la Tunisie (Collections de M. H. Gauthier), Première liste. Bull. Soc. Hist. natur. Afrique Nord, Alger, 16: 189-238.
Walter, C. (1928) Acarina I. Hydracarina. In: Monod, T.: Contribution à l’étude de la faune du Cameroun. In: Gruvel, Faune des Colonies Francaises, Paris 1927, 1 (6): 625-631.
Walter, C. & Bader, C. (1952) Hydracarina. In: Mission scientifique de l’Omo. Mém. Mus. Hist. natur., Paris, (n. s.), (sér. A), Zool., 4 (3): 87-236.
Wiles, P. R. (1982) A note on the watermite *Hydromora despiciens* feeding on chironomid egg masses. - Freshwater Biology, 12: 83-87.
Wiles, P. R. (1985) The systematics of the British Hydrodromidae VIETS, 1936. Arch. Hydrobiol., Suppl. 70 (3): 365-403.
Wiles, P. R. (1986) *Hydromora monticola* (PIERSIG) (Hydrachnidia, Hydrodromidae KOCH 1837): a redefinition of the species. Arch. Hydrobiol., 108 (1): 135-140.
Wiles, P. R. (1987) Observations on the parasitic biology of the watermite *Hydromora despiciens pilosa* BESSELING (Acari: Hydrachnidia). Arch. Hydrobiol., Suppl. 76, 4: 369-392.