NORTH-WESTERN JOURNAL OF ZOOLOGY 16 (1): 29-35
Article No.: e191201

http://biozoojournals.ro/nwjz/index.html

Review of two seed wasps genera (Hymenoptera: Eurytomidae) in Iran with description of a new species

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Received: 17. March 2019 / Accepted: 01. June 2019 / Available online: 10. June 2019 / Printed: June 2020

Abstract. Two seed wasps genera, *Bruchophagus* Ashmead and *Systole* Walker (Hymenoptera: Eurytomidae) of Iran were reviewed. Host plants and distribution data in Iran are summarized for the species known from Iran including some new biological data. One new species, namely *Systole longigaster* Lotfalizadeh **sp. nov.,** is described based on recently collected material. Discriminating characters of this are discussed. Illustrations are provided to distinguish the new species and finally its diagnostic characters are discussed. *Bruchophagus platypterus* (Walker), *B. smirnoviae* Nikolskaya, *B. verbasci* (Erdös) and *Systole besaparica* Stojanova are recorded for the first time in Iran. Totally, 34 species of these genera were listed for Iran, including 25 and nine species from *Bruchophagus* and *Systole*, respectively.

Key words: new species, *Bruchophagus*, *Systole*, Chalcidoidea, pest, Iran, fauna.

Introduction

In the family Eurytomidae, two genera, *Bruchophagus* Ashmead and *Systole* Walker, are known as seed-eater wasps of the families Fabaceae, Lamiaceae, Liliaceae and Apiaceae. Damage of seed-eaters is one of the important factors that reduce seed production of rangelands plants (Lotfalizadeh & Zarnegar 2014). Within these species, alfalfa seed wasp, *B. roddi* Gussakovsky, is a key pest of seed production fields of alfalfa in Iran and is widely distributed (Eslamizadeh et al. 2008).

Bruchophagus and *Systole* include 170 and 40 species, respectively (Noyes 2019). In the Palaearctic region, *Bruchophagus* includes 92 species and *Systole* includes 33 species (Noyes 2019). Only seven species of the genus *Systole* have been recorded for Iran (Saghaei et al. 2018, Zerova et al. 2019). The types of *Bruchophagus trjapitzini* Zerova have been originally described from Iran (Zerova et al. 2008). Nine species of the genus *Bruchophagus* associated with Fabaceae have been reported from the Qazvin province (Lotfalizadeh & Zarnegar 2014, Zarnegar & Lotfalizadeh 2014). Parsa et al. (2018) reviewed the host range of 10 species of *Bruchophagus* in Iran reporting some new host plants, which some of them need to be confirmed. Naghizadeh et al. (2017) reported 13 species from East-Azarbaijan province in addition to four new records: *B. coluteae, B. macronycis*, *B. parvulus* and *B. ponticus*. Totally, 21 species of the genus *Bruchophagus* have been listed for Iran (Saghaei et al. 2018, Naghizadeh et al. 2017).

During our collection of Chalcidoidea in Iran, we found a new species of the genus *Systole*. The aim of this paper is description of this species as well as cataloging all the data on Iranian species of the genera *Bruchophagus* and *Systole*.

Material and methods

Some of the specimens were collected using a Malaise trap installed in the rangelands while others were reared from collected seeds. The collected material was transferred to the entomology laboratory of the Department of Plant Protection, East-Azarbaijan Agricultural and Natural Resources Research and Education Center, Tabriz, and sorted specimens were placed in ethanol 75%. Then these specimens were card-mounted using a method described by Noyes (1982).

An Olympus™ SZH stereomicroscope and Leica CLS 150X fiber optic light source were used for card-mounted specimen observation. Specimens were identified using keys provided by Szelényi (1961, 1976), Zerova & Seryogina (1994), Zerova (1978, 1995) and descriptions from Stojanova (2002).

The imaging of specimens was done using a Keyence VHX-5000 equipment. Assemblage and edition of illustrations in the plates were done in Adobe Photoshop CS4© software.

Terminology for surface sculpturing follows Harris (1979) and for morphology follows those from the Chalcidoidea Morphology Matrix (CMM) (http://chalcid.ucr.edu/public/chr/list_chrs_by_matrix/268).

For each species, geographical distribution in Iran and reported biological association for reported species from Iran were supported. In biological association of some species, strange associations were indicated by an asterisk (*) that need to be confirmed. The type material of the newly described species is deposited in HMIM (Hayk Mirzayans Insect Museum, Tehran, Iran).

Abbreviations:
F1- F6: Funicular segment 1–6
POL: Distance between posterior ocelli
OOL: Distance between a posterior ocellus and the adjacent eye
GT1- GT6: Gastral tergites 1-6

Results

The list below presents 25 species of *Bruchophagus* and nine species of *Systole* in Iran. Among them, one new species, *Systole longigaster* Lotfalizadeh **sp. nov.** is described and compared with closely allied species. Also *Bruchophagus platypterus* (Walker), *B. smirnoviae* Nikolskaya, *B. verbasci* (Erdös) and *Systole besaparica* Stojanova are recorded for the first time in Iran.

***Bruchophagus abnormis* Zerova, 1984**

Distribution in Iran. Chaharmahal-Bakhtiari (Haghighian et al. 2011), Qazvin (Lotfalizadeh & Zarnegar 2014).

Biological association in Iran. *Prangos ferulacea* (L.) (Apiaceae)* (Haghighian et al. 2011), *Astragalus guttatus*

Banks & Sol. and *A. avicennus* Parsa (Lotfalizadeh & Zarnegar 2014).

***Bruchophagus astragali* Fedoseeva, 1954**

Distribution in Iran. Chaharmahal-Bakhtiari (Haghighian 2004), Qazvin (Lotfalizadeh & Zarnegar 2014), West-Azarbaijan (Zerova et al. 2008), Qom (Parsa et al. 2018), East-Azarbaijan (Naghizadeh et al. 2017).

Biological association. *Astragalus alyssoides* Lam. (Naghizadeh et al. 2017), *A. brachydontus* Boiss. (Lotfalizadeh & Zarnegar 2014, Parsa et al. 2018), *A. chrysostachys* Boiss. (Zerova et al. 2008), *A. compylorrhynchus* Fisch. & C. Mey. (Parsa et al. 2018), *A. iranicus* Bunge (Parsa et al. 2018, Naghizadeh et al. 2017), *A. onobrychis* L. (Naghizadeh et al. 2017), *A. oxyglottis* Bunge (Parsa et al. 2018), *A. podocarpus* C.A. Mey., *Medicago sativa* L. (Naghizadeh et al. 2017) and *Oxytropis immerse* (Safarov) (Lotfalizadeh & Zarnegar 2014).

***Bruchophagus bajarii* (Erdös, 1957)**

Distribution in Iran. East-Azarbaijan (Lotfalizadeh et al. 2007, Naghizadeh et al. 2017).

Biological association in Iran. *Euphorbia* sp. (Lotfalizadeh et al. 2007).

***Bruchophagus caucasicus* Zerova, 1992**

Material examined: Bushehr, viii.2017, ex *Astragalus meridonalis* Bunge, Zh. Alizadeh leg., 2♀ & 2♂.

Distribution in Iran. North-Khorasan (Kalantary et al. 2017), Bushehr (present study).

Biological association in Iran. *A. pellitus* Bunge, *A. macropelmatus* Bunge (Kalantary et al. 2017) and *A. meridonalis* (present study).

***Bruchophagus coluteae* (Bouček, 1954)**

Distribution in Iran. East-Azarbaijan (Naghizadeh et al. 2017).

Biological association. *Chardinia orientalis* (L.) Kuntze (Asteraceae)* (Naghizadeh et al. 2017).

***Bruchophagus dahuricus* (Zerova, 1992)**

Distribution in Iran. North-Khorasan (Kalantary *et al*. 2017), Qom (Parsa et al. 2018), East-Azarbaijan (Naghizadeh et al. 2017).

Biological association in Iran. *Dorema ammoniacum* (D. Don.) (Asteraceae)* and *A. oxyglottis* (Kalantary et al. 2017).

***Bruchophagus evolans* Szelenyi, 1961**

Distribution in Iran. North-Khorasan (Kalantary et al. 2017), East-Azarbaijan (Naghizadeh et al. 2017).

Biological association in Iran. *Medicago lupulina* L. (Kalantary et al. 2017) and *M. sativa* (Naghizadeh et al. 2017).

***Bruchophagus gibbus* (Boheman, 1836)**

Distribution in Iran. Khuzestan (Eslamizadeh & Ebrahimi 2002, Eslamizadeh et al. 2008), Qazvin (Lotfalizadeh & Zarnegar 2014), Qom (Parsa et al. 2018), East-Azarbaijan (Naghizadeh et al. 2017).

Biological association in Iran. *Medicago sativa* (Eslamizadeh & Ebrahimi 2002, Eslamizadeh et al. 2008), *M. sativa, Onobrychis radiate* (Desf.) M. Bieb. (Kalantary et al. 2017), *Trifolium pratense* L., *Lotus corniculatus* L. (Naghizadeh et al. 2017), *T. pratense*, *Dorema ammoniacum** (Parsa et al. 2018). *Astragalus gutatus*, *A. brachydontus* and *Zosima absinthifolia* (Vent)* (Apiaceae) (Lotfalizadeh & Zarnegar 2014).

***Bruchophagus glycyrrhizae* (Nikolaskaya, 1952)**

Material examined: Iran, Qazvin, Alamut, 50°31'55"E & 36°21'50"N, 2250m, 21.viii.2011, B. Gharali leg., 4♀.

Distribution in Iran. Qazvin (Arbab et al. 2004).

Biological association in Iran. *Glycyrrhiza glabra* L. (Fabaceae) (Arbab et al. 2004).

***Bruchophagus iranicus* Özdikmen, 2011**

The original name is *Bruchophagus trjapitzini* Zerova, 2008, which is a junior secondary homonym of *B. iranicus* Özdikmen, 2011 (Özdikmen 2011).

Distribution in Iran. West-Azarbaijan (Zerova et al. 2008).

Biological association in Iran. *Astragalus* sp. (Zerova et al. 2008).

***Bruchophagus kononovae* Zerova, 1994**

Distribution in Iran. North-Khorasan (Kalantary et al. 2017), Qom (Parsa et al. 2018), East-Azarbaijan (Naghizadeh et al. 2017).

Biological association in Iran. *Astragalus iranicus* (Kalantary et al. 2017), *A. brachyodontus* L., *A. compylorrhynchus* Fisch. & C. Mey., (Parsa et al. 2018) and *A. refractus* Boiss. & Buhse (Naghizadeh et al. 2017).

***Bruchophagus macronycis* Fedoseeva, 1956**

Distribution in Iran. East-Azarbaijan (Naghizadeh et al. 2017).

Biological association in Iran. *Astragalus macrourus* Fisch & C.A.Mey. (Naghizadeh et al. 2017).

***Bruchophagus medicaginis* Zerova, 1992**

Distribution in Iran. North-Khorasan (Kalantary et al. 2017), Qom (Parsa et al. 2018).

Biological association in Iran. *Trigonella persica* Boiss. (Kalantary et al. 2017), *Medicago lupulina* L. and *M. sativa* (Parsa et al. 2018).

***Bruchophagus mutabilis* Nikolaskaya, 1952**

Material examined: Iran, East-Azarbaijan, Yam, 15.viii.2017, ex *Astragalus persicus* (DC.) Fisch & C.A.Mey, Zh. Alizadeh leg., 11♀ & 18♂. East-Azarbaijan, Tabriz, 21.v.2019, ex *Robinia pseudoacacia* L., H. Lotfalizadeh leg., 3♀ & 8♂.

Distribution in Iran. Qazvin (Arbab et al. 2004, Lotfalizadeh & Zarnegar 2014), Qom (Parsa et al. 2018), East-Azarbaijan (Naghizadeh et al. 2017).

Biological association in Iran. *Glycyrrhiza glabra* L. (Arbab et al. 2004), *A. brachydontus* and *A. avicennus* Parsa (Lotfalizadeh & Zarnegar 2014), *A. oxyglottis*. (Parsa et al. 2018), *Astragalus chrysostachys, A. onobrychioides* M. Bieb., *A. persicus* (DC.) Fisch. & C.A.Mey., *A. tricholobus* DC., *A. macrorus* Fisch. & C.A.Mey. and *Prangos scabra* Nabelek (Apiaceae)* (Naghizadeh et al. 2017); *Astragalus persicus* and *Robinia pseudoacacia* L. (Fabaceae) (present study).

***Bruchophagus nikolskayae* (Zerova, 1968)**

Distribution in Iran. Khorasan-Razavi (Dashti & Lotfali-

zadeh 2008), East-Azarbaijan (Naghizadeh et al. 2017).

Biological association in Iran. *Eremurus spectabilis* M.Bieb. (Xanthorrhoeaceae)* (Dashti & Lotfalizadeh 2008) and *Potentilla* sp. (Rosaceae)* (Naghizadeh et al. 2017).

***Bruchophagus parvulus* Zerova, 1994**

Distribution in Iran. East-Azarbaijan (Naghizadeh et al. 2017).

Biological association in Iran. *Hypericum scabrum* L. (Hypericaceae)* (Naghizadeh et al. 2017).

***Bruchophagus platypterus* (Walker, 1834)**

Material examined: Iran, Ardebil, 26.viii.2014, Alfalfa field, H. Lotfalizadeh leg., 1♀. Qazvin province, Alamut, 50°31'55"E & 36°21'50"N, 2250m, 21.viii.2013, ex *Astragalus brachydonatus*, B. Gharali leg., 2♀ & 2♂.

Distribution in Iran. Ardebil, Qazvin provinces (**new record for Iran**).

Biological association in Iran. *Lotus* sp. and *Astragalus brachydonatus* (Fabaceae).

***Bruchophagus ponticus* Zerova, 1994**

Distribution in Iran. East-Azarbaijan (Naghizadeh et al. 2017).

Biological association in Iran. *Astragalus schelichowii* Turcz. (Naghizadeh et al. 2017).

***Bruchophagus robiniae* Zerova, 1970**

Material examined: Iran, East-Azarbaijan, Tabriz, 21.v.2019, ex *Robinia pseudoacacia* L., H. Lotfalizadeh leg., 3♀ & 8♂.

Distribution in Iran. Tehran (Rakhshani et al. 2005), East-Azarbaijan.

Biological association in Iran. *Robinia pseudoacacia* L. (Fabaceae) (Rakhshani et al. 2005).

***Bruchophagus roddi* Gussakovsky, 1933**

Distribution in Iran. East-Azarbaijan, West-Azarbaijan, Kermanshah, Kordestan, Tehran, Zanjan (Azmayesh Fard and Esmaili 1974, Arbab 2006, Khanjani and Kalafchi 2003, Mohammadbeigi 2014), Qom (Parsa et al. 2018).

Biological association in Iran. *M. sativa* L. (Azmayesh Fard and Esmaili 1974, Arbab 2006, Khanjani and Kalafchi 2003, Mohammadbeigi 2014, Parsa et al. 2018).

***Bruchophagus shohadae* (Zerova, 2008)**

Distribution in Iran. West-Azarbaijan (Zerova et al. 2008).

Biological association in Iran. *Astragalus caryolotus* (Zerova et al. 2008).

***Bruchophagus smirnoviae* Nikolskaya, 1955**

Material examined: Iran, Alborz, Karaj, vi.2018, Zh. Alizadeh leg. 10♀ & 13♂.

Distribution in Iran. Alborz (**new record for Iran**).

Biological association in Iran. Unknown.

***Bruchophagus trigonellae* Zerova, 1970**

Distribution in Iran. Qazvin (Zarnegar & Lotfalizadeh 2014), Qom (Parsa et al. 2018), East-Azarbaijan (Naghizadeh et al. 2017).

Biological association in Iran. *Astragalus odoratus* Lam. and *A. avicennus* (Lotfalizadeh & Zarnegar 2014), *Trigonella monantha* C. A. Mey. (Parsa et al. 2018) and *A. tricholobus* (Naghizadeh et al. 2017).

***Bruchophagus turkestanicus* Zerova, 1994**

Distribution in Iran. Qazvin (Lotfalizadeh & Zarnegar 2014), Qom (Parsa et al. 2018), East-Azarbaijan (Naghizadeh et al. 2017).

Biological association in Iran. *Astragalus brachydontus* (Lotfalizadeh & Zarnegar 2014), *A. alyssoides* Lam, *A. chrysostachys, A. macrourus, A. neo-mobayenii* Massoumi, *A. podocarpus*, and *Trifolium pretense* L. (Naghizadeh et al. 2017) *Dorema ammoniacum* (D. Don.) (Parsa et al. 2018).

***Bruchophagus verbasci* (Erdös, 1969)**

Material examined: Iran, East-Azarbaijan province, Arshad-Chaman, (37°45'04"N, 46°18'51"E, 2847m, 30.viii.2016, H. Lotfalizadeh leg. 6♀. Qazvin province, Alamut, 50°31'55"E & 36°21' 50"N, 2250m, 21.viii.2013, B. Gharali leg., 5♀.

Distribution in Iran. East-Azarbaijan and Qazvin (**new record for Iran**).

Biological association in Iran. Unknown.

***Systole longigaster* Lotfalizadeh sp. nov.** (Figs 1-2)

Type material. Holotype ♀: IRAN: East-Azarbaijan province, Arshad-Chaman, 21.viii.2017, 37°45'04"N, 46°18'51"E, 2847m, ex *Prangos ferulacea* (Apiaceae), H. Lotfalizadeh leg. (deposited in HMIM). Paratypes: 4♀ & 2♂, with the same labels as holotype (deposited in HMIM).

Description. Female (Fig. 1A). Body 2.6–3.5 mm long, holotype 3.02 mm.

Body black; pedicel and flagellum, all femora medially and telotarsi brownish-dark; scape, apices of mid and hind coxae, apices of all femora, all tibiae and tarsi yellowish-brown; wings hyaline, veins pale yellow, with white setation (Figs 2D-E); ovipositor in basal half yellowish-brown, in distal part yellow.

Head finely alveolate and sparsely umbilicate in dorsal and frontal view (Figs 2C, 2F), with white pubescence. Head dorsally 2.8 times as broad as long (140:50), 1.22 times as broad as pronotum (140:115), in frontal view 1.33 times as wide as high (140:105); POL 2.18 times as long as OOL (48:22). Malar space 0.69 times as long as eye height (22:32); clypeus ventrally bilobed, well protruding and elevated laterally, dorso-medially alveolate, dorso-laterally radiating striate; gena slightly carinate posteriorly.

Antenna inserted at middle of face, in half distance between clypeal margin and median ocellus, slightly above lower ocular line; scrobal depression not reaching median ocellus; scape long, 3 times as long as broad (90:30); anellus strongly transverse, pedicel longer than its distal width (38:27); F1 conical, elongate, 1.8 times as long as wide (45:25), F2 slightly longer than wide (35:30), F3-F5 as long as wide (30:30), clava 2.24 times as long as wide (85:38), longer than two apical funiculars, setation of flagellum sparse.

Mesosoma (Fig. 1A) weakly convex (in lateral view), wide, 1.18 times as long as wide in dorsal view (165:140), about as long as high in lateral view (165:162); pronotum 2.5 times as broad as long dorsally (115:45), mid lobe of mesoscutum as long as mesoscutellum (65:65), pro- and mesonotum alveolate with sparse shallow umbilicate punctures; mesopleuron finely reticulate; propodeum strongly sloping,

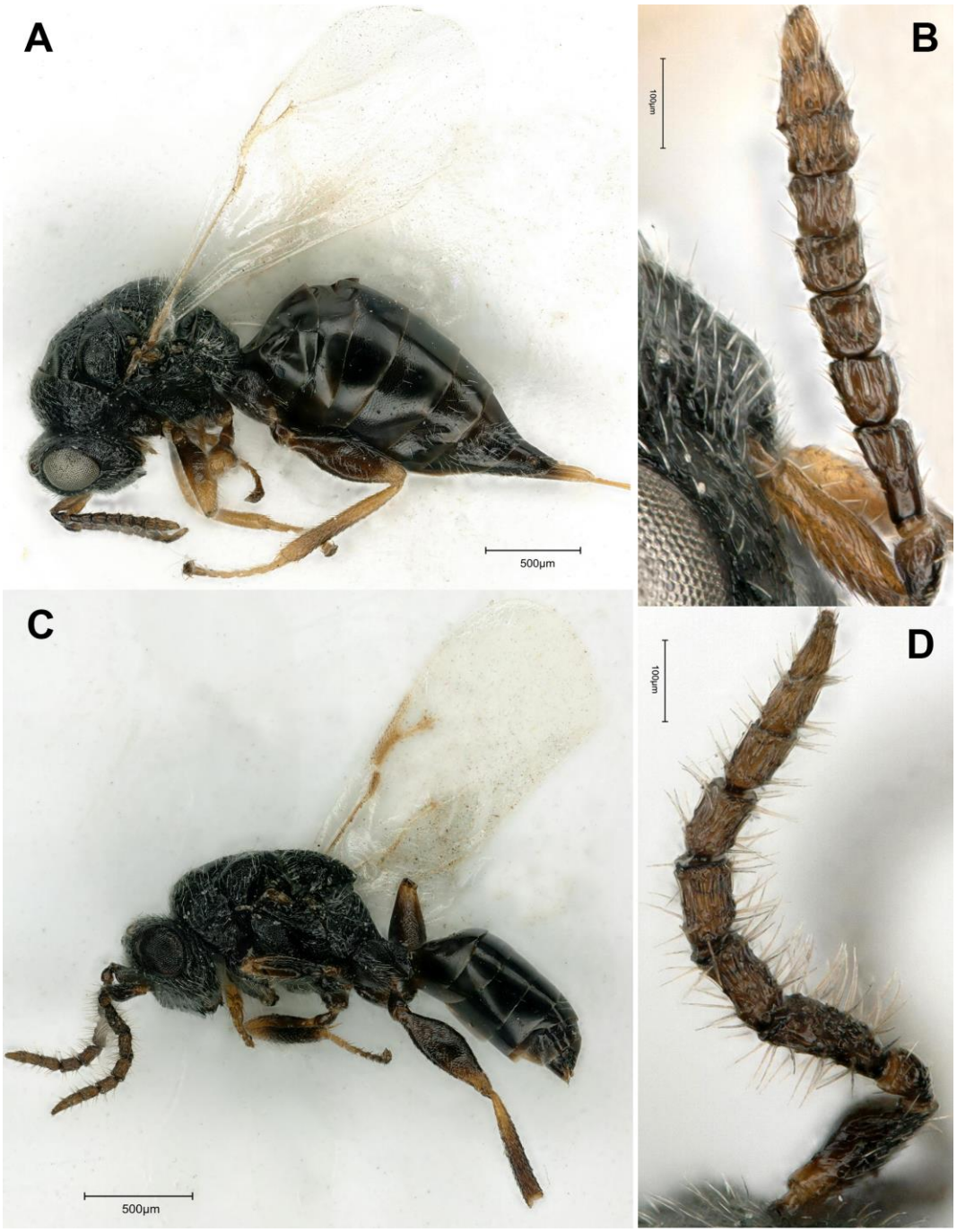

Figure 1. *Systole longigaster* Lotfalizadeh sp. nov.: A- Female in lateral view, B- Antenna of female, C- Male in lateral view, D- Antenna of male.

irregularly rugose, with rather sparse fine longitudinal carinae; all coxae reticulate laterally. Fore wing slightly more than 2 times as long as wide (195:95), basally bare, the rest with very short white sparse pubescence; veins pale; costal cell 7.69 times as long as wide (100:13); postmarginal vein 1.67 times as long as marginal vein; marginal, postmarginal and stigmal veins length ratio 60:100:75, respectively.

Gaster 1.8 times as long as mesosoma (100:55), elongate, acuminate, Gt1 and Gt2 smooth, polished, Gt3–Gt6 in basal half with thin punctulation, Gt4 slightly longer than Gt3 (28:25), Gt4–Gt7 (syntergum) with white sparse setation; ovipositor sheaths as long as syntergum; ovipositor slightly upturned.

Male (Fig. 1B). Body length 2.1-3.15 mm. Coloration as for female except antenna dark-brown, all tibiae darker than in the female. Antennal formula 11143 (Fig. 3D); scape 2.33 times as long as wide (70:30), widening distally; pedicel slightly longer than wide (25:20); F1 1.9 times as long as wide (48:25), F2 about 1.6 times longer than wide, F3-F4 about 1.4 times as long as wide, clava 4 times longer than wide; relative measurements: F2 (40:25), F3 (35:25), F4 (35:25), clava (88:22). Gaster with long petiole, more than half as long as hind coxa.

Variation. Body length of females vary from 2.2 to3.6 mm and males from 2.2 to 2.6 mm.

Distribution. As far as known, only Iran (East-Azarbaijan

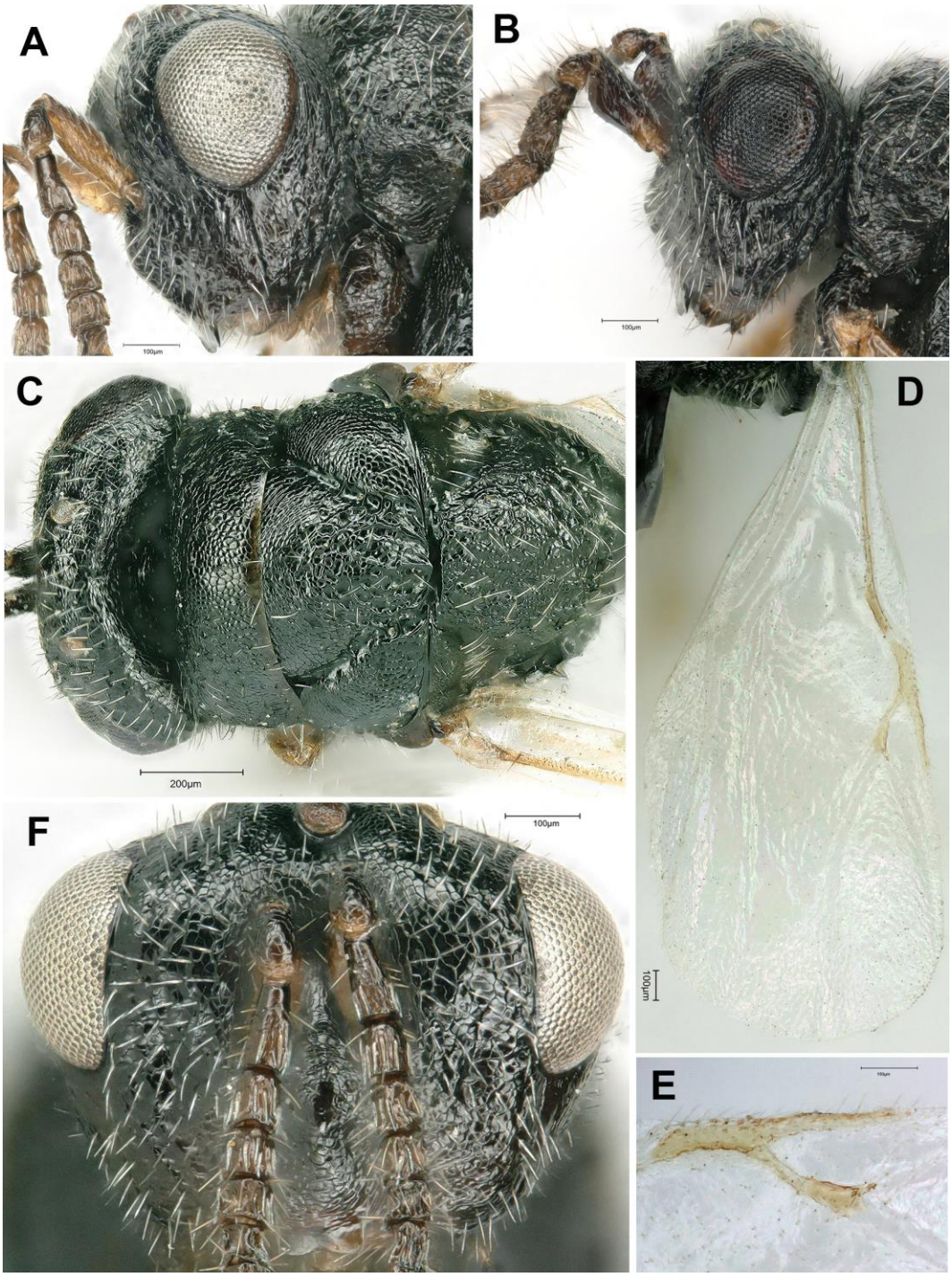

Figure 2. *Systole longigaster* Lotfalizadeh sp. nov.: A- Head of female in lateral view, B- Head of male in lateral view, C- Head and mesosoma in dorsal view, D- Fore wing, E- Head of female in frontal view, E- Fore wing venation.

province).

Diagnosis. The following combination of morphological characters which differentiate females of *S. longigaster* **sp. nov.** from other species of the genus are as follow: F1 conical, elongate, 1.8 times as long as wide; clypeus ventrally bilobed, well protruding and elevated laterally; metasoma 1.8 times as long as mesosoma; postmarginal vein 1.67 times as long as the marginal; stigmal vein 1.25 times as long as the marginal.

Notes. According to the structure of the antenna, *S. longigaster* **sp. nov.**, when using the key to species provided by Zerova & Seregina (1994), is most similar to *S. prangicola* Zerova, 1972, but differs strongly in the shape of the clypeus, in the size of pronotum, shape and size of the funiculars and the relative length of fore wing, the proportions of the venations and also relative length of metasoma. Detailed comparisons are presented in Table 1.

Biological association in Iran. *Prangos ferulacea* (L.) (Apiaceae)**.**

Etymology. *longigaster*, an adjective describing the long abdomen of the species in female within this genus.

Table 1. Compared morphological characters of *Systole longigaster* Lotfalizadeh sp. nov. and *Systole prangicola* Zerova.

Characters	*S. longigaster* sp. nov.	*S. prangicola*
Pronotum dorsally	2.5× as broad as long	3.5 to 4× as broad as long
F1 shape	distinctly conical (Fig. 3B)	not conical (Zerova, 1972; Fig. 3)
Funicular segments	F1-F3 longer than wide only (Fig. 3B)	all funiculars longer than wide
PMv/Mv	1.67× (Fig. 4E)	1.25× (Zerova, 1972; Fig. 5)
Stv/Mv	1.25× (Fig. 4E)	0.88× (Zerova, 1972; Fig. 5)
Metasoma/mesosoma	1.67× (Fig. 3A)	1.16× (Zerova, 1972; Fig. 1)
Clypeus	distinctly bilobed, well protruding and elevated laterally (Figs 4A, B, F)	neither bilobed nor protruding and elevated (Zerova, 1972; Fig. 2)
Exerted part of ovipositor	as long as or slightly shorter than Mt7 (Fig. 3A)	less than half of Mt7 length (Zerova, 1972; Fig. 1)

***Systole albipennis* Walker, 1832**
Distribution in Iran. Iran (Bouček 1952, 1977).
Biological association in Iran. Unknown.

***Systole besaparica* Stojanova, 2002**
Material examined. Iran, Qazvin, Alamut, 21.viii.2013, 50° 31' 55"E & 36°21' 50"N, 2250m, B. Gharali leg., 7♀.
Distribution in Iran. Qazvin (**new record for Iran**).
Biological association in Iran. Unknown.

***Systole coriandri* Gussakovsky, 1933**
Distribution in Iran. Iran (Zerova 1978).
Biological association in Iran. Unknown.

***Systole dzintari* Zerova et Fursov, 2019**
Distribution in Iran. Lorestan (Zerova et al. 2019).
Biological association in Iran. *Ferula gumosa* Boiss (Apiaceae) (Zerova et al. 2019).

***Systole complanata* Zerova, 1972**
Distribution in Iran. Lorestan (Zerova et al. 2019).
Biological association in Iran. Unknown.

***Systole eremodauci* Zerova, 1994**
Distribution in Iran. Fars (Alehosein et al. 2014)
Biological association in Iran. *Dorema ammoniacum* (Alehosein et al. 2014).

***Systole foeniculi* Otten, 1941**
Distribution in Iran. Iran (Otten 1941; Bouček 1952; Zerova 1978).
Biological association in Iran. *Foeniculum vulgare* Mill. (Apiaceae) (Otten 1941; Bouček 1952).

***Systole irana* Zerova et Al-Sendi, 2019**
Distribution in Iran. Lorestan (Zerova et al. 2019).
Biological association in Iran. *Prangos acaulis* (DC.) Boronm (Apiaceae) (Zerova et al. 2019).

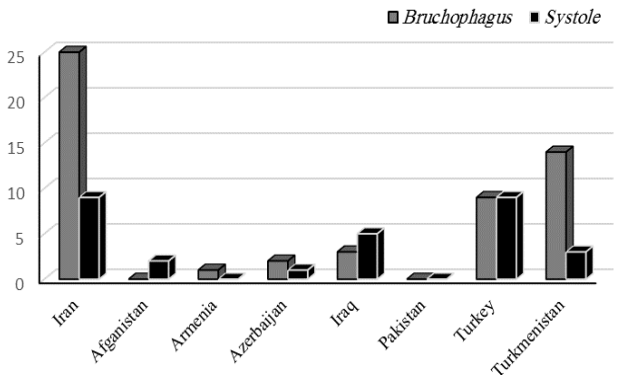

Figure 3. Number of species of the genera *Bruchophagus* and *Systole* in Iran (from previous data and present study) and neighboring countries (from Noyes, 2019).

Discussion

Totally, *Bruchophagus* and *Systole* of Iran include 25 and nine species, respectively. These listed species for Iran include about 15% and 20.9% of the Palaearctic fauna of *Bruchophagus* and *Systole*, respectively. Comparing with fauna of the adjacent countries (Noyes 2019) it reveals that the fauna of Iran is better explored (Fig. 3). It contains six new species originally described from Iran: *B. shohadae, B. trjapitzini*, *S. dzintari, S. foeniculi, S. irana* and *S. longigaster* Lotfalizadeh **sp. nov.**; that's why further collection, especially from southern parts can lead us to further new findings and new species.

Three species *B. astragali*, *B. gibbus* and *B. roddi* are reported as most widely distributed in Iran. It may be resulted from their host plants that the first one was reported on several species of *Astragalus* and two last species are alfalfa seed wasps that are most economical in Iran.

Bruchophagus abnormis, *B. coluteae*, *B. dahuricus, B. gibbus, B. mutabilis* and *B. nikolskayae* were reported on the families Apiaceae, Asteraceae, Xanthorrhoeaceae, Rosaceae and Hypericaceae. These reports may be resulted from misidentification of the host plant species or problem in the rearing stage. These biological associations need to be confirmed; therefore, further studies can clarify these strange associations.

Considering that Iran is located in the Palaearctic region and has exchanges with the Oriental and Afrotropical regions, it seems that the Iranian fauna of *Bruchophagus* and *Systole* is richer and needs more attention.

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