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Pteromalids (Hymenoptera: Chalcidoidea: Pteromalidae) of Syrdarya–Kyzylkum and Betpakdala–Moyynkum desert territories in southern Kazakhstan

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ABSTRACT

An inventory of the pteromalid fauna of Syrdarya–Kyzylkum and Betpakdala–Moyynkum desert territories of southern Kazakhstan is presented for the first time. Thirty-four species in 23 genera are listed, and information on their hosts and distribution is provided. *Mesopolobus auditor* Dzhanokmen, 1975 is treated here as a subspecies *Mesopolobus diffinis auditor* Dzhanokmen, 1975, stat. rev. The subspecies is known so far only from the desert and semidesert areas of Kazakhstan and Central Asia.

KEYWORDS: Hymenoptera, Chalcidoidea, Pteromalidae, Kazakhstan, Kyzylkum, Betpakdala, Moyynkum, fauna, inventory.

INTRODUCTION

This contribution presents an inventory of the pteromalid (Hymenoptera, Chalcidoidea, Pteromalidae) fauna in a vast arid expanse in southern Kazakhstan. The study area (Fig. 1) includes the plain adjacent to the Syrdarya River, Kyzylkum sand desert along the moderately elevated Karaktau outlier mountains, Moyynkum (*aka* Muynkum) sand desert and Betpakdala (*aka* Northern Golodnaya Steppe) argillaceous desert. The Betpakdala Desert, one of the world's vastest clay deserts, stretches over the territory landmarked by the Sarysu River in the West, Balkhash Lake in the East, and the Chu River in the South. The Moyynkum sands constitute a sandy plain around the lower reaches of the Chu and Sarysu rivers. The Kyzylkum is one of the greatest sand deserts in Central Asia. Merely a northern part of it is in Kazakhstan.

The family Pteromalidae is one of the largest families of chalcidoid wasps and comprises over 3000 described species in 552 genera (Bouček & Heydon 1997). Nevertheless our knowledge of the world pteromalid fauna is still incomplete. Each year new species and genera of pteromalids are being described from various parts of the world. At the same time, some species and genera become synonyms.

Pteromalids develop as solitary and gregarious parasites of various stages of insects or, rarely, linked trophically with spiders. Pteromalids may be primary parasites and hyperparasites as well as ectoparasites and endoparasites. A few species are known to be phytophagous (Riek 1962; Bouček 1988; Askew & Blasco-Zumeta 1997, 2000).

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Fig. 1: A physical map of Central Asia, showing Syrdarya–Kyzylkum and Betpakdala–Moyynkum desert territories in southern Kazakhstan.

Taking into account the predisposition of pteromalids to secondary parasitism, ectoparasitic pteromalids should be regarded as potential biocontrol agents against agricultural and silvicultural pests with utmost caution (Dzhanokmen 2002).

MATERIALS AND METHODS

The listed specimens were collected mainly by me during the expeditions organized in 1980, 1984, 1988 and 1992 by the Institute of Zoology of the Kazakhstan Academy of Sciences (now Institute of Zoology, Committee of Science, Ministry of Education and Science of the Republic of Kazakhstan), and also by my colleagues. The material was collected by sweeping and by rearing from the parasitized hosts.

The pteromalids are studied as dry specimens and on microscopic slides. The first stage of the slide preparation involves removal of antennae and wings off the body of a specimen mounted on a plate or on a point attached to a pin. In order to achieve separation, a dissecting needle is dipped into clove oil and engaged with either antenna or a wing; once in contact with oil, an appendage would easily get detached from the body, while remaining attached to the tip of the needle. The wing is immediately transfered onto the slide and positioned within a drop of clove oil, the ventral area of the appendage adjacent to the slide. Thereupon, a drop of Canada Balsam is placed on the wing and a glass cover slip is applied. It should

be noted that the chaetotaxy of species from arid habitats is often distinguished by the presence of highly transparents pilosity. Once immersed into Canada Balsam, the microtrichiae of the wing usually become either barely detectable or totally invisible. As a consequence, identification of some pteromalids can pose a serious problem. In such cases, wings are to be directly placed on the slide (neither in clove oil nor in Canada Balsam!) and covered with a glass cover slip, which corners are to be secured externally with tiny drops of balsam. The balsam penetrates only along the edges of the cover slip and thereby ensures a tighter connection between the slide and the cover slip.

Slide mounting of antennae can be done in two ways, depending on the pigmentation of antennae. *Fair-colored* antennae: first, objects are immersed into the cavity of a hollow ground-glass slide filled with clove oil (or, alternalively, into a watch-glass) and in due course (depending on the desired degree of clearing) are transferred on another slide in the drop of clove oil and superimposed with balsam. Further, the antennae are positioned in the center of a flattened drop and covered with the glass cover slip. *Dark-colored* antennae: first, they are placed in a test tube with 10% potassium hydroxide (KOH) solution and incubated for as long as a few minutes to one day, depending on the degree of pigmentation. Heating up the tube with the antennae in KOH solution is not advisable (with very few exeptions to the rule). Then the antennae are transferred from KOH into clove oil for further clearing; thereupon, they are placed on a microscope slide into a fresh drop of clove oil and superimposed with balsam. The procedure is completed in the same way as for fair-colored antennae.

The 10% KOH solution should also be used for slide mounting of the head capsule, mesosoma, and metasoma, although the length of incubation for such objects must be extended to 1–3 days, depending on the degree of sclerotisation and pigmentation. In the latter case, heating up the solution to a moderate level for a short time may be admissible. To ensure a greater degree of discoloration while incubating exceedingly pigmented and heavily sclerotized cuticular structures in KOH, two to three drops of 5–10% hydrogen peroxide solution can be added into the test tube during the process. After 20–30 min of incubation, the sufficiently discolored and mollified appendages are transferred into clove oil for another 2–3 hours for clearing and smooth cleansing. Thereafter, the objects are placed on a microscope slide into a fresh drop of clove oil, dissected if necessary, superimposed with balsam, and covered with a glass cover slip. Placing fragments of glass capillary tubes or shards of cover slips between the cover slip and the slide itself prevents deformation of sculptured sclerites as a result of flattening.

The described technique of slide mounting helps reaching a desired degree of transparency and ensures retainment of the sculpture. Studying such slide-mounted objects using the polarized light microscopy even allows to visualize clearly endoskeletal structures.

The unpublished full description of this technique can be found in my doctoral thesis “Comparative morphology, trophic links, and evolution of pteroma-

lid wasps (Hymenoptera, Chalcidoidea, Pteromalidae) mainly on Palaearctic materials" (Dzhanokmen 1991), which is archived in the library of the Zoological Institute of the Russian Academy of Sciences (St. Petersburg).

The examined material is deposited at the Institute of Zoology of the Republic of Kazakhstan in Almaty.

The abbreviations used for the most frequently cited collectors are as follows: K.D. – K.A. Dzhanokmen, V.K. – V.L. Kazenas, Z.F. – Z.A. Fedotova.

While specific names of all the pteromalids are current, some of their hosts (in the cited literature sources) may be outdated; these are indicated in square brackets following the valid names. Full synonymy of listed pteromalid species is available in the *Universal Chalcidoidea Database* (Noyes 2016).

In distribution of species the countries are generally listed from north to south and from west to east.

ANNOTATED LIST OF SPECIES

Family Pteromalidae Dalman, 1820

Subfamily Cleonyminae Walker, 1837

Notanisus clavatus Bouček, 1961

Notanisus clavatus Bouček, 1961: 471.

Material examined: Kazakhstan: Koshkurgan Vill., Turkistan Distr., South Kazakhstan Area, cereal meadow, 9.ix.1988 (K.D.).

Host: Unknown.

Distribution: Kazakhstan. Croatia, Romania, Bulgaria, Greece, Cyprus, Georgia, China.

Subfamily Colotrechninae Thomson, 1876

Colotrechnus subcoeruleus Thomson, 1878

Colotrechnus subcoeruleus Thomson, 1878: 46–47.

Material examined: Kazakhstan: Dzhetysai [now Zhetysai, South Kazakhstan Area], from larvae of *Mecinus pyraster* (Herbst, 1795) (Curculionidae) in flower-stalk of *Plantago lanceolata* Linnaeus (Plantaginaceae), 3, 8, 17.vi.1980 (K.D.).

Host: The primary parasite of *Mecinus pyraster* (Herbst) (Coleoptera: Curculionidae) and *Melanagromyza* sp. (Diptera: Agromyzidae) (Dzhanokmen 1984; Noyes 2016).

Distribution: Kazakhstan. UK, Sweden, Germany, France, Spain, Italy, Czech Republic, Slovakia, Austria, Hungary, Croatia, Bosnia and Herzegovina, Serbia, Macedonia, Romania, Moldova, Azerbaijan, India.

Colotrechnus viridis (Masi, 1921)

Zanonia viridis Masi, 1921: 187–189, figs 4–6.
Colotrechnus viridis (Masi): Delucchi 1956*b*: 234, 236–237; Graham 1969: 851.

Material examined: Kazakhstan: 160 km NE of Chiili Vill. [now Shieli Vill., Kyzylorda Area], environs of Taykonur Vill., Suzak Distr., South Kazakhstan Area, southwestern part of Betpakdala

Desert, 4.v.2002 (V.K); foothills of Karaktau Mts, 30 km W of Bairkum Vill. (South Kazakhstan Area), edge of Kyzylkum sands, from fruits of *Astragalus bungei* C. Winkl. (Fabaceae) with Curculionidae larvae, 6.vi.1992 (K.D.); 50 km NW of Bairkum Vill., Kyzylkum sands, from inflorescences of *Microcephala lamellata* (Bunge) Pobed. (Asteraceae) with puparia of Tephritidae, 13.v.1992 (K.D.); Dzhetysai [=Zhetysai], from inflorescences of *Acroptilon repens* (Linnaeus) DC. (Asteraceae), 23.vi.1980 (K.D.); same locality, on *Tamarix* sp., 23.viii.1980 (K.D.); Saryagach Vill., Keles River floodland, from puparia of *Tephritis postica* (Loew, 1844) (Tephritidae), on *Carthamus lanatus* Linnaeus (Asteraceae), 25.vii.1976 (Ivannikov). **Uzbekistan**: Dzhar-Kurgan, sands, 10.iv.1964 (Tobias). **Turkmenistan**: Murgab River, gallery forest [=tugaj], near Krasnoe Znamya Vill., 24.iv.1980 (Kasparyan); Badkhyz Reserve, forbs, 2.v.1990 (Belokobylskij); Tedzhen River, Puli-Khatum, forbs, 30.iv.1990 (Belokobylskij); Southeastern Karakum, 40 km SW of Kerki, desert, 19.v.1990 (Belokobylskij).

Host: The host range includes *Microlarinus lypriformis* (Wollaston, 1861) (Coleoptera: Curculionidae), *Jaapiella cirsiicola* Rübsaamen, 1916 (Diptera: Cecidomyiidae), *Acanthiophilus helianthi* (Rossi, 1794), *Chaetorellia carthami* Stackelberg, 1929, *Tephritis postica* (Loew, 1844), *Terellia luteola* (Wiedemann, 1830), *Urophora mauritanica* Macquart, 1851 (Diptera: Tephritidae) (Bouček 1961; Dzhanokmen 1980, 1984; Hertevtzian & Dzhanokmen 1986; Lotfalizadeh & Gharali 2008; Noyes 2016).

Distribution: Kazakhstan, Uzbekistan, Turkmenistan. The Canary Islands, North Africa (Libya), Spain, Czech Republic, Slovakia, Hungary, Romania, Croatia, Lithuania, Georgia, Armenia, Azerbaijan, Turkey, Iran, Russian Far East.

Subfamily Miscogastrinae Walker, 1833

Ksenoplata medicaginis Bouček, 1965

Ksenoplata medicaginis Bouček, 1965: 376, fig. 5.

Material examined: Kazakhstan: Dzhetysai, from beans of *Medicago* sp. (Fabaceae), 7.vii.1980 (K.D.).

Host: Reared from *Bruchidius bimaculatus* (Olivier, 1795) (Coleoptera: Chrysomelidae: Bruchinae) on *Medicago polymorpha* Linnaeus [=*Medicago lappacea* Desr.] (Fabaceae) (Bouček 1965; Graham 1969; Dzhanokmen 1980 [as *Ksenoplata quadrata* Bouček, 1965]).

Distribution: Kazakhstan. North Africa (Algeria).

Subfamily Ormocerinae Walker, 1833

Systasis (Systasis) darlingi Dzhanokmen, 1996

Systasis (Systasis) darlingi Dzhanokmen, 1996*b*: 1795–1796, pl. 2, figs 4–6.

Material examined: Kazakhstan: Chiili Vill., right bank of Syrdarya River, from bud galls of *Dasyneuriola suaedae* Marikovskij, 1961 (Cecidomyiidae) on *Suaeda microphylla* Pall. (Chenopodiaceae), 25.vi.1984 (K.D.).

Host: *Dasyneuriola suaedae* Marikovskij (Diptera: Cecidomyiidae) (Dzhanokmen 1996*b*).

Distribution: Southern Kazakhstan.

Subfamily Pireninae Haliday, 1844
Gastrancistrus sugonjaevi Dzhanokmen, 1995

Gastrancistrus sugonjaevi Dzhanokmen, 1995*a*: 692–694, figs 23–26.

Material examined: Kazakhstan: 160 km NE of Chiili Vill., environs of Taykonur Vill., southwestern part of Betpakdala Desert, on *Tamarix* sp., 4.v.2002 (V.K.); 50 km W of Koksu Vill., left bank of Syrdarya River, Kyzylkum sand desert, from flower galls of *Contarinia ovipositosclera* Fedotova, 1993 (Cecidomyiidae) on *Astragalus paucijugus* Schrenk, 29.x.1992 (K.D.) (after diapause under laboratory condition).

Host: Parasite of larvae of *Bremiola* (s. str.) *karatavica* Fedotova, 1994 and *Contarinia ovipositosclera* Fedotova, 1993 (Diptera: Cecidomyiidae) (Dzhanokmen 1995*a*).

Distribution: Kazakhstan, Uzbekistan, Turkmenistan.

Subfamily Pteromalinae Dalman, 1820
Amphidocius xanthogaster Dzhanokmen, 1974

Amphidocius xanthogaster Dzhanokmen, 1974: 294–295, figs 5–7.

Material examined: Kazakhstan: Dzhetysai, on *Tamarix* spp., 9.viii–1.ix.1980 (K.D.).

Host: Probably a parasite of *Dasineura tamaricicarpa* Fedotova, 1983 (Cecidomyiidae), and also of other small Diptera in sand, argillaceous and salt deserts and semideserts.

Distribution: Kazakhstan, Turkmenistan. Turkey, Mongolia.

Caenocrepis arenicola Thomson, 1878

Caenocrepis arenicola Thomson, 1878: 51–52.

Material examined: Kazakhstan: 30 km W of Bairkum Vill., foot of Karaktau Mts in the southeastern periphery of Kyzylkum sands, from galls of Curculionoidea on *Horaninovia ulicina* Fisch. & C.A. Mey. (Chenopodiaceae), 16.v.1992 (K.D.); Dzhetysai, on *Tamarix* spp., 9–27.v.1980, 9.viii.1980 (K.D.).

Host: *Pachycerus madidus* (Olivier, 1807) (Coleoptera: Curculionidae) (Noyes 2016).

Distribution: Kazakhstan. Morocco, Sweden, France, Spain, Czech Republic, Slovakia, Austria, Hungary, Romania, Croatia, Serbia, Montenegro, Greece, Turkey, Lithuania, Moldova, Russia, Georgia, Azerbaijan.

Catolaccus crassiceps (Masi, 1911)

Merisoides crassiceps Masi, 1911: 141–145, pl. 1, figs 1–5.
Catolaccus crassiceps (Masi): Verma *et al*. 1976: 44.

Material examined: Kazakhstan: Chiili Vill., right bank of Syrdarya River, from flower buds of *Karelinia caspia* (Pall.) Less. (Asteraceae), 4.viii.1984 (K.D.).

Hosts: A parasite of Coleophoridae, Gelechiidae, Noctuidae, Pieridae, Pyralidae (Lepidoptera), usually through Braconidae and Ichneumonidae (Hymenoptera); it was reared from cocoons of *Coniatus indicus* Marshall, 1916 (Coleoptera:

Curculionidae) on *Tamarix dioica* Roxb. ex Roth; from cocoons of *Chrysoperla carnea* (Stephens, 1836) and *Suarius fedschenkoi* (McLachlan, 1875) (Neuroptera: Chrysopidae); from galls of *Diplolepis fructuum* Rübsaamen, 1882 (Hymenoptera: Cynipidae) on *Rosa canina* Linnaeus; and also trophically associated with *Coccidohystrix insolita* (Green, 1908) (Hemiptera: Pseudococcidae) (Bouček 1977; Bouček *et al.* 1978; Dzhanokmen 1980, 1984; Farooqi & Subba Rao 1986; Lotfalizadeh & Gharali 2008; Noyes 2016).

Distribution: Kazakhstan, Uzbekistan. Morocco, Sweden, Spain, Italy, Slovakia, Hungary, Romania, Croatia, Macedonia, Russia (Crimea and SE of European part), Armenia, Azerbaijan, Iran, Pakistan, India.

Cheiropachus quadrum (Fabricius, 1787)

Ichneumon quadrum Fabricius, 1787: 270.
Cheiropachus quadrum (Fabricius): Westwood 1829: 25; Graham 1969: 416.

Material examined: Kazakhstan: Dzhetysai, from *Scolytus multistriatus* (Marsham, 1802) (Scolytidae) on apple (*Malus* sp.), 20.viii.1974 (Fol'kina). **Turkmenistan** (new record): Kushka [now Serkhetabad, Mary velayat], from *Anthaxia kreuzbergi* (Richter, 1944) (Buprestidae), on *Pistacia* sp., 15.vi.1997 (Kreitzberg).

Hosts: Coleoptera: *Apate* sp., *Sinoxylon sexdentatum* (Olivier, 1790) (Bostrichidae), *Agrilus viridis* (Linnaeus, 1758), *Anthaxia ephippiata* Redtenbacher, 1850 [=*A. kreuzbergi* (Richter, 1944)] (Buprestidae), *Tetrops praeusta* (Linnaeus, 1758) (Cerambycidae), *Magdalis aenescens* LeConte, 1876, *M. armicollis* (Say, 1824), *M. armigera* (Geoffroy in Fourcroy, 1785), *M. barbicornis* (Latreille, 1804), *M. barbita* (Say, 1831) (Curculionidae), *Carphoborus perrisi* (Chapuis, 1869), *Chaetoptelius vestitus* (Mulsant & Rey, 1860), *Dryocoetes autographus* (Ratzeburg, 1837), *Hylesinus fraxini* (Panzer, 1779), *H. orni* (Fuchs, 1906), *H. toranio* (Danthoine, 1788) [=*H. oleiperda* (Fabricius, 1792)], *H. varius* (Fabricius, 1775), *Ips amitinus* (Eichhoff, 1871), *I. sexdentatus* (Boerner, 1767), *I. typographus* (Linnaeus, 1758), *Phloeosinus canadensis* Swaine, 1917, *P. punctatus* LeConte, 1876, *Phloeotribus caucasicus* Reitter, 1891, *P. scarabaeoides* (Bernard, 1788) [=*P. oleae* (Fabricius, 1792)], *Pityogenes chalcographus* (Linnaeus, 1761), *Pteleobius vittatus* (Fabricius, 1787), *Scolytus rugulosus* (Müller, 1818) [=*Ruguloscolytus mediterraneus* (Eggers, 1922)], *S. amigdali* Guérin, 1847, *S. carpini* (Ratzeburg, 1837), *S. ensifer* Eichhoff, 1881, *S. intricatus* (Ratzeburg, 1837), *S. japonicus* Chapuis, 1875, *S. kirschi* Skalitzky, 1876, *S. koenigi* Schevyrew, 1890, *S. laevis* Chapuis, 1873, *S. mali* (Bechstein & Scharfenberg, 1805), *S. multistriatus* (Marsham, 1802), *S. pygmaeus* (Fabricius, 1787), *S. ratzeburgi* Janson, 1856, *S. rugulosus* (Müller, 1818), *S. schevyrevi* Semenov, 1902, *S. scolytus* (Fabricius, 1775), *Tomicus minor* (Hartig, 1834), *T. piniperda* (Linnaeus, 1758), *Xyleborus xylographus* (Say, 1826) (Scolytidae), and infrequently Lepidoptera *Zeuzera pyrina* (Linnaeus, 1761) (Cossidae) and *Lymantria dispar* (Linnaeus, 1758) (Lymantriidae) (Talitskiy, 1966 [as *Cheiropachus colon* Linnaeus, 1758]; Graham 1969; Avetyan *et al.* 1976; Bouček 1977; Zharkov & Dzhanokmen 1976, 1977; Dzhanokmen 1978, 1980; Burks 1979; Sta-

nyonite & Dzhanokmen 1982, 1990; Hertevtzian & Dzhanokmen 1985; Xiao & Huang 2001; Sureshan & Narendran 2003; Lotfalizaden & Gharali 2008; Lotfalizadeh & Khalghani 2008; Tselikh 2010; Ghahari & Huang 2012; Noyes 2016).

Distribution: Kazakhstan, Turkmenistan, Kyrgyzstan, Uzbekistan, Tadjikistan. *Palearctic*: The Canary Islands, North Africa (Morocco, Tunisia, Egypt), UK, Norway, Sweden, The Netherlands, Belgium, Germany, France, Spain, Switzerland, Italy (Sardinia), Czech Republic, Slovakia, Austria, Hungary, Slovenia, Croatia, Bosnia and Herzegovina, Serbia, Macedonia, Poland, Lithuania, Ukraine, Moldova, Russia (European part, Northern Caucasus and Far East), Georgia, Armenia, Azerbaijan, Turkey, Lebanon, Israel, Iran, Pakistan, Mongolia, China. *Oriental*: India. *Nearctic*: Canada, USA. *Neotropics*: Chile, Argentina.

Conomorium amplum (Walker, 1835)

Pteromalus amplum Walker, 1835: 480.
Conomorium amplum (Walker): Graham 1992: 200.

Material examined: Kazakhstan: Koshkurgan Vill. (*c*. 18 km NE of Turkistan, South Kazakhstan Area), right bank of Syrdarya River, argillaceous semidesert, forbs, 16.ix.1988 (K.D.).

Host: The pupal parasite of Lepidoptera: *Arctia caja* (Linnaeus, 1758), *Epicallia villica* (Linnaeus, 1758) [=*Arctia villica* (Linnaeus)], *Hyphantria cunea* (Drury, 1773) and *Rhyparia purpurata* (Linnaeus, 1758) (Arctiidae), *Agriopis bajaria* (Denis & Schiffermüller, 1775) (Geometridae), *Parocneria* sp. (Lymantriidae), and *Notodonta* sp. (Notodontidae) (Nikolskaya & Kyao 1954; Graham 1992; Boriani 1994; Xiao & Huang 2000; Yang & Baur 2004; Noyes 2016).

Distribution: Kazakhstan, Uzbekistan. Madeira, the Canary Islands, Sweden, UK, The Netherlands, Belgium, Germany, France, Switzerland, Spain, Italy, former Czechoslovakia, Hungary, Romania, Greece, Russia (Far East), China.

Cyrtoptyx lichtensteini (Masi, 1922)

Dinarmus lichtensteini Masi, 1922*a*: 77.
Cyrtoptyx lichtensteini (Masi): Delucchi 1956*b*: 254.

Material examined: Kazakhstan: Environs of Dzhetysai, from larvae of *Sternuchopsis karelini* (Boheman, 1844) (Curculionidae) in seed cases of *Convolvulus arvensis* Linnaeus (Convolvulaceae), 21.vi.1980, 3.vii.1980 (K.D.).

Hosts: *Mononychus punctumalbum* (Herbst, 1784), *Lixus* sp., *Sternuchopsis karelini* (Boheman) (Coleoptera: Curculionidae), and *Etiella zinckenella* (Treitschke, 1832) (Lepidoptera: Pyralidae) (Graham 1969; Dzhanokmen 2015; Noyes 2016).

Distribution: Kazakhstan. North Africa (Morocco), France, China, USA (incl. Puerto Rico).

Dibrachys (Dibrachys) microgastri (Bouché, 1834)

Diplolepis microgastri Bouché, 1834: 168.
Dibrachys (Dibrachys) microgastri (Bouché): Graham 1969: 810; Peters & Baur 2011: 13.

Material examined: Kazakhstan: Near Chardara Vill. [now Shardara Town], bank of Chardara basin, from bud galls of *Halodiplosis saxauli* Kaplin, 1991 (Cecidomyiidae) on *Haloxylon persicum* Bunge ex Boiss. & Buhse (Chenopodiaceae), 23.v.1992 (K.D.).

Hosts: As a primary parasite or hyperparasite this species is trophically associated mainly with insects and rarely with spiders. Hosts have been identified in Anobiidae, Bruchidae, Cerambycidae, Coccinellidae, Cucujidae, Curculionidae, Scolytidae, Trogossitidae (Coleoptera), Forficulidae (Dermaptera), Agromyzidae, Calliphoridae, Cecidomyiidae, Hippoboscidae, Muscidae, Sarcophagidae, Tachinidae, Tephritidae (Diptera), Pseudococcidae (Hemiptera), Apidae, Braconidae, Cephidae, Chalcididae, Diprionidae, Eulophidae, Eurytomidae, Ichneumonidae, Pteromalidae, Sphecidae, Tenthredinidae, Vespidae (Hymenoptera), Agonoxenidae, Arctiidae, Bucculatricidae, Choreutidae, Crambidae, Coleophoridae, Gelechiidae, Geometridae, Glyphipterygidae, Lasiocampidae, Lymantriidae, Lyonetiidae, Momphidae, Noctuidae, Notodontidae (Thaumetopoeinae), Nymphalidae, Oecophoridae, Pieridae, Psychidae, Pterophoridae, Pyralidae, Saturniidae, Sesiidae, Tineidae, Tortricidae, Yponomeutidae, Zygaenidae (Lepidoptera), Chrysopidae, Hemerobiidae, Sympherobiidae (Neuroptera), Mengenillidae (Strepsiptera), and in Araneidae and Thomisidae (Arachnida: Araneae) (Nikolskaya & Kyao 1954; Kolomiets 1958; Talitsky 1966; Graham 1969; Askew 1970; Avetyan *et al.* 1976; Bouček 1977; Mukhin 1977; Bouček *et al.* 1978; Chu 1978; Dzhanokmen 1978, 1980, 1984; Stanyonite & Dzhanokmen 1978, 1990; Talitskiy & Kuslitskiy 1980; van Frankenhuyzen 1981; Sharkov 1982; Kamijo 1983; Cock 1985; Herthevzian & Dzhanokmen 1985; Zerova *et al.* 1986; Doğanlar 1987; van Achterberg & Mehrnejad 2002; Mehrnejad 2002, 2003; Sureshan & Narendran 2003; Andriescu & Mitroiu 2004; Peters & Baur 2011; Noyes 2016).

Distribution: Kazakhstan, Kyrgyzstan, Uzbekistan, Turkmenistan, Tajikistan. *Palearctic*: North Africa (Morocco, Algeria, Tunisia, Egypt), UK, Sweden, Finland, The Netherlands, Belgium, Denmark, Germany, France, Portugal, Spain, Switzerland, Italy, Czech Republic, Slovakia, Austria, Hungary, Croatia, Bosnia and Herzegovina, Serbia, Romania, Bulgaria, Greece, Lithuania, Belarus, Ukraine, Moldova, Russia (European part, Siberia and Far East), Armenia, Turkey, Cyprus, Syria, Iraq, Iran, Afghanistan, Pakistan, China, Republic of Korea, Japan. *Afrotropics*: Sudan, Eritrea, South Africa. *Oriental*: India. *Australasian*: Australia, New Zealand. *Nearctic*: Canada, USA. *Neotropics*: Mexico, Peru, Brazil, Chile, Argentina, Uruguay.

Homoporus fulviventris (Walker, 1835)

Pteromalus fulviventris Walker, 1835: 190.
Homoporus fulviventris (Walker): Delucchi 1957: 415.

Material examined: Kazakhstan: Koshkurgan Vill., right bank of Syrdarya River, forbs in sandy depressions, 9.ix.1988 (K.D.).

Hosts: *Panteliella* sp., *Phanacis centaureae* Förster, 1860, *Timaspis cichorii* (Kieffer, 1909), *T. phoenixopodos* Mayr, 1882 (Hymenoptera: Cynipidae), *Eupelmus*

cicadae Giraud, 1872 (Hymenoptera: Eupelmidae), *Tetramesa aciculata* (Schlechtendal, 1891), *T. hyalipennis* (Walker, 1832), *T. maderae* (Walker, 1849) [=*Philachyra apterum* Portschinsky, 1881], and *T. rossica* (Rimskiy-Korsakov, 1914) (Hymenoptera: Eurytomidae) (Rimskiy-Korsakov 1914; Bouček 1977; Andriescu & Mitroiu 2004; Noyes 2016).

Distribution: Kazakhstan. Madeira Island, the Canary Islands, UK, Sweden, The Netherlands, Belgium, Germany, Spain, Italy, Czech Republic, Slovakia, Hungary, Croatia, Bosnia and Herzegovina, Serbia, Romania, Lithuania, Ukraine, Moldova, Azerbaijan, Turkey, Iran, China, Russian Far East.

Mesopolobus deserti Dzhanokmen, 1994

Mesopolobus deserti Dzhanokmen, 1994: 373–374, figs 5–8.

Material examined: Kazakhstan: 30 km W of Bairkum Vill., foot of Karaktau Mts in the southeastern periphery of Kyzylkum sands, from bud galls of gall midge *Halodiplosis noxia* (Marikovskij, 1955) (Cecidomyiidae) on *Haloxylon aphyllum* (Minkw.) Iljin, 16, 25.v.1992 (K.D.); same locality, from bud galls of gall midge *Halodiplosis meridianus* (Marikovskij, 1956) on *H. aphyllum*, 16, 26, 28, 30.v–1, 3.vi.1992 (K.D.); 35 km SW of Bairkum Vill., Baimakhan well, from stem galls of gall midge *Stefaniola deformans* (Marikovskij, 1953) on *H. aphyllum*, 11, 13.v.1992 (K.D.); same locality, from bud galls of gall midge *Halodiplosis salsolicola* (Marikovskij, 1956) on *Salsola richteri* (Moq.) Kar. ex Litv. (Chenopodiaceae), 11, 20.v.1992 (K.D.); same locality, from larvae of gall midge *Asphondylia mitroshinae* Fedotova, 1991 in fruit of *S. richteri*, 2.vi.1992 (K.D.); 50 km NW of Bairkum Vill., from galls of gall midge *H. salsolicola* on *S. richteri*, 2.vi.1992 (K.D.); same locality, from bud galls of gall midge *Halodiplosis consociata* (Marikovskij, 1955) on *H. aphyllum*, 13, 17, 27.v.1992 (K.D.); same locality, from bud galls of gall midge *H. meridianus* on *H. aphyllum*, 13, 30.v.1992 (K.D.); 50 km W of Koksu Vill., Kyzylkum sands, from bud galls of *Halodiplosis (H.) saxauli* Kaplin, 1991 on *Haloxylon persicum* Bunge ex Boiss. & Buhse, 7.v.1992 (K.D.); near Chardara Vill., bank of Chardara basin, from bud galls of *Halodiplosis vernalis* (Marikovskij, 1955) on *H. persicum*, 15, 23, 26.v.1992 (K.D.); same locality, from stem galls of *Baldratia kozlovi* Marikovskij, 1955, on *H. persicum*, 7, 23.v.1992 (K.D.); same locality, from bud galls of *H. saxauli* on *H. persicum*, 7, 14, 15, 17.v.1992 (K.D.).

Hosts: Parasite of *Asphondylia mitroshinae* Fedotova, *Baldratia kozlovi* Marikovskij, *B. tubulata* Mamaev, 1972, *Halodiplosis aestivas* (Marikovskij, 1953), *H. consociata* (Marikovskij), *H. meridianus* (Marikovskij), *H. noxia* (Marikovskij), *H. orientalis* Fedotova, 1994, *H. panderiae* Fedotova, 1992, *H. propria* (Marikovskij, 1955), *H. salsolicola* (Marikovskij), *H. saxauli* Kaplin, *H. stackelbergi* (Marikovskij, 1955), *H. vernalis* (Marikovskij), *Stefaniola asiatica* (Marikovskij, 1957), and *S. deformans* (Marikovskij) (Diptera: Cecidomyiidae) (Dzhanokmen 1994, 2005; Noyes 2016). It was found in all types of deserts from Mangyshlak Peninsula to the southern half of the Balkhash Lake basin.

Distribution: Southern and Southeastern Kazakhstan. Iran.

Mesopolobus dichrocerus Dzhanokmen, 1974

Mesopolobus dichrocerus Dzhanokmen, 1974: 295–296, figs 8–12.

Material examined: Kazakhstan: 160 km NE of Chiili Vill., environs of Taykonur Vill., southwestern part of Betpakdala Desert, 4.v.2002 (V.K.); 30 km W of Bairkum Vill., foot of Karaktau Mts in

the southeastern periphery of Kyzylkum sands, from bud galls of gall midge *Halodiplosis propria* (Marikovskij) (Cecidomyiidae) on *Salsola orientalis* S.G. Gmel., 16.v.1992 (K.D.).

Hosts: A parasite of *Halodiplosis fedtschenkovi* (Marikovskij, 1965), *H. primoveris* (Marikovskij, 1953), and *H. propria* (Marikovskij) (Diptera: Cecidomyiidae) mainly on Chenopodiaceae and Tamaricaceae (Dzhanokmen 1974, 1995*b*, 2005). It was found in salinized meadows in deserts and semideserts of various types, on desertified and dry steppe foothills of arid mountains.

Distribution: Southwestern, southern and southeastern Kazakhstan. Mongolia.

Mesopolobus diffinis auditor Dzhanokmen, 1975, **stat. rev.**

Mesopolobus auditor: Dzhanokmen 1975: 627–629, figs 9–13; 2006: 132; 2013: 168.

Material examined: Kazakhstan: 160 km NE of Chiili Vill., environs of Taykonur Vill., southwestern part of Betpakdala Desert, 4.v.2002 (V.K.). **Turkmenistan** (new record): 21 km SW of Ashgabat, 19.iv.1980 (Kasparyan).

Hosts: This species develops on larvae of gall midges *Dichelonyx terraealbae* Fedotova, 2001, *Dracunculomyia ehstragoni* Fedotova, 1999, and *Seriphidiomyia juncea* Fedotova, 2000 (Diptera: Cecidomyiidae) (Dzhanokmen 1995*b*). It is common in saline biotopes of argillaceous and sand deserts, and also in dry steppe and desertified biotopes on slopes of arid mountains.

Distribution: Kazakhstan, Turkmenistan.

Comment: Decribed in 1975 and synonymized with *Mesopolobus diffinis* (Walker, 1834) (Dzhanokmen 2006) *Mesopolobus auditor* is treated here as a subspecies *Mesopolobus diffinis auditor* Dzhanokmen. This subspecies is known so far only within desert and semidesert areas from Mangyshlak Peninsula to the southern half of the Balkhash Lake basin and the Middle Ili River valley in Kazakhstan, and also from Turkmenistan.

Mesopolobus diffinis auditor differs from *M. diffinis diffinis* in the colour of the clava in the male antennal flagellum: male of *M. diffinis auditor* possesses a yellow or reddish yellow clava of the antennal flagellum, whereas male of *M. diffinis diffinis* has a brown or black-brown clava.

Mesopolobus quadrimaculatus Dzhanokmen, 1975

Mesopolobus quadrimaculatus Dzhanokmen, 1975: 629–631, figs 14–20.

Material examined: Kazakhstan: Near Chardara Vill., left bank of Syrdarya River, floodland, from galls of Cecidomyiidae on *Haloxylon persicum*, 12.v.1982 (Z.F.); near Chu Town (8 km SW of collective farm Kommunist), Moyynkum sands, from galls on *H. persicum*, 11.v.1982 (Z.F.).

Hosts: Parasite of *Halodiplosis meridianus* (Marikovsij), *H. nanophytonis* Fedotova, 1990, *Psectrosema iliense* (Marikovskij, 1961), *Stefaniola gigas* (Marikovskij, 1953), *S. fragosa* Mamaev, 1972, and *S. iliensis* Fedotova, 1989 (Diptera: Cecidomyiidae) (Dzhanokmen 2005; Noyes 2016).

Distribution: Southern and southeastern Kazakhstan.

Mesopolobus szelenyii Bouček, 1974

Mesopolobus szelenyii Bouček, 1974: 26–27, figs 9–11.

Material examined: Kazakhstan: 160 km NE of Chiili Vill., environs of Taykonur Vill., southwestern part of Betpakdala Desert, 4.v.2002 (V.K.); 35 km SW of Bairkum Vill., Kyzylkum sands, Baimakhan well, from bud galls of *Halodiplosis indurentis* Fedotova, 1993 (Cecidomyiidae) on *Salsola arbuscula* Pall. (Chenopodiaceae), 30.v.1992 (K.D.); near Chardara Vill., bank of Chardara basin, from bud galls of *Halodiplosis vernalis* (Marikovskij) on *Haloxylon persicum*, 15.v.1992 (K.D.); environs of Dzhetysai, from galls of *Apion* (*Onychapion*) *lopatini* Ter-Minassian, 1963 (Apionidae) on *Tamarix ramosissima* Ledeb. (Tamaricaceae), 27.v.1980 (K.D.); 40 km W of Chu Town [now Shu Town, Zhambyl Area], Chu River valley, from stem galls of *Harrisiana mamaevi* Fedotova, 1993 (Cecidomyiidae) on *Tamarix* sp., 20.iv.1982 (Z.F.); 16 km SE of Burylbaital Vill. (Moyynkum Distr., Zhambyl Area), from bud pubescent galls of *Halodiplosis anabasidigemmae* Fedotova, 1989 on *Anabasis salsa* (C. A. Mey.) Benth. ex Volkens (Chenopodiaceae), 27.v.1984 (Z.F.).

Hosts: Primary parasite of *Careopalpis suaedae* Fedotova, 1983, *C. suaedicola* Fedotova, 1985, *Halodiplosis anabasidigemmae* Fedotova, *H. fedtschenkovi* (Marikovskij), *H. indurentis* Fedotova, *H. mutabilis* (Marikovskij, 1985), *H. vernalis* (Marikovskij, 1955), *Harrisiana mamaevi* Fedotova, *Jaapiella kovalevi* Fedotova, 1990, *Pseudokochiomyia vicina* (Marikovskij, 1961), *Seriphidomyia juncea* Fedotova, 2000, *Stefaniella kazenasae* Fedotova, 1991, *Stefaniola bilobata* (Kieffer, 1913), *S. climacopterae* Fedotova, 1989, *S. foliosae* Fedotova, 1992, *S. fragosa* Mamaev, 1972, *S. fructua* Möhn, 1971, *S. furtiva* (Marikovskij, 1953), *S. salsolae* (Tavares, 1904) (Diptera: Cecidomyiidae), and also from galls of *Apion* (*Onychapion*) *lopatini* Ter-Minassian (Coleoptera: Apionidae) (Dzhanokmen 1984, 1995*a*, 2005; Noyes 2016).

Distribution: Kazakhstan, Turkmenistan. The Canary Islands, Spain, Ukraine, Azerbaijan.

Mesopolobus tamaricis Dzhanokmen, 1994

Mesopolobus tamaricis Dzhanokmen, 1994: 371–373, figs. 1–4.

Material examined: Kazakhstan: 30 km W of Bairkum Vill., foot of Karaktau Mts, SE periphery of Kyzylkum sands, from stem galls of *Psectrosema dentipes* (Marikovskij, 1961), *Psectrosema barbatum* (Marikovskij, 1961), *Harrisiana mamaevi* Fedotova, 1993 on *Tamarix ramosissima,* 16.v.1992 (K.D.); same locality, from bud galls of *Psectrosema diversicornis* Mamaev & Becknazarova, 1983, and *Psectrosema turkmenica* Mamaev & Becknazarova, 1983 on *T. ramosissima*, 16.v.1992 (K.D.).

Hosts: Primary parasite of *Baldratia przewalskii* Marikovskij, 1955, *Harrisiana mamaevi* Fedotova, *Psectrosema barbatum* (Marikovskij), *P. dentipes* (Marikovskij), *P. diversicornis* Mamaev & Becknazarova, *P. grummgrzhimajloi* (Fedotova, 1983), *P. noxium* (Marikovskij, 1961), *P. turkmenica* Mamaev & Becknazarova, *Stefaniola furtiva* (Marikovskij) (Diptera: Cecidomyiidae) (Dzhanokmen 1995*b*, 2005; Noyes 2016).

Distribution: Kazakhstan.

Mesopolobus trjapitzini Dzhanokmen, 1982

Mesopolobus trjapitzini Dzhanokmen, 1982: 97–98, figs 10–12.

Material examined: Kazakhstan: 160 km NE of Chiili Vill., environs of Taykonur Vill., southwestern part of Betpakdala Desert, 5.v.2002 (V.K.).

Host: *Halodiplosis* sp. (Dzhanokmen, 2005), *Kochiomyia stackelbergi* (Mamaev, 1972) [recorded for the first time: SW Kazakhstan, 38 km NE of Sarykamys Vill., Kyzyltan Vill, Caspian Karakum Desert, from bud galls of *Kochiomyia stackelbergi* on *Salsola paulsenii* Litw. (Chenopodiaceae) (Z.F.)] (Diptera: Cecidomyiidae). It is often caught on *Tamarix* spp., *Haloxylon* spp. and *Salsola* spp. in solonetz and solonchak biotopes. It may be found on plains and in lowerings or lowlands surrounded by arid mountains from the Mangyshlak Peninsula to the Dzhungarian Alatau Range.

Distribution: Kazakhstan.

Mesopolobus tsherkesi Dzhanokmen, 1995

Mesopolobus tsherkesi Dzhanokmen, 1995*b*: 109–110, figs 6–8.

Material examined: Kazakhstan: 35 km SW of Bairkum Vill., Kyzylkum sands, Baimakhan well, from stem spheroidal galls of *Stefaniola vexillata* Mamaev & Pak, 1989 (Cecidomyiidae) on *Salsola richteri* (Moq.) Kar. ex Litv., 10.xi.1992 (K.D.); near Chardara Vill, from stem galls of *Baldratia kozlovi* Marikovskij (Cecidomyiidae) on *Haloxylon persicum*, 1.ix.1992 (K.D.).

Hosts: Reared from galls of *Stefaniola vexillata* Mamaev & Pak and *Baldratia kozlovi* Marikovskij (Diptera: Cecidomyiidae) (Dzhanokmen 1995*b*, 2005; Noyes 2016).

Distribution: Southern Kazakhstan.

Norbanus (Picroscytoides) cerasiops (Masi, 1922)

Picroscytoides cerasiops Masi, 1922*b*: 154–158, pl. 4, figs 1–3.
Norbanus (Picroscytoides) cerasiops (Masi): Bouček 1991: 204.

Material examined: Kazakhstan: Environs of Dzhetysai, from larvae of *Larinus planus* (Fabricius, 1792) and *L. turbinatus* (Gyllenhal, 1835) (Curculionidae) in inflorescences of *Cirsium arvense* (Linnaeus) Scop. (Asteraceae), 8–23.vi.1980 (K.D.).

Hosts: Primary parasite of *Larinus planus* (Fabricius), *L. turbinatus* (Gyllenhal), *L.* sp., *Lixus ascanii* (Linnaeus, 1767), *L. brevirostris* Boheman, 1835, *L. cardui* (Olivier, 1807), *L. juncii* Boheman, 1835, *L. scabricollis* Boheman, 1843, and *L.* sp. (Coleoptera: Curculionidae) developing in stems and fruits of *Amaranthus*, *Artemisia*, *Carduus*, *Cirsium*, *Crambe*, and *Onopordum*; but may be a secondary parasite through *Bracon intercessor* Nees, 1834 (Hymenoptera: Braconidae) or *Eurytoma* sp. (Hymenoptera: Eurytomidae) (Graham 1969; Bouček 1977; Dzhanokmen 1984, 1999; Rizzo & Mitroiu 2010; Noyes 2016).

Distribution: Kazakhstan. Madeira, North Africa (Morocco), France, Spain, Italy, Czech Republic, Slovakia, Hungary, Croatia, Serbia, Greece, Romania, Moldova, Russia (Northern Caucasus), Turkey, Cyprus, Iran, China.

Pachycrepoideus vindemmiae (Rondani, 1875)

Pteromalus vindemmiae Rondani, 1875: 148, figs 4–6.
Pachycrepoideus vindemmiae (Rondani): Delucchi 1956*a*: 139 (as *vindemiae*).

Material examined: Kazakhstan: Dzhetysai, it was caught in a cowshed, 20.vi.1980 (K.D.).

Host: The primary parasite of *Delia antiqua* (Meigen, 1826), *D. radicum* (Linnaeus, 1758) [=*Hylemya brassicae* (Bouché, 1833), *Phorbia brassicae* Bouché] (Diptera: Anthomyiidae), *Calliphora* sp., *Chrysomya albiceps* (Wiedemann, 1819), *C. megacephala* (Fabricius, 1794), *C. putoria* (Wiedemann, 1830), *Lucilia illustris* (Meigen, 1826), *L. sericata* (Meigen, 1826) [=*Phaenicia sericata* (Meigen, 1826)], *Lucilia* sp., *Phormia regina* (Meigen, 1826) (Diptera: Calliphoridae), *Orseolia oryzae* (Wood-Mason, 1889) (Diptera: Cecidomyiidae), *Drosophila melanogaster* Meigen, 1830 [=*D. uvarum* Rondani, 1875], *D.* sp. (Diptera: Drosophilidae), *Silba virescens* Macquart, 1851 [=*Lonchaea aristella* Becker, 1902] (Diptera: Lonchaeidae), *Fannia canicularis* (Linnaeus, 1761), *F. scalaris* (Fabricius, 1794), *Haematobia irritans* (Linnaeus, 1758), *H. exigua* Meijere, 1903, *Hydrotaea aenescens* (Wiedemann, 1830), *H. ignava* (Harris, 1780) [=*Hydrotaea leucostoma* (Wiedemann, 1817), *Ophyra leucostoma* (Wiedemann, 1817)], *Lyperosia* sp., *Musca domestica* Linnaeus, 1758, *M. sorbens* Wiedemann, 1830, *M.* sp., *Muscina stabulans* (Fallén, 1817) [=*Musca stabulans* Fallén, 1817], *Ophyra capensis* (Wiedemann, 1818) [=*Ophyra anthrax* (Meigen, 1826)], *Stomoxys calcitrans* (Linnaeus, 1758), *S. nigra* Macquart, 1851, *S.* sp. (Diptera: Muscidae), *Megaselia scalaris* (Loew, 1866) (Diptera: Phoridae), *Piophila casei* (Linnaeus, 1758), *Piophila* sp. (Diptera: Piophilidae), *Oxysarcodexia thornax* (Walker, 1849), *Peckia (Sarcodexia) lambens* (Wiedemann, 1830), *Ravinia pernix* (Harris, 1780) [=*Ravinia striata* (Fabricius, 1794)] (Diptera: Sarcophagidae), *Poecilosomella angulata* (Thomson, 1869) (Diptera: Sphaeroceridae), *Hermetia illucens* (Linnaeus, 1758) (Diptera: Stratiomyidae), *Anastrepha fraterculus* (Wiedemann, 1830), *A. ludens* (Loew, 1873), *A. obliqua* (Macquart, 1835) [=*A. mombinpraeoptans* Sein, 1933], *A. sororcula* Zucchi, 1979, *A. suspensa* (Loew, 1862), *A.* sp., *Bactrocera cucurbitae* (Coquillett, 1899) [=*Dacus cucurbitae* Coquillett, 1899], *B. dorsalis* (Hendel, 1912) [=*Dacus dorsalis* Hendel, 1912], *B. oleae* (Rossi, 1790) [=*Dacus oleae* (Rossi, 1790)], *B. passiflorae* (Froggatt, 1911) [=*Dacus passiflorae* Froggatt, 1911], *Ceratitis capitata* (Wiedemann, 1824), *C. rosa* Karsch, 1887, *C.* sp., *Dacus ciliatus* Loew, 1862, *Myiopardalis pardalina* (Bigot, 1891), *Rhagoletis cingulata* (Loew, 1862), *R. fausta* (Osten Sacken, 1877), *R. indifferens* Curran, 1932, *R.* sp., *Terellia fuscicornis* (Loew, 1844) (Diptera: Tephritidae), *Anasa tristis* (De Geer, 1773) (Hemiptera: Coreidae), *Bombus* sp. (Hymenoptera: Apidae), *Bombyx mori* Linnaeus, 1758 (Lepidoptera: Bombycidae), *Diatraea saccharalis* (Fabricius, 1794) (Lepidoptera: Crambidae), *Cadra cautella* (Walker, 1863), *Ephestia kuehniella* Zeller, 1879, *Plodia interpunctella* (Hübner, 1813) (Lepidoptera: Pyralidae); sometimes as a hyperparasite through *Sarcophagula occidua* (Fabricius, 1794), *S.* sp. (Diptera: Sarcophagidae), *Exorista sorbillans* (Wiedemann, 1830), *Lydella minense* (Townsend, 1927) [=*Metagonistylum minense* Townsend, 1927], *Billaea brasiliensis* (Townsend, 1917) [=*Paratheresia brasiliensis* Townsend, 1917], *Billaea claripalpis* (Wulp, 1896) [=*Paratheresia claripalpis* Wulp, 1896], *Trichopoda pennipes* (Fabricius, 1781) (Diptera: Tachinidae), *Asobara tabida* (Nees, 1834), *Diachasmimorpha fullawayi* (Silvestri, 1912) [=*Diachasma fullawayi* Silvestri,

1914], *D. tryoni* (Cameron, 1911) [=*Diachasma tryoni* (Cameron, 1911)] (Hymenoptera: Braconidae), *Coptera silvestrii* (Kieffer, 1913) [=*Galesus silvestrii* Kieffer, 1913] (Hymenoptera: Diapriidae), *Encyrtus* sp. (Hymenoptera: Encyrtidae), *Tetrastichus giffardianus* Silvestri, 1915 (Hymenoptera: Eulophidae), and *Muscidifurax raptor* Girault & Sanders, 1910 (Hymenoptera: Pteromalidae) (Sychevskaya 1963; Graham 1969; Bouček 1977; Bouček *et al.* 1978; Dzhanokmen 1978; Farooqi & Subba Rao 1986; Bouček & Rasplus 1991; Sureshan & Narendran 2003; Gibson & Floate 2004; Noyes 2016).

Distribution: Kazakhstan, Kyrgyzstan, Uzbekistan. *Palearctic*: The Canary Islands, North Africa (Morocco, Tunisia), UK, Sweden, Denmark, The Netherlands, Belgium, Germany, Spain, Italy, Switzerland, Czech Republic, Slovakia, Croatia, Romania, Serbia, Bulgaria, Greece, Moldova, Russia, Turkey, Israel, Iran, Republic of Korea, Japan. *Afrotropical*: Ghana, Réunion Island. *Oriental*: India, Taiwan, the Philippines, Malaysia, Indonesia. *Australasian*: Australia, New Zealand, Fiji. *Oceania*: Hawaiian Islands (Hawaii, USA). *Nearctic*: Canada, USA. *Neotropical*: Mexico, Belize, Costa Rica, Panama, Jamaica, Dominican Republic, Puerto Rico (USA), Saint Kitts and Nevis, Barbados, Trinidad and Tobago, Colombia, Venezuela, Brazil, Bolivia, Argentina.

Pachyneuron aphidis (Bouché, 1834)

Diplolepis aphidis Bouché, 1834: 170.
Pachyneuron aphidis (Bouché): Reinhard 1859: 192, 195.

Material examined: Kazakhstan: Near Chiili Vill. [now Shieli Vill.], right bank of Syrdarya River, from aphid mummy on *Alhagi pseudalhagi* (M. Bieb.) Fisch. (Fabaceae), 20.vi.1984 (K.D.); Dzhetysai, from *Pterochloroides persicae* Cholodkovsky, 1899 (Aphididae: Lachninae) on *Persica vulgaris* Mill. (Rosaceae), 28.x.1977 (Fol'kina); same locality, from *Aphis fabae* Scopoli, 1763 (Aphididae: Aphidinae) on *Rumex confertus* Willd. (Polygonaceae), 24.ix.1978 (Fol'kina); same locality, from *Hyalopterus pruni* (Geoffroy, 1762) (Aphididae: Aphidinae) on *Armeniaca vulgaris* Lam. (Rosaceae), 29.v.1976 (Fol'kina); same locality, on *Tamarix* sp., 9.viii, 1.ix.1980 (K.D.).

Host: This species develops as a primary parasite or hyperparasite. A list of its hosts includes Aphididae, Pemphigidae, Coccidae, Kermesidae, Pseudococcidae, Psyllidae (Hemiptera), Agromyzidae, Cecidomyiidae, Syrphidae (Diptera), Aphelinidae, Braconidae, Cynipidae, Encyrtidae, Figitidae, Scelionidae (Hymenoptera), Coccinellidae (Coleoptera), Gelechiidae, and Tortricidae (Lepidoptera) (Kamijo 1983; Gibson 2001; Sureshan & Narendran 2003; Dzhanokmen 2009; Lotfalizadeh & Gharali 2008; Noyes 2016).

Distribution: Kazakhstan, Kyrgyzstan, Turkmenistan, Tajikistan. *Palearctic*: The Canary Islands, North Africa (Morocco, Libya, Egypt), UK, Sweden, The Netherlands, Belgium, Germany, France, Spain, Switzerland, Italy, Poland, Czech Republic, Slovakia, Hungary, Romania, Croatia, Serbia, Montenegro, Macedonia, Bulgaria, Greece, Ukraine, Moldova, Russia (European and Asian parts), Armenia, Turkey, Syria, Israel, Iraq, Iran, Pakistan, China, Korean Peninsula, Japan. *Afrotropical*: Ruanda, Yemen. *Oriental*: India, Taiwan. *Australasian*: Australia, New Zealand. *Oceania*: Hawaiian Islands (Hawaii, USA). *Nearctic*: Canada, USA. *Neo-*

tropical: Mexico, El Salvador, Cuba, Puerto Rico (USA), Trinidad and Tobago, Colombia, Venezuela, Peru, Brazil, Chile, Argentina, Uruguay.

Pachyneuron planiscuta Thomson, 1878

Pachyneuron planiscuta Thomson, 1878: 29.

Material examined: Kazakhstan: Dzhetysai, on *Phragmites australis* (Cav.) Trin. ex Steud., 12.viii. 1980 (K.D.).

Hosts: Reared from syrphid puparia (Diptera: Syrphidae) on *Phragmites australis* (Cav.) Trin. ex Steud. and *Oryza sativa* Linnaeus (Poaceae), and also from *Nesticoccus sinensis* Tang, 1977 and *Nipaecoccus viridis* (Newstead, 1894) (Hemiptera: Pseudococcidae) (Vikberg 1982; Dzhanokmen 1984; Ghahari *et al.* 2010; Noyes 2016).

Distribution: Kazakhstan. UK, Sweden, Finland, The Netherlands, Czech Republic, Hungary, Romania, Moldova, Russia (Krasnodar Territory), Iran.

Pterapicus isjaslavi Dzhanokmen, 1974

Pterapicus isjaslavi Dzhanokmen, 1974: 292, 294, figs 3, 4.

Material examined: Kazakhstan: 20 km N of Chiili Vill., right bank of Syrdarya River, from stem gall of *Stefaniola gigas* (Marikovskij, 1953) on *Haloxylon persicum*, 29.vii.1984 (K.D.); left bank of Syrdarya River opposite the Chardara Vill. [now Shardara Town], from stem galls of *Stefaniola insignis* (Marikovskij, 1953) on *H. persicum*, 14.v.1982 (Z.F.); same locality, from stem galls of *S. gigas* on *H. persicum*, 22.v.1982 (Z.F.); near Chu Town, Muyunkum (=Moyynkum) sands, from stem gall of *S. insignis* on *H. persicum*, 22.v.1982 (Z.F.).

Hosts: Trophically associated with *Baldratia tubulata* Mamaev, 1972, *Stefaniola gigas* (Marikovskij, 1953), *S. insignis* (Marikovskij, 1953), *S. mangyshlakensis* Fedotova, 1989, and *S. rotunda* Möhn, 1971 (Diptera: Cecidomyiidae) (Dzhanokmen 1996*a*).

Distribution: Kazakhstan. Mongolia.

Pteromalus (Habrocytus) platyphilus Walker, 1874

Pteromalus platyphilus Walker, 1874: 317.

Material examined: Kazakhstan: 70 km NW of Bairkum Vill., from galls of *Halodiplosis saxauli* Kaplin, 1991 (Cecidomyiidae) on *Haloxylon persicum*, 1.vi.1992 (K.D.). **Lithuania**: National Park Zhuvintas, 29.vi.1982 (Yakimavichyus).

Hosts: *Dictyna arundinacea* (Linnaeus), *D. uncinata* Thorell, 1856, *D.* sp. (Arachnida: Araneae: Dictynidae), *Eriosoma* sp. (Hemiptera: Aphididae), also reared from Cecidomyiidae galls and from Lepidoptera eggs (a clutch of an unknown species) (Graham 1969; Dzhanokmen 1984, 2001; Herthevtzian & Dzhanokmen 1986; Noyes 2016).

Distribution: Kazakhstan, Turkmenistan, Kyrgyzstan. UK, Sweden, Finland, The Netherlands, Germany, Spain, Czech Republic, Hungary, Croatia, Serbia, Macedonia, Lithuania, Moldova, Armenia, Azerbaijan, Turkey, Afghanistan, Russia (Siberia and Far East).

Pteromalus (Habrocytus) sequester Walker, 1835

Pteromalus (Habrocytus) sequester Walker, 1835: 495.

Material examined: Kazakhstan: Chiili Vill., right bank of Syrdarya River, from beans of *Astragalus* sp., 26.vi.1984 (K.D.); 30 km W of Bairkum Vill., Kyzylkum sands, left bank of Syrdarya River, from curculionid larvae in beans of *Astragalus «bungei»*, 28, 31.v., 6.vi.1992 (K.D.); 15 km N of Chardara, left bank of Syrdarya River, from beans of *Astragalus ammodendron* Bunge, 30.v.1980 (K.D.); Dzhetysai, from larvae of *Lepidotychius* sp. (Curculionidae) in buds of *Alhagi pseudalhagi*, 2.vii.1980 (K.D.); same locality, from beans of *Alhagi pseudalhagi*, 9.vii.1980 (K.D.); same locality, in seed cases of *Convolvulus arvensis* Linnaeus (Convolvulaceae), 21.vi.1980 (K.D.); same locality, from stems of *Plantago lanceolata* Linnaeus (Plantaginaceae), 3.vi.1980 (K.D.).

Host: As a primary or secondary parasite it is trophycally associated with *Apion flavofemoratum* Herbst, 1797, *Exapion fuscirostre* (Fabricius, 1775) [=*Apion fuscirostre* (Fabricius, 1775)], *E. ulicis* (Förster, 1771) [=*Apion ulicis* Förster, 1771], *Ischnopterapion loti* (Kirby, 1808) [=*Apion loti* Kirby, 1808], *Oxystoma cerdo* (Gerstaecker, 1854) [=*Apion cerdo* Gerstaecker, 1854], *O. ochropus* (Germar, 1818), *Pseudapion fulvirostre* (Gyllenhal, 1833) [=*Apion fulvirostre* Gyllenhal, 1833] (Coleoptera: Apionidae), *Bruchidius ater* (Marsham, 1802), *B. fulvus* (Allard, 1883), *B. glycyrrhizae* (Gyllenhal, 1839), *B. lividimanus* (Gyllenhal, 1833), *B. marginalis* (Fabricius, 1775), *Bruchus affinis* Frölich, 1799, *B. atomarius* (Linnaeus, 1758) (Coleoptera: Chrysomelidae), *Gymnetron asellus* Gravenhorst, 1807, *G. netum* (Germar, 1821), *Hypera venusta* (Fabricius, 1781), *Lepidotychius morawitzi* Klima, 1936, *Mecinus collaris* Germar, 1821, *Microlarinus lypriformis* (Wollaston, 1861), *Pachytychius hordei* (Brullé, 1832) (Coleoptera: Curculionidae), *Asphondylia sarothamni* (Loew, 1850) [=*A. mayeri* Liebel, 1889], *A.* sp., *Contarinia hedysarocarpi* Fedotova, 1993, *Seriphidomyia rerichi* Fedotova, 2001 (Diptera: Cecidomyiidae), *Hypenidium oculatum* (Becker, 1908) (Diptera: Tephritidae), *Bruchophagus caraganae* (Nikol'skaya, 1952), *B. coluteae* (Bouček, 1954) [=*Eurytoma coluteae* Bouček, 1954], *B. coronillae* Erdélyi & Szelényi, 1975, *B. gibbus* (Boheman, 1836) [=*B. funebris* (Howard, 1880)], *B. platypterus* (Walker, 1834) [=*B. kolobovae* Fedoseeva, 1956], *B. roddy* Gussakovsky, 1933, *Eurytoma onobrychidis* Nikol'skaya, 1933, *Systole coriandri* Gussakovsky, 1933, *S.* sp. (Hymenoptera: Eurytomidae), *Galleria mellonella* (Linnaeus, 1758) (Lepidoptera: Pyralidae), *Dinarmus italicus* (Masi, 1922) [=*Oedaule italica* Masi, 1922] (Hymenoptera: Pteromalidae) (Graham 1969; Rzaeva 1971; Avetian *et al.* 1976; Bouček *et al.* 1978; Dzhanokmen 1978, 1980, 1984, 2001; Stanyonite 1982; Artokhin 1983; Herthevtzian & Dzhanokmen 1986; Noyes 2016).

Distribution: Kazakhstan, Kyrgyzstan. *Palearctic*: The Canary Islands, UK, Sweden, The Netherlands, Belgium, Germany, France (Corsica), Spain (Balearic Islands), Poland, Lithuania, Czech Republic, Slovakia, Hungary, Romania, Serbia, Bulgaria, Ukraine, Russia (Crimea, European part, Siberia, and Far East), Armenia, Azerbaijan, Turkey, Israel, Iraq, Iran. *Oriental*: India. *Australasian*: Australia, New Zealand. *Oceania*: Hawaiian Islands (Hawaii, USA). *Nearctic*: Canada, USA. *Neotropical*: Mexico, Chile.

Rhaphitelus maculatus Walker, 1834

Rhaphitelus maculatus Walker, 1834: 179.

Material examined: Kazakhstan: Dzhetysai, from segments of apple-tree branches populated by *Scolytus multistriatus* (Marscham, 1802) (Scolytidae), 21.ix.1976 (Fol'kina). **Georgia** (new record): Tbilisi, from larvae *Agrilus viridis* Linnaeus, 1758 (Coleoptera: Buprestidae) on *Ulmus minor* Mill. [=*U. foliacea* Gilibert ex C.K. Schneid. (Ulmaceae)], reared in laboratory, iii.1986 (D.G. Zharkov).

Host: *Magdalis armicollis* (Say, 1824), *M. armigera* (Geoffroy, 1785), *M. barbita* (Say, 1831), *M.* sp., *Pissodes strobi* (Peck, 1817), *P.* sp. (Coleoptera: Curculionidae), *Carphoborus perrisi* (Chapuis, 1869), *Chaetoptelius vestitus* (Mulsant & Rey, 1860) [=*Hylesinus vestitus* Mulsant & Rey, 1860], *Hylesinus californicus* (Swaine, 1916), *H. orni* (Fuchs, 1906), *H. toranio* (Danthoine, 1788) [=*H. oleiperda* (Fabricius, 1792)], *H. varius* (Fabricius, 1775) [=*H. fraxini* (Panzer, 1779)], *Hypoborus ficus* Erichson, 1836, *Phloeosinus armatus* Reitter, 1887, *P. aubei* (Perris, 1855) [=*P. bicolor* Bedel, 1888], *P. cupressi* Hopkins, 1903, *P. punctatus* LeConte, 1876, *P. serrifer* Wichmann, 1916, *P.* sp., *Phloeotribus rhododactylus* (Marsham, 1802) [=*Phloeophthorus rhododactylus* (Marsham, 1802)], *P. scarabaeoides* (Bernard, 1788), *P. vinogradovi* Semenov, 1902, *P.* sp., *Pteleobius vittatus* (Fabricius, 1787), *Scolytus amygdali* Guérin-Méneville, 1847, *S. butovitschi* Stark, 1936 [=*S. butovitschi* Eggers, 1942], *S. ensifer* Eichhoff, 1881, *S. intricatus* (Ratzeburg, 1837), *S. japonicus* Chapuis, 1875, *S. kirschii* Skalitzky, 1876, *S. mali* (Bechstein, 1805), *S. multistriatus* (Marsham, 1802), *S. nitidus* Schedl, 1936, *S. pygmaeus* (Fabricius, 1787), *S. rugulosus* (Mueller, 1818), *S. schevyrewi* Semenov, 1902, *S. scolytus* (Fabricius, 1775), *S. semenovi* (Spessivtsev, 1919), *S. seulensis* Murayama, 1930, *S. sulcifrons* Rey, 1892, *S. zaitzevi* Butovitsch, 1929, *S.* sp. (Coleoptera: Scolytidae), *Zeuzera pyrina* (Linnaeus, 1761) (Lepidoptera: Cossidae), *Coeloides filiformis* Ratzeburg, 1852, and *C. melanotus* Wesmael, 1838 (Hymenoptera: Braconidae) (Peck 1963; Graham 1969; Avetian *et al.* 1976; Zharkov & Dzhanokmen 1976, 1977; Bouček 1977; Burks 1979; Dzhanokmen 1980; Kamijo 1981; Sureshan & Narendran 2003; Lotfalizadeh & Gharali 2008; Lotfalizadeh & Khalghani 2008; Tselikh 2010; Noyes 2016).

Distribution: Kazakhstan, Kyrgyzstan, Turkmenistan, Uzbekistan, Tajikistan. *Palearctic*: North Africa (Tunisia, Egypt), UK, Sweden, The Netherlands, Belgium, Germany, France, Spain, Italy (Sicily), Czech Republic, Slovakia, Hungary, Croatia, Serbia, Romania, Bulgaria, Poland, Ukraine, Moldova, Russia (European part and Far East), Georgia, Armenia, Turkey, Israel, Iran, China, Japan. *Oriental*: India. *Australasian*: Australia, New Zealand. *Nearctic*: Canada, USA. *Neotropical*: Chile, Argentina.

Trichargyrus jaxartensis Dzhanokmen, 1989

Trichargyrus jaxartensis Dzhanokmen, 1989: 42–43, figs 1–4.

Material examined: Kazakhstan: Chiili Vill., from galls on *Aeluropus littoralis* (Gouan) Parl. (Poaceae), 13.vii.1984 (K.D.).

Host: Unknown.

Distribution: Southern Kazakhstan.

Trichomalus inops (Walker, 1835)

Pteromalus inops Walker, 1835: 499.
Trichomalus inops (Walker): Graham 1956: 249, 1969: 735; Dzhanokmen 2008: 97, figs 5–8.

Material examined: Kazakhstan: 50 km W of Koksu Vill., Kyzylkum sands, left bank of Syrdarya River, from galls of *Catapion gemulum* (Faust, 1885) (Apionidae) at the root collar of *Astragalus campylorrhynchus* Fisch. & C.A. Mey (Fabaceae), 15, 21, 24, 25.v.1992 (K.D.).

Host: This species was reared from *Apion* sp. and *Catapion gemulum* (Faust) (Coleoptera: Apionidae) (Graham 1969; Dzhanokmen 1984, 2008).

Distribution: Kazakhstan. Sweden, Ireland, UK, Germany, former Czechoslovakia, Austria, former Yugoslavia, Lithuania, Belarus.

Comment: Following Graham (1969), I consider *Trichomalus inops* as a valid species, not a junior synonym of *Trichomalus rufinus* (Walker, 1835).

Trichomalus pherospilus Dzhanokmen, 1975

Trichomalus pherospilus Dzhanokmen, 1975: 631–632, figs 21–24.

Material examined: Kazakhstan: 30 km W of Bairkum Vill., foot of Karaktau Mts in the southeastern periphery of Kyzylkum sands, forbs, 17.v.1992 (K.D.); 50 km NW of Bairkum Vill., Kyzylkum sands, herbaceous vegetation, 14.v.1992 (K.D.); 50 km W of Koksu Vill., Kyzylkum sands, left bank of Syrdarya River, grass vegetation, 9.v.1992 (K.D.).

Host: Unknown.

Distribution: Southern and Southeastern Kazakhstan.

Subfamily Spalangiinae Haliday, 1833

Spalangia erythromera Foerster, 1850

Spalangia erythromera Foerster, 1850: 512–513; Graham 1969: 54.

Material examined: Kazakhstan: 160 km SE of Kyzylkum Vill., Kyzylkum, South Kazakhstan Area, sands, herbaceous vegetation near the well, 29.viii.1978.

Host: A parasite of pupae of *Delia antiqua* (Meigen, 1826), *D. florilega* (Zetterstedt, 1845), *D. platura* (Meigen, 1826), *Pegomya* sp., *Phorbia* sp. (Diptera: Anthomyiidae), *Lonchaea* sp. (Diptera: Lonchaeidae), *Haematobia irritans* (Linnaeus, 1758), *Musca domestica* Linnaeus, 1758, *Muscina* sp. (Diptera: Muscidae), *Spiniphora* sp. (Diptera: Phoridae), and *Nemopoda* sp. (Diptera: Sepsidae) (Bouček 1963, 1977; Graham 1969; Gibson 2009; Noyes 2016).

Distribution: Kazakhstan. UK, Sweden, The Netherlands, Belgium, Germany, France, Spain, Czech Republic, Slovakia, Switzerland, Austria, Hungary, Montenegro, Albania, Romania, Bulgaria, Moldova, China, North (Canada, USA) and South (Venezuela) Americas.

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