

Koleopterologische Rundschau	75	29–44	Wien, Juni 2005
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# ***Hygrotus curvilobus* sp.n. and *H. stefanschoedli* sp.n. from Iran, and re-instatement of *H. orthogrammus* (SHARP, 1882) as valid species (Coleoptera: Dytiscidae)**

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## **Abstract**

*Hygrotus* (*Coelambus*) *curvilobus* sp.n. and *Hygrotus* (*Coelambus*) *stefanschoedli* sp.n. are described from Iran. *Hygrotus* (*Coelambus*) *orthogrammus* (SHARP, 1882) from the Persian Gulf region is re-instituted as valid species. The closely related eastern Mediterranean *Hygrotus* (*Coelambus*) *lernaesus* (SCHAUM, 1857) is included in the studies. The male and female genitalia of all four species are figured, and the key to Palearctic *Hygrotus* in FERY (2003) is modified to reflect the two new and the one re-instituted species.

**Key words:** Coleoptera, Dytiscidae, *Hygrotus*, *Coelambus*, new species, re-instatement, key to species, Iran, Persian Gulf.

## **Introduction**

According to NILSSON (2001) and FERY (2003) the chiefly Holarctic genus *Hygrotus* includes 70 species in total, 11 of these in the subgenus *Hygrotus* s.str. and 59 in the subgenus *Coelambus*. NILSSON (2003a, 2003b) records the following species from Iran: *Hygrotus* (s.str.) *inaequalis* (FABRICIUS, 1777), *H. (Coelambus) confluens* (FABRICIUS, 1787), *H. (C.) enneagrammus* (AHRENS, 1833), *H. (C.) impressopunctatus* (SCHALLER, 1783), *H. (C.) inscriptus* (SHARP, 1882), *H. (C.) lernaesus* (SCHAUM, 1857), *H. (C.) pallidulus* (AUBÉ, 1850), and *H. (C.) saginatus* (SCHAUM, 1857). All these records except *H. lernaesus* are due to or can at least be confirmed by the collecting activities of the Department of Biology of the Shiraz University performed within the last 35 years.

*Hygrotus* (s.str.) *versicolor* (SCHALLER, 1783) has been recorded from Iran by F. BALFOUR-BROWNE (1940: 206) ("Persia"), by HOSSEINIE (1974: 241) (Fars prov.), and by MCCULLERS (1976: 16) (Fars prov.). However, all specimens studied recently have proved to belong to *Herophydrus musicus* (KLUG, 1834), a species which indeed looks like *H. versicolor* at first glance. At present, *H. versicolor* must be excluded from the Iranian fauna and can be regarded as a chiefly European species which in Asia is known only from West Siberia.

HOSSEINIE (1978: 169) recorded *H. lernaesus* from several localities in Fars province. According to our investigations, however, all these specimens must be referred either to *H. stefanschoedli* sp.n., *H. curvilobus* sp.n. or to *H. (Coelambus) orthogrammus* (SHARP). The latter had been described by SHARP (1882: 405) from "Persia" (in genus *Coelambus*), but later it was treated either as a synonym or variety of *H. lernaesus*. The study of the male and female genitalia, however, shows that this taxon must be re-instituted as a valid species.

The two new species and *H. orthogrammus* are described below and compared with *H. lernaeus*, to which they are very similar. The key to Palearctic members of *Hygrotus* provided in FERY (2003) is slightly modified to include these three species.

### Material, methods, and acknowledgements

More than 200 specimens of the two new species and of *H. orthogrammus* have been studied, the major part of these collected by the staff of the CBSU. Additional material has been made available by several other museums and colleagues. The following abbreviations are used for the collections where material is located:

BML	The Natural History Museum [formerly: British Museum], London, UK (S. Hine)
CBSU	collection of the Department of Biology, Shiraz University, Iran (S. Hosseini)
CGW	coll. G. Wewalka, Wien, Austria
CHF	coll. H. Fery, Berlin, Germany, property of NMW
CJS	coll. J. Štátný, Liberec, Czech Republic
CRA	coll. R.B. Angus, Surrey, U.K.
MNHN	Muséum National d'Histoire Naturelle, Paris, France (H. Perrin)
MRTO	Museo Regionale di Scienze Naturali, Torino, Italy (M. Daccordi)
NHMP	National History Museum, Praha, Czech Republic (J. Jelínek, J. Hájek)
NMB	Naturhistorisches Museum Basel, Switzerland (coll. M. Brancucci)
NMW	Naturhistorisches Museum Wien, Austria (M.A. Jäch)
ZSM	Zoologische Staatssammlung, Munich, Germany (M. Baehr, M. Kühbandner)

The male and female genitalia of most specimens were dissected and studied wet. Figures have been drawn with the help of photographs (Nikon Coolpix 995 digital camera, adapted to an Olympus SZ stereomicroscope) and afterwards touched up electronically. Total length and maximum width of the specimens were measured with the same stereomicroscope which was equipped with a micrometer eyepiece. For the presentation of the coordinates of several localities we have adopted the style of "The Times Atlas of the World, Comprehensive Edition (London, 1997)", "Stiehlers Handatlas (Gotha, 1928/30)", "Andrees Handatlas (Bielefeld, Leipzig, 1890)", and "Microsoft Encarta World Atlas 2000" have been used additionally to recognise some localities and to find their co-ordinates. The complete label texts are cited in quotation marks for the holo- and paratypes, however, not so for most other specimens.

The authors thank all colleagues mentioned above for their help. Thanks are also due to D. Bilton (Plymouth, UK) for the lingual revision of an earlier version of this work. In particular, we thank K. Elmi, former technician at the CBSU, for his famous collecting activities and the technical assistance which he always offered generously.

### Systematics

*Hygrotus curvilobus* sp.n. is described in detail below, but descriptive notes on other species are kept shorter by giving only the relevant differences from *H. curvilobus* sp.n. Descriptions chiefly relate to males, and particular female characters are presented at the end of the respective section. The terminology to denote the genitalia's orientation follows MILLER & NILSSON (2003). For more thorough information about the Palearctic members of *Hygrotus* the reader is referred to FERY (2003).

***Hygrotus (Coelambus) curvilobus* sp.n.**

? *Coelambus orthogrammus* SHARP; SCHOLZ 1916: 169 (partim).

? *Coelambus lernaues* var. *orthogrammus* SHARP; ZIMMERMANN 1920: 68, 1930: 101 (partim).

*Coelambus lernaues* (SCHAUM); HOSSEINIE 1978: 169.

*Hygrotus (Coelambus) lernaues* (SCHAUM); NILSSON 2003a, 2003b: 72 (partim).

**Type locality:** Iran, Fars province, Zarghan, ca. 33 km NE Shiraz, ca. 29.46N 52.43E, ca. 1600 m (see HOSSEINIE 1974: 241 for more details).

**Holotype:** 1 ♂, “25.5.1976 Iran, Fars prov., Zarghan, Elmi leg. (#375)”, “water 18°C, air 24°C, hum. 51%, alt. 1620 m”, “Coleoptera-Dytiscidae, *Coelambus lernaues*, Det. K. Elmi 1976”, “Holotype, *Hygrotus (Coelambus) curvilobus* sp.n., Fery, Sadeghi & Hosseinie det. 2004” [red] (NMW).

**Paratypes** (66 paratypes in total): 1 ♀, “Iran Ostan-e-Fars [= Fars prov.], Zarghan, 11.VII.[19]72, #136 ShHosseinie”, “water 28°C, air 37°C”, “*Coelambus lernaues* (Schaum), Det. ShHosseinie”, female sex symbol, “*Coelambus lernaues* Sch, Det. FNYoung” (CBSU). 1 ♀, “27.4.1976 Iran, Fars prov., Zarghan, Elmi leg. (#370)”, “water 20°C, air 26.5°C, hum. 20.5%, alt. 1650 m”, “Coleoptera-Dytiscidae, *Coelambus lernaues*, Det. K. Elmi 1976” (CBSU). 3 ♂♂, 1 ♀, “25.5.1976 Iran, Fars prov., Zarghan, Elmi leg. (#375)”, “water 18°C, air 24°C, hum. 51%, alt. 1620 m”, “*Coelambus lernaues* (Schaum) 1978, Det. Sh. Hosseinie” (CBSU). 2 ♂♂, 1 ♀, “19.7.1976 Iran, Fars prov., Zarghan, Elmi leg. (#455)”, “water 25°C, air 35°C, hum. 47%, alt. 1570 m”, “Coleoptera-Dytiscidae, *Coelambus lernaues*, Det. K. Elmi 1976”; female totally dissected (CBSU). 3 ♂♂, 1 ♀, “9.8.1976 Iran, Fars prov., Zarghan, 33 km N Shiraz, Elmi leg. (#461)”, “marshland, water 28°C, air 30°C, alt. 1600 m”, “*Coelambus lernaues* (Schaum) 1978, Det. Sh. Hosseinie” (CBSU). 3 ♂♂, 2 ♀♀, “9.8.1976 Iran, Fars prov., Zarghan, Elmi leg. (#461)”, “marshland, water 28°C, air 30°C, alt. 1600 m”, “*Coelambus lernaues* (Schaum.) ? , Iden. Sh. Hosseinie. 1977, Iden. Gh. Baboli. 1994” (CBSU). 1 ♂, “9.8.1976 Iran, Fars prov., Zarghan, Elmi leg. (#461)”, “marshland, water 28°C, air 30°C, alt. 1600 m”, “*Coelambus lernaues* (Schaum.) ? , Det. Sh. Hosseinie. 1977, Det. Gh. Baboli. 1994” (CBSU). 1 ♂, “9.8.1976 Iran, Fars prov., Zarghan, pond, Hosseinie (#461-2)”, “marshland, water 28°C, air 30°C, alt. 1600 m” (CBSU). 1 ♀, “7.11.1976 Iran, Fars prov., Zarghan, pond, Hosseinie (#570-1)”, “marshland, water 12°C, air 13°C, hum. 77 %, alt. 1595 m” (CBSU). 1 ♀, “8.2.1977 Iran, Fars prov., Zarghan, Elmi leg. (#588)”, “water 12.5°C, air 5°C, hum. 46%, alt. 1520 m”, “Coleoptera-Dytiscidae, *Coelambus lernaues*, Det. K. Elmi 1977” (CBSU). 1 ♀, “26.4.1970 Iran, Fars prov., Paul-e-Fassa [= Pol-e Fasa, ca. 20 km SE Shiraz, ca. 29.28N 52.38E] Hosseinie leg. (#24)”, “*Coelambus lernaues* (Schaum.) ? , Det. Sh. Hosseinie. 1974, Gh. Baboli. 1994” (CBSU). 2 ♀♀, “19.6.1972 Iran, Fars prov., Paul-e-Fassa, Elmi leg. (#134)”, “water 31°C, air 35°C, alt. 1500 m”, “*Coelambus lernaues* (Schaum.) ? , Det. Sh. Hosseinie. 1974, Gh. Baboli. 1994” (CBSU). 1 ♂, “Iran Ostan-e-Fars [= Fars prov.], Paul-e-Fassa Rd., 19.VI.[19]72, #134 KElmi”, “water 31°C, air 35°C, alt. 1500 m”, “*Coelambus lernaues* (Schaum), Det. ShHosseinie”, “*Coelambus lernaues* Sch, Det. FNYoung” (CBSU). 1 ♂, “Iran Ostan-e-Fars, Paul-e-Fassa Rd., 19.VI.[19]72, #134 KElmi”, “water 31°C, air 35°C, alt. 1500 m”, “*Coelambus lernaues* (Schaum), Det. ShHosseinie”, “*Coelambus lernaues* Sch, Det. FNYoung”, “genitalia, MSlide (genitalia absent) (CBSU). 1 ♂, “5.7.1972 Iran, Fars prov., Paul-e-Fassa, K. Elmi leg. (#135)”, “water 28°C, air 34°C, alt. 1500 m”, “*Coelambus lernaues* (Schaum.) ? , Det. Sh. Hosseinie. 1974, Gh. Baboli. 1994” (CBSU). 1 ♀, “Iran Ostan-e-Fars [= Fars prov.], Paul-e-Fassa, 21.IV.[19]73, #147, HAssadi”, “*Coelambus lernaues* (Schaum), Det. ShHosseinie” (CBSU). 1 ♀, “Iran, Fars, #147, 21.IV.[19]73, Leg. H. Assadi”, “Iran, Fars, Paul-e-Fassa”, female sex symbol, “*Coelambus lernaues* (Schaum, det. G. Wewalka 75” (CBSU). 4 ♂♂, “13.4.1976 Iran, Fars prov., Paul-e-Fassa, Elmi leg. (#364)”, “water 17°C, air 25°C, hum. 22%, alt. 1460 m”, “Coleoptera-Dytiscidae, *Coelambus lernaues*, Det. K. Elmi 1976”; one male totally dissected (CBSU). 2 ♂♂, 2 ♀♀, “29.7.1976 Iran, Fars prov., Paul-e-Fassa, Elmi leg. (#458)”, “water 26°C, air 24°C, alt. 1520 m”, “*Coelambus lernaues* (Schaum) 1978, Det. Sh. Hosseinie” (CBSU). 1 ♂, “22.11.1976 Iran, Fars prov., Paul-e-Fassa, Elmi leg. (#573)”, “water 11°C, air 8°C, hum. 72%, alt. 1440 m”, “Coleoptera-Dytiscidae, *Coelambus lernaues*, Det. K. Elmi 1976” (CBSU). 1 ♀, “19.12.1976 Iran, Fars prov., Paul-e-Fassa, 17 Km SE Shiraz, Elmi leg. (#579)”, “Coleoptera-Dytiscidae, *Coelambus lernaues*, Det. K. Elmi 1976” (CBSU). 4 ♀♀, “1.6.1977 Iran, Fars prov., Paul-e-Fassa, 17 km S Shiraz, Elmi leg. (#651)”, “water 22°C, air 25°C, hum. 21%, alt. 1500 m”, “*Coelambus lernaues* (Schaum.) ? , Iden. Sh. Hosseinie. 1977, Iden. Gh. Baboli. 1994”; one female without genitalia (CBSU). 1 ♀, “1.6.1977 Iran, Fars prov., Paul-e-Fassa, Elmi leg. (#651)”, “water 22°C, air 25°C, hum. 21%, alt. 1500 m”, “*Coelambus lernaues* (Schaum) 1978, Det. Sh. Hosseinie” (CBSU). 1 ♂, “1.6.1977 Iran, Fars prov., Paul-e-Fassa, 17 km S Shiraz, Elmi leg. (#651)”, “water 22°C, air 25°C, hum. 21%, alt. 1500 m”, “*Coelambus lernaues* (Schaum.) ? , Det. K. Elmi. 1978, Det. Gh. Baboli. 1994” (CBSU). 2 ♂♂, “6.1.1977 Iran, Fars prov., Paul-e-Fassa, pond, Hosseinie (#651-3)” (CBSU). 1 ♀, “6.1.1977 Iran, Fars prov., Paul-e-Fassa, pond, Hosseinie (#651-4)” (CBSU). 1 ♂, “25.9.1977 Iran, Fars prov., Paul-e-Fassa, Elmi leg. (#865)”, “water 16°C, air 21°C, hum. 40%, alt. 1460 m”, “Coleoptera-Dytiscidae, *Coelambus lernaues*, Det. K. Elmi 1977” (CBSU). 1 ♂, “Iran Ostan-e-Fars [= Fars prov.], Barm-e-Delak [ca. 5 km SE Shiraz], 22.VI.[19]69, #18 ShHosseinie”, “marshland”, “*Coelambus lernaues* (Schaum), Det. ShHosseinie”, “*Coelambus lernaues* Sch, Det. FNYoung”

(CBSU). 1 ♂, “3.6.1973 Iran, Fars, prov., Dasht-e-Arzan [ca. 60 km W Shiraz, ca. 29.38N 51.58E] rd., leg. ?”, “*Coelambus lernaues* (Schaum), Det. ShHosseinie” (CBSU). 1 ♂, 1 ♀, “5.6.1973 Iran, Fars prov., Chenar-Dar [= Chenar Rah Dar, ca. 10 km W Shiraz, ca. 29.36N 52.25E], Elmi leg. (#152)”, “stream, water 22°C, air 33°C”, “*Coelambus lernaues* (Schaum.) ? , Det. Sh. Hosseinie. 1974, Gh. Baboli. 1994” (CBSU). 1 ♂, “Iran Ostan-e-Fars [= Fars prov.], Sheikhbeed [= Sheikh Bid, ca. 45 km NE Shiraz, between Marv Dasht and Persepolis, ca. 29.55N 52.50E] (I), 30.VI.[19]74, #204 KElmi”, “stream system, water 25°C, air 27°C”, “*Coelambus lernaues* (Schaum), Det. ShHosseinie”, “*Coelambus lernaues* Sch., Det FNYoung” (CBSU). 2 ♂♂, 2 ♀♀, “1.6.1976 Iran, Fars prov., Kheirabad – Marvdasht Rd., ca. 69 km N Shiraz, Elmi leg. (#379)”, “river/pond, water 15°C, air 20.5°C, hum. 55 %, alt. 1615 m”, “*Coelambus lernaues* (Schaum), Det. Sh. Hosseinie 1977” (CBSU). 2 ♀♀, “25.9.1977 Iran, Fars prov., Barm-e-Shur [= Barm-e Shur-e-Bala], ca. 29.26N 52.40E, ca. 28 km S Shiraz, Elmi leg. (#864)”, “marshland, water 22°C, air 21°C, hum. 34.5 %, alt. 1480 m”, “*Coelambus lernaues* (Schaum) 1978, Det. Sh. Hosseinie” (CBSU). 1 ♂, “31.7.1978 Iran, Fars prov., Shiraz-Kavar rd., ca. 60 km S Shiraz, Elmi leg. (#992)”, “river, water 24°C, air 28°C, hum. 47 %, alt. 920 m”, “Coleoptera-Dytiscidae, *Coelambus lernaues*, Det. K. Elmi 1978” (CBSU). 1 ♀, “12.2.1996 Iran, Fars prov., Shiraz, Nouryeghad leg.”, “*Coelambus* Thoms., Det. Elmi 2000” (CBSU). 1 ♂, “*Coelambus* Thoms., Det. Elmi 2000” (CBSU). 1 ♂ 1 ♀, “21.4.1998, Iran, Fars prov., ca. 140 km (on road) ENE Shiraz, road to Abadeh-e Tashk, 1700 m”, “between Arsanjan and Tashk, ca. 29.50N 53.25E, Cheshmeh [= spring] Gomian, Elmi leg. (#2094)” (CBSU). 1 ♂, “S Iran, Naghshe Rostam [= Naqsh-e Rostam, ca. 20 km NE Marv Dasht, ca. 29.58N 52.54E], 20.-21.6.1973”, “Loc. no. 250, Exp. Nat. Mus., Praha” (NHMP). Each paratype is provided with its respective red label.

For more details about most of the localities mentioned above the reader is referred to HOSSEINIE (1974, 1978), where the specimens are listed under *Coelambus lernaues* (SCHAUM).

**Additional material:** The following three specimens lack exact collecting data and thus are excluded from the series: 1 ♀, “*Coelambus* Thoms., Det. Elmi 2000” (CBSU). 1 ♀, “ca. 1975 Iran, Fars prov., Elmi leg., exact locality unknown” (CBSU). 1 ♀ (shiny), “Dytiscidae, *Coelambus*, K Elmi 13.4.[19]75”, “SP. changed, (Wewalka, [19]78), New for Iran” (CBSU).

**Diagnosis:** Habitus oval oblong, sides evenly rounded; discontinuity between sides of pronotum and those of elytra perceptible. Elytra brownish yellow, with blackish longitudinal vittae. Head and pronotum more reddish yellow, with brownish spots. Whole upper surface shiny in males, rarely in females.

Head with anterior margin not raised; truncate, slightly concave; in strictly dorsal view, however, clypeus appearing evenly rounded anteriorly, because anterior margin not visible; two clypeal impressions anteriorly between eyes. Whole surface microreticulated, slightly matt. Punctuation on clypeus fine and sparse, becoming coarser and denser on frons; on vertex again very fine and sparse; clypeal grooves with punctuation somewhat denser. Vertex with a transverse brown spot of variable extent; clypeus with two small and ill-defined, slightly darkened interocular spots; shining through brownish behind anterior margin and near insertions of antennae. In a few specimens interocular spots on head practically absent, thus resembling *H. orthogrammus*. In such cases, however, transverse spot on vertex and discal spot on pronotum at least perceptible.

Pronotum with sides only slightly rounded, almost straight in posterior half, and provided with a distinct rim. Posterior angles more or less right-angled. Centre of disc with a small longitudinal scratch. Surface microreticulated and matt behind anterior margin, with rest of surface smooth and shiny. Punctuation on disc rather fine, becoming slightly coarser near sides; punctuation absent directly behind anterior margin, then very fine, but very coarse before disc; punctures very coarse before posterior margin, in part longitudinally deformed and strongly impressed. Disc with brown to blackish brown spot of variable extent, transversely broadened in some specimens. Anterior and posterior margins somewhat darker shining through.

Elytra with maximum width before their midlength. In dorsal view epipleural rim (or lateral margin of elytron) visible only at base of elytron and before apex because sides of elytra turned inwards elsewhere. Epipleural rim in lateral view weakly ascending towards humeral angle. Whole surface without microreticulation, and thus shiny. Punctuation double in anterior third, almost simple behind; coarser punctures with distance equal to or slightly larger than their diameter; with sparsely interspersed very small punctures in anterior third, behind this only with

a very few. Coarser punctures becoming slightly smaller backwards, and rather dense near somewhat dull apex. Each elytron with two indistinct puncture lines on disc, which coincide more or less with second and fourth vittae; first puncture line – if recognisable – present only in anterior two thirds, second line only in first third. Some larger punctures between fifth vitta and elytral margin indicate a third line in anterior third. In anterior quarter, beside suture, coarse punctures slightly denser, thus indicating a suture line. Whole surface with a short yellowish setation, very weak in anterior third, becoming denser to sides and apex, here with a very few setae of double length.

Pattern on elytra as follows: suture, four discal vittae, a lateral and a submarginal one, and a basal transverse band, which ends before shoulder, blackish brown. Second and fourth vittae reach farther forwards than first and third, which end far before base. About half of specimens studied with second vitta ending before base; rest of specimens with second vitta reaching basal band, however, in almost all of these specimens vitta noticeably reduced in width before base. Fourth vitta broader, never fused with basal band; reaching backwards only until end of second third of elytra, interrupted in their middle, only exceptionally not interrupted, if so, however, then strongly narrowed in middle. Lateral vitta shortened, only present in anterior half, and ending far before base. Submarginal vitta beginning near middle, more or less parallel to elytral margin, reaching until apex, and here fused with sutural line. First to fourth vittae fused shortly before their end; in several specimens second vitta narrowly fused with submarginal one near apex.

Ventral surface black in large part; head, prosternum on sides, epipleura, and legs yellowish brown; prosternal process darker before base and on sides of lanceolate posterior part. Metacoxal processes apically, hind margins of third to fifth abdominal segments, and an area before apex of last visible abdominal segment shining through brownish. In some specimens also centre of metasternum, metaepisterna, parts of metacoxal plates, and first abdominal segment brownish. Whole venter distinctly microreticulated, only slightly shining, but not distinctly matt; metasternal processes more shiny. Punctuation on metacoxal plates and metasternum distinct, but not strongly impressed, sparser and weaker near middle of metasternum, absent in posterior third of metacoxal plates. Punctuation more distinct on metasternal processes. Abdominal segments with punctures, becoming denser to last segment, coarser on sides of first and second segment. Third to fifth segment with some dense and small punctures in middle, these provided with long and backwardly directed setae. Last visible abdominal segment almost unpunctured in middle; in some specimens a very weak impression perceptible before apex.

Prosternal process posteriorly lanceolate, longitudinally carinate, with tectiform cross section before apex; apex broadly rounded, sides slightly broadened, however not flattened, and here with some coarse punctures, and provided with a rim; setae not perceptible; with a small sharp elevation between anterior coxae, but not transversely ridged; in some specimen elevation provided with weak setae; before elevation with very indistinct transverse grooves or only rough surface. Epipleura rather broad anteriorly, more or less as broad as apex of mesotibia; weakly reticulated and punctured. Epipleural carina meeting epipleural rim at shoulders at an angle of about 25°. Inner side of elytra in posterior half provided with a carina near margin and a ligula in its posterior part which is strongly raised anteriorly, and abruptly descending posteriorly (e.g. as in *Hygrotus (Coelambus) caspius* (WEHNCKE, 1875); see FERY 2003: Fig. 170). Hind margins of metacoxal processes sinuate, centrally somewhat prolonged posteriorly. Metacoxal lines diverging forwards, ending before hind margin of metasternum. Fore and hind femora provided with a row of coarse setiferous punctures, weaker on fore femora; mid femur with two such rows. Fore tibiae on frontal (upper) surface with two longitudinal rows of very coarse setiferous punctures, one almost in middle; a second near extern side, straight or slightly curved inwards

before apex; a third row on intern margin; mid tibiae provided with similar rows of setiferous punctures.

♂♂: Median lobe of aedeagus as in Fig. 1; strongly curved before apex in lateral view; tip on dorsal side with a more or less triangular enlargement (Fig. 1a), which becomes broader towards rear; this enlargement, however, not as distinct as in Fig. 1a in all males studied, in some specimens rather weakly developed. Median lobe in ventral view not parallel, and not evenly tapering towards apex over the whole length. Dorsal side of lobe provided with some very sparse and short setae. Parameres (Fig. 5) almost triangular, blunt tip provided with fine hairs. First three protarsomeres strongly broadened, claws unequal, anterior claw shorter, strongly thickened and curved (Fig. 19); posterior claw distinctly less broadened, evenly curved. Mid legs with tarsomeres broadened as in fore legs; claws slightly thickened, anterior one a little shorter and more curved than posterior one. Third and fifth mesotarsomeres of almost equal length, or fifth very slightly shorter. Hind legs with claws of equal size and shape. Antennae reddish-yellowish with articles progressively darkened distally, beginning with fifth; third and in particular fourth article shorter than second and fifth.

♀♀: Dimorphic; 26 of 30 studied females matt on pronotum and elytra, but with reticulation on head as in males. On pronotum difference in size of coarse and fine punctures less prominent. On elytra reticulation becoming less impressed to apex and thus a little more shiny here. Puncture lines on elytra rather indistinct. Punctuation between these lines almost simple; finer punctures distinctly smaller than coarse punctures, but larger than fine punctures in males, rather evenly distributed; some slightly larger punctures present near base, however, their diameter still smaller than that of coarse punctures in males; only exceptionally some very fine punctures interspersed in anterior third. Punctuation becoming progressively denser behind anterior third. On venter punctuation generally somewhat finer and less impressed, reticulation slightly more prominent. Four females shiny, with surface appearing as that of males, however, elytra in posterior third with weakly impressed microreticulation, and here a little less shiny. On venter punctuation equal to that of males, however, reticulation more prominent. Gonocoxosternum somewhat variable (Figs. 14–15); gonocoxae also variable in shape (Figs. 9–10), predominantly as in Fig. 10; in lateral view (not figured) distinctly flatter than in *H. lernaeus* (Fig. 13a), and even flatter than in *H. orthogrammus* (Fig. 12a).

Measurements: TL: 3.8–4.5 mm, MW: 1.9–2.25 mm (holotype: TL: 4.2 mm, MW: 2.1 mm).

**Distribution:** Endemic to Iran; so far only known from Fars province in south-western Iran (Fig. 20).

**Derivatio nominis:** The new species is named “curvilobus” due to the strongly curved median lobe in lateral view.

### *Hygrotus (Coelambus) stefanschoedli* sp.n.

? *Coelambus orthogrammus* SHARP; SCHOLZ 1916: 169 (partim).

? *Coelambus lernaeus* var. *orthogrammus* SHARP; ZIMMERMANN 1920: 68, 1930: 101 (partim).

*Hygrotus (Coelambus) lernaeus* (SCHAUM); NILSSON 2003a, 2003b: 72 (partim).

**Type locality:** Iran, Markazi province, between Khomeyn and Arak, 33 km NW Khomeyn, ca. 33.53N 49.52E, 1880 m.

**Holotype:** ♂, “3.8.1995, Iran, Markazi prov., 33 km NW Khomeyn, road to Arak, ca. 33.53N 49.52E, 1880 m, stream, Elmi leg. (#1623)”, “Holotype, *Hygrotus (Coelambus) stefanschoedli* sp.n., Fery, Sadeghi & Hosseinie det. 2004” [red] (NMW). This specimen has been chosen as the holotype because it is in the best condition of all males studied; nevertheless, it lacks the left hind tibia and tarsomeres, and the last two tarsomeres of the right fore leg; the right antenna is slightly deformed and has only nine articles. All following CBSU paratypes lack either legs and/or antennae or parts of these.

**Paratypes** (13 paratypes in total): 2 ♂♂, 5 ♀♀, “5.8.1995, Iran, Lorestan prov., ca. 170 km (on road) W Khorramabad”, “road to Eslamabad, ca. 33.35N 47.02E, stream, 1700 m, Elmi leg. (#1637)” (CBSU, CHF). 3 ♂♂, 1 ♀, “5.8.1995, Iran, Kermanshah prov., 14 km E Ravansar, road to Kamyaran”, “ca. 34.47N 46.46E, marshland, 1420 m, Elmi leg. (#1641)” (CBSU, CHF). 1 ♂, 1 ♀, “Issaraq, Perse, IV 1936. M.” [hw Guignot], the respective genus-symbol, “Muséum Paris, 1960, coll. F. Guignot” (MNHN). Each paratype with its respective red label.

We have found several localities in Iran which might be considered being “Issaraq” (see under the names Hisarak, Hesarak, Hesarek, Hissar, Hisar, Hesar in the divers maps etc.). Two possibilities, however, seem to us to be most probable: (1) “Hesarak” (ENCARTA: 35.51N 50.56E) = “Hesarek” (STIEHLERS HANDATLAS), NW Karaj, in Tehran province, which is most probably the same as “Hisarak” of which ADAMEC (1976: 237) writes: “Hisarak: The second station on the new post-road from Tehran to Kazvin [= Qazvin]. The name is a diminutive of Hissar”. (2) “Hesar” (ENCARTA: 36.02N 48.34E) = “Hisar” (TIMES ATLAS) = “Hissar” (ANDREES HANDATLAS), ca. 70 km S Zanjan, in Zanjan province.

**Diagnosis** (only relevant differences from description of *H. curvilobus* sp.n. given): Head weakly, almost invisibly chagrined, more shiny than in *H. curvilobus* sp.n., with an area without microreticulation before frons. Vertex with transverse spot dark brown; interocular spots distinct, large, dark brown, and more clearly defined, in some specimens fused with spot on vertex and/or brownish areas near the insertions of the antennae. Punctuation on disc of pronotum weaker, in some specimens very weak; whole surface appearing more shiny. Coarser punctures on elytra of smaller diameter and less dense, smaller punctures more numerous; thus elytra also appearing more shiny. Puncture lines more prominent, because punctures of larger diameter than that of coarser punctures between puncture lines. Lines well recognisable far beyond midlength. Setation on elytra more prominent, longer hairs very long and more numerous, present also on sides of elytra; in some specimens longer setae also along the puncture lines. Principal structure of elytral pattern same as in *H. curvilobus* sp.n., however, vittae reaching more forward; except the female from “Issaraq”, in all specimens second vitta reaching basal transverse band and mostly not narrowed before base; fourth vitta reaching basal band or ending only shortly before, in several specimens not interrupted medially. Prosternal process posteriorly broader, sides more flattened, punctures and rim more prominent, with a few setae in some specimens.

♂♂: Median lobe longer, in lateral view less curved apically (Fig. 2); structure of apical enlargement totally different (Fig. 2a); in ventral view sides very slightly tapering over almost whole length, nearly parallel, only stronger converging shortly before apex; area before corrugated membrane more excavated; parameres with apical part longer and narrower (Fig. 6). Most males with a distinct oval impression before apex of last abdominal segment. Protarsal claws more or less as in *H. curvilobus* sp.n. (Fig. 19). Both mesotarsal claws broader than those of *H. curvilobus* sp.n.; anterior claw shorter and more curved than posterior one. Mesotarsomere 5 distinctly longer than 3, ratio ca. 1.3:1.0.

♀♀: All females studied with dorsal surface microreticulated and thus matt. Head duller than in males, chagrined also before frons. Reticulation and punctuation of elytra more or less like in matt females of *H. curvilobus* sp.n. Abdominal segment with impression very weak or absent. First three pro- and mesotarsomeres less broadened than in males, fifth and third mesotarsomeres of about same length. Gonocoxosternum as in Fig. 16; gonocoxae predominantly as in Fig. 11, however, slightly variable in shape as in *H. curvilobus* sp.n. (Figs. 9–10); in lateral view flat as in *H. curvilobus* sp.n. Females of *H. curvilobus* sp.n. and *H. stefanschoedli* sp.n. cannot be distinguished unambiguously only by their genitalia.

Measurements: TL: 4.6–5.0 mm, MW: 2.3–2.45 mm (holotype: TL: 4.7 mm, MW: 2.3 mm).

**Distribution:** Endemic to Iran; so far only known from central, northern and western Iran: Markazi, Lorestan, Kermanshah, and Tehran or Zanjan (see Fig. 20; the last two localities with question marks).

**Derivatio nominis:** We name this new species after our valued colleague and famous specialist in Hydrophilidae, Stefan Schödl, who left us much too early in April 2005.

***Hygrotus (Coelambus) orthogrammus* (SHARP, 1882)**

*Coelambus orthogrammus* SHARP 1882: 405. – MARSEUL 1882: 56. – JACOBSON 1908: 420. – SCHOLZ 1916: 169 (partim).

*Coelambus lernaues* var. *orthogrammus* SHARP; ZIMMERMANN 1920: 68; 1930: 101 (partim). – ZAITZEV 1953: 137; 1972: 143 (partim).

*Coelambus lernaues* SCHAUM; RÉGIMBART 1895: 35 (partim). – ZIMMERMANN 1919: 151 (partim). – GUIGNOT 1959: 332 (partim, synonymy). – HOSSEINIE 1978: 169 (partim). – ALI 1978: 12. – GUÉORGUIEV 1981: 404 (partim).

*Hygrotus (Coelambus) lernaues* (SCHAUM); AL-HOUTY & ANGUS 1999: 184. – NILSSON 2001: 207, 2003a, 2003b: 72 (partim).

**Type locality:** “Persia”.

**Holotype:** ♀, genus-symbol on glue-card, “Type” [round label with red margin, printed, most probably mounted by J. Balfour-Browne], “Persia” [hw Sharp], “Sharp coll. 1905-313.” [printed], “Type 202” [hw Sharp], “*Coelambus orthogrammus* n. sp.” [hw Sharp], “Persia” [sic! hw Sharp], “Holotype, Fery 1993” [red] (BML). The holotype is slightly immature; the left antenna lacks the last, the right antenna the last five articles. Paratypes do not exist.

**Additional material studied:** **Iran:** 6 ♂♂, 6 ♀♀, “Iran mer. occ., Bandar-e Ganave [Bushehr prov.], 11.5.1999, L. Klima leg.” (CJS, CHF). 1 ♂, 31.1.1999, Bushehr, road Bandar-e-Deilam to Ganaveh, 35 km S Deilam, ca. 29°54′/50°14′, wetland, Elmi leg. (#2188) (CBSU). 1 ♂, 1.2.1999, Bushehr, road Khvormuj to Kangan, 69 km SE Khvormuj, ca. 28°14′/51°36′, stream, 80 m, Elmi leg. (#2196) (CBSU). 36 exs., 3.4.1995 Iran, Khuzestan, NNE Bandar-e-Mahshahr, 3 km S Ramshir, ca. 30°52′/49°23′, wetland, 40 m, Elmi leg., air 22°C, hum. 22.5%, alt. 440 m (#1523) (CBSU, CHF). 50 exs., 27.3.1999, Khuzestan, road Shush to Ahwaz, 63 km S Shush, ca. 31°46′/48°28′, wetland, 130 m, Elmi leg. (#2242) (CBSU, CHF). 5 ♀♀, 29.3.1999, Khuzestan, Bandar-e-Mahshahr [ca. 30.42N 49.10E], wetland, 330 m, Elmi leg. (#2256) (together with *H. inscriptus* and *H. confluens*) (CBSU, CHF). 2 exs., 29.3.1999, Khuzestan, road Bandar-e-Mahshahr to Hendijan, 9 km E Mahshahr, ca. 30°32′/49°16′, wide stream, 350 m, Elmi leg. (#2257) (together with *H. inscriptus* and *H. confluens*) (CBSU). 2 exs., 30.3.1999, Khuzestan, road Hendijan to Bandar-e-Deilam, 5 km E Hendijan, ca. 30°13′/49°45′, wetland, 380 m, Elmi leg. (#2260) (together with *H. saginatus* and *H. confluens*) (CBSU). 1 ♂, 1 ♀, 29.1.2001, Khuzestan, near Ahwas [ca. 31.15N 48.40E], wetland, 30 m, Elmi leg. (#2390) (together with *H. inscriptus*) (CBSU). 1 ♂, 1 ♀, 31.1.2001, Khuzestan, Shush to Ahwaz road, 49 km S Shush [ca. 31.49N 48.24E], wetland, 20 m, Elmi leg. (#2403) (CBSU). 2 ♀♀, 2.2.2001, Khuzestan, 6 km S Abadan, ca. 30°17′/48°21′, wetland, 10 m, Elmi leg. (#2408) (CHF). 2 ♂♂, 1 ♀, 3.2.2001, Khuzestan, 11 km E Bandar-e-Mahshahr, ca. 30°32′/49°16′, wetland, 20 m, Elmi leg. (#2415) (CHF). 1 ex., 3.2.2001, Khuzestan, road Bander-e-Mahshahr to Hendijan, 15 km E Bander-e-Mahshahr, ca. 30°32′/49°16′, Elmi leg. (#2417) (CBSU). 3 ♂♂, 2 ♀♀, “1999, Fars, Niriz [= Neyriz = Neyriz, ca. 29.11N 54.19E], 250 km SE Shiraz, Zahabi leg.” (together with *H. enneagrammus* and *H. confluens*) (CBSU, CHF). 1 ♂, “11.6.1975 Iran, Fars prov., Jahrom-Lar rd., Mansoorabad [= Mansurabad], ca. 28.15N 54.02E, 256 km SE Shiraz, Elmi leg. (#264)”, “stream, water 31°C, alt. 995 m”, “*Coelambus lernaues* (Schaum.) ?”, Iden. Sh. Hosseinie. 1977, Iden. Gh. Baboli. 1994” (CBSU). 1 ♀, “S Iran, 6 km W Geno [= Genu], 7.-9.5.1977”, “Loc. no. 332, Exped. Nat. Mus., Praha”, “*Coelambus parallelogrammus* Ahr., det. V. Guéorguiev 1982”; this locality is situated in Hormozgan prov., ca. 30 km N Bandar-e Abbas, ca. 27.26N 56.14E (privately communicated by J. Hájek, Praha) (NHMP). 2 ♀♀, “Perse, Susa [= ancient Susa, today’s Shush, ca. 20 km SW Dezful, 32.11N 48.14E], Escalera IV.1899”, “Muséum Paris, Coll Maurice Régimbart, 1908”; one specimen with additional “orthogrammus Shp” [hw Régimbart] (MNHN). 2 ♂♂, 2 ♀♀, “Perse, Susa, Escalera IV.1899”, “Dr Régimbart [sic!] vident 1900.”, “Muséum Paris, ex Coll. R. Oberthur, ex Wehncke”; one specimen with additional “orthogrammus Shp” [hw Régimbart?]; standing behind a label “*Coelambus unguicularis*” (MNHN). 1 ♂, “Perse, Coll. Léveillé”, in coll. Peschet (MNHN). **Iraq:** 1 ♂, “23.V.1963, Bakuba [= Baqubah], NO v. [= NE of] Bagdad. Irak, Kasy & Vartian” (MRTO). 1 ♂, “23.V.1963, Bakuba, NO v. Bagdad. Irak, Kasy & Vartian” (NHMW). 1 ♂, “Kanán [= Kan’an, 33.41N 44.49E, 20 km SE Bakuba], Dialz [collector?], 16.VIII.1983” (NMB). 1 ♂, “Iraq, Al Faisal and Auda [= Hawr al Awda, lake ca. 40 km SW Al’Amarah, ca. 31.40N 46.50E]” (NMB). **Kuwait:** 1 ♂, 2 ♀♀, “Kuwait., Jahra distr., pool with reedswamp., 9.v.1996. R.B. Angus.” (CRA). **Saudi-Arabia:** 2 ♂♂, “Quatif [ca. 26.33N 50.00E], 14-15.IV.1983”, “Saudi Arabia, C. Holzschuh” (CGW). 1 ♂, 5 ♀♀, “Quatif [ca. 26.33N 50.00E], 14-15.IV.1983”, “Saudi Arabia, C. Holzschuh” (NMB). 1 ♂, 1 ♀, “Hofuf [= Al-Hufuf, ca. 25.52N 49.35E], 23.III.1980”, “Saudi Arabia, W. Büttiker” (NMB). All studied specimens from Saudi Arabia are rather immature.



**Diagnosis** (only relevant differences from description of *H. curvilobus* sp.n. given): Head and pronotum without dark spots, at least diffusely shining through darker pigment in places, or in a few specimens centre of pronotum around the longitudinal scratch slightly darkened. Second vitta reaching basal transverse band in almost all specimens. Fourth vitta never reaching base, mostly interrupted medially. Fifth vitta reduced, often absent. Submarginal vitta often interrupted in middle. Discal puncture lines distinct until behind midlength, however, coarser punctures between these lines only somewhat denser near base, otherwise very sparse, smaller punctures much more numerous. In posterior third coarse punctures actually absent, smaller punctures becoming larger and denser, and very dense near apex. Setae on elytra like in *H. curvilobus* sp.n., however, long hairs longer and less sparse, and often present on sides also.

Prosternal process behind procoxae rather flat, not carinate; sides somewhat broadened, hardly flattened, provided with a rim and a few punctures, these not very coarse; setae not observed. Punctures on venter relatively small and little impressed.

SHARP (1882: 405) states in the original description of *H. orthogrammus*: "... it resembles *Hydroporus lernaues* extremely but is broader in proportion to its length ..." and "The only individual I have seen is a female." The holotype is indeed rather broad (see measurements below), however, according to our studies the proportions of both species are rather variable and we cannot confirm Sharp's observation as a rule which is applicable in general for separating *H. orthogrammus* and *H. lernaues*.

♂♂: Median lobe as in Fig. 3; in lateral view straight in apical two third; tip with a triangular enlargement (Fig. 3a), thus remembering that of *H. curvilobus* sp.n., however, enlargement small, often strongly reduced, or even absent and tip only obliquely truncate; parameres as in Fig. 7. Protarsal claws principally as in *H. curvilobus* sp.n. (Fig. 19), however, anterior one more strongly curved, posterior one relatively longer. Mesotarsal claws as in *H. curvilobus* sp.n. Fifth mesotarsomere as long or shorter than third.

♀♀: All females studied shiny, however, elytra in posterior third with weakly impressed microreticulation, and so a little less shiny here. Gonocoxosternum as in Fig. 17; gonocoxae in ventral view (Fig. 12), shorter than in *H. curvilobus* sp.n. (Fig. 9–10), but longer than in *H. lernaues* (Fig. 13); in lateral view (Fig. 12a) flatter than in *H. lernaues*.

Measurements: TL: 3.9–4.5 mm, MW: 2.05–2.35 mm (holotype: TL: 4.2 mm, MW: 2.2 mm).

**Distribution:** Iran, Iraq, Kuwait, and Saudi Arabia; a species of the Persian Gulf region, seemingly preferring low altitudes, however, found also in higher altitudes in the south of Fars province, southern Iran (Fig. 20).

### *Hygrotus (Coelambus) lernaues* (SCHAUM, 1857)

*Hydroporus lernaues* SCHAUM 1857: 153. – SHARP 1882: 405.

*Coelambus lernaues* (SCHAUM); SEIDLITZ 1887: 41 (partim). – RÉGIMBART 1895: 35 (partim). – ZIMMERMANN 1919: 151, 1920: 68, 1930: 101 (partim). – GUIGNOT 1959: 332 (partim). – GUÉORGUEV 1981: 404 (partim). – DIMENTMAN et al. 1992: 50. – FERY 1992: 119 (designation of lectotype).

*Coelambus lernoies* [sic!] var. *orthogrammus* SHARP; BAUDI 1894: 3.

*Coelambus orthogrammus* SHARP; RÉGIMBART 1893: 362.

*Hygrotus (Coelambus) lernaues* (SCHAUM); NILSSON 2001: 207, 2003a, 2003b: 72 (partim). – FERY 2003: 138 (key), 175 (genitalia).

**Type locality:** "Lernäische Sümpfe bei Nauplia" [= Lernaean marches near Nauplia], ca. 37.34N 22.48E, Pelopónnisos, Greece. The lectotype is stored in the ZSM.

**Diagnosis** (only relevant differences from description of *H. curvilobus* sp.n. given): Head with interocular spots, reduced in a few specimens, but always perceptible, however; dark transverse band on vertex and discal spot on pronotum present.

We have studied about 80 specimens, three quarters of these have the second vitta reaching basal transverse band; the others have the second vitta interrupted shortly before base. Some specimens with fourth vitta reaching almost until basal band, however, only connected with this band in two specimens, but strongly narrowed before basal band. Coarser punctures in anterior third of elytra more numerous than in *H. orthogrammus*, but less so than in *H. curvilobus* sp.n. Setae on elytra as in *H. curvilobus* sp.n., however, longer hairs not perceptible in most specimens, and if present then very sparse. Prosternal process rather sharply carinate, tectiform in cross-section, apex more narrowly rounded than in *H. orthogrammus*.

♂♂: Median lobe as in Fig. 4; in lateral view weakly, but perceptibly curved before apex; tip without any enlargement; parameres as in Fig. 8. Protarsal and mesotarsal claws as in *H. orthogrammus*. Fifth mesotarsomere a little longer than third.

♀♀: All females shiny. Gonocoxosternum as in Fig. 18; gonocoxae (Fig. 13) very short, proximally strongly bent upwards (see lateral view in Fig. 13a).

GUIGNOT (1959: 332) records almost matt females ("submate"), however, among all the specimens from diverse localities which we have studied no really matt female was found, all such specimens have proved to belong to the matt form of *Hygrotus* (*Coelambus*) *parallellogrammus* (AHRENS, 1812).

Measurements: TL: 3.8–4.5 mm, MW: 1.9–2.3 mm.

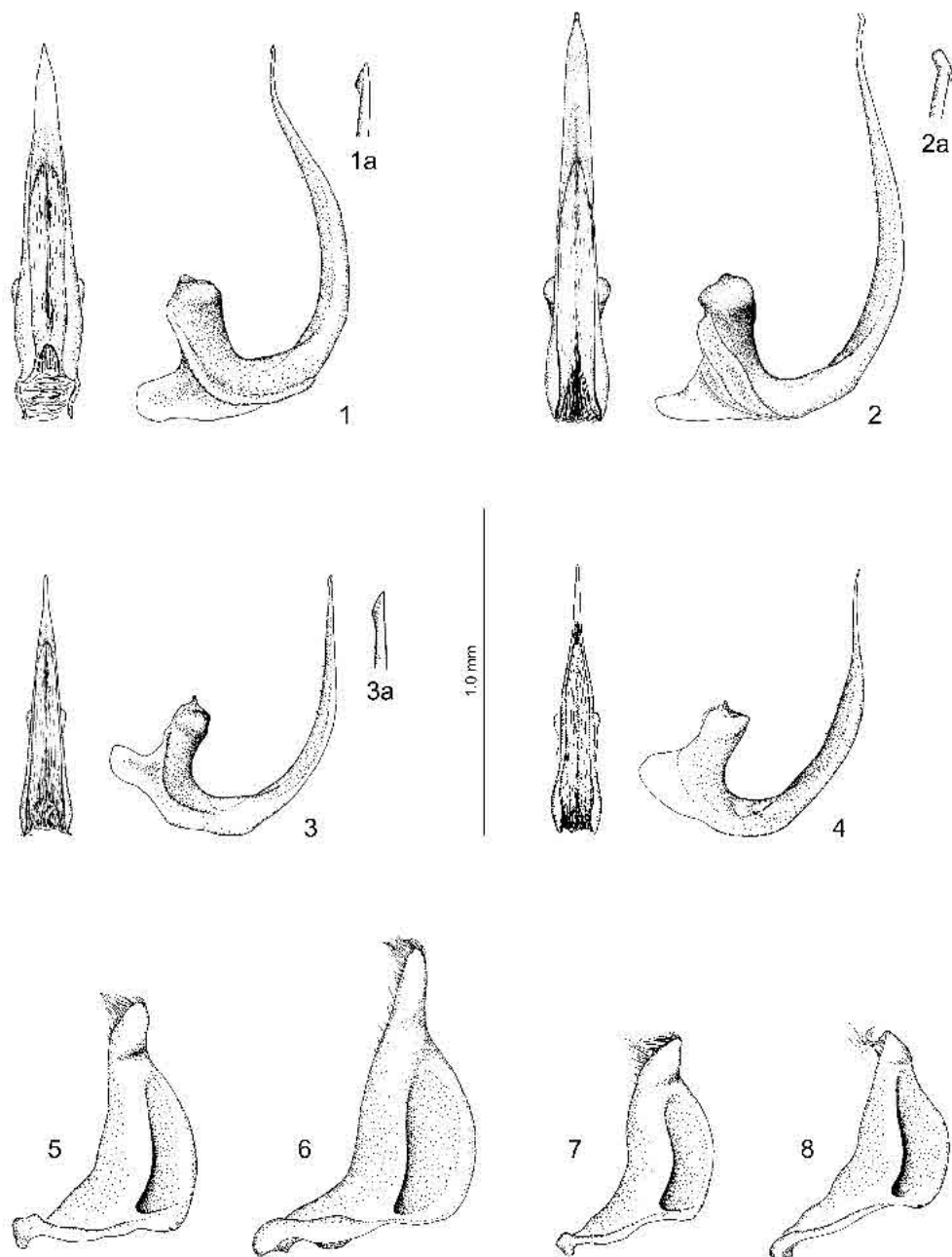
**Distribution:** The distribution of *H. lernaeus* (Fig. 20) is eastern Mediterranean (Ponto-Mediterranean). Areas given in NILSSON (2003a, 2003b) are in need of revision, chiefly due to the results of the present work. We have studied material from Macedonia, Romania, Bulgaria, Greece, Turkey, Syria, and Israel (some Israeli records given also by DIMENTMAN et al. 1992: 50). Records from Morocco (e.g. KOCHER 1958: 15) refer to *Hygrotus* (*Coelambus*) *lagari* (FERY, 1992), those from Kuwait (AL-HOUTY & ANGUS 1999: 184) to *H. orthogrammus*.

RÉGIMBART (1893: 362) recorded *Coelambus orthogrammus* from several localities in Syria (El-Ataibeh, Birket Abbâdi, Homs (Oronte)). He concluded these specimens to be a variety of *C. lernaeus*. From the known distribution of *H. orthogrammus*, however, we conclude that Régimbart indeed had *H. lernaeus* before him and not *H. orthogrammus*.

## Discussion

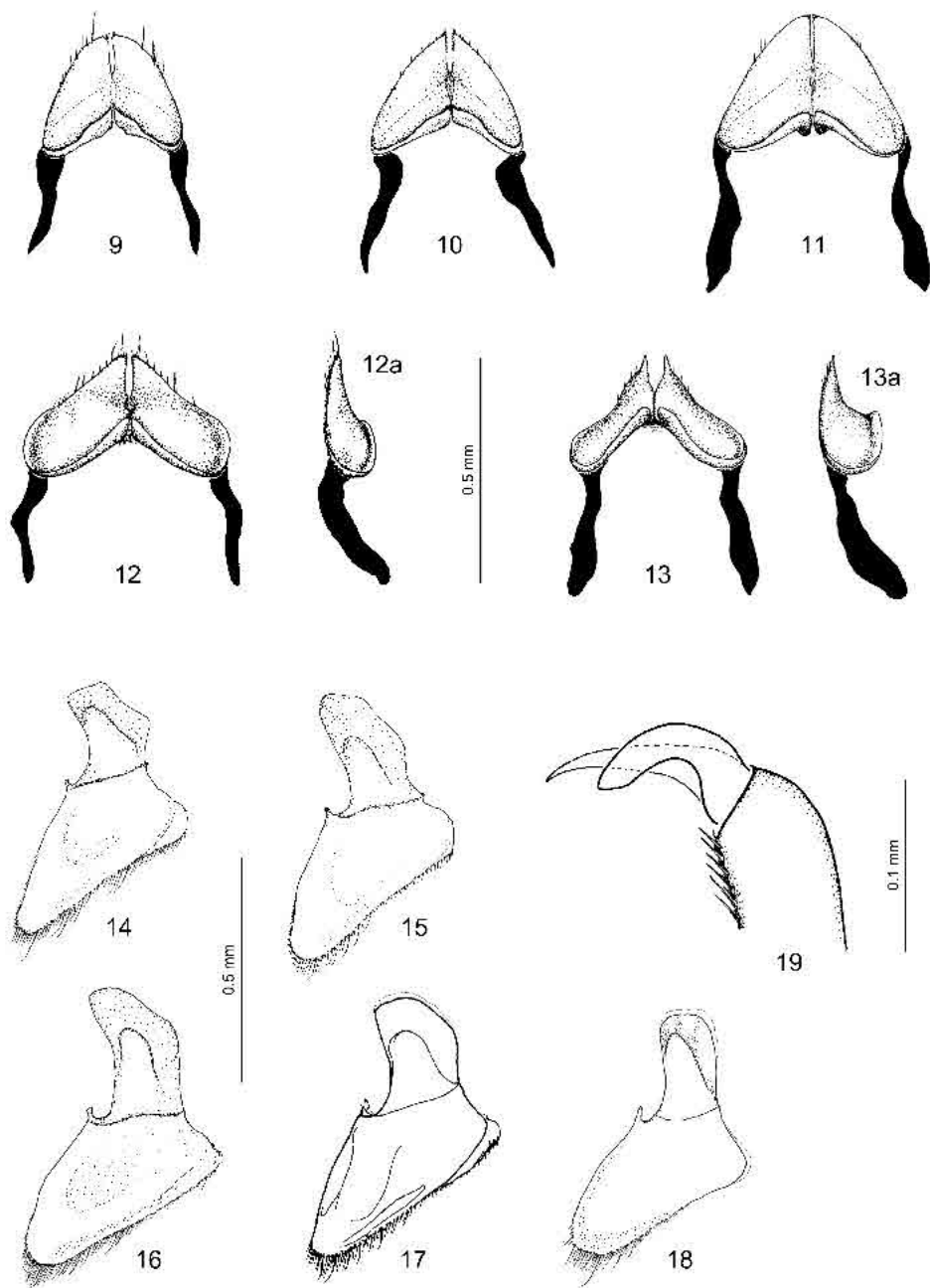
In general, the four species treated in this work can be distinguished straightaway by external characters – colour of head and pronotum, punctuation of elytra, and total length. However, if somewhat deviating specimens are studied – e.g. immature ones – the external characters can be misleading. In such cases the study of the male and female genitalia is necessary and will allow a correct determination, except in the case of females of *H. curvilobus* sp.n. and *H. stefanschoedli* sp.n. Incorporation of the distributional areas into the determination can be helpful, since according to our present knowledge all four species occur allopatrically.

We have reflected on the possibility that *H. curvilobus* sp.n. and *H. stefanschoedli* sp.n. should be seen as subspecies. However, the distinct and constant distinguishing characters (shape of median lobe, total length) in combination with the relatively large gap of ca. 500 km which separates both populations in the Zagros mountain range, have prompted us to treat both as species. Similar arguments led us also to treat *H. lernaeus* and *H. orthogrammus* as species. Their populations are separated by the Syrian desert and the deserts of the Arabian Peninsula. If, however, in the future, material is found which shows intermediate characters between *H. curvilobus* sp.n. and *H. stefanschoedli* sp.n. on the one hand and between *H. lernaeus* and *H. orthogrammus* on the other, the status of the respective taxa must be considered anew.



Figs. 1–4: Median lobe of aedeagus in ventral and lateral view of 1) *Hygrotus curvilobus* sp.n., 2) *H. stefanschoedli* sp.n., 3) *H. orthogrammus*, 4) *H. lernaeus*; Figs. 1a–3a: Enlarged tip of median lobe in lateral view of 1a) *H. curvilobus* sp.n., 2a) *H. stefanschoedli* sp.n., 3a) *H. orthogrammus*.

Figs. 5–8: Paramere of 5) *Hygrotus curvilobus* sp.n., 6) *H. stefanschoedli* sp.n., 7) *H. orthogrammus*, 8) *H. lernaeus*.



Figs. 9–13: Gonocoxae of 9) *Hygrotus curvilobus* sp.n., 10) *H. curvilobus* sp.n. (variant), 11) *H. stefanschoedli* sp.n., 12) *H. orthogrammus*, 13) *H. lernaeus*; Figs. 12a–13a: Gonocoxae in lateral view of 12a) *H. orthogrammus*, 13a) *H. lernaeus*.

Figs. 14–18: Gonocoxosternum of 14) *Hygrotus curvilobus* sp.n., 15) *H. curvilobus* sp.n., (variant), 16) *H. stefanschoedli* sp.n., 17) *H. orthogrammus*, 18) *H. lernaeus*.

Fig. 19: Protarsal claws of *Hygrotus curvilobus* sp.n.

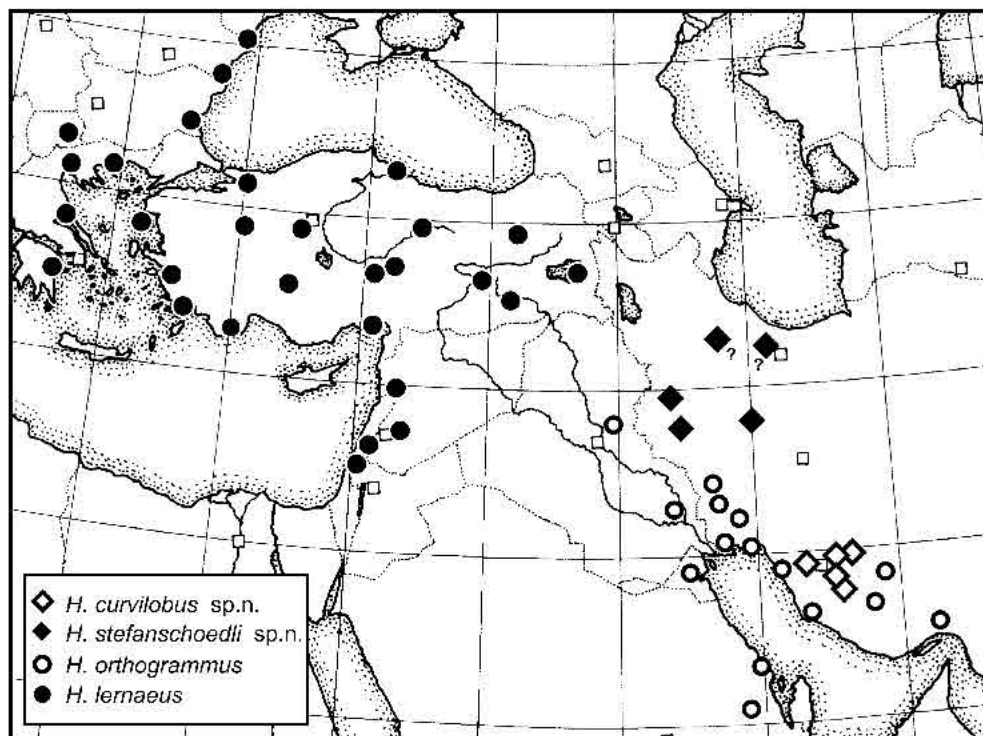


Fig. 20: Geographical distribution of *Hygrotus curvilobus* sp.n., *H. stefanschoedli* sp.n., *H. orthogrammus*, and *H. lernaeus*.

All four species form a well characterised group within the subgenus *Coelambus* which is similar to another group of species which, however, have the median lobe considerably more robust in lateral view: *H. parallellogrammus*, *H. lagari*, and *Hygrotus (Coelambus) sanfilippoi* (FERY, 1992). The two latter are distributed in the western Mediterranean, whereas *H. parallellogrammus* is a widespread Palearctic species which is known from Catalonia (Spain), central and south-eastern Europe, Great Britain, Fennoscandia, and eastwards through Asia Minor and Afghanistan to East Siberia (NILSSON & HOLMEN 1995: 36; NILSSON 2003a, 2003b).

### Modified part of the key to *Hygrotus*

Numbers with an asterisk (\*) relate to figures in FERY (2003).

8. Habitus more elongate. Median lobe in lateral view evenly curved in distal two thirds, almost straight in apical third (Figs. 31\*–35\*). Gonocoxae more or less heart-shaped (Figs. 41\*–46\*). Parameres broadly triangular (Figs. 36\*–39\*), except in *H. inscriptus* (Fig. 40\*). ..... 9
- Habitus more rounded. Median lobe in lateral view and parameres of various shape. Gonocoxae not heart-shaped..... 13
9. Smaller (3.5–4.2 mm). Usually each elytron beside black suture with only two vittae, sometimes with a third vitta, very rarely a fourth one indicated; submarginal vitta in posterior half weakly indicated, often absent. Median lobe as in Fig. 35\*, paramere almost L-shaped,

- not broadly triangular (Fig. 40\*). Gonocoxae (Fig. 41\*) rather long; gonocoxosternum as in Fig. 47\*..... **inscriptus**
- Larger (3.9–5.5 mm). Each elytron with four, more or less well developed discal vittae; a fifth vitta near sides represented by a short longitudinal spot which can be absent; submarginal vitta in posterior half distinct. Paramere broadly to narrowly triangular (Figs. 36\*–39\* and Figs. 5–8). Gonocoxae shorter. The following seven species can be determined with certainty only by the study of the male and/or female genitalia..... 10
  - 10. Median lobe laterally in apical third rather thin; distribution: from eastern Mediterranean, Near and Middle East..... 10a
  - Median lobe laterally in apical third thicker; two smaller species (4.1–4.9 mm) from western Mediterranean, and a larger one (4.5–5.5 mm) which is distributed from central Europe to eastern Siberia..... 11
  - 10a Median lobe laterally straight or only slightly curved in apical third (Figs. 3–4); tip with or without enlargement in lateral view..... 10b
  - Median lobe laterally strongly curved in apical third (Figs. 1–2); tip with enlargement in lateral view..... 10c
  - 10b Median lobe laterally slightly curved in apical third (Fig. 4), tip simply pointed; prosternal process carinate, apex shortly rounded; coarser punctures between puncture lines numerous in apical third; pronotum on centre, head on vertex and between eyes with dark spots; gonocoxae very short (Fig. 13); distribution: eastern Mediterranean..... **lernaesus**
  - Median lobe laterally straight in apical third (Figs. 3), tip with triangular enlargement in lateral view or at least obliquely truncate (Figs. 3a); prosternal process rather flat, apex broadly rounded; coarser punctures between puncture lines sparse in apical third; head and pronotum without dark spots or at least with weakly darkened areas; gonocoxae longer (Fig. 12); distribution: Persian Gulf region and southern Iran..... **orthogrammus**
  - 10c Smaller (3.8–4.5 mm); distribution: Fars province in Iran; median lobe strongly curved laterally (Figs. 1); enlargement of tip as in Fig. 1a..... **curvilobus sp.n.**
  - Larger (4.6–5.0 mm); distribution: central and northern provinces in Iran; median lobe less strongly curved (Figs. 2); enlargement of tip as in Fig. 2a..... **stefanschoedli sp.n.**
  - 11. Usually larger (4.5–5.5 mm); male protarsomeres rather broad. Median lobe, paramere, gonocoxae, and gonocoxosternum as in Figs. 31\*, 36\*, 42\*, 48\*; distribution: Palearctic..... **parallelogrammus**
  - Usually smaller (4.1–4.9 mm); male protarsomeres less broad; distribution: West Mediterranean..... 12
  - 12. Median lobe, paramere, gonocoxae, and gonocoxosternum as in Figs. 32\*, 37\*, 44\*, 50\*; distribution: southern Iberian Peninsula, North Africa, and Sicily..... **lagari**
  - Median lobe, paramere, gonocoxae, and gonocoxosternum as in Figs. 33\*, 38\*, 45\*, 51\*; distribution: Sardinia..... **sanfilippoi**

## References

- ADAMEC, L.W. 1976: Historical Gazetteer of Iran vol. I. Tehran and northwestern Iran. – Akademische Druck- u. Verlagsanstalt Graz, xvii+734 pp., several maps.
- AL-HOUTY, W. & ANGUS, R.B. 1999: A preliminary account of some families of aquatic Coleoptera of Kuwait (Coleoptera: Dytiscidae, Gyrinidae, Helophoridae, Hydrophilidae). – Koleopterologische Rundschau 69: 183–186.
- ALI, H.A. 1978: A list of some aquatic beetles of Iraq (Coleoptera: Dytiscidae). – Bulletin of the Natural History Research Centre 7 (2): 11–14.
- BALFOUR-BROWNE, F. 1940: British Water Beetles I. – London: Ray Society: i–xix, 1–375, 5 pls.

- BAUDI, F. di Selve 1894: Viaggio del Dr. E. Festa in Palestina, nel Libano e regioni vicine. Coleotteri. – Bollettino dei Musei di Zoologia e Anatomia Comparata della Reale Università di Torino 9 (173): 1–13.
- DIMENTMAN, C., BROMLEY, H.J. & POR, F.D. 1992: Lake Hula, reconstruction of the fauna and hydrobiology of a lost lake. – Jerusalem: Israel Academy of Sciences and Humanities, 170 pp.
- FERY, H. 1992: *Coelambus lagari* n.sp. und *Coelambus sanfilippoi* n.sp. aus dem westlichen Mittelmeergebiet (Coleoptera, Dytiscidae). – Entomologische Zeitschrift 102 (7): 113–124.
- FERY, H. 2003: Taxonomic and distributional notes on *Hygrotus* Stephens, with emphasis on the Chinese fauna and a key to the Palearctic species. pp. 133–193. – In: Jäch, M.A. & Ji, L. (eds.): Water beetles of China, Vol. 3. – Wien: Zoologisch-Botanische Gesellschaft in Österreich und Wiener Coleopterologenverein, vi+572 pp.
- GUÉORGUEV, V.B. 1981: Résultat de l'expédition zoologique du Musée National de Prague en Turquie. Coleoptera: Haliplidae, Dytiscidae, Gyrinidae. – Acta Entomologica Musei Nationalis Pragae 40: 399–424.
- GUIGNOT, F. 1959: Révision des hydrocanthares d'Afrique (Coleoptera Dytiscoidea). 2. – Annales du Musée Royal du Congo Belge Série 8vo (Sciences Zoologiques) 78: 323–648.
- HOSSEINIE, S.O. 1974: Water beetles found in the vicinity of Shiraz, Iran (Coleoptera, Dytiscidae, Noteridae, Haliplidae, Gyrinidae, and Hydrophilidae). – The Coleopterists Bulletin 28 (4): 237–243.
- HOSSEINIE, S.O. 1978: Aquatic Coleoptera from southwestern Iran (Haliplidae, Dytiscidae, and Gyrinidae with a note on Hydrophilidae). – The Coleopterists Bulletin 32 (2): 167–176.
- JACOBSON, G.G. 1905–1915: The beetles of Russia, West Europe, and adjacent countries. 11 fasc. – Petersburg, 1024 pp. [in Russian; no. 6, pp. 401–480 from 1908.]
- KOCHER, L. 1958: Catalogue commenté des coléoptères du Maroc. Fascicule II, hydrocanthares, palpicornes, brachélytres. – Travaux de l'Institut Scientifique Chérifien (Société des Sciences Naturelles et Physiques du Maroc); sér. Zool. 14: 1–244.
- MARSEUL, S.-A. de 1882: Nouveau répertoire contenant les descriptions des espèces de coléoptères de l'ancien-monde publiées isolément ou en langues étrangères, en dehors des monographies ou traités spéciaux et de l'Abeille. – L'Abeille 20: 1–196.
- MCCULLERS, R.B. 1976: Preliminary report of aquatic insects survey of Iran. Prepared in cooperation with the National Museum of Natural History (MMTT) and the American Peace Corps, 69 pp. [unpublished]
- MILLER, K.B. & NILSSON, A.N. 2003: Homology and terminology: Communicating information about rotated structures in water beetles. – Latissimus 17: 1–4.
- NILSSON, A.N. 2001: Dytiscidae (Coleoptera). – In: World Catalogue of Insects 3: 1–395.
- NILSSON, A.N. 2003a: Catalogue of Palearctic Dytiscidae. – Internet version as present on June 16th 2003 at: [http://www.bmg.umu.se/biginst/andersn/Cat\\_main.htm](http://www.bmg.umu.se/biginst/andersn/Cat_main.htm).
- NILSSON, A.N. 2003b: Family Dytiscidae, pp. 35–78. – In: Löbl, I. & Smetana, A. (eds.). Catalogue of Palaearctic Coleoptera, 1. Archostemata – Myxophaga – Adepaga. – Stenstrup: Apollo Books.
- NILSSON, A.N. & HOLMEN, M. 1995: The aquatic Adepaga (Coleoptera) of Fennoscandia and Denmark, II., Dytiscidae. – Fauna Entomologica Scandinavica 32: 1–188.
- RÉGIMBART, M. 1893: Liste des Dytiscidae, Gyrinidae, Hydrophilidae et Dryopidae recueillis par M. le Dr Théod. Barrois en Syrie. – Revue Biologique du Nord de la France 5 (1892-1893): 362–365.
- RÉGIMBART, M. 1895: Revision des Dytiscidae et Gyrinidae d'Afrique et Madagascar et îles voisines. – Mémoires de la Société Entomologique de Belgique 4: 1–244.
- SCHAUM, H. 1857: Beitrag zur Käferfauna Griechenlands. Erstes Stück: Cicindelidae, Carabici, Dytiscidae, Gyrinidae. – Berliner Entomologische Zeitschrift 1: 116–158.

- SCHOLZ, R. 1916: Wissenschaftl. Ergebnisse der Bearbeitung von O. Leonhard's Sammlungen. 8. Zweiter Beitrag zur Kenntnis und Verbreitung paläarktischer Wasserkäfer (Haliplidae, Dytiscidae). – Entomologische Mitteilungen 5 (5/8): 163–182.
- SEIDLITZ, G. 1887: Bestimmungs-Tabelle der Dytiscidae und Gyrinidae des europäischen Faunengebietes. – Verhandlungen des Naturforschenden Vereines in Brünn 25 (1886): 3–136.
- SHARP, D. 1882: On aquatic carnivorous Coleoptera or Dytiscidae. – Scientific Transactions of the Royal Dublin Society (2) 2: 179–1003, pls. 7–18.
- ZAITZEV, F.A. 1953: Nasekomye zhestkokrylye. Plavuntsovye i vertyachki. – Fauna SSSR 4 (N.S. 58): 1–376. [in Russian]
- ZAITZEV, F.A. 1972: Fauna of the USSR. Coleoptera. Families: Amphizoidae, Hygrobiidae, Haliplidae, Dytiscidae, Gyrinidae. – Jerusalem: Israel Program for Scientific Translations, 401 pp. [English translation of ZAITZEV 1953]
- ZIMMERMANN, A. 1919: Die Schwimmkäfer des Deutschen Entomologischen Museums in Berlin-Dahlem. – Archiv für Naturgeschichte 83 (1917) (A 12): 69–249.
- ZIMMERMANN, A. 1920: Dytiscidae, Haliplidae, Hygrobiidae, Amphizoidae. – In: Schenkling, S. (ed.): Coleopterorum Catalogus. Vol. 4, pars 71. – Berlin: W. Junk, 326 pp.
- ZIMMERMANN, A. 1930: Monographie der paläarktischen Dytisciden, I. Noterinae, Laccophilinae, Hydroporinae (1. Teil). – Koleopterologische Rundschau 16: 35–118.

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Autor(en)/Author(s): Fery Hans, Sadeghi Ladan, Hosseinie Shidokht

Artikel/Article: [Hygrotus curvilobus sp.n. and H. stefanschoedli sp.n. from Iran, and re-instatement of H. orthogrammus \(SHARP, 1882\) as valid species \(Coleoptera: Dytiscidae\). 29-44](#)