New records of Dryinidae Haliday, 1833 (Hymenoptera, Chrysidoidea) from Iran

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ABSTRACT
New records of Dryinidae Haliday, 1833 (Hymenoptera, Chrysidoidea) from Iran are listed. Two subfamilies (Anteoninae R. Perkins, 1912 and Aphelopinae R. Perkins, 1912), three genera (Anteon Jurine, 1807; Aphelopus Dalman, 1823; and Bocchus Ashmead, 1893) and five species viz. Anteon abdulnouri Olmi, 1987, An. pubicorne (Dalman, 1818), Aphelopus melaleucus (Dalman, 1818), Ap. orphanidesi Olmi, 1994 and Bocchus hyalinus Olmi, 1998 are newly recorded from Iran. The putative male of Dryinus tamaricicola Rakhshani & Olmi, 2016 is discovered in Iran and described. Aphelopus orphanidesi is recorded for the first time from Germany and Sweden. The diagnostic characters of the newly known species are re-evaluated. A key to the Iranian Dryinidae (excluding Gonatopodinae Kieffer, 1906) and a brief description is presented and a distribution map is provided for each species.

KEY WORDS
Anteoninae, Aphelopinae, Bocchines, Dryininae, Auchenorrhyncha, Palaeartic, new records.

MOTS CLÉS
Anteoninae, Aphelopinae, Bocchines, Dryininae, Auchenorrhyncha, Paléartique, signalisations nouvelles.
INTRODUCTION

The Dryinidae Haliday, 1833 (Hymenoptera, Chrysidioidea) are a small cosmopolitan family known to parasitize Hemiptera Auchenorrhyncha Dumeril, 1806 (Guglielmino & Olmi 2007; Guglielmino et al. 2013). About 1886 species are attributed to this family (Olmi 2020). All species of Dryinidae are ectophagous, except for the completely endophagous genus Crovetta Olmi, 1984 (not present in Iran) and the first endophagous larval instar of the genus Aphelopus Dalman, 1823 (Olmi & van Haren 2000). Dryinidae are easily distinguished from other members of Chrysidioidea by ten antennomeres and the chelate female protarsi except for the subfamilies Aphelopinae R. Perkins, 1912 (Aphelopus Dalman, 1823 and Crovetta Olmi, 1984) and Erwininiae Olmi & Guglielmino, 2010 (Erwininus Olmi & Guglielmino, 2010), whose females are achelate (Olmi & Virla 2014) and capture the hosts by their mandibles and forelegs (Olmi 1994). Males of this interesting family are little known and sexual dimorphism is so strong that opposite sexes cannot be associated without rearing or DNA analysis (Olmi 1984; Olmi et al. 2000). This study could reveal interesting biogeographic patterns and clarify the status of the genera and species. Anyway, the group is sufficiently distinct to warrant recognition at the generic level (Olmi et al. 2019).

The family Dryinidae has remained insufficiently known in Iran, due to the lack of sampling. The few known details about the Dryinidae of Iran refer to studies and descriptions of new species by Derafshan et al. (2016, 2017, 2020) in the eastern part of the country. Our investigations in the central, North-Eastern and South-Eastern parts of Iran, during 2015-2018, resulted in the first country records of five species representing three genera and two subfamilies records and increased the number of known Dryinidae from 12 to 17 species.

MATERIAL AND METHODS

Sampling and collection of specimens were done in various habitats (Fig. 1A-F) of the eastern and central provinces of Iran during 2015-2018, using Malaise traps (Fig. 1A, B, D, F), with 75% ethanol solution as a preservative, sweeping (Fig. 1C), and beating vegetation to knock insects onto sheets. More than seventy dryinid specimens were separated from other collected Hymenoptera and stored in plastic vials in 75% ethanol and later prepared in Alcohol-Xylene-Amyl acetate (AXA protocol: van Achterberg 2009), mounted on cards, labeled, and examined under a Nikon® SMZ645 stereomicroscope. Photographs of the external morphological characters of the specimens were taken using a Canon® EOS 700D (Canon® Inc., Japan). Image stacking was performed with ZereneStacker™ version 1.04. Plates were composed in Photoshop® CS6.

Identification of subfamilies and genera were performed using keys published by Olmi (2006), Olmi & Virla (2014) and Olmi & Xu (2015). Females of Dryinidae were identified to the species level by using keys from Olmi & Xu (2015). Terminology of morphological characters followed that of Olmi (1984), Olmi & Xu (2015), Kawada et al. (2015) and Azevedo et al. (2018). The term “metapetal-propodeal complex” is here used in the sense of Kawada et al. (2015). It corresponds to the term “propodeum” sensu Olmi (1984), Olmi & Virla (2014) and Olmi & Xu (2015). The terms “disc of metapetal-propodeal complex” and “first abdominal tergum” sensu Kawada et al. (2015), used here, correspond to the terms “dorsal surface of propodeum” and “posterior surface of propodeum”, sensu Olmi (1984), Olmi & Virla (2014) and Olmi & Xu (2015). The names of cells and veins of the fore wing are here used in the sense of Azevedo et al. (2018). The correspondence between old and new names is the following (the first name is the old name): median cell: radial cell (R); submedian cell: first cubital cell (1Cu); marginal cell: second radial 1 cell (2R1); first brachial cell: second cubital cell (2Cu); stigmal vein: second radial cross&radial sector (2r-2s&Rs); metacarp: poststigmal abscissa of radial 1 (PostabR1). In the text, cells and veins will be named by their respective abbreviations, including costal cell (C). Geographic coordinates, when not available on specimen labels, were obtained using Google Earth®. Maps were prepared using SimpleMappr (Shorthouse 2010).

ABBREVIATIONS

Biogeographic regions
AFR Afrotropical;
E-PAL Eastern-Palaearctic;
W-PAL Western-Palaearctic.

Depositories and institutions
AMNH American Museum of Natural History, New York;
CNC Canadian National Collection of Insects, Ottawa;
DPPZ Department of Plant Protection, College of Agriculture, University of Zabol;
HNHM Hungarian Natural History Museum, Budapest;
HTC Hubert Tussac’s collection, Cahors, France (now in the Museum of Natural History, Genève, Switzerland);
MNHN Muséum national d’Histoire naturelle, Paris;
MOLC Massimo Olmi’s Collection, c/o DAFNE Department, University of Tuscia, Viterbo;
MRSN Museo Regionale di Scienze Naturali di Torino;
MTC Michael von Tschirnhaus collection, c/o Senckenberg Deutsches Entomologisches Institut (DEI), Müncheberg;
NHMUK The Natural History Museum, London;
NHIRS Naturhistorisk Museum, Stockholm;
NUM NTNU University Museum, Trondheim;
USNM National Museum of Natural History, Washington, District of Columbia;
ZIL Zoological Institute, Lund;
ZMUH Zoological Museum of the University, Helsinki.

The collected specimens from Iran are retained in the Department of Plant Protection, College of Agriculture, University of Zabol, Muséum national d’Histoire naturelle, Paris and the Massimo Olmi’s Collection, c/o DAFNE Department, University of Tuscia.

RESULTS

Two subfamilies (Anteoninae R. Perkins, 1912 and Aphelopinae) and three genera of Dryinidae are recorded for the first time from Iran represented by five species Anteon abdulnouri Olmi, 1987, Anteon pubicorne (Dalman, 1818), Aphelopus
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...melaleucus (Dalman, 1818), Aphelopus orphanidesi Olmi, 1994, and Bocchus hyalinus Olmi, 1998. In addition, the putative male of Dryinus tamaricicola Rakhshani & Olmi, 2016 in Derafshan et al. 2016 was collected for the first time. Three previously recorded species (Mirodryinus atlanticus Olmi, 1984; Dryinus ghanei Olmi, 2005; D. taraconensis Marshall, 1868) are also listed in this paper. The newly recorded taxa are marked with an asterisk (*).
TAXONOMIC ACCOUNTS

Class INSECTA Linnaeus, 1758
Order HYMENOPTERA Linnaeus, 1758
Family Dryinidae Haliday, 1833
Subfamily Anteoninae R. Perkins, 1912*

Genus Anteon Jurine, 1807*

Anteon Jurine, 1807: 302.

Type species. — Anteon jurineanum Latreille, 1809, by subsequent monotypy.

Anteon abdulnouri Olmi, 1987*
(Figs 2A; 3A; 4; 5)

Anteon abdulnouri Olmi, 1987: 33.

Type Locality. — Lebanon, Fanar (holotype ♀, AMNH).

Material Examined. — Iran (new record) • 1 ♂; MOLC; Sistan-o Baluchestan province, Zabol; 23.V.2016; H. A. Derafshan leg.; swept on weeds; Nim–215 • 1 ♂; MNHN; same locality label; 23.IV.2015; swept on mix vegetations; Nim–45 • 1 ♀; MNHN; North Khorasan province, Qale Khan; 05.VI.2018; Z. Rahmani leg.; swept in orchard undergrowth. Yemen • 1 ♂; MOLC; Lahj; VI-VII.1998; A. van Harten & A. Sallam leg.; Malaise trap • 2 ♂, 9 ♀; MOLC; Lahj; VIII.1998; A. van Harten & A. Sallam leg.

Distribution in Iran (Fig. 13A). — North Khorasan and Sistan-o Baluchestan Provinces.

General Distribution (Fig. 13A). — AFR, E-PAL and W-PAL.

Description

Female (Figs 2A; 4)
Head dull, completely granulate (Fig. 4B); frontal line complete (Fig. 4A). Pronotum dull, almost completely granulate, only with posterior margin unsculptured (Fig. 4C); posterior surface shorter than mesoscutum (5:9); pronotal tubercle reaching tegula (Fig. 4C); mesoscutum shiny, slightly granulate (Fig. 4C); notaual reaching approximately 0.3-0.4 × length of mesoscutum (Fig. 4C); metapetal-propodeal disc dull, reticulate rugose, with strong transverse posterior keel

Fig. 2. — Chelae, female: A, Anteon abdulnouri Olmi, 1987 (Lebanon – Redrawn from Olmi 1987); B, Anteon pubicorne (Dalman, 1818) (Italy – redrawn from Olmi, 1984); C, Bocchus hyalinus Olmi, 1998 (Oman – Redrawn from Olmi 1998); D, Dryinus tamaricicola Rakhshani & Olmi, 2016 (Iran – redrawn from Derafshan et al. 2016). Scale bars: 100 μm.
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(Fig. 4D); propodeal declivity reticulate rugose, without longitudinal keels (Fig. 4D). Protarsomere 5 with two rows of approximately 27 bristles, occasionally with two rows of approximately 12-13 lamellae in addition to some bristles (Fig. 2A); apex with about 4-6 lamellae (Fig. 2A).

Male (Fig. 5)
Head dull, completely granulate (Fig. 5A, B); frontal line absent (occasionally incomplete) (Fig. 5A); notaull reaching about 0.4 × length of mesoscutum (Fig. 5C); metapetal-propodeal complex with strong transverse keel between disc of metapetal-propodeal complex and propodeal declivity (Fig. 5C); disc of metapetal-propodeal complex reticulate rugose (Fig. 5D). Propodeal declivity without longitudinal keels, completely reticulate rugose. Paramere without distal inner pointed process, with inner medial process surrounded by membranous band (Fig. 3A).

Remarks
In specimens from Oman, antenna darkened, legs testaceous, except brown metacoxa and clubs of femora; head slightly granulate; mesoscutum dull and strongly granulate. In specimens from Dubai and Afghanistan, frons with unsculptured area in front of anterior ocellus. Frontal line incomplete in some specimens from Afghanistan and Japan, sometimes absent in some Japanese specimens.
Anteon pubicorne (Dalman, 1818)*
(Figs 2B; 3B; 6-8)

Gonatopus pubicornis Dalman, 1818: 87.

Type locality. — Sweden, Småland (holotype ♀, NHRS).

Material examined. — Iran (new record) • 2 ♀; MOLC, MNHN; North Khorasan province, Abshar; 37°32’28”N, 56°56’57”E; 1100 m; 25.IX.2016; B. Motamedinia leg.; Malaise trap.

Distribution in Iran (Fig. 13A). — North Khorasan province.

General distribution (Fig. 13A). — E-PAL and W-PAL.
DESCRIPTION
Female (Figs 2B; 6–8)
Head shiny, smooth, finely or strongly punctate, unsculptured among punctures (Fig. 6A–C); frons with two lateral keels around orbits directed towards antennal toruli (Fig. 6B); frontal line incomplete or absent in small specimens (Fig. 6B); temple present (Fig. 6C). Pronotum shiny, strongly punctate (Fig. 6H); pronotal tubercle reaching tegula (Fig. 6H); no-tauli reaching approximately 0.5–0.6 × length of mesoscutum (Fig. 6H); metapectal-propodeal complex reticulate rugose, with strong transverse keel between disc of metapectal-propodeal complex and propodeal declivity (Fig. 6H). Propodeal
Fig. 6. — *Anteon pubicorne* (Dalman, 1818), female: A, head, lateral view; B, head, frontal view; C, head, dorsal view; D, antenna, lateral view; E, chela; F, mesosoma, lateral view; G, fore wing; H, metapental-propodeal complex and mesosoma, dorsal view; I, metasoma, dorsal view. Scale bars: A–E, H, 300 μm; F, G, I, 500 μm.
declivity with two longitudinal keels and median area usually as rugose as lateral areas (Fig. 6I); occasionally median area totally or partly shiny and smooth (Fig. 6I). Protarsomere 1 approximately 0.66 as long as protarsomere 4; protarsomere 2 produced into hook; protarsomere 5 with one row of 20-23 lamellae; distal apex with about 5-6 lamellae (Figs 2B; 6E).

**Male**
Not collected in Iran.

**REMARK**
In some specimens from Sweden, head uniformly brown or with cupreous tints; scape or scape + pedicel testaceous; antenna testaceous, except antennomeres 3-6 brown; mesosoma uniformly brown or with cupreous tints; legs occasionally with clubs of femora brown.

**Subfamily Aphelopinae** R. Perkins, 1912*

**Genus Aphelopus** Dalman, 1823*

*Aphelopus* Dalman, 1823: 8.

**Type species.** *Dryinus atratus* Dalman, 1823; designated by Westwood (1840).

*Aphelopus melaleucus* (Dalman, 1818)*

(Figs 3C; 8)

*Gonatopus melaleucus* Dalman, 1818: 82.

**Type locality.** Sweden, Västergötland (holotype ♀, NHRS).

**Material examined.** Iran (new record) • 2 ♂; MOLC; Isfahan province, Nisian; 32°59’5.61”N, 52°28’13.91”E, 2191 m; 8-28. VIII.2015; E. Nader leg.; Malaise trap in orchard; code-17 • 1 ♂; MNHN; same locality label; 7-31.VII.2015; code-7 • 1 ♂; DPPZ; same locality label; 8-21.VII.2015; code-14 • 1 ♂; DPPZ; Khorasane Razavi province; 15.IX.2016; B. Motamedinia leg.; Malaise trap.

**Distribution in Iran** (Fig. 13B). — Isfahan and Khorasan-e Razavi provinces.

**General distribution** (Fig. 13B). — E-PAL and W-PAL.

**Description**

**Male** (Figs 3C; 8)
Black; occasionally antennomeres 9-10 light. Head dull, granulate (Fig. 8A, B); frontal line incomplete, not present
in front of anterior ocellus, high carina shaped on anterior half of frons (Fig. 8A). Mesoscutum occasionally with median scutal line (Fig. 8C); notaulli reaching approximately 0.5 × length of mesoscutum (Fig. 8C); metapetal-propodeal complex dull, reticulate rugose; propodeal declivity with two complete longitudinal keels, median area shiny, almost smooth, with few irregular slight keels, less rugose than lateral areas (Fig. 8D). Distal apex of aedeagus not tridentate, not trumpet-shaped, basivolsella with one subdistal bristle and with outer basal process little or very protruding (Fig. 3C).

Female
Not collected in Iran.
REMARKS
In many male specimens from England (Awbridge), head and body brown-testaceous, except mandible, clypeus and few small spots situated between antennal toruli and on gena whitish or yellowish; other specimens from above mentioned locality testaceous-reddish. In other specimens from all countries where this species is present, head occasionally completely black, without light spots.

*Aphelopus orphanidesi* Olmi, 1994
(Figs 3D; 9, 10)

*Aphelopus orphanidesi* Olmi, in Olmi & Orphanides, 1994: 408.

**Type Locality.** — Cyprus, Paphos (holotype ♂ and paratype ♀, AMNH).

**Material Examined.** — Holotype. Cyprus • ♂; AMNH; Paphos II.1993.
Paratypes. Cyprus • 7 ♀; AMNH; Pakhna; II.1993; G. Orphanides leg.; reared from *Zygina rhamni* Ferrari • 6 ♂; AMNH • 1 ♂; USNM; • 2 ♀, 2 ♀; MRSN; same date and locality label • 1 ♀; NHMUK; same date and locality label.

France • 1 ♀; NHMUK; Bouches-du-Rhône, Fonscolombe; 24.VI.1986; M. de V. Graham leg. • 3 ♂; MOLC, HTC; Pyrénées-Orientales, Le Perthus; 42°27.04’N, 02°51.82’E; 1.VIII.1995; J. P. Sarthou leg.; Malaise trap.

Germany (new record) • 1 ♀; MOLC; Schleswig-Holstein, Frörup S of Flensbu Forest; Werner Barkemeyer leg.; L2727; ex Michael von Tschirnhaus collection • 1 ♂; MTC; 1.5 km NNE of Tensfeld; 54°03.37’N, 10°19.33’E; 2.V.1989; Hans Meyer leg.; K965; ex Michael von Tschirnhaus collection.

Iran (new record) • 10 ♂; 1 ♀; MOLC, DPPZ; Isfahan province, Nisian; 32°59’5.61’’N, 52°28’13.91’’E; 2191 m; 8-28.VIII.2015; E. Nader leg.; code-17; Malaise trap in orchards • 4 ♂; DPPZ; same
**Bocchus hyalinus** Olmi, 1998*

(Figs 2C; 3E; 11)

**Bocchus hyalinus** Olmi, 1998: 65.

**Type locality.** — Oman, 4 km South of Dhagmar (holotype ♀, CNC).

**Material examined.** — Iran (new record) • 1 ♀; MNHN; Kerman province, Faryab; 5.VIII.2016; M. Arab leg.; Malaise trap in Natural Ecosystem • 1 ♀; DPPZ; Sistan-o Baluchestan province, Iranshahr, Daman; 27°25′N, 060°54′E; 879 m; 18.VI.2016; H. Davari leg.; Malaise trap 2 mounted among planted Mazari palm, *Nannorrhops Ritchiana* (Griff.) Aitch. • 3 ♀; DPPZ, MOLC; same locality label; 27°24′N, 060°54′E; 876 m; 16-26.VI.2016; Malaise trap 4. Oman • 1 ♀ 5♂; NHMUK, MOLC; Al-Uyaina – Samail; 30.IV.2006; K. Al-Miqbali leg.; ex. *Ommatus黎bicic De Bergevin* (Tropiduchidae) on date palm.

**Distribution in Iran** (Fig. 14A). — Kerman and Sistan-O Baluchestan provinces.

**General distribution** (Fig. 14A). — AFR and W-PAL.

**Description**

**Female** (Figs 2C; 11)

Body almost totally yellow-whitish, except ocelli slightly darkened; occasionally mesothoracic axilla and sutures behind mesoscutum, mesoscutellum and metanotum darkened (Fig. 11D-F). Antenna short, with antennomeres 5-9 longer than broad (antennomere 5: 6:3; antennomere 9: 4.5:3.5); head dull, completely granulate and reticulate rugose (Fig. 11A-C); frontal line complete (Fig. 11B). Pronotum crossed by strong transverse impression, reticulate rugose (Fig. 11E); prontal tubercle reaching tegula (Fig. 11E); lateral regions of prothorax continuous with mesopleuron so that the epicnemium is not exposed (Fig. 11D); notauli posteriorly separated, occasionally hardly visible (Fig. 11E); mesoscutellum very slightly granulate, not rugose (Fig. 11E); metanotum short and rugose (Fig. 11F); metapleural-propodeal disc reticulate rugose; propodeal declivity dull and rugose (Fig. 11F). Petiole very long, much shorter than metasoma (6:27) (Fig. 11F). Protarsomere 5 with one preapical lamella, two bristles and an inner band (Fig. 2C).

**Male.**

Not collected in Iran.

**Remarks**

In specimens from the United Arab Emirates, mesosoma ferruginous and metasoma brown; mesoscutellum with anterior half unsculptured and posterior half reticulate rugose. In contrast, in specimens from Kenya, mesosoma ferruginous and metasoma partly brown and partly ferruginous; mesoscutum strongly reticulate rugose, with notauli completely invisible; mesoscutellum granulate.

**Genus Mirodryinus** Ponomarenko, 1972

*Mirodryinus* Ponomarenko, 1972: 673.

**Type species.** — *Radimuncus olmii* Moczar, 1983, by original designation.

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Fig. 11. – *Bocchus hyalinus* Olmi, 1998, female: A, head, lateral view; B, head, frontal view; C, head, dorsal view; D, mesosoma, lateral view; E, mesosoma, dorsal view; F, metasomal-propodeal complex, dorsal view; G, chela. H, habitus, lateral view. Scale bars: A-C, E, F, 300 μm; D, 500 μm; G, 200 μm; H, 1 mm.
Mirodryinus atlanticus Olmi, 1984

Mirodryinus atlanticus Olmi, 1984: 672.

Type locality. — Spain, Canary Islands, Fuerteventura Island, Gran Tarajal (holotype ♀, ZMUH).

Distribution in Iran (Fig. 14A). — Sistan-o Baluchestan province.

General distribution (Fig. 14A). — E-PAL and W-PAL.

Description

Reviewed in Derafshan et al. (2017) for males and females, both known in Iran.
Subfamily **Dryininae** Haliday, 1833

Genus *Dryinus* Latreille, 1804

*Dryinus* Latreille, 1804: 176.

**Type species.** — *Dryinus collaris* (Linnaeus, 1767), by subsequent monotypy (Latreille 1805).

**Dryinus gharaeii** Olmi, 2005

*Dryinus gharaeii* Olmi, 2005: 207.

**Type locality.** — Iran, Ilam Province, Chogasabz Region (holotype ♀, MOLC).

**Distribution in Iran** (Fig. 14B). — Ilam province.

**General distribution** (Fig. 14B). — W-PAL.

**Material examined.** — Iran • Holotype ♀; MOLC; Ilam Province, Chogasabz Region, Ilam; 1.IX.2003; Babak Gharaei leg.

**Description**

Reviewed in Derafshan *et al.* (2016).

**Male**

Unknown.

**Dryinus tamaricicola** Rakhshani & Olmi, 2016

(Figs 2D; 3F; 12)

*Dryinus tamaricicola* Rakhshani & Olmi, *in* Derafshan *et al.* 2016: 412.
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**Type locality.** — Iran, Sistan-o Baluchestan, Zabol (holotype ♀, MOLC).

**Material examined.** — **Iran** • 1 ♂; MNHN; Sistan-o Baluchestan province, Zabol; 13.V.2015; H. A. Derafshan leg.; Nim–75; swept on *Tamarix stricta* • 2 ♂; DPPZ, MOLC; same locality label; 20.IX.2016; H. A. Derafshan leg.; Nim–243; swept on *Tamarix stricta*.

**Distribution in Iran** (Fig. 14B). — Sistan-o Baluchestan province.

**General distribution** (Fig. 14B). — W-PAL.

**Description**

*Male (putatively associated with the female - Figs 3F; 12)*

Head testaceous, except occiput and part of vertex black; antenna testaceous; mesosoma black; metasoma brown; legs testaceous, except metacoxa partly brown and tarsi whitish. Antennomere 3 about seven times as long as broad (14:2) (Fig. 12A); antennomeres in following proportions: 5:5:14:12:12:10:9:8:7:9; head dull, granulate and partly reticulate rugose (Fig. 12A, B); frontal line absent (Fig. 12A); temple absent (Fig. 12B); greatest breadth of posterior ocelli shorter than OL (3:4) (Fig. 12B); posterior ocelli touching occipital carina (Fig. 12B); occipital carina completely visible on dorsal side of head, where it reaches laterally eyes (Fig. 12B); palpal formula 6/3. Mesoscutum dull, granulate and reticulate rugose (Fig. 12C); notaui reaching about 0.5 × length of mesoscutum (Fig. 12C); mesoscutellum shiny, unsculptured (Fig. 12C); metanotum shiny, unsculptured, except anterior half rugose (Fig. 12C); metapetal-propodeal complex reticulate rugose, without transverse or longitudinal keels (Fig. 12D). Genitalia with distivolsella situated near distal apex of aedeagus (Fig. 3F); paramere with inner side sculptured by many papillae (Fig. 3F). Tibial spurs 1/1/2.

*Female*

In Derafshan et al. (2016).
Remarks
The male specimens were collected from the same locality as female specimens collected earlier in the same habitat (on Tamarix plants), and by the same methods (with a beating sheet). They were not reared. Thus, here we tentatively assign the male specimens to *D. tamaricicola*.

*Dryinus tarracensis* Marshall, 1868

*Dryinus tarracensis* Marshall, 1868: 204.

**Type locality.** — Spain, Huesca, near Torla (holotype ♀, HNHM).

**Material examined.** — **Iran** • 1 ♀; MOLC; Kerman Province, Bam County, Sangemes; 28°56'33.44"N, 58°07'52.36"E; 2101 m; 08.III.2015; M. Vafaei leg.; swept on weeds • 1 ♀; DPPZ; Kerman province, Bam country, Moghoye; 28°57'24.18"N, 58°06'34.90"E, 1693 m; 11.VIII.2015; M. Vafaei l.

**Distribution in Iran (Fig. 14B).** — Kerman province.

**General distribution (Fig. 14B).** — E-PAL and W-PAL.

**Description**
Reviewed in Derafshan et al. (2016).

**Male.**
Unknown.

**Remarks**
This subfamily has been completely reviewed in Derafshan et al. (2020). Distribution in Iran is showed in figure 15.

**Key to the Iranian Dryinidae**

**Females**

1. Protarsus chelate (Fig. 2A-D) ............................................................... 2
   — Protarsus not chelate [Aphelopinae R. Perkins, 1912, in Iran only *Aphelopus* Dalman, 1823] ............... 5

2. Chela with one rudimentary claw (Fig. 2C, D) ........................................ 3
   — Chela without rudimentary claw (Fig. 2A, B) [Anteoninae R. Perkins, 1912, in Iran only *Anteon* Jurine, 1807] .......................................................... 6

3. Median leg with one tibial spur (formula 1/1/1 or 1/1/2) ............................. 4
   — Median leg without tibial spurs (formula 1/0/1 or 1/0/2) ............................... [Gonatopodinae Kieffer, 1906; see Derafshan et al. 2020, for key to Iranian species]

4. Epicnemium concealed (Fig. 11D) [Bocchinae Richards, 1939] ................ 7
   — Epicnemium exposed [Dryininae Haliday, 1833] ........................................ 8

5. Head with mandibles, clypeus and lower parts of frontal region white or testaceous ........................................... *Aphelopus melaleucus* (Dalman, 1818)
   — Head with mandibles white or testaceous; clypeus uniformly black; rest of head black (Fig. 9A) ............... *Aphelopus orphanidesi* Olmi, 1994

6. Protarsomere 4 at most 0.5 as long as protarsomere 1; protarsomere 3 or 4 produced into hook (Fig. 2A) ..... *Anteon abdulnouri* Olmi, 1987
   — Protarsomere 4 at least 0.66 as long as protarsomere 1; protarsomere 2 produced into hook (Fig. 2B)......... *Anteon pubicorne* (Dalman, 1818)

7. Segment 5 of protarsus with inner membranous band, two bristles and with one preapical lamella (Fig. 2C) .
   — Segment 5 of protarsus without inner membranous band, with 1 row of about 18 lamellae and 1 row of about 7 bristles, distal apex with approximately 4-10 lamellae ............... *Mirodryinus atlanticus* Olmi, 1984

8. Enlarged claw with one subapical tooth ........................................... *Dryinus tarracensis* Marshall, 1868
   — Enlarged claw without subapical teeth or with many small subapical teeth ........................................ 9

9. Posterior ocelli not touching occipital carina. Enlarged claw with many small subapical teeth .................. *Dryinus gharaeii* Olmi, 2005
   — Posterior ocelli touching occipital carina. Enlarged claw without subapical teeth ............................... *Dryinus tamaricicola* Rakhshani & Olmi, 2016
DISCUSSION

Few studies have been conducted on the Dryinidae fauna of Iran, with most of the papers restricted to descriptions of species collected sporadically (Olmi 1984, 2005; Olmi & Xu 2015). Before the present study, three subfamilies (Bocchinae, Dryininae and Gonatopodinae), five genera (Dryinus, Echthrodelphax R. Perkins, 1903, Gonatopus R. Perkins, 1910, Haplogonatopus R. Perkins, 1905 and Mirodryinus) and twelve species were known from Iran (Derafshan et al. 2016, 2017, 2020). With the new records reported herein the totals are increased to five subfamilies (Fig. 16), eight genera and 17 species.

Some species listed in the current study, are known exclusively on the basis of only one sex. Only females are known for An. pubicorne, B. hyalinus, D. gharesi, and D. tarracensis and only the male in Ap. melaleucus. Both sexes are known for three species (An. abdulnouri, M. atlanticus, and D. tamaricicola). With respect to our collection of D. tamaricicola, because of the pronounced morphological difference between female and male in Dryinus species, the males we collected were putatively associated with the female. We believe the association is reasonable, particularly because of the aforementioned concordance of the sexes in collection location, habitat and method. Nonetheless, molecular data are necessary for confirmation.

From the biogeographical point of view, all the nine species we collected are found in the following sub-regions: An. abdulnouri (E-PAL and W-PAL); An. pubicorne (E-PAL and W-PAL); Ap. melaleucus (E-PAL and W-PAL); Ap. orphanidesi (W-PAL); B. hyalinus (W-PAL); M. atlanticus (E-PAL and W-PAL); D. gharesi (W-PAL); D. tamaricicola (W-PAL); D. tarracensis (W-PAL). Two species, D. gharesi and D. tamaricicola, are provisionally considered as endemic, but since Dryinidae have been poorly collected in Iran, their geographic distribution could be larger. An. abdulnouri and B. hyalinus have already been recorded from the Afrotropical region (Olmi 1998; Olmi & Xu 2015). We expect that more dryinids are common to both (southern part of) Iran and the Afrotropical region, as provinces located in the south-eastern and southern parts of Iran share similar climatic and floral conditions (Derafshan et al. 2016, 2020; Ghafouri Moghaddam et al. 2019; Heraty et al. 2019). However, further field research is necessary to verify this hypothesis.

To date, there are no host records for Dryinidae collected in Iran. Known hosts of all the species considered in this study belong to the family Cicadellidae Latreille, 1802, except B. hyalinus whose host belongs to the family Tropiduchidae.
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Stål, 1866. *Dryinus* species are parasitoids of Fulgoromorpha Latreille, 1807, and their hosts in the Western Palaearctic sub-region are known only for *D. tarraconensis* (Guglielmino & Olmi 2007; Guglielmino et al. 2013).

An overall analysis of the discovered Dryinidae in Iran (Fig. 16) reveals that very little information was added until 2005, and also the lack of focus on this important group of biological control agents. The steep rise of the curve between 2005-2019 reveals the importance of efficient samplings, supplemented by the recent findings in Derafshan et al. (2016, 2017, 2020), with a significant number of the newly recorded species. According to the sporadical samplings, many areas particularly in the rainforest of the north, mountain forests in the west and semi-desertic parts in the south of the country remained unexplored. So that many other species of Dryinidae (including endemic species) are yet to be discovered by the subsequent studies.

Conflict of interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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