COMENTARIO

Taxonomy of the genus *Anagrus* Haliday (Hymenoptera: Mymaridae) of the world: an annotated key to the described species, discussion of the remaining problems, and a checklist

Triapitsyn, Serguei V.
Entomology Research Museum, Department of Entomology, University of California, Riverside, California, 92521, USA.

➤ **Abstract** — The described species of *Anagrus* Haliday of the world are reviewed. An identification key for females of the 82 valid species is provided, and other nine nominal, valid species are treated as *nomina dubia*. A short, coded redescription is given for all the species included in the key; information or updates on the known host associations and geographical distribution are also provided. The following new synonymies are proposed: *A. proscassellatii* Viggiani & Jesu syn. nov. and *A. spiritus* Girault syn. nov. = *A. atomus* (Linnaeus); *A. capensis* Heqvist syn. nov. = *A. fennicus* Soyka; *A. dilatatus* Soyka syn. nov., *A. holci* I. Walker syn. nov., *A. longus* Soyka syn. nov., *A. obvius* Soyka syn. nov. and *A. similis* Soyka syn. nov. = *A. nigriceps* (Smits van Burgst); *A. prounilinearis* Viggiani & Jesu syn. nov. = *A. optabilis* (Perkins); and *A. supremosimilis* Soyka syn. nov. = *A. subfuscus* Foerster. An updated checklist of *Anagrus* species is presented, and some of the remaining taxonomic problems to be solved in the genus are discussed. As egg parasitoids, some members of *Anagrus* are important for biological control of agricultural pests, particularly of leafhoppers and planthoppers (Hemiptera: Cicadellidae and Delphacidae).

Keywords: Mymaridae, *Anagrus*, taxonomy, biodiversity, host associations, egg parasitoid, biological control.

➤ **Resumen** — "Taxonomía del género *Anagrus* Haliday (Hymenoptera: Myrmaridae) del mundo: clave anotada de las especies, discusión de problemas restantes, y un checklist". Se revisan las especies descritas de *Anagrus* Haliday del mundo. Se presenta una clave para la identificación de 82 especies válidas, y otras nueve especies nominales y válidas son tratadas como *nomina dubia*. Se provee una redescripción corta, codificada para todas las especies incluidas en la clave y también se presenta información conocida o actualizaciones sobre las asociaciones con sus hospederos y distribución geográfica. Se proponen las siguientes sinonimías: *A. proscassellatii* Viggiani & Jesu syn. nov. y *A. spiritus* Girault syn. nov. = *A. atomus* (Linnaeus); *A. capensis* Heqvist syn. nov. = *A. fennicus* Soyka; *A. dilatatus* Soyka syn. nov., *A. holci* I. Walker syn. nov., *A. longus* Soyka syn. nov., *A. obvius* Soyka syn. nov. y *A. similis* Soyka syn. nov. = *A. nigriceps* (Smits van Burgst); *A. prounilinearis* Viggiani & Jesu syn. nov. = *A. optabilis* (Perkins); y *A. supremosimilis* Soyka syn. nov. = *A. subfuscus* Foerster. Se presenta una lista revisada de las especies de *Anagrus*, y se discuten algunos de los problemas taxonómicos que deben aún resolverse en el género. Como parasitoides oófilos, algunos miembros de *Anagrus* son importantes para el control biológico de plagas agrícolas, particularmente de las chicharritas y saltahojas (Hemiptera: Cicadellidae y Delphacidae).

Palabras clave: Mymaridae, *Anagrus*, taxonomía, biodiversidad, asociaciones con hospederos, parasitoide oófilo, control biológico.

INTRODUCTION

Anagrus Haliday is one of the most collected genera of Mymaridae (Hymenoptera: Chalcidoidea) globally along with *Anaphes* Haliday, *Gonatocerus* Nees ab Esenbeck, *Lymaenon* Walker and *Polynema* Haliday. Many *Anagrus* species are important biological control agents and some of them have been used in integrated pest management programs; they are certainly also very important natural regulators of many other host phytophagous insects that thus are not considered to be pests.

Recibido: 18/05/15 – Aceptado: 18/08/15

Recognizing *Anagrus* (Figs 1, 2) from other mymarid genera is usually not a problem; any available keys can be used, such as Annecke & Doutt (1961) for the world (females only), Huber (1997) for the Nearctic region, Yoshimoto (1990) for the New World, Triapitsyn & Huber (2000) for the Palearctic region, Lin *et al*. (2007) for Australia, etc. However, the most recent diagnoses of the genus (Chiappini *et al*., 1996; Chiappini & Lin, 1998; Triapitsyn, 2000a, 2002a) differ somewhat from the previous definitions of *Anagrus* as more is getting to be known about its diversity globally.

Since Chiappini (1989) revised the European species of *Anagrus*, several other publications have enriched knowledge of its diversity. Chiappini *et al*. (1996) keyed the Holarctic species of *Anagrus* and presented a checklist of all the described taxa by ecozones, Triapitsyn (1997, 2000a, and 2002a) described several new species from the New World, and Chiappini & Lin (1998) revised the Chinese species of this genus, describing nine new ones. Chiappini & Triapitsyn (1999) proposed several new synonymies under *A. avalae* Soyka, Donev (1998) provided distributional data on the *Anagrus* in the Balkan Peninsula, describing one new species, and Baquero & Jordana (1999) gave useful information on its species in Navarre, Spain. More recently, Triapitsyn & Beardsley (2000) reviewed the Hawaiian species, Triapitsyn (2001) revised the Australa-

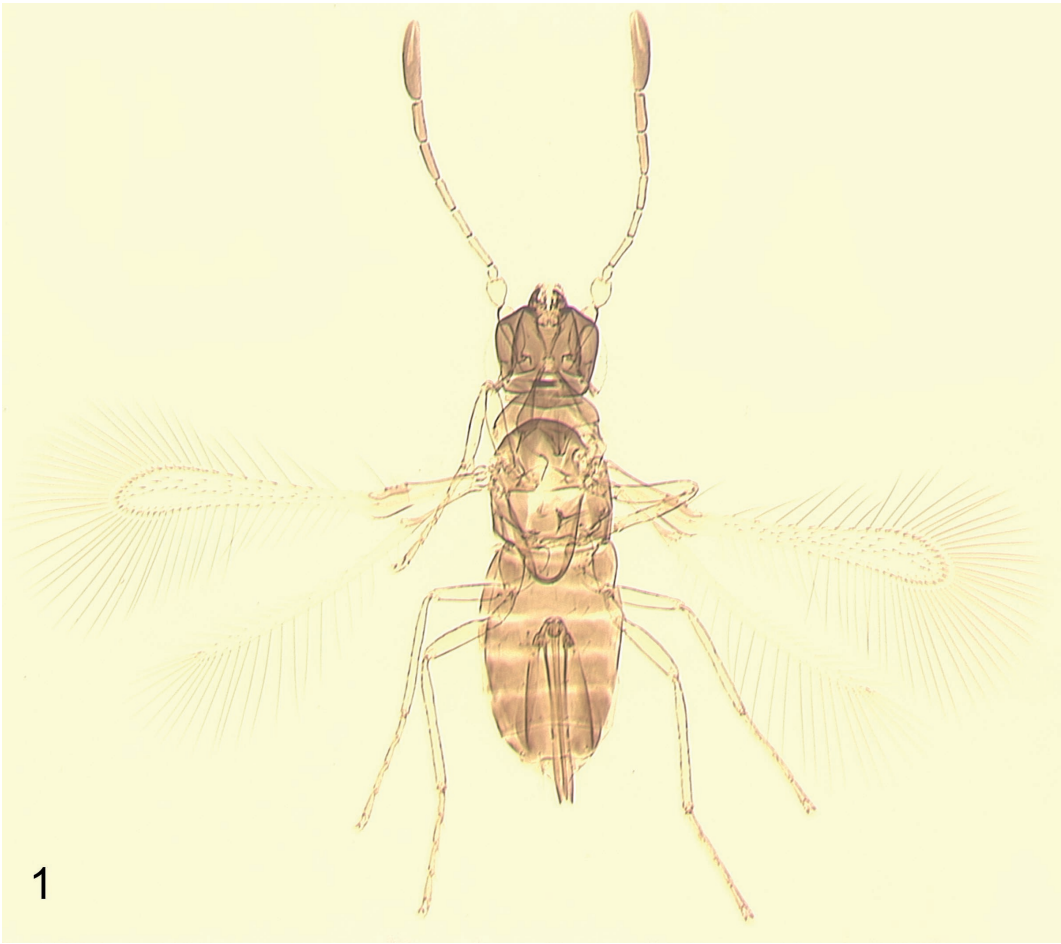


Figure 1. *Anagrus* (*Anagrus*) *erythroneurae* S. Trjapitzin & Chiappini, female (paratype, Baja California, Mexico). Habitus.

sian species, Triapitsyn (2002a) keyed the Neotropical species, and Triapitsyn & Berezovskiy (2004) reviewed the genus in Russia.

With this annotated key, a review is provided to all the described species of *Anagrus* to date (as of August 2015) on a worldwide basis; that is done for the first time for a large genus in the Mymaridae. I do not intend to describe any new taxa in this paper but am aware of the existence of at least 30 species that await to be described as new (Triapitsyn, 2002b) and assume that more could be discovered. Because of a probability that the potential user of this key will be dealing with an undescribed species, the key is complemented with a short, «coded» redescription of every taxon included. In such redescriptions, information is provided on the most important morphological characters that are used for species differentiation. Unfortunately, for various reasons including space limitations I am not able to provide illustrations of all the included species, so for that users will need to turn to the respective original descriptions and redescriptions, if any.

A checklist of *Anagrus* species is also presented, which is an update of that in Chiappini *et al*. (1996). The purpose of the checklist is to facilitate further taxonomic studies on *Anagrus* by summarizing the existing information on the described species, which presently are considered to be valid, as well as on the actual specific synonymies.

The features used in this key are those provided by morphology, but I am aware that in

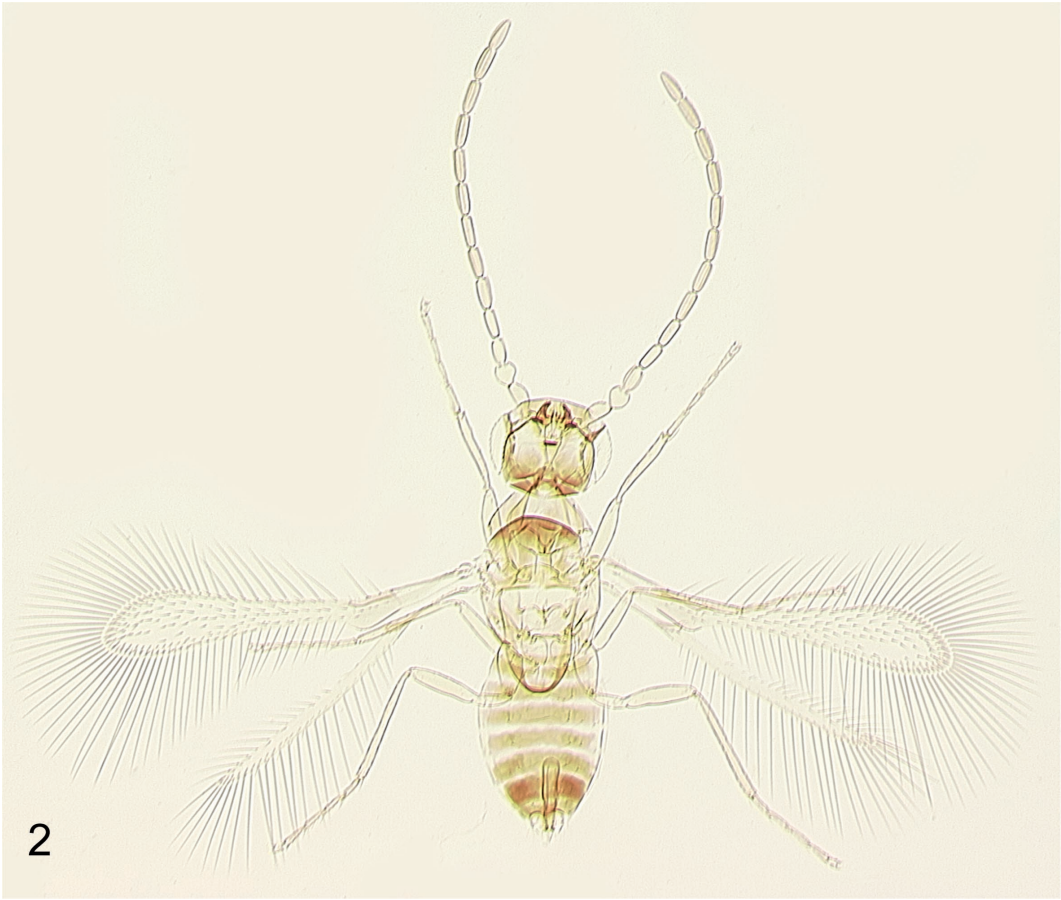


Figure 2. *Anagrus* (*Anagrus*) *tretiakovae* Triapitsyn, male (Las Nutrias, Socorro Co., New Mexico, USA). Habitus.

some cases they can be subject to intraspecific variability and therefore of limited value to define the species. For example, species within the *A. incarnatus* Haliday (see Triapitsyn & Berezovskiy, 2004) and *A. brocheri* Schulz complexes are so similar to each other that it is practically impossible to separate them in a dichotomic key based solely on the morphological characters, which seem not to be stable within each such complex. Therefore, in the key they are distinguished partially based on distributional and other useful data, which are also provided to facilitate further steps towards their identification. Ultimately, species relationships in such groups will have to be resolved by acquisition of additional biological, molecular, and ecological data on such forms. These complexes may eventually turn out to be either more speciose conglomerations of sibling species or, otherwise, represent a few highly variable species. At this point of knowledge, I have no resources to go any further than listing them together; even synonymizing the almost identical species, such as *A. incarnatus* and *A. nilaparvatae* Pang & Wang, would be counterproductive because of the considerable amount of the existing literature on them and the differences in their geographical distribution and host associations.

The main distinguishing characters used are female antennal segments' proportions (these, however, need to be considered with caution because of common and often significant intraspecific variation and also because I mostly used the available primary types and the original descriptions to indicate relative lengths of the funicle segments), as well as fore wing shape and chaetotaxy. Other characters, such as the presence and number of longitudinal sensilla on funicle segments of the female antenna and particularly the relative ovipositor length, may also vary but yet can be useful if studied in a sufficient number of specimens of a defined species.

Males of *Anagrus* differ from females in the normal sexually dimorphic features of genitalia and having a filiform, usually 11-segmented antennal flagellum (as in Fig. 2) except in *A. ogloblini* Triapitsyn, in which the flagellum is 10-segmented (Triapitsyn, 2000a). Fore wings are often relatively a little wider in males than in conspecific females. Female features are used extensively as one of the main diagnostic tools for species recognition in the genus and in the key. Because of this identification of males to species is often difficult or even impossible morphologically without rearing them together or associating them through collecting the sexes together at one time and place. Therefore, sometimes it is not the species that is differentiated but only the females of that species. Males of some species are still unknown.

See Triapitsyn & Berezovskiy (2001) for a brief discussion of collecting and preservation methods for the Mymaridae. It must be noted that correct identifications of *Anagrus* species is usually very difficult, and often impossible, without making good quality microscopic slides. Platner *et al*. (1999) and Huber (2015) describe proper slide-mounting techniques which generally may be applicable to *Anagrus*.

MATERIAL AND METHODS

After I had an idea, around the very beginning of the millennium, of compiling such a key, accompanied by the coded redescriptions of each species, and an updated checklist, an incomplete draft of this review with a tentative key was written back in 2002 (Triapitsyn, 2002b) in cooperation with Elisabetta Chiappini, when we worked jointly on the key and some coded redescriptions. Our intention was to provide illustrations of a female antenna and a female fore wing for every species included in the key. That, however, has never materialized, and the project was largely abandoned until 2015 when I alone significantly updated the manuscript by re-writing the introduction, material and methods section, and the key, and by including all the species described since 2001, checking and completing the coded redescriptions for most of the species, and adding the discussion, checklist, and references, etc.

The coded redescriptions are based on the study of the type material and other specimens available. The new synonymies proposed here are based on examinations of the type specimens of all these species; label data and depositories of those types are mentioned in the original descriptions and are not indicated here for brevity and to avoid repetition. All specimens included under «Material examined» sections were identified by me except for the female of *A. sensillatus* Viggiani & Jesu from Gabon which was identified together with Elisabetta Chiappini.

The terms for morphological characters follow Gibson (1997). Abbreviations used in the text are: F = funicle segment, FWL = fore wing length, FWW = fore wing maximum width, and mps = multiporous plate sensillum or sensilla on the antennal flagellar segments (= longitudinal sensillum or sensilla, or sensory ridge(s)).

Species redescriptions (females only) are coded in the following way («?» means not indicated in the available description(s) or unknown):

1 = color (descriptive);

2 = antennal characters: 2a = proportions of the antennomeres relative to F1 length (i. e., F1 = 1); 2b = number of mps on F2 to F6 and on clava (F1 always lacks mps);

3 = midlobe of mesoscutum with (+) (as in Fig. 19) or without (-) (as in Figs 17, 18) adnotaular setae;

4 = fore wing characters: 4a = FWL: FWW ratio; 4b = a hairless (bare) area present (+) (as in Figs 26, 29, 30) or absent (-) (as in Figs 25, 27, 28) on the widest part of the disc; 4c = number of rows of setae in the widest part of the disc;

5 = ovipositor characters: 5a = ovipositor length:protibia length ratio; 5b = number of setae on the second valvifer (= external plate of the ovipositor) (Chiappini, 1989; Chiappini *et al.*, 1996) (e.g., with 3 such setae in Fig. 35); 5c = ovipositor not exserted beyond gastral apex (-) or, if exserted, ratio of its total length to length of its exserted part;

6 = male known (+) or unknown (-).

For brevity, and to avoid unnecessary repetition, data on the known host associations and geographical distribution of some of the most common species with broad distribution ranges or with many hosts, such as, for instance, *A. atomus* (Linnaeus), are omitted, and only updates are provided when necessary if somewhat different from those given in the Universal Chalcidoidea Database (Noyes, 2015). New ecozone and country records are marked by an asterisk (*).

Abbreviations used for specimen depositories are: BMNH – The Natural History Museum, London, England, UK; CNC – Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa, Ontario, Canada; CZUG – Centro de Estudios en Zoología, Universidad de Guadalajara, Las Agujas, Zapopan, Jalisco, Mexico; EMEC – Essig Museum of Entomology, University of California, Berkeley, California, USA; IEFA – E. Chiappini collection, Istituto di Entomologia e Patologia vegetale, Università Cattolica del Sacro Cuore, Piacenza, Italy; INHS – Illinois Natural History Survey, Champaign, Illinois, USA; ISNB – Institut Royal des Sciences Naturelles de Belgique, Brussels, Belgium; MLPA – Museo de La Plata, La Plata, Buenos Aires, Argentina; UCRC – Entomology Research Museum, Department of Entomology, University of California, Riverside, California, USA.

TAXONOMY

Key to species of *Anagrus* in the world, females

1 Ocelli on a stemmaticum (as in Figs 6, 7; best observed on dry-mounted, critical point dried specimens, but often difficult to see in slide-mounted specimens) 2

– Ocelli not on a stemmaticum (as in Fig. 5) [subgenus *A.* (*Anagrella* Bakkendorf)] 4

2 (1) Mesoscutum without notauli (see Fig. 3, p. 553 in Chiappini & Lin, 1998) ..... *Anagrus dalhousieanus* Mani & Saraswat

– Mesoscutum with notauli (as in Figs 15–19) 3

3 (2) Frenum of scutellum with triangular paramedial plates widely separated from each

other (as in Fig. 15; also see Fig. 8, p. 95 in Chiappini, 1989); metafemur short, less than 2x trochanter length, trochantellus incision almost 1/2 way between coxa-trochanter and femur-tibia articulations (Fig. 31) [subgenus *A.* (*Paranagrus* Perkins)] 14

– Frenum of scutellum with triangular paramedial plates very close to each other (as in Figs 16–19; also see Fig. 9, p. 95 in Chiappini, 1989); metafemur long, more than 2x trochanter length, trochantellus incision about 1/3 way between coxa-trochanter and femur-tibia articulations (Fig. 32) [nominate subgenus, *A.* (*Anagrus* Haliday) *sensu stricto*] 16

4 (1) F2 at most 1.5x F1 length (as in Fig. 8) 5

– F2 at least 2.0x F1 length (as in Fig. 9) 7

5 (4) Fore wing with 1 row of discal setae extending from marginal vein to its apex and a few scattered setae at apex 6

– Fore wing with only 1 incomplete row of setae extending from about middle of the wing to its apex (Fig. 21) .... *Anagrus* (*Anagrella*) *humicola* Mathot

6 (5) F5 with 1 mps, fore wing hyaline .... *Anagrus* (*Anagrella*) *brevis* Chiappini & Lin

– F5 with 2 mps, fore wing infuscate .... *Anagrus* (*Anagrella*) *quasibrevis* Triapitsyn

7 (4) Fore wing disc without setae .... *Anagrus* (*Anagrella*) *albiclava* Chiappini & Lin

– Fore wing disc with setae (as in Figs 20, 22, 23) 8

8 (7) F5 without mps and F3, F4 and F5 together at most as long as clava 9

– F5 with 1 mps or, if without, F3, F4 and F5 together longer than clava 10

9 (8) F2 longer than clava; F3, F4 and F5 together as long as clava (Fig. 9) .... *Anagrus* (*Anagrella*) *hirashimai* Sahad

– F2 shorter than clava; F3, F4 and F5 together shorter than clava .... *Anagrus* (*Anagrella*) *mockfordi* Triapitsyn

10 (8) Fore wing with almost parallel margins and reduced (Fig. 20) ..... *Anagrus* (*Anagrella*) *mymaricornis* (Bakkendorf)

– Fore wing not as above, normally shaped 11

11 (10) Fore wing with 1 complete row of discal setae extending from marginal vein to its apex (Fig. 22); FWL:FWW about 10; ratio between lengths of distal and proximal macrochaetae on marginal vein less than 2; ratio of total ovipositor length to length of its exserted part about 8 .... *Anagrus* (*Anagrella*) *rilensis* Donev

– Fore wing with 1 incomplete row of at least 2 discal setae on the distal third of wing only; FWL/FWW at least 11.5; ratio between lengths of distal and proximal macrochaetae on marginal vein much more than 2; ratio of total ovipositor length to length of its exserted part less than 4 12

12 (11) F2 more than 3x length of F3; F4, F5, and F6 with 1 mps each 13

– F2 less than 2x length of F3; mps absent on F4 and F5, and F6 with 2 mps .... *Anagrus* (*Anagrella*) *funebris* Mathot

13 (12) Fore wing disc with median row of at least 6 setae in apical third ..... *Anagrus* (*Anagrella*) *semiglabrus* Chiappini & Lin

– Fore wing disc with median row of just 2 setae in apical third ..... *Anagrus* (*Anagrella*) *kashtanka* Triapitsyn

14 (3) F3 and F4 without mps .... *Anagrus* (*Paranagrus*) *unilinearis* Soyka

– F3 (usually) and F4 with 1 mps each 15

15 (14) Ovipositor projecting beyond apex of gaster by about 1/3 of its total length; ovipositor: protibia ratio at least 3.5 .... *Anagrus* (*Paranagrus*) *perforator* (Perkins)

– Ovipositor not projecting or at most slightly projecting beyond apex of gaster; ovipositor: protibia ratio at most 2.5 .... *Anagrus* (*Paranagrus*) *optabilis* (Perkins)

16 (3) Clava with 6 mps (Fig. 10); fore wing with longest marginal setae subequal to or just a little longer than maximum fore wing width (Fig. 24) (*stethynioides* species group) .... *Anagrus* (*Anagrus*) *stethynioides* Triapitsyn

– Clava either with 3 or 5 mps; fore wing with longest marginal setae much longer than maximum fore wing width 17

17 (16) Clava with 3 mps (as in Fig. 11) (*atomus* species group) 18

– Clava with 5 mps (as in Fig. 14) (*incarnatus* species group) 40

18 (17) F3 with 2 mps 19

– F3 either without mps or with 1 mps 20

19 (18) Mesoscutum with adnotaular setae; fore wing disc with a hairless area .... *Anagrus* (*Anagrus*) *scassellatii* Paoli

– Mesoscutum without adnotaular setae; fore wing disc without a hairless area .... *Anagrus* (*Anagrus*) *sensillatus* Viggiani & Jesu

20 (18) F3 with 1 mps 21

– F3 without mps 28

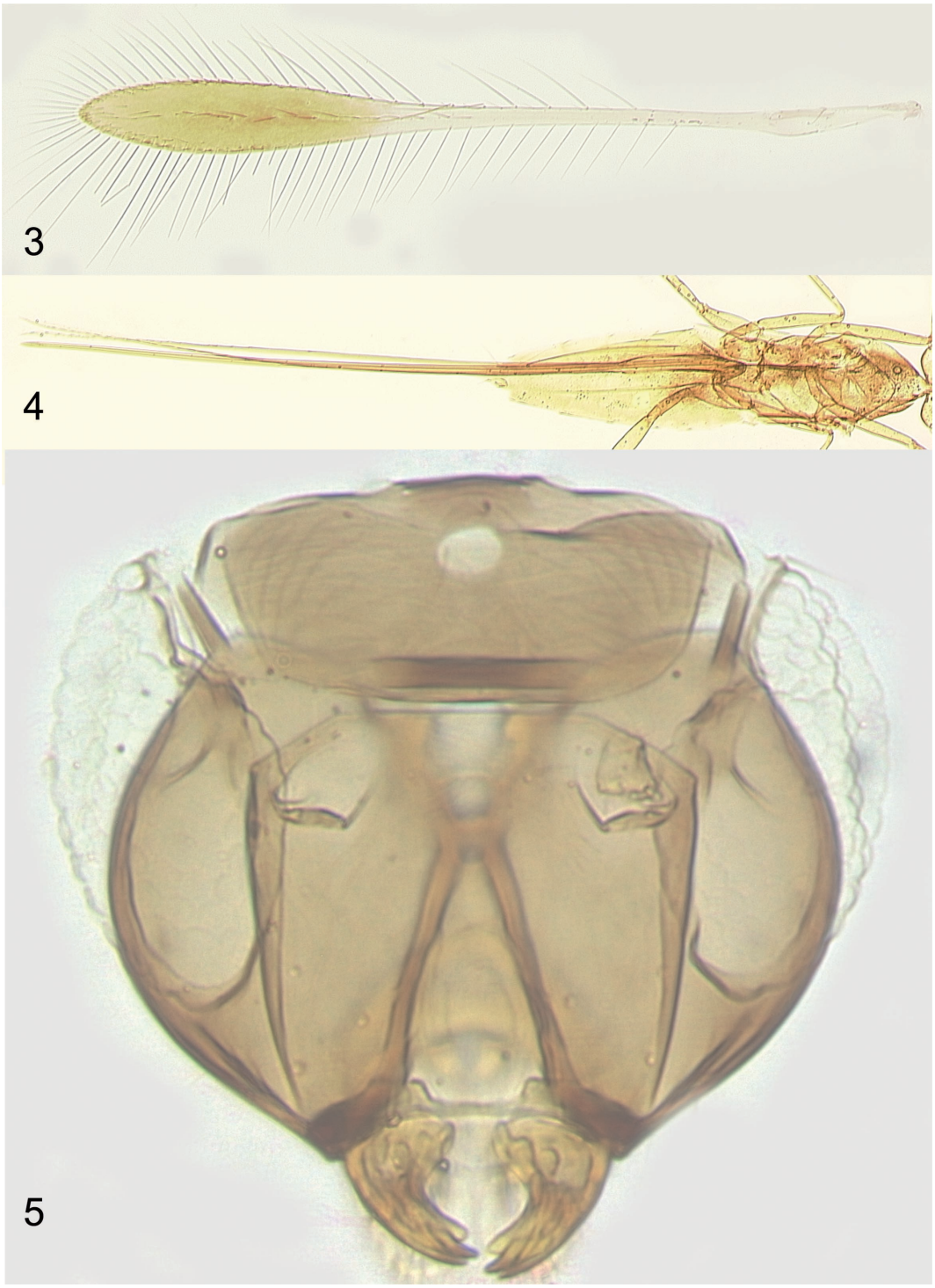
21 (20) Fore wing disc without a hairless area (as in Fig. 25) 22

– Fore wing disc with a hairless area 24

22 (21) Ovipositor:protibia ratio at most 1.7 23

– Ovipositor:protibia ratio at least 2.1 .... *Anagrus* (*Anagrus*) *baeri* Girault

23 (22) F4 and F5 each with 2 mps .... *Anagrus* (*Anagrus*) *setosus* Chiappini & Lin



Figures 3–5. *Anagrus* (*Anagrella*) spp., females. (3) *A.* (*Anagrella*) sp., fore wing (Isecheno Nature Reserve, Kakamega District, Kenya); (4) Same specimen, mesosoma and metasoma; (5) *A.* (*Anagrella*) *hirashimai* Sahad, head in frontal view (Gornotayozhnoye, Primorskiy kray, Russia).

– F4 and F5 each with 1 mps .... *Anagrus* (*Anagrus*) *breviclavatus* Jesu & Viggiani

24 (21) F4 with 2 mps ..... *Anagrus* (*Anagrus*) *flaviapex* Chiappini & Lin

– F4 with 1 mps 25

25 (24) Ovipositor:protibia ratio at most 1.6 .... *Anagrus* (*Anagrus*) *longitibialis* Donev

– Ovipositor:protibia ratio at least 2.0 26

26 (25) Ovipositor:protibia ratio less than 3.0 27

– Ovipositor:protibia ratio more than 3.0 .... *Anagrus* (*Anagrus*) *elegans* Chiappini (part)

27 (26) F5 with 1 mps; FWL:FWW at least 10.5 .... .. *Anagrus* (*Anagrus*) *frequens* Perkins (part)

– F5 with 2 mps; FWL:FWW at most 8.2 .... *Anagrus* (*Anagrus*) *ainu* Triapitsyn & Berezovskiy

28 (20) F4 without mps (as in Fig. 11) 29

– F4 with mps 35

29 (28) Mesoscutum with adnotaular setae .... *Anagrus* (*Anagrus*) *vilis* Donev

– Mesoscutum without adnotaular setae 30

30 (29) Ovipositor:protibia ratio at least 3.0 .... *Anagrus* (*Anagrus*) *aegyptiacus* Soyka

– Ovipositor:protibia ratio at most 2.5 31

31 (30) Fore wing disc with only 1 more or less complete row of setae .... *Anagrus* (*Anagrus*) *klop* Triapitsyn

– Fore wing disc with at least 2 complete rows of setae 32

32 (31) Fore wing disc without a hairless area .... *Anagrus* (*Anagrus*) *longifrangiatus* Jesu & Viggiani

– Fore wing disc with a hairless area 33

33 (32) Ovipositor:protibia ratio at most 1.6 .... *Anagrus* (*Anagrus*) *lindberginae* Nugnes & Viggiani

– Ovipositor:protibia ratio at least 1.7 (usually 1.8-2.2) 34

34 (33) Palearctic (probably unintentionally introduced from Europe to Argentina, Chile and New Zealand) ..... *Anagrus* (*Anagrus*) *parvus* Soyka (*sensu* Viggiani, 2014)

– Nearctic (possibly unintentionally introduced from North America to New Zealand) .... *Anagrus* (*Anagrus*) *erythroneurae* S. Trjapitzin & Chiappini

35 (28) F2 and F3 together about as long as F6 or just slightly longer 36

– F2 and F3 together much longer than F6, at least by almost 1/2 of their combined length 37

36 (35) F5 and F6 together as long as clava; F4 with 2 mps ..... *Anagrus* (*Anagrus*) *japonicus* Sahad

– F5 and F6 together markedly shorter than clava (by about 1/4 of its length); F4 with 1 mps ..... *Anagrus* (*Anagrus*) *brevifuniculatus* Viggiani & Jesu

37 (35) Fore wing disc with a hairless area 38

– Fore wing disc without a hairless area .... *Anagrus* (*Anagrus*) *kvas* Triapitsyn & Berezovskiy

38 (37) Hairless area on fore wing disc occupying its whole posterior half; FWL:FWW more than 10.5 39

– Hairless area only at broadest part of fore wing disc; FWL:FWW at most 10.0 .... *Anagrus* (*Anagrus*) *atomus* (Linnaeus)

39 (38) Ovipositor:protibia ratio less than 3.0 .... *Anagrus* (*Anagrus*) *frequens* Perkins (part)

– Ovipositor/protibia ratio more than 3.0 .... *Anagrus* (*Anagrus*) *elegans* Chiappini (part)

40 (17) Ovipositor anteriorly broadly rounded (with a large basal loop) (Fig. 33) .... *Anagrus* (*Anagrus*) *armatus* (Ashmead)

– Ovipositor not as above (without a large basal loop) 41

41 (40) Ovipositor markedly exserted beyond apex of gaster (as in Fig. 34), ratio of total ovipositor length to length of its exserted part at most 3.5 42

– Ovipositor either not exserted or, if exserted, then ratio of total ovipositor length to length of its exserted part more than 3.5 46

42 (41) F3 with 1 mps ..... *Anagrus* (*Anagrus*) *paranagrosimilis* Chiappini & Lin

– F3 without mps 43

43 (42) Mesoscutum without adnotaular setae .... *Anagrus* (*Anagrus*) *delicatus* Dozier

– Mesoscutum with adnotaular setae 44

44 (43) Fore wing disc sparsely setose, with only 1 row of setae 45

– Fore wing disc uniformly covered with setae arranged in more than 1 row .... *Anagrus* (*Anagrus*) *ensifer* Debauche

45 (44) F4 with 2 mps, F5 with 1 mps .... *Anagrus* (*Anagrus*) *antipodus* Triapitsyn (part)

– F4 with 1 mps, F5 without mps .... *Anagrus* (*Anagrus*) *empanadus* Triapitsyn

46 (41) Clava about as long as combined length of 3 preceding funicle segments .... *Anagrus* (*Anagrus*) *minutus* Chiappini & Lin

– Clava notably shorter than combined length of 3 preceding funicle segments 47

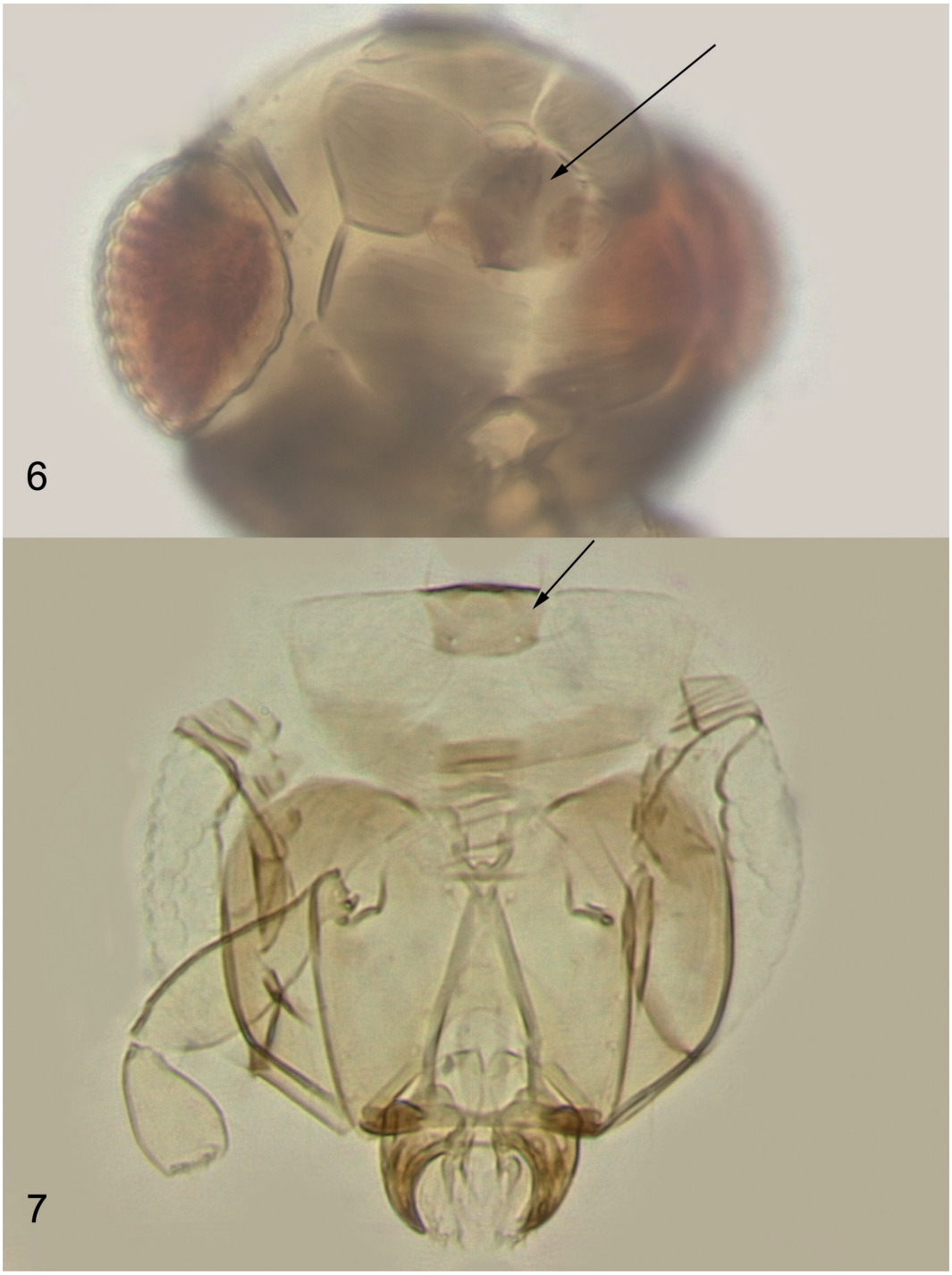
47 (46) F2 subglobular, about as long as F1 (Fig. 12) .... *Anagrus* (*Anagrus*) *brasiliensis* Triapitsyn

– F2 cylindrical, longer than F1 48

48 (47) Clava white .... *Anagrus* (*Anagrus*) *ogloblini* Triapitsyn

– Clava differently colored 49

49 (48) Both F2 and F3 notably shorter than following funicle segments (as in Figs 13, 14) 50



Figures 6, 7. *Anagrus* (*Anagrus*) spp., female heads (arrows pointing to stemmaticum). (6) *A.* (*Anagrus*) *atomus* (Linnaeus), dorsal view (Kavar Province, Iran); (7) *A.* (*Anagrus*) *baeri* Gurault, frontal view (Nundah, Brisbane, Queensland, Australia).

– Either F2 or F3, or both longer, subequal to, or just slightly shorter than at least one of following funicle segments 58

50 (49) Fore wing disc with a single row of setae beyond venation (as in Fig. 29) 51

– Fore wing disc with more than 1 row (complete or incomplete) of setae beyond venation 53

51 (50) Fore wing disc notably infuscate, particularly medially ... *Anagrus* (*Anagrus*) *amazonensis* Triapitsyn, Querino & Feitosa

– Fore wing disc hyaline or almost hyaline (as in Fig. 29) 52

52 (51) F4 with 1 mps; ovipositor:protibia ratio at most 2.1 ..... *Anagrus* (*Anagrus*) *lineolus* Triapitsyn

– F4 with 2 mps; ovipositor:protibia ratio more than 3.5 ..... *Anagrus* (*Anagrus*) *antipodus* Triapitsyn (part)

53 (50) Fore wing disc with a more or less distinct hairless area (as in Fig. 30) 54

– Fore wing without a distinct hairless area 57

54 (53) Mesoscutum without adnotaular setae .... *Anagrus* (*Anagrus*) *takeyanus* Gordh

Mesoscutum with adnotaular setae 55

55 (54) FWL:FWW at most 6.6 (egg parasitoid of Tingidae] ..... *Anagrus* (*Anagrus*) *virginiae* Triapitsyn & Puttler

– FWL:FWW at least 6.9 (egg parasitoids of Cicadellidae] 56

56 (55) F5 without mps .. *Anagrus* (*Anagrus*) *raygilli* Triapitsyn

F5 with 1 mps ..... *Anagrus* (*Anagrus*) *tretiakovae* Triapitsyn

57 (53) Ovipositor:protibia ratio at least 2.6 .... *Anagrus* (*Anagrus*) *bakkendorfi* Soyka

– Ovipositor:protibia ratio at most 2.3 .... *Anagrus* (*Anagrus*) *avalae* Soyka

58 (49) Fore wing very wide (FWL:FWW at most 6.7) 59

– Fore wing narrower (FWL:FWW at least 7.0) 61

59 (58) Fore wing with discal setae arranged in at least 10 longitudinal rows at broadest part (Fig. 28) ..... *Anagrus* (*Anagrus*) *puella* Girault

– Fore wing with discal setae arranged in at most 4 rows at broadest part 60

60 (59) Mesoscutum with adnotaular setae .... *Anagrus* (*Anagrus*) *vulneratus* Triapitsyn

– Mesoscutum without adnotaular setae .... *Anagrus* (*Anagrus*) *fragranticus* Triapitsyn

61 (58) F2 with 1 mps 62

– F2 without mps 63

62 (61) Mesoscutum with adnotaular setae .... *Anagrus* (*Anagrus*) *yawi* Fullaway

– Mesoscutum without adnotaular setae .... *Anagrus* (*Anagrus*) *gonzalezae* Triapitsyn

63 (61) Fore wing disc with a more or less distinct hairless area (as in Fig. 26) 64

– Fore wing disc without hairless area (as in Fig. 27) 72

64 (63) Fore wing with 6 to 10 setae in the middle of disc only ..... *Anagrus* (*Anagrus*) *urichi* Pickles

– Fore wing with many more than 10 discal setae arranged in at least 1 complete row beyond venation 65

65 (64) Fore wing with a single complete row of discal setae beyond venation and a few additional setae at the broadest part not arranged in complete or incomplete row(s) 66

– Fore wing with at least 1 complete and at least 1 incomplete rows of discal setae beyond venation 68

66 (65) F1 notably shorter than 2/3 length of pedicel (a little more than 1/2) 67

– F1 a little longer than 2/3 length of pedicel ..... *Anagrus* (*Anagrus*) *striatus* Chiappini & Lin

67 (66) Second valvifer (= external plate of ovipositor) with 2 setae ..... *Anagrus* (*Anagrus*) *oahuensis* Triapitsyn & Beardsley

– Second valvifer (= external plate of ovipositor) with 3 setae (as in Fig. 35) .... *Anagrus* (*Anagrus*) *iti* Triapitsyn

68 (65) F2 the longest funicle segment 69

– F2 not the longest funicle segment 70

69 (68) Mesoscutum without adnotaular setae (Fig. 18) ..... *Anagrus* (*Anagrus*) *breviphragma* Soyka

– Mesoscutum with adnotaular setae .... *Anagrus* (*Anagrus*) *naulti* Triapitsyn & Moya-Raygoza

70 (68) Second valvifer (= external plate of ovipositor) almost always with 2 setae .... *Anagrus* (*Anagrus*) *daanei* Triapitsyn

– Second valvifer (= external plate of ovipositor) with 3 setae 71

71 (70) Ovipositor:protibia ratio at least 2.8 .... *Anagrus* (*Anagrus*) *epos* Girault

– Ovipositor:protibia ratio at most 2.4 .... *Anagrus* (*Anagrus*) *empoascae* Dozier

72 (63) Mesoscutum with adnotaular setae 76

– Mesoscutum without adnotaular setae (*A. incarnatus* complex, see comments in the Introduction) 73

73 (72) Ovipositor:protibia ratio at least 4.0 [Palearctic] ..... *Anagrus* (*Anagrus*) *fisheri* Donev

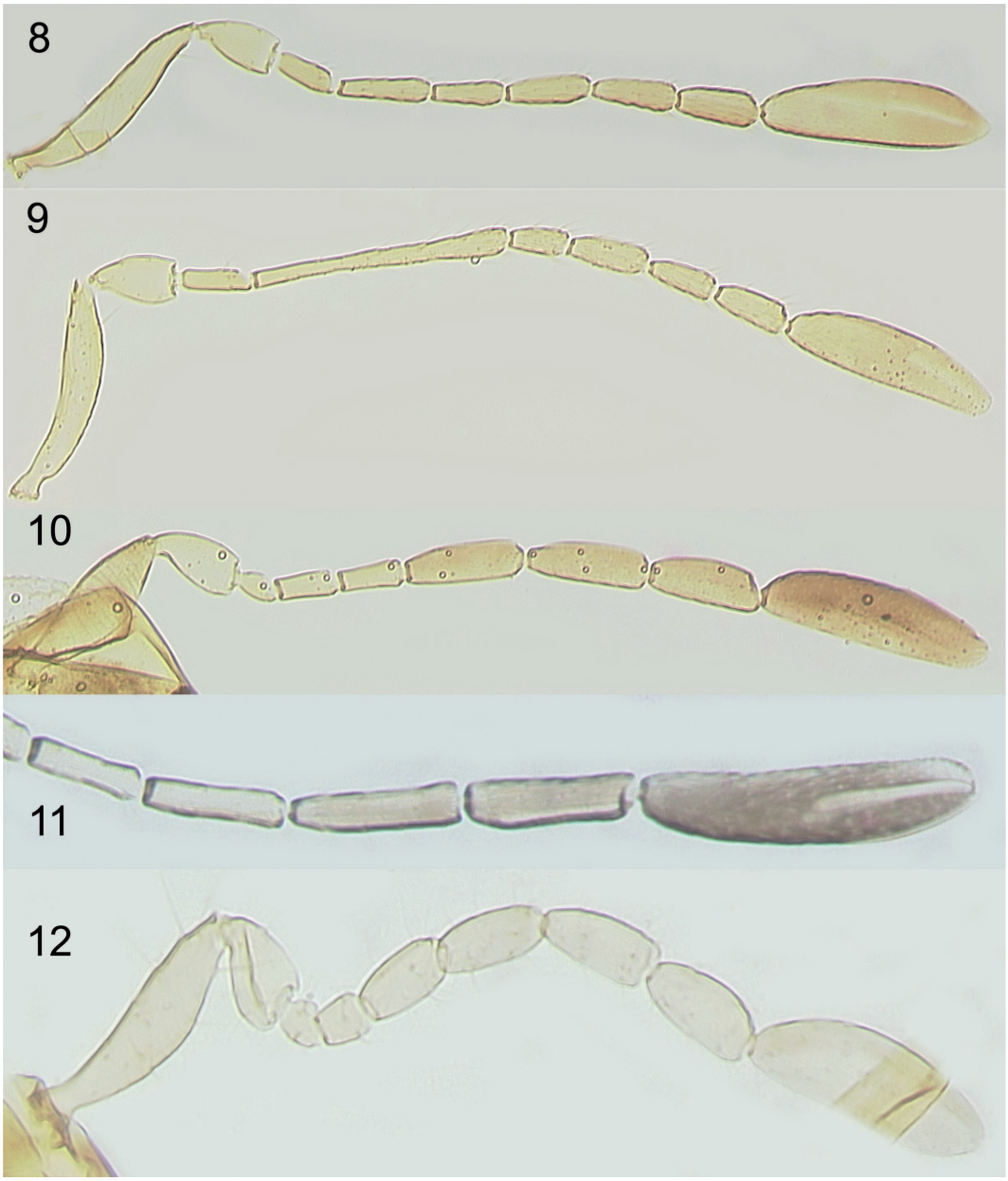
– Ovipositor:protibia ratio at most 3.2 74

74 (73) Mainly Nearctic ..... *Anagrus* (*Anagrus*) *columbi* Perkins

– Mainly not Nearctic 75

75 (74) Mainly Palearctic ..... *Anagrus* (*Anagrus*) *incarnatus* Haliday

– Mainly Oriental and eastern Palearctic (egg parasitoid of rice leafhoppers and planthop-



Figures 8–12. *Anagrus* spp., female antennae. (8) *A.* (*Anagrella*) *humicola* Mathot (Lamto, Ivory Coast); (9) *A.* (*Anagrella*) *hirashimai* Sahad (Gornotayozhnoye, Primorskiy kray, Russia); (10) *A.* (*Anagrus*) *stethynioides* Triapitsyn (Chillá, Sacatepéquez, Guatemala); (11) *A.* (*Anagrus*) *erythroneurae* S. Trjapitzin & Chiappini, F3–F6 and clava only (paratype, Baja California, Mexico); (12) *A.* (*Anagrus*) *brasiliensis* Triapitsyn (paratype, Nova Teutonia, Santa Catarina, Brazil).

pers) ..... *Anagrus* (*Anagrus*) *nilaparvatae* Pang & Wang
76 (72) F4 without mps ..... *Anagrus* (*Anagrus*) *sophiae* S. Trjapitzin
– F4 with mps 77
77 (76) F1 distinctly cylindrical, at least as long as 2/3 length of pedicel 78
– F1 subglobular, clearly shorter than 2/3 length of pedicel 79
78 (77) Ovipositor:protibia ratio at least 3.0..... *Anagrus* (*Anagrus*) *subfuscus* Foerster
– Ovipositor:protibia ratio less than 2.5 .... *Anagrus* (*Anagrus*) *fennicus* Soyka
79 (77) Body color contrastingly black and yellow (at least part of mesosoma) .... *Anagrus* (*Anagrus*) *nigriventris* Girault
– Body more or less uniformly colored, from yellow to dark brown (*A. brocheri* complex, see comments in the Introduction) 80
80 (79) F3 without mps 81
– F3 with mps 83
81 (80) General body color yellow-brown [New World] ... *Anagrus* (*Anagrus*) *flaveolus* Waterhouse
– General body color brown or dark brown 82
82 (81) Ovipositor:protibia ratio 2.1-2.3 [Hawaiian Islands] ..... *Anagrus* (*Anagrus*) *insularis* Dozier (part)
– Ovipositor:protibia ratio about 2.6 [Palearctic] ..... *Anagrus* (*Anagrus*) *brocheri* Schulz
83 (80) FWL:FWW about 7.0 [Palearctic] .... *Anagrus* (*Anagrus*) *obscurus* Förster
– FWL:FWW at least 8.0 84
84 (83) Neotropical ..... *Anagrus* (*Anagrus*) *miriamae* Triapitsyn & Virla
– Not Neotropical 85
85 (84) Holarctic ..... *Anagrus* (*Anagrus*) *nigriceps* (Smits van Burgst)
– Known only from the Hawaiian Islands .... *Anagrus* (*Anagrus*) *insularis* Dozier (part)

Coded species redscriptions (in alphabetical order by a subgenus and a species group within the nominate subgenus)

Subgenus *incertae sedis*

Anagrus dalhousieanus Mani & Saraswat, 1973

Coded redescription: 1 Brown except frenum of scutellum, metanotum, propodeum, legs, scape and pedicel yellow; 2a (2.0: 1.1: 1: 1.3: 1.2: 1.2: 1.1: 1.4: 2.7); 2b (0, 0, 0, 0, 2, 5); 3 (+); 4a (7.4); 4b (-); 4c (5-6); 5a (1.5); 5b (3); 5c (-); 6 (-).

Distribution: Oriental: China (Chiappini & Lin, 1998) and India (Mani & Saraswat, 1973).

Hosts: Unknown.

Important reference: Chiappini & Lin (1998) – redescription.

Subgenus *A.* (*Anagrella* Bakkendorf, 1962)

Anagrus (*Anagrella*) *albiclava* Chiappini & Lin, 1998

Coded redescription: 1 Bright yellow with antenna light brown except F6 yellow and clava white; 2a (3.0: 1.1: 1: 2.6: 1.6: 1.6: 1.5: 1.5: 3.0); 2b (0, 0, 0, 1, 1, 5); 3 (+); 4a (13); 4b (+); 4c (0); 5a (1.5); 5b (1); 5c (-); 6 (-).

Distribution: Oriental: China (Chiappini & Lin, 1998), *India, *Thailand.

Material examined: India, Karnataka, Mudigere, 13°07'09"N 75°37'41"E, 994 m, 24-25.xi.2003, J. M. Heraty [1 female, UCRC]. Thailand: Phang Nga, Khura Buri, Koh Ra, 9°10'47"N 98°16'00"E, 20 m, G. Ballmer: 30.i-4.ii.2001 [1 female, UCRC]; 29.i-3.ii.2003 [1 female, UCRC]. Trang, Khao Chong, Forest Research Station, 7°33'02"N 99°47'23"E, 75 m, 29-31.i.2005, D. Lohman [1 female, UCRC].

Hosts: Unknown.

Anagrus (*Anagrella*) *brevis* Chiappini & Lin, 1998

Coded redescription: 1 Brown except scape, pedicel, legs, frenum of scutellum, metanotum, and propodeum yellow-brown, metasoma dark brown; 2a (2.6: 1.1: 1: 1.3: 0.9: 1: 1.1: 1.1: 2.7); 2b (0, 0, 1, 1, 2, 5); 3 (+); 4a (9.5); 4b (+); 4c (0); 5a (2.2); 5b (1); 5c (-); 6 (-).

Distribution: Oriental: China (Chiappini & Lin, 1998); Palearctic: Japan (Triapitsyn & Berezovskiy, 2004).

Hosts: Unknown.

Anagrus (*Anagrella*) *funebris* Mathot, 1968

Coded redescription: 1 Head and posterior part of metasoma black with mesosoma

Figures 13–15. *Anagrus* spp., females. (13) *A.* (*Anagrus*) *takeyanus* Gordh, antenna (Griffin, Spalding Co., Georgia, USA); (14) *A.* (*Anagrus*) *tretiakovae* Triapitsyn, pedicel and flagellum of antenna (Las Nutrias, Socorro Co., New Mexico, USA); (15) *A.* (*Paranagrus*) sp., mesosoma (Pietermaritzburg, KwaZulu-Natal, South Africa); arrows pointing to triangular paramedial plates on frenum of the scutellum.

and anterior part of metasoma white; 2a (3.4: 1.1: 1: 2.2: 1.3: 1.6: 1.4: 1.7: 3.7); 2b (0, 0, 0, 0, 2, 5); 3 (+); 4a (13.3); 4b (+); 4c (1); 5a (3.3); 5b (2); 5c (2.5); 6 (-).

Distribution: Afrotropical: Democratic Republic of the Congo (Mathot, 1968).

Hosts: Unknown.

Important reference: Triapitsyn (1998b) – type information.

Anagrus (*Anagrella*) *hirashimai* Sahad, 1982 (Figs 5, 9, 16, 23)

Coded redescription: 1 Brown: head, anterior half of mesonotum and basal five gastral terga, yellow: posterior half of mesonotum and apical gastral terga; 2a (3.0: 1.5: 1: 4.3: 1.0: 1.3: 1.0: 1.3: 3.3); 2b (0, 0, 1, 0, 1, 5); 3 (+); 4a (12); 4b (+); 4c (1); 5a (2.2); 5b (2); 5c (4); 6 (+).

Distribution: Oriental: China (Chiappini & Lin, 1998); Palearctic: Japan (Sahad, 1982; Triapitsyn & Berezovskiy, 2004), Republic of Korea (Triapitsyn & Berezovskiy, 2004), Russia (Far East) (Triapitsyn & Berezovskiy, 2004).

Material examined: Russia, Primorskiy kray, Gornotayozhnoye, 5.ix.2003, M. V. Michailovskaya [1 male, UCRC].

Hosts: Unknown.

Important references: Chiappini *et al*. (1996) – redescription; Chiappini & Lin (1998) – type information, measurements; Triapitsyn & Berezovskiy (2004) – distribution.

Anagrus (*Anagrella*) *humicola* Mathot, 1968 (Figs 8, 21)

Coded redescription: 1 Yellow with flagellum, mesonotum and metasomal terga brown-grey; 2a (2.8: 1.1: 1: 1.6: 1.2: 1.2: 1.1: 1.2: 3.2); 2b (0, 0, 1, 0, 2, 5); 3 (+); 4a (11.7); 4b (+); 4c (1); 5a (2.1); 5b (2); 5c (5.5); 6 (-).

Distribution: Afrotropical: *Ivory Coast (Côte d'Ivoire) and Uganda (Mathot, 1968).

Material examined: Ivory Coast (Côte d'Ivoire), Lamto, 5°02'W 6°13'N, xi.1988, J. S. Noyes [2 females, CNC].

Hosts: Unknown.

Anagrus (*Anagrella*) *kashtanka* Triapitsyn, 2009

Coded redescription: 1 Body brown to dark brown except frenum of scutellum whitish and metanotum and propodeum light brown to brown, appendages light brown to brown; 2a (2.7: 1.0: 1: 3.15: 0.96: 1.0: 1.04: 1.0: 2.55); 2b (0, 0, 1, 1, 1, 5); 3 (+); 4a (11.5); 4b (+); 4c (1); 5a (2.9); 5b (2); 5c (3.8); 6 (-).

Distribution: Palearctic: Austria (Triapitsyn, 2009).

Hosts: Unknown.

Anagrus (*Anagrella*) *mockfordi* Triapitsyn, 2000

Coded redescription: 1 Head, pronotum, mesoscutum and metasoma (except apex) dark brown, apex of metasoma and appendages light brown to brown, remainder of mesosoma white; 2a (4.7: 1.8: 1: 3.1: 1.2: 1.6: 1.3: 1.7: 5.2); 2b (0, 0, 1, 0, 1, 5); 3 (+); 4a (11.1); 4b (+); 4c (1); 5a (2.6); 5b (3); 5c (5.6); 6 (-).

Distribution: Nearctic: USA (Triapitsyn, 2000b).

Host: Apparently associated with *Echmepteryx hageni* (Packard) (Psocoptera: Lepidopsocidae) (Triapitsyn, 2000b).

Anagrus (*Anagrella*) *mymaricornis* (Bakkendorf, 1962) (Fig. 20)

Coded redescription: 1 Brown except metanotum and propodeum yellow; 2a (3.1: 1.1: 1: 2.7: 0.9: 1.1: 1.2: 1.2: 3.3); 2b (0, 0, 1, 1, 2, 5); 3 (+); 4a (15); 4b (-); 4c (1); 5a (3.3); 5b (1-2); 5c (3.1); 6 (+).

Distribution: Palearctic: France (Viggiani, 1970), *Hungary, Italy (Viggiani, 1970), Switzerland (Bakkendorf, 1962).

Material examined: France, Haute-Savoie, Vongy, 11.vi.1964, C. Besuchet (on old stump) [1 female, CNC]. Hungary, Vas Co., W of Köszeg, 47°23'09"N 16°31'19"E, 355 m, 16-20.vi.2009, I. Mikó [1 female, UCRC]. Switzerland, Valais: Euseigne, 900 m, 8.viii.1986, C. Besuchet (in dead leaves) [2 females, CNC]. Gondo, 800 m, 13.ix.1984, C. Besuchet (in dead leaves) [2 females, 2 males, CNC].

Hosts: Unknown.

Important references: Chiappini (1989) – illustration; Triapitsyn (2009) – key.

Anagrus (*Anagrella*) *quasibrevis* Triapitsyn, 2001

Coded redescription: 1 Body and appendages brown except scape, pedicel, frenum of scutellum and propodeum light brown, fore wing disc strongly infuscate with brown behind and beyond venation; 2a (3.2: 1.2: 1: 1.5: 1.2: 1.6: 1.75: 1.75: 3.3); 2b (0, 0, 1, 2, 2, 5); 3 (+); 4a (9.0); 4b (-); 4c (5); 5a (2.7); 5b (2); 5c (7); 6 (-).

Distribution: Australasia: Papua New Guinea (Triapitsyn, 2001).

Hosts: Unknown.

Anagrus (*Anagrella*) *rilensis* Donev, 1996 (Fig. 22)

Coded redescription: 1 Brown to dark brown except frenum of scutellum, metanotum, and propodeum light yellow, antenna light brown, legs light yellow except metacoxa light brown; 2a (3.5: 1.0: 1: 3.0: 1.5: 1.5: 1.5: 1.5: 3.5); 2b (0, 0, 1, 1, 2, 5); 3 (+); 4a (10); 4b (+); 4c (1); 5a (2.8); 5b (2); 5c (8.0); 6 (+).

Distribution: Palearctic: Bulgaria (Chiappini *et al*., 1996) and Italy (Triapitsyn & Berezovskiy, 2004).

Hosts: Unknown.

Important references: Donev (1998) – key; Triapitsyn & Berezovskiy (2004) – distribution, description of the male.

Anagrus (*Anagrella*) *semiglabrus* Chiappini & Lin, 1998

Coded redescription: 1 Brown except scape, pedicel, frenum of scutellum, metanotum, propodeum, legs and apex of gaster yellow-brown; 2a (2.2: 0.8: 1: 3.0: 0.8: 0.9: 0.9: 0.8: 2.2); 2b (0, 0, 1, 1, 1, 5); 3 (+); 4a (13); 4b (+); 4c (1); 5a (3.1); 5b (2); 5c (4); 6 (-).

Distribution: ?Australasia: ?Australia (Triapitsyn, 2001); Palearctic: China (Chiappini & Lin, 1998) and Russia (Far East) (Triapitsyn & Berezovskiy, 2004).

Hosts: Unknown.

Subgenus *A.* (*Paranagrus* Perkins, 1905)

Anagrus (*Paranagrus*) *optabilis* (Perkins, 1905) (Fig. 31)

Coded redescription: 1 Yellow-brown except vertex, flagellum, 2 triangular symmetric spots on central part of mesoscutum and its lateral lobes, 1st to 3rd gastral terga, and apex of gaster dark brown; 2a (3: 0.8: 1: 1.3: 1.3: 1.3: 1.3: 1.3: 2.0); 2b (0, 1, 1, 1, 2, 3); 3 (+); 4a (14); 4b (+); 4c (2-3); 5a (1.8-2.5); 5b (1); 5c (-); 6 (+).

Distribution: Afrotropical: Cape Verde Islands, Madagascar, Mauritius, Réunion, South Africa, *Yemen (Jesu & Viggiani, 2007 [as *A. prounilinearis* Viggiani & Jesu]); Australasia: Australia, New Zealand, Papua New Guinea; Nearctic: USA; Oceania: Fiji, Guam, Hawaiian Islands, Samoa; Oriental: Bangladesh, China, India, Indonesia, Malaysia, Philippines, Sri Lanka, Taiwan, Thailand; Palearctic: China, Japan, Republic of Korea, Russia (Far East), Spain; see Baquero & Jordana (1999) and Noyes (2015) for the respective references. As noted by Triapitsyn (1997), the Neotropical record of this species from Ecuador needs confirmation.

Material examined: India: Karnataka, Mudigere, 13°07'09"N 75°37'41"E, 994 m, 24-25.xi.2003, J. M. Heraty [2 females, UCRC]. National Capital Territory of Delhi, New Delhi, Indian Agricultural Research Institute, 28°37'51"N 77°09'50"E, 220 m, 6-7.xi.2003, J. M. Heraty [1 female, UCRC]. New Zealand, North Island, Raglan, 37°49'39"S 174°49'28"E, 100 m, 8-21.ii.2006, B. V. Brown [1 female, UCRC]. Thailand, Chiang Mai, Toong Tha Tam, Amphur Mae Wang, 1-10.x.1997, S. Sonthichai [7 females, UCRC].

Hosts: Various planthoppers (Delphacidae) listed by Baquero & Jordana (1999) and Noyes (2015).

Important references: Sahad & Hirashima (1984), Chiappini *et al*. (1996), Triapitsyn & Beardsley (2000), Triapitsyn (2001).

Anagrus (*Paranagrus*) *perforator* (Perkins, 1905)

Coded redescription: 1 Yellow-brown except flagellum, mesoscutum, notauli and axilla dark brown; 2a (2.2: 1.0: 1: 1.3: 1.3: 1.4: 1.3: 1.4: 2.4); 2b (0, 1, 1, 1, 2, 3); 3 (+); 4a (14-15); 4b (+); 4c (1); 5a (3.5-3.6); 5b (1); 5c (3); 6 (-).

Distribution: Australasia: Australia and Papua New Guinea (Triapitsyn, 2001); Oceania: Fiji (Perkins, 1905) and Hawaiian Islands (USA: Hawaii, introduced) (Triapitsyn & Beardsley, 2000); Oriental: Bangladesh (Sahad & Hirashima, 1984), China (Chiappini & Lin, 1998), India (Noyes, 2015), Malaysia (Noyes, 2015), Philippines (Sahad & Hirashima, 1984), Sri Lanka (Trjapitzin & Strong, 1995), *Thailand; Palearctic: Japan (Sahad & Hirashima, 1984). Neotropical records of this species from Cuba, listed by Noyes (2015), need confirmation as misidentifications are likely.

Material examined: Thailand: Chiang Mai, Toong Tha Tam, Amphur Mae Wang, 1-10.x.1997, S. Sonthichai [3 females, UCRC]. Phetchaburi, Kaeng Krachan National Park, Ban Krang, 12°47.896'N 99°27.196'E, 324 m, 24.vi.2008, B. V. Brown [1 female, UCRC].

Hosts: Various Delphacidae listed by Noyes (2015).

Important references: Sahad & Hirashima (1984), Chiappini *et al.* (1996), Chiappini & Lin (1998), Triapitsyn & Beardsley (2000), Triapitsyn (2001).

Anagrus (*Paranagrus*) *unilinearis* Soyka, 1950

Coded redescription: 1 Light yellow with antenna light grey; 2a (2.6: 1.2: 1: 1.3: 1.3: 1.4: 1.5: 1.5: 2.7); 2b (0, 0, 0, 1, 2, 3); 3 (+); 4a (13.8); 4b (+); 4c (1-2); 5a (2.0); 5b (1); 5c (-); 6 (+).

Distribution: Afrotropical: South Africa (Triapitsyn, 1997); Nearctic: USA (Triapitsyn, 2002a); Neotropical: Mexico (Triapitsyn, 1997), Trinidad and Tobago (Triapitsyn, 1997); Palearctic: Bulgaria (Chiappini *et al.*, 1996; Donev, 1998), Egypt (Soyka, 1950), Greece (Donev, 1998), Italy (Triapitsyn & Berezovskiy, 2004).

Material examined: Mexico, Nuevo León: Municipio El Carmen, El Carmen, 10.vii.1983, F. Reyes-Vélez [1 female, UCRC]. San Juan, Río San Juan, 14.vii. 1983, M. A. Rodríguez-Pérez [1 female, UCRC]. USA, Texas, Robertson Co., 8 mi. E of Hearne, 3.vi.1991, M. Hallmark [1 female, UCRC].

Hosts: Unknown.

Important references: Chiappini *et al.* (1996) – redescription; Triapitsyn (1997) – illustration.

Subgenus *A.* (*Anagrus*) *sensu stricto* (*stethynioides* species group)

Anagrus (*Anagrus*) *stethynioides* Triapitsyn, 2002 (Figs 10, 24)

Coded redescription: 1 Yellow to light brown with the following parts darker (brown): transverse trabecula, gena, flagellum (clava dark brown), anterior part of mesoscutum, axilla, propodeum, legs, lateral spots on gastral terga, and tips of ovipositor sheaths; 2a (5.3: 2.5: 1: 1.3: 1.3: 3.0: 3.0: 2.9: 6.2); 2b (0, 0, 2-3, 2-3, 2-3, 6); 3 (+); 4a (4.6-4.9); 4b (+ [2 indistinct spots]); 4c (10-12); 5a (2.5-2.6); 5b (2); 5c (7-9); 6 (+).

Distribution: Nearctic: Mexico, USA; Neotropical: Argentina, Guatemala, Mexico, Trinidad and Tobago (Triapitsyn, 2002a).

Host: *Homalodisca vitripennis* (Germar) (Cicadellidae) (Triapitsyn, 2006).

Subgenus *A.* (*Anagrus*) *sensu stricto* (*atomus* species group)

Anagrus (*Anagrus*) *aegyptiacus* Soyka, 1950

Coded redescription: 1 Yellow-brown with antenna darker and legs lighter; 2a (4.2: 2.1: 1: 2.5: 2.2: 2.6: 2.8: 3.1: 5.8); 2b (0, 0, 0, 1, 2, 3); 3 (-); 4a (10); 4b (-); 4c (4); 5a (3.0-3.3); 5b (1); 5c (5.9-7.1); 6 (+).

Distribution: Palearctic: Egypt (Soyka, 1950).

Hosts: Unknown.

Important reference: Chiappini *et al*. (1996) – redescription.

Anagrus (*Anagrus*) *ainu*
Triapitsyn & Berezovskiy, 2004

Coded redescription: 1 Body and appendages mostly light brown except head, clava, mesoscutum, and basal gastral terga brown, and frenum of the scutellum whitish; 2a (4.85: 2.3: 1: 2.6: 3.05: 3.05: 3.2: 3.2: 6.05); 2b (0, 1, 1, 2, 2, 3); 3 (-); 4a (7.8-8.2); 4b (+); 4c (3 or 4); 5a (2.0-2.2); 5b (1); 5c (20); 6 (-).

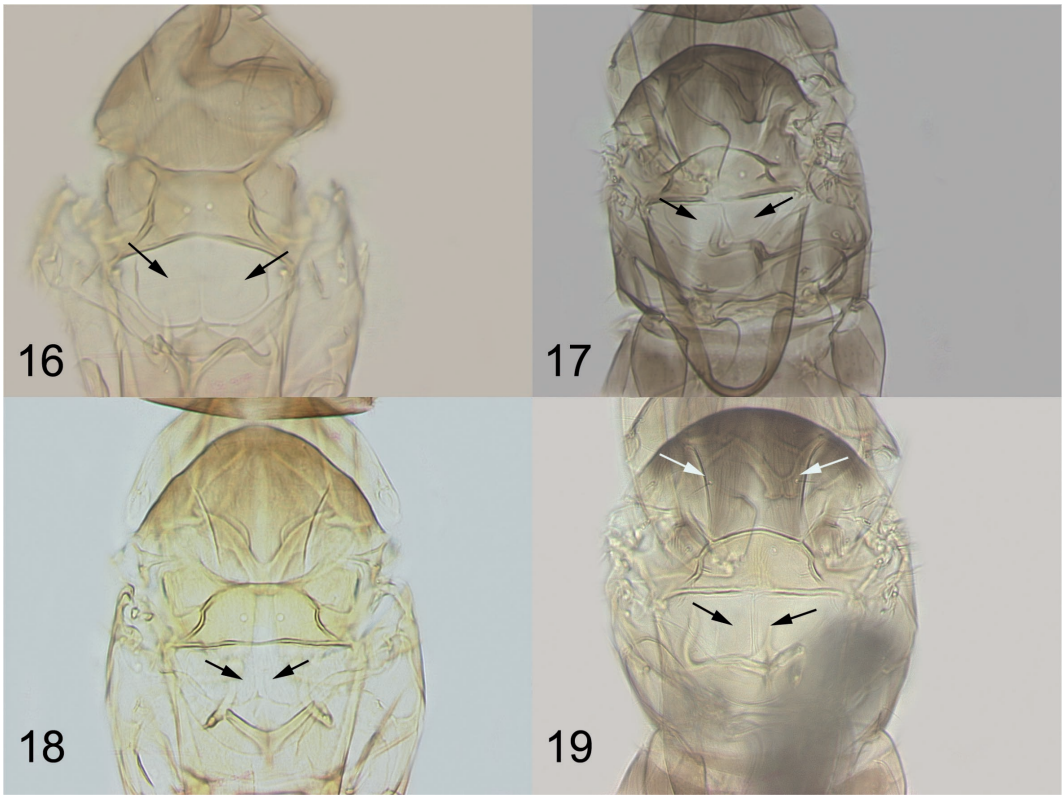
Distribution: Palearctic: Russia (Far East) (Triapitsyn & Berezovskiy, 2004).

Hosts: Unknown.

Anagrus (*Anagrus*) *atomus*
(Linnaeus, 1767) (Fig. 6)

Coded redescription: 1 Yellowish to brown with flagellum and anterior part of mesoscutum brown; 2a (4.3: 2.2: 1: 2.1: 2.2: 2.8: 2.8: 2.9: 6); 2b (0, 0, 1, 1, 2, 3); 3 (-); 4a (6.8-10.0); 4b (+); 4c (3-4); 5a (1.9-2.1); 5b (1); 5c (- or 15); 6 (+).

Distribution: Afrotropical: Cape Verde Islands, *Yemen (Jesu & Viggiani, 2007 [as *A. proscassellatii* Jesu & Viggiani]); Australasia: New Zealand; Nearctic: Canada, USA; Neotropical: Argentina, Chile; Oriental: China, Pakistan; Palearctic: Austria, Belgium, Bulgaria, China, Croatia, Denmark, Egypt, Finland, France, Germany, Greece, Iran, Isra-



Figures 16–19. *Anagrus* spp., mesosomata (black arrows pointing to triangular paramedial plates on frenum of the scutellum, white arrows pointing to adnotaular setae on midlobe of the mesoscutum). (16) *A.* (*Anagrella*) *hirashimai* Sahad, female (Gornotayozhnoye, Primorskiy kray, Russia); (17) *A.* (*Anagrus*) *erythroneurae* S. Trjapitzin & Chiappini, female (paratype, Baja California, Mexico); (18) *A.* (*Anagrus*) *breviphragma* Soyka, female (Castelporziano Presidential Estate, Roma Province, Lazio, Italy); (19) *A.* (*Anagrus*) *tretiakovae* Triapitsyn, male (Las Nutrias, Socorro Co., New Mexico, USA).

el, Italy, Kyrgyzstan, Macedonia, Moldova, Poland, Republic of Korea, Romania, Russia, Serbia, Spain, Sweden, Switzerland, Turkey, Turkmenistan, UK (Triapitsyn & Berezovskiy, 2004; Noyes, 2015).

Hosts: Mostly various Cicadellidae and some Delphacidae, but some records are unconfirmed (see Matteucig & Viggiani, 2008, Noyes, 2015, and Nugnes & Viggiani, 2014).

Important references: Chiappini (1987, 1989), Triapitsyn (1998a), Chiappini & Triapitsyn (2007), Nugnes & Viggiani (2014).

Comments: I examined the holotype of *A. spiritus* Girault (INHS) and found out that it lacks the adnotaular setae on the midlobe of the mesoscutum; thus it is a typical *A. atomus*, hence the synonymy. The information provided and treatment of this species as a valid taxon by Chiappini *et al*. (1996) was incorrect.

Anagrus (*Anagrus*) *baeri*
Girault, 1912 (Fig. 7)

Coded redescription: 1 General body color of live or freshly preserved specimens reddish-brown, that of dead specimens pale to light brown with the following parts darker (brown): stemmaticum, trabeculae, occiput, flagellum (except F1), mesoscutum (especially its anterior half), axilla, gastral terga, and tip of ovipositor; 2a (3.4: 1.6: 1: 1.8: 2.2: 2.1: 2.4: 2.5: 5.4); 2b (0, 1, 1, 1, 2, 3); 3 (-); 4a (7.5-8.3); 4b (-); 4c (5-6); 5a (2.1-2.2); 5b (1); 5c (6-11); 6 (+).

Distribution: Australasia: Australia (Girault, 1912; Triapitsyn, 2001; Triapitsyn & Freebairn, 2005); Oceania: French Polynesia (Tahiti Archipelago) (Triapitsyn, 2001).

Hosts: *Austroasca alfalfae* (Evans) and *Empoasca smithi* Fletcher & Donaldson (Cicadellidae) (Triapitsyn & Freebairn, 2005).

Important references: Trjapitzin (1996) – redescription of the holotype; Triapitsyn (2001) – distribution; Triapitsyn & Freebairn (2005) – redescription of the female and description of the male.

Anagrus (*Anagrus*) *breviclavatus*
Jesu & Viggiani, 2007

Coded redescription: 1 Body mostly brownish except ventral part of mesosoma and metasoma yellowish, scape, pedicel and F1 lighter colored; 2a (6.0: 2.0: 1: 3.0: 2.8: 3.0: 3.0: 3.0: 4.8); 2b (0, 1, 1, 1, 2, 3); 3 (-); 4a (7.5); 4b (-); 4c (6-7); 5a (1.7); 5b (1); 5c (4.6); 6 (-).

Distribution: Afrotropical: Yemen (Jesu & Viggiani, 2007).

Hosts: Unknown.

Anagrus (*Anagrus*) *brevifuniculatus*
Viggiani & Jesu, 1995

Coded redescription: 1 Yellow-brown with head and antenna darker (except pedicel and F1) and legs yellow (except procoxa, meso- and metatibiae and part of metafemur darker); 2a (3.9: 2.2: 1: 1.5: 1.3: 2.0: 2.0: 2.3: 5.4); 2b (0, 0, 1, 1, 1-2, 3); 3 (-); 4a (6.5-7); 4b (+); 4c (2); 5a (2.0); 5b (1); 5c (-); 6 (-).

Distribution: Afrotropical: Cape Verde Islands (Viggiani & Jesu, 1995) and Yemen (Jesu & Viggiani, 2007).

Hosts: Unknown.

Anagrus (*Anagrus*) *elegans*
Chiappini, 2002

Coded redescription: 1 Yellow with head, F2-F6 and clava orange-yellowish, anterior and lateral parts of mesoscutum, axilla, base and lateral apex of gaster and tip of ovipositor brown; 2a (3.7: 1.9: 1: 2.4: 2.2: 2.5: 2.7: 2.5: 4.8); 2b (0, 0-1, 1-2, 1, 2, 3); 3 (-); 4a (12.5); 4b (+); 4c (2-3); 5a (3.0-3.8); 5b (1); 5c (3.7-5.0); 6 (+).

Distribution: Oriental: India, Indonesia, Malaysia, Sri Lanka, Thailand (Chiappini, 2002).

Material examined: India, Goa, Bambolim Beach (S of Panaji), 15°26'46"N 73°51'19"E, 5 m, 15.xi.2003, J. M. Heraty [1 female, UCRC].

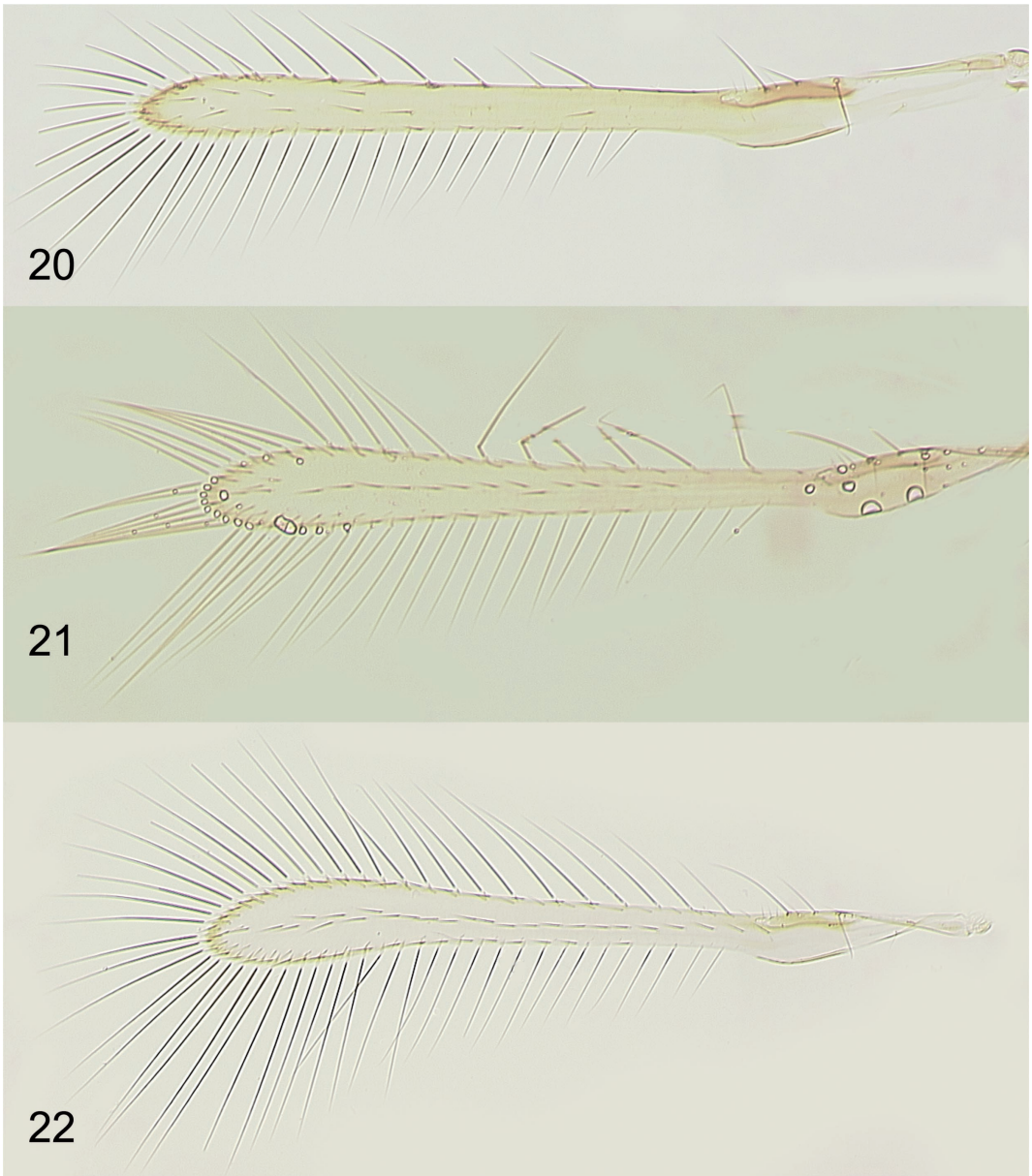
Hosts: *Nephotettix* sp. (Cicadellidae), *Nilaparvata lugens* (Stål) and *Sogatella furcifera* (Horváth) (Delphacidae) (Chiappini, 2002).

Anagrus (*Anagrus*) *erythroneurae* S. Trjapitzin & Chiappini, 1994
(Figs 1, 11, 17)

Coded redescription: 1 Dark brown except scape, pedicel, F1, frenum of scutellum, propodeum and legs light brown to brown; 2a (4.2: 2.1: 1: 2.4: 2.1: 2.4: 2.8: 3.0: 5.6); 2b (0, 0, 0, 1, 2, 3); 3 (-); 4a (7.0-9.0); 4b (+); 4c (2-3); 5a (1.8-2.5); 5b (1); 5c (-); 6 (+).

Distribution: Australasia: ?New Zealand (de León *et al.*, 2008); Nearctic: Canada (Lowery *et al.*, 2007), Mexico, USA (Trjapitzin & Chiappini, 1994; Triapitsyn, 1997, 1998a).

Hosts: *Dikrella cockerellii* (Gillette), *Dikrella* spp. [most probably including *D.*



Figures 20–22. *Anagrus* (*Anagrella*) spp., female fore wings. (20) *A. mymaricornis* (Bakkendorf) (Kőszeg, Vas Co., Hungary); (21) *A. humicola* Mathot (Lamto, Ivory Coast); (22) *A. rilensis* Donev (Bosco di Manziana, Roma Province, Lazio, Italy).

californica (Lawson) and *D. cruentata* (Gillette)], *Edwardsiana prunicola* (Edwards), *Erasmoneura variabilis* (Beamer), *Erythroneura bistrata* McAtee, *Erythroneura comes* (Say), *Erythroneura elegantula* Osborn, and *Zonocyba pomaria* (McAtee) (Cicadellidae) (Triapitsyn, 1998a).

Important references: Trjapitzin (1995) [as *Anagrus* sp. «B»] – correction of previous misidentifications of *A. epos* Girault; Triapitsyn (1998a) – distribution, host association; de León *et al.* (2008) – molecular and morphometric studies.

Anagrus (*Anagrus*) *flaviapex*
Chiappini & Lin, 1998

Coded redescription: 1 Brown except scape, pedicel, F1, scutellum, propodeum and 2 apical gastral terga yellow; 2a (5.8: 2.2: 1: 2.8: 3.2: 3.5: 3.2: 3.3: 6.3); 2b (0, 1, 2, 1, 2, 3); 3 (-); 4a (8.8); 4b (+); 4c (2); 5a (2.1-2.3); 5b (1); 5c (-); 6 (+).

Distribution: Oriental: *Cambodia, China (Chiappini & Lin, 1998), Christmas Island (Australia) (Triapitsyn, 2001), India (Triapitsyn, 1999, 2001), and *Thailand; *Palearctic: *Republic of Korea.

Material examined: Cambodia: Battambang, Preak Toal, 29.iii.2006, O. Yothin [1 female, ISNB]. Siem Reap, Angkor, Preah Khan Temple, 21-28.iii.2006, K. Hout [1 female, ISNB]. Republic of Korea, Kyungki-do, Kwangu, Dochek, Taehwasan, 5.viii.1998, J.-B. Leon, S.-H. Lee [1 female, UCRC]. Thailand, Trang, Khao Chong, Forest Research Station, 7°33'02"N 99°47'23"E, 75 m, 1.iv.2005, D. Lohman [1 female, UCRC].

Hosts: *Amrasca biguttula biguttula* Shiraki *(=Empoasca devastans* Distant), *Empoasca lybica* (de Bergevin & Zanon), and ?*Watara sudra* (Distant) (Cicadellidae) (Triapitsyn, 1999, 2001), and also a rice planthopper (Delphacidae), probably *Sogatella furcifera* (Horváth) (Chiappini & Lin, 1998).

Important reference: Triapitsyn (1999) – description of the male, distribution.

Anagrus (*Anagrus*) *frequens*
Perkins, 1905

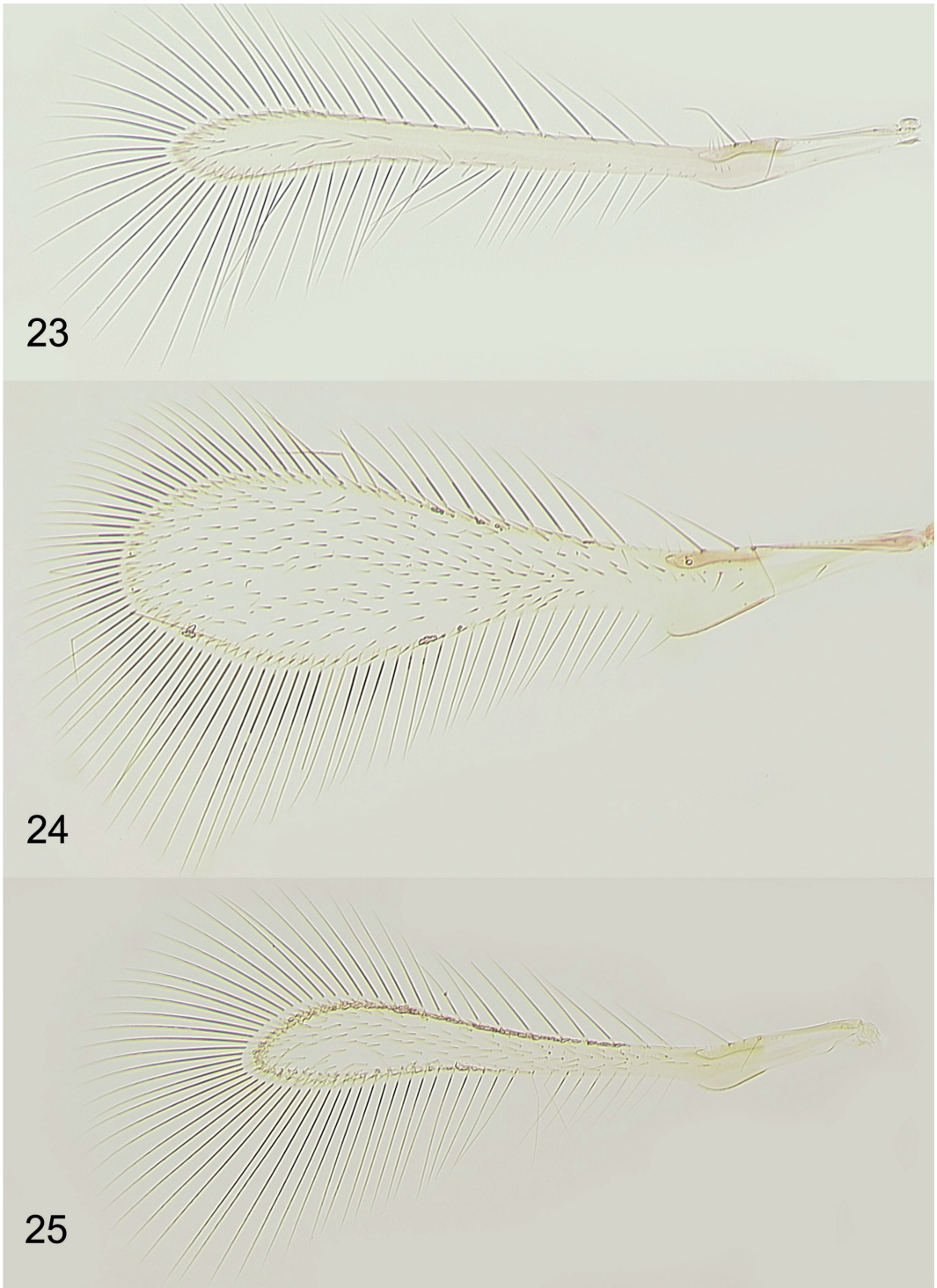
Coded redescription: 1 Yellow or brownish-yellow with F2-F6 and clava light brown or brown; 2a (4.2-4.3: 2.2-2.4: 1: 2.8-3.1: 2.4-2.6: 2.6: 2.8: 2.6-2.8: 5.3-5.8); 2b (0, 0-1, 1, 1, 2, 3); 3 (-); 4a (10.5-12); 4b (+); 4c (2); 5a (2.3-2.7); 5b (1); 5c (5-15); 6 (+).

Distribution: Afrotropical: Democratic Republic of the Congo (Triapitsyn, 1998b), South Africa (Triapitsyn & Beardsley, 2000); Australasia: Australia, New Zealand, Norfolk Island, Papua New Guinea (Triapitsyn, 2001); Oceania: American Samoa, Fiji, French Polynesia (Tahiti Archipelago), Hawaiian Islands (introduced), Northern Mariana Islands (Guam and Saipan Islands) (Triapitsyn, 1997, 2001; Triapitsyn & Berezovskiy, 2004); Neotropical: Colombia, Ecuador, Mexico, Saint Christopher Island (Saint Kitts), Trinidad and Tobago (Triapitsyn, 1997, 2002a); Oriental: China, Christmas Island (Australia), Malaysia, Philippines, Taiwan, Thailand (Triapitsyn, 1997, 2001; Triapitsyn & Berezovskiy, 2004; Noyes, 2015); Palearctic: Japan, Russia (Far East) (Triapitsyn & Berezovskiy, 2004). Triapitsyn (1998b) misidentified one of the two females from the Democratic Republic of the Congo as *A. frequens*.

Material examined: Mexico: Chiapas: Cañon El Sumidero, 16-17.vii.1984, G. Gordh [1 female, UCRC]. Ocozocoautla de Espinoza, Rancho «El Kikapú», 15-12.vii.1984, G. Gordh [4 females, UCRC]. Michoacán, 100 km N of Lázaro Cárdenas, 7.viii.1984, G. Gordh [2 females, UCRC]. Sinaloa, 12 mi. N of Mazatlán, 25.x.1982, J. T. Huber [1 female, UCRC]. Veracruz: 3 mi. N of Cardel by Río Actopan, 31.x.1982, J. T. Huber, A. González-Hernández [1 female, UCRC]. Fortín de las Flores, 30.x.1982, J. T. Huber, A. González-Hernández [1 female, UCRC].

Hosts: Various Cicadellidae and Delphacidae (Noyes, 2015).

Important references: Sahad & Hirashima (1984), Chiappini *et al.* (1996), Triapitsyn (1997, 2001), Chiappini & Lin (1998), Triapitsyn & Beardsley (2000).



Figures 23–25. *Anagrus* spp., female fore wings. (23) *A.* (*Anagrella*) *hirashimai* Sahad (Gornotayozhnoye, Primorskiy kray, Russia); (24) *A.* (*Anagrus*) *stethynioides* Triapitsyn (Chillá, Sacatepéquez, Guatemala); (25) *A.* (*Anagrus*) *setosus* Chiappini & Lin (Gornotayozhnoye, Primorskiy kray, Russia).

Anagrus (*Anagrus*) *japonicus*
Sahad, 1982

Coded redescription: 1 Yellow-grey with vertex, mesonotum and metasomal terga brown-grey, scape and clava grey, and funicle, tibiae and tarsi light brown; 2a (4.2: 2.2: 1: 1.8: 1.4: 2.7: 2.9: 3.1: 5.9); 2b (0, 0, 2, 1, 2, 3); 3 (-); 4a (7.5); 4b (+); 4c (2); 5a (2.1-2.3); 5b (1); 5c (10); 6 (-).

Distribution: Australasia: Australia, Papua New Guinea; Oriental: Christmas Island (Australia); Palearctic: Japan and Russia (Far East) (Triapitsyn, 2001; Triapitsyn & Berezovskiy, 2004).

Hosts: Unknown.

Important reference: Chiappini *et al*. (1996) – redescription.

Anagrus (*Anagrus*) *klop*
Triapitsyn, 2001

Coded redescription: 1 Body and appendages light brown except head and anterior half of mesoscutum slightly darker; 2a (4.45: 3.2: 1: 2.4: 2.0: 2.45: 2.8: 3.45: 6.6); 2b (0, 0, 0, 1, 2, 3); 3 (-); 4a (8.5); 4b (+); 4c (1-2); 5a (2.1); 5b (1); 5c (11); 6 (-).

Distribution: Australasia: Australia (Triapitsyn, 2001).

Hosts: Unknown.

Anagrus (*Anagrus*) *kvas*
Triapitsyn & Berezovskiy, 2004

Coded redescription: 1 Head, mesoscutum and metasoma brown, remainder of mesosoma pale to light brown, appendages light brown except F2-F6 and clava brown; 2a (6.05: 2.5: 1: 3.05: 2.9: 3.2: 3.55: 3.7: 6.3); 2b (0, 0, 1, 2, 2, 3); 3 (-); 4a (7.3-7.7); 4b (-); 4c (5-6); 5a (1.9-2.1); 5b (1); 5c (10-12); 6 (-).

Distribution: Palearctic: China and Russia (Far East) (Triapitsyn & Berezovskiy, 2004).

Hosts: Unknown.

Anagrus (*Anagrus*) *lindberginae*
Nugnes & Viggiani, 2014

Coded redescription: 1 Brown except head and pronotum darker, scape, pedicel, F1-F4, scutellum and legs yellowish to light brown; 2a (3.55: 2.2: 1: 2.35: 2.0: 2.3: 2.55: 2.7: 5.15); 2b (0, 0, 0, 1-2, 1-2, 3); 3 (-); 4a (8.8); 4b (+); 4c (2-4); 5a (1.4-1.6); 5b (1); 5c (-); 6 (+).

Distribution: Palearctic: Italy (Nugnes & Viggiani, 2014).

Host: *Lindbergina aurovittata* (Douglas) (Cicadellidae) (Nugnes & Viggiani, 2014).

Anagrus (*Anagrus*) *longifrangiatus*
Jesu & Viggiani, 2007

Coded redescription: 1 Body yellowish except head and metasoma brownish, scape and pedicel yellowish, flagellum darker; 2a (4.7: 2.7: 1: 2.3: 2.0: 2.7: 2.7: 3.3: 6.0); 2b (0, 0, 0, 1, 2, 3); 3 (-); 4a (9.0); 4b (-); 4c (4); 5a (1.9); 5b (1); 5c (5.7); 6 (+).

Distribution: Afrotropical: Yemen (Jesu & Viggiani, 2007).

Hosts: Unknown.

Anagrus (*Anagrus*) *longitibialis*
Donev, 1996

Coded redescription: 1 Head, mesoscutum and metasoma brown, mesosoma yellowish, antenna light brown except scape, pedicel, and F1 light yellow, legs light yellow except tibiae light brown; 2a (4.3: 2.0: 1: 3.0: 3.3: 3.3: 3.0: 3.3: 5.7); 2b (0, 1, 1, 1, 2, 3); 3 (-); 4a (7.3); 4b (+); 4c (3); 5a (1.5-1.6); 5b (1); 5c (-); 6 (-).

Distribution: Palearctic: Bulgaria (Chiappini *et al*., 1996) and Italy (Triapitsyn & Berezovskiy, 2004).

Hosts: Unknown.

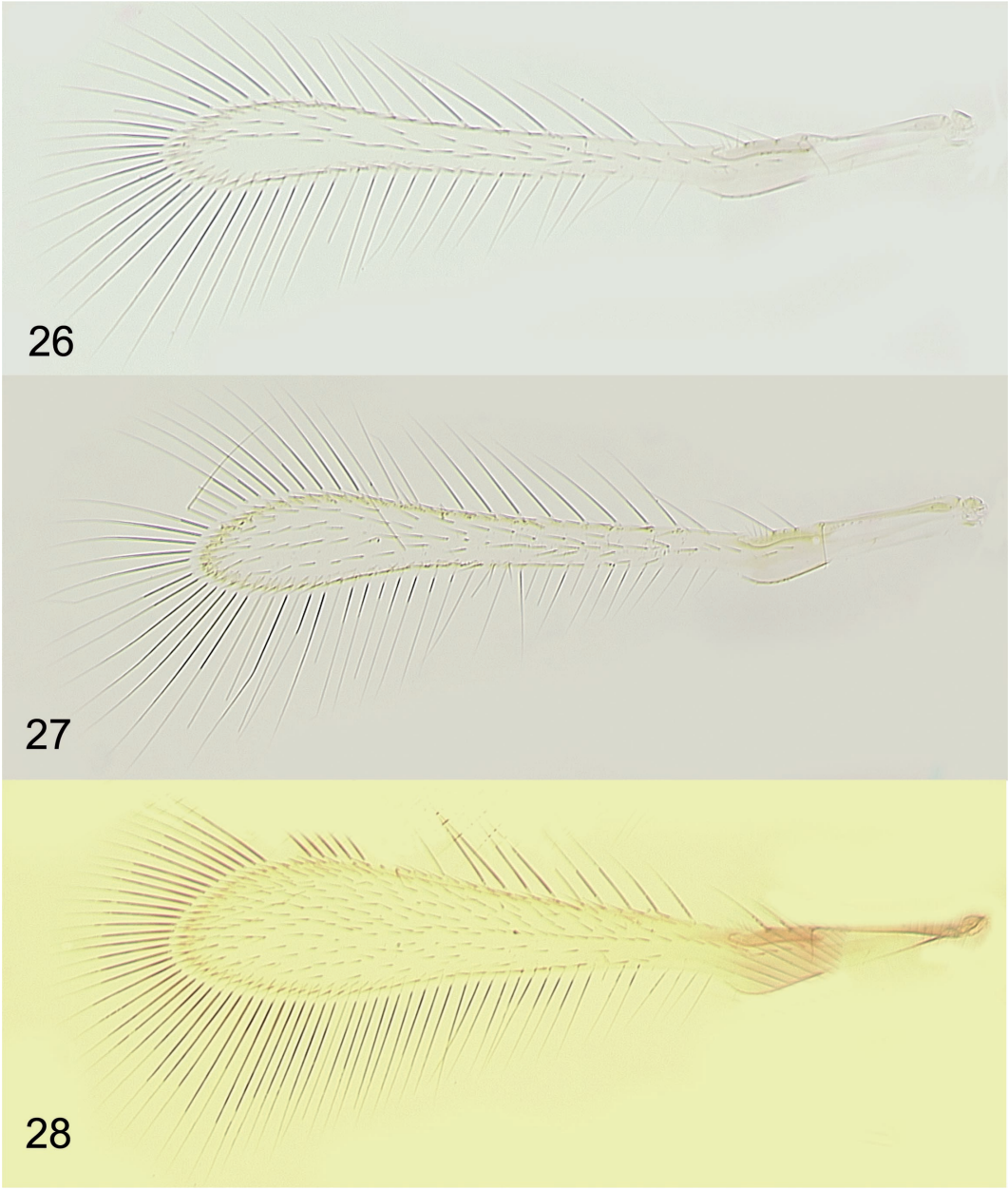
Anagrus (*Anagrus*) *parvus*
Soyka, 1956
(= *A. ustulatus* Haliday, 1833
sensu Chiappini, 1989,
see Viggiani, 2014)

Coded redescription: 1 Brown; 2a (3.5: 2.0: 1: 2.1: 1.8: 2.1: 2.4: 2.6: 5.2); 2b (0, 0, 0, 1, 2, 3); 3 (-); 4a (6.9-9.8); 4b (+); 4c (3-5); 5a (1.7-2.5); 5b (1); 5c (-); 6 (+).

Distribution: Australasia: New Zealand; Neotropical: Argentina, Chile; Palearctic: Belgium, Bulgaria, France, Ireland, Israel, Italy, Kyrgyzstan, Netherlands, Russia, Spain, Sweden, UK (Triapitsyn & Berezovskiy, 2004; Noyes, 2015).

Hosts: *Agalmatium flavescens* (Oliver), *Edwardsiana froggatti* (Baker), *E. rosae* (Linnaeus), *Ribautiana tenerrima* (Herrich-Schäffer), *Empoasca vitis* (Göthe), *Zygina rhamni* Ferrari (Cicadellidae) (Triapitsyn & Teulon, 2002; Triapitsyn & Berezovskiy, 2004; de León *et al*., 2008; Noyes, 2015) as well as other leafhoppers indicated by Matteucig & Viggiani (2008).

Important references: Chiappini (1987, 1989); Triapitsyn & Berezovskiy (2004) – distribution; de León *et al*. (2008) – molecu-



Figures 26–28. *Anagrus* (*Anagrus*) spp., female fore wings. (26) *A. breviphragma* Soyka (Castelporziano Presidential Estate, Roma Province, Lazio, Italy); (27) *A. incarnatus* Haliday (Uppsala, Uppsala Co., Sweden); (28) *A. puella* Girault (Rio Nido, Sonoma Co., California, USA).

lar and morphometric studies; Nugnes & Viggiani (2014), Viggiani (2014).

Anagrus (*Anagrus*) *scassellatii* Paoli, 1930

Coded redescription: 1 Light yellow with flagellum brown, gradually darker towards clava and, often, with anterior part of mesoscutum and metasoma brown; 2a (4.5: 2.2: 1: 3.3: 3: 3.2: 3.1: 3.0: 5.8); 2b (1-2, 2, 2, 2, 2, 3); 3 (+); 4a (7.5); 4b (+); 4c (2); 5a (1.3); 5b (1); 5c (-); 6 (+).

Distribution: Afrotropical: Cape Verde Islands (Viggiani & Jesu, 1995), Somalia (Paoli, 1930), *Sudan, and Yemen (Jesu & Viggiani, 2007).

Material examined: Sudan, Al Gezira, Wad Madani, vii.1932, A. P. G. Michelmore (on *Lablab purpureus*) [1 female, BMNH].

Hosts: *Empoasca* (*Matsumurasca*) *dolichi* Paoli and *Jacobiasca facialis* (Jacobi) (Cicadellidae) (Paoli, 1930).

Anagrus (*Anagrus*) *sensillatus* Viggiani & Jesu, 1995

Coded redescription: 1 Yellow-brown with flagellum, apical tarsomeres, midlobe of mesoscutum, metasomal terga and third valvulae darker; 2a (5.1: 1.9: 1: 2.4: 2.4: 2.8: 2.9: 2.9: 5.2); 2b (0-1, 2, 2, 2, 2, 3); 3 (-); 4a (7.5-8); 4b (-); 4c (5-6); 5a (2.4); 5b (1); 5c (-); 6 (+).

Distribution: Afrotropical: Cape Verde Islands (Viggiani & Jesu, 1995), *Gabon, and Yemen (Jesu & Viggiani, 2007).

Material examined: Gabon, Estuaire, N'toum, vii.1984, A. Puuli [1 female, IEFA].

Hosts: Unknown.

Anagrus (*Anagrus*) *setosus* Chiappini & Lin, 1998 (Fig. 25)

Coded redescription: 1 Brown except scape, pedicel, F1-F4, legs, posterior half of mesoscutum, scutellum, metanotum and propodeum light yellow; 2a (4.3: 1.9: 1: 2.9: 2.9: 3.0: 3.1: 2.9: 4.6); 2b (0, 1, 2, 2, 2, 3); 3 (-); 4a (8); 4b (-); 4c (-); 5a (1.4-1.6); 5b (1); 5c (-); 6 (-).

Distribution: Oriental: China (Chiappini & Lin, 1998), Nepal (Triapitsyn & Berezovskiy, 2004), Taiwan (Triapitsyn & Berezovskiy, 2004); Palearctic: Russia (Far East) (Triapitsyn & Berezovskiy, 2004).

Hosts: Unknown.

Anagrus (*Anagrus*) *vilis* Donev, 1989

Coded redescription: 1 Brown with scape, pedicel and mesosoma yellow; 2a (5: 2.5: 1: 2.5: 2.5: 3: 3: 3.5: 6.5); 2b (0, 0, 0, 1, 2, 3); 3 (+); 4a (8.6); 4b (+); 4c (3-4); 5a (2.4); 5b (1); 5c (14); 6 (+).

Distribution: Palearctic: Bulgaria (Donev, 1989) and Spain (Chiappini *et al.*, 1996).

Hosts: Unknown.

Important reference: Chiappini *et al.* (1996) – redescription.

Subgenus *A.* (*Anagrus*) *sensu stricto* (*incarnatus* species group)

Anagrus (*Anagrus*) *amazonensis* Triapitsyn, Querino & Feitosa, 2008

Coded redescription: 1 Body mostly brown except frenum of scutellum whitish and gastral terga partially light brown, appendages light brown except flagellum brown; 2a (5.3: 2.5: 1: 2.5: 2.4: 2.9: 3.0: 3.25: 6.4); 2b (0, 0, 1, 1, 2, 5); 3 (+); 4a (11.0-11.1); 4b (+); 4c (1); 5a (2.0–2.1); 5b (2); 5c (15-20); 6 (+).

Distribution: Neotropical: Brazil (Triapitsyn *et al.*, 2008).

Host: An unknown species of Zygoptera (Odonata) (Triapitsyn *et al.*, 2008).

Anagrus (*Anagrus*) *antipodus* Triapitsyn, 2001

Coded redescription: 1 Body pale to light brown, with the following parts darker: head, mesoscutum, axilla, ovipositor sheaths, and basal and subapical gaster terga, appendages light brown to brown except scape and pedicel pale; 2a (2.6: 1.35: 1: 2.0: 1.75: 1.7: 1.6: 1.6: 3.4); 2b (0, 0, 2, 1, 2, 5); 3 (+); 4a (9.9-11.7); 4b (+); 4c (1); 5a (3.3-3.6); 5b (1-2); 5c (3.3-4.1); 6 (-).

Distribution: Australasia: Australia; Oriental: Christmas Island (Australia) (Triapitsyn, 2001).

Hosts: Unknown.

Anagrus (*Anagrus*) *armatus*
(Ashmead, 1887) (Fig. 33)

Coded redescription: 1 General color light brown, head (except face), flagellum, anterior half of mesoscutum, basal terga of gaster, and ovipositor sheaths darker (brown); 2a (4.1: 2.1: 1: 3.3: 3.0: 3.0: 2.9: 2.6: 5.0); 2b (0, 1, 1, 2, 2, 5); 3 (+); 4a (10.5); 4b (+); 4c (1-3); 5a (3.7); 5b (2); 5c (3.5-3.7); 6 (-).

Distribution: Nearctic: USA (Ashmead, 1887); Neotropical: *Costa Rica, Puerto Rico (USA) (Triapitsyn, 2002a).

Material examined: Costa Rica, Puntarenas, Finca La 45 (near Esterillos Oeste), 9°31'55"N 84°29'25"W, 12-26.ix.2011, P. Hanson (in rice field) [1 female, UCRC]. USA, Florida: Jefferson Co., Monticello, University of Florida North Florida Research & Education Center, 5.x.2001, R. Mizell, III [1 female, UCRC]. Orange Co., Orlando, University of Central Florida MacKay Tract, 18.i.1999, P. Russell, S. Fullerton [1 female, UCRC].

Hosts: Unknown.

Important references: Chiappini *et al*. (1996) – redescription; Triapitsyn (2002a) – redescription, distribution.

Anagrus (*Anagrus*) *avalae*
Soyka, 1956

Coded redescription: 1 Light yellow except clava and mesoscutum partially a little darker; 2a (3.9: 2.0: 1: 2.0: 1.8: 2.4: 2.2: 2.4: 5.4); 2b (0, 0-1, 1, 0-1, 1-2, 5); 3 (+); 4a (7.0); 4b (-); 4c (6-7); 5a (1.9-2.3); 5b (2); 5c (-); 6 (+).

Distribution: Australasia: Australia, New Zealand (Triapitsyn, 2001; Triapitsyn & Teulon, 2002); Nearctic: Canada, USA (Triapitsyn & Berezovskiy, 2004); Neotropical: Chile (Noyes, 2015) (unconfirmed); Palearctic: Belgium, Bulgaria, France, Germany, Greece, Iran, Italy, Netherlands, Russia, Serbia, Sweden, UK (Triapitsyn & Berezovskiy, 2004; Noyes, 2015).

Hosts: Various Cicadellidae listed by Triapitsyn & Berezovskiy (2004) and Noyes (2015).

Important references: Chiappini & Triapitsyn (1999) – redescription; Triapitsyn (2001) and Triapitsyn & Berezovskiy (2004) – distribution.

Anagrus (*Anagrus*) *bakkendorfi*
Soyka, 1946

Coded redescription: 1 Light brown except anterior part of mesoscutum and notauli darker; 2a (3.4: 1.8: 1: 1.9: 1.8: 2.5: 2.3: 2.4: 5.0); 2b (0, 0, 1, 0-1, 2, 5); 3 (+); 4a (7); 4b (-); 4c (6-7); 5a (2.6-3.2); 5b (2); 5c (7); 6 (+).

Distribution: Palearctic: Germany, Netherlands, Poland, Romania, UK (England) (Triapitsyn & Berezovskiy, 2004), as well as *France and *Spain.

Material examined: France, Gironde, Sainte Colombe, 44°54'N 0°02'W, 13.viii.1998, M. van Helden [1 female, UCRC]. Spain, Navarre, Iratibizkar, 1120 m, E. Baquero (in *Fagus sylvatica* forest): 23.viii.2000 [5 females, UCRC]; 7.ix.2000 [1 male, UCRC].

Hosts: Unknown.

Important references: Chiappini (1989) – redescription; Triapitsyn & Berezovskiy (2004) – comments, distribution.

Anagrus (*Anagrus*) *brasiliensis*
Triapitsyn, 1997 (Fig. 12)

Coded redescription: 1 Brown except head, pronotum and mesoscutum dark brown; 2a (5.4: 2.5: 1: 1.1: 2.2: 2.6: 2.5: 2.7: 5.6); 2b (0, 1-2, 1-2, 1-2, 1-2, 5); 3 (+); 4a (10.0-11.0); 4b (+); 4c (1-2); 5a (2.4-2.5); 5b (2); 5c (11); 6 (+).

Distribution: Neotropical: Brazil (Triapitsyn, 1997).

Hosts: Unknown.

Anagrus (*Anagrus*) *breviphragma*
Soyka, 1956 (Figs 18, 26, 35)

Coded redescription: 1 Light brown-reddish or orange-yellow except head, F2-F6, clava, mesoscutum, notauli, axilla, and proximal and distal terga of metasoma

brown, scutellum yellow; 2a (3.6: 1.7: 1: 3.0: 2.4: 2.4: 2.3: 2.2: 4.2); 2b (0, 1, 1, 2, 2, 5); 3 (-); 4a (7.6); 4b (+); 4c (3); 5a (2.7-3.0); 5b (3); 5c (16); 6 (+).

Distribution: Nearctic: Mexico (Moya-Raygoza *et al.*, 2014); Neotropical: Argentina, Brazil, Colombia, Guadeloupe, Guyana; Palearctic: Austria, Belgium, Bulgaria, China, France, Germany, Greece, Hungary, Italy, Japan, Kyrgyzstan, Romania, Russia, Sweden, UK (Triapitsyn, 1997, 2002a; Triapitsyn & Berezovskiy, 2004; Noyes, 2015).

Material examined: Mexico, Jalisco, Zapopan, G. Moya-Raygoza (from eggs of *Dalbulus maidis* (DeLong) on maize, *Zea mays*): 10.ix.2008 [12 females, 5 males, UCRC]; 20.viii.2009 [1 female, 1 male, UCRC].

Hosts: *Agalliana ensigera* Oman, *Chlorotettix fraterculus* (Berg), *Cicadella viridis* (Linnaeus), *Ciminius platensis* (Berg), *Dalbulus elimatus* (Ball), *Dalbulus maidis* (DeLong), *Dechacona missionum* (Berg), *Exitianus obscurinervis* (Stål), *Hortensia similis* (Walker), *Xerophloea viridis* (Fabricius) (Cicadellidae), *Conomelus anceps* (Germar), *Delphacodes kuscheli* Fennah, *Dicranotropis hamata* (Boheman), *Muellerianella fairmairei* (Perris), *Peregrinus maidis* (Ashmead) (Delphacidae), and *Orthotylus virescens* (Douglas & Scott) (Miridae) (Triapitsyn & Berezovskiy, 2004; Luft Albarracin *et al.*, 2009; Moya-Raygoza *et al.*, 2014; Noyes, 2015).

Important references: Chiappini (1989) – redescription; Triapitsyn (1997) – distribution, illustrations; Triapitsyn & Berezovskiy (2004) – distribution.

Anagrus (*Anagrus*) *brocheri*
Schulz, 1910

Coded redescription: 1 Brown or dark brown except pedicel and F1 light brown; 2a (3.7: 1.7: 1: 2.4: 2.0: 2.2: 2.1: 2.2: 4.3); 2b (0, 0, 1, 1, 2, 5); 3 (+); 4a (9.4); 4b (-); 4c (4); 5a (2.6); 5b (3); 5c (10); 6 (+).

Distribution: Palearctic: Austria, Belgium, Bulgaria, ?Denmark, Greece, Italy, Kazakhstan, Kyrgyzstan, Macedonia, Netherlands, Russia (Far East), Switzerland (Triapitsyn & Berezovskiy, 2004).

Hosts: *Coenagrion pulchellum* (Vander Linden), ?*Erythromma najas* (Hansemann) (Coenagrionidae); ?*Lestes* sp. and *Sympecma paedisca* (Brauer) (Lestidae) (Triapitsyn & Berezovskiy, 2004).

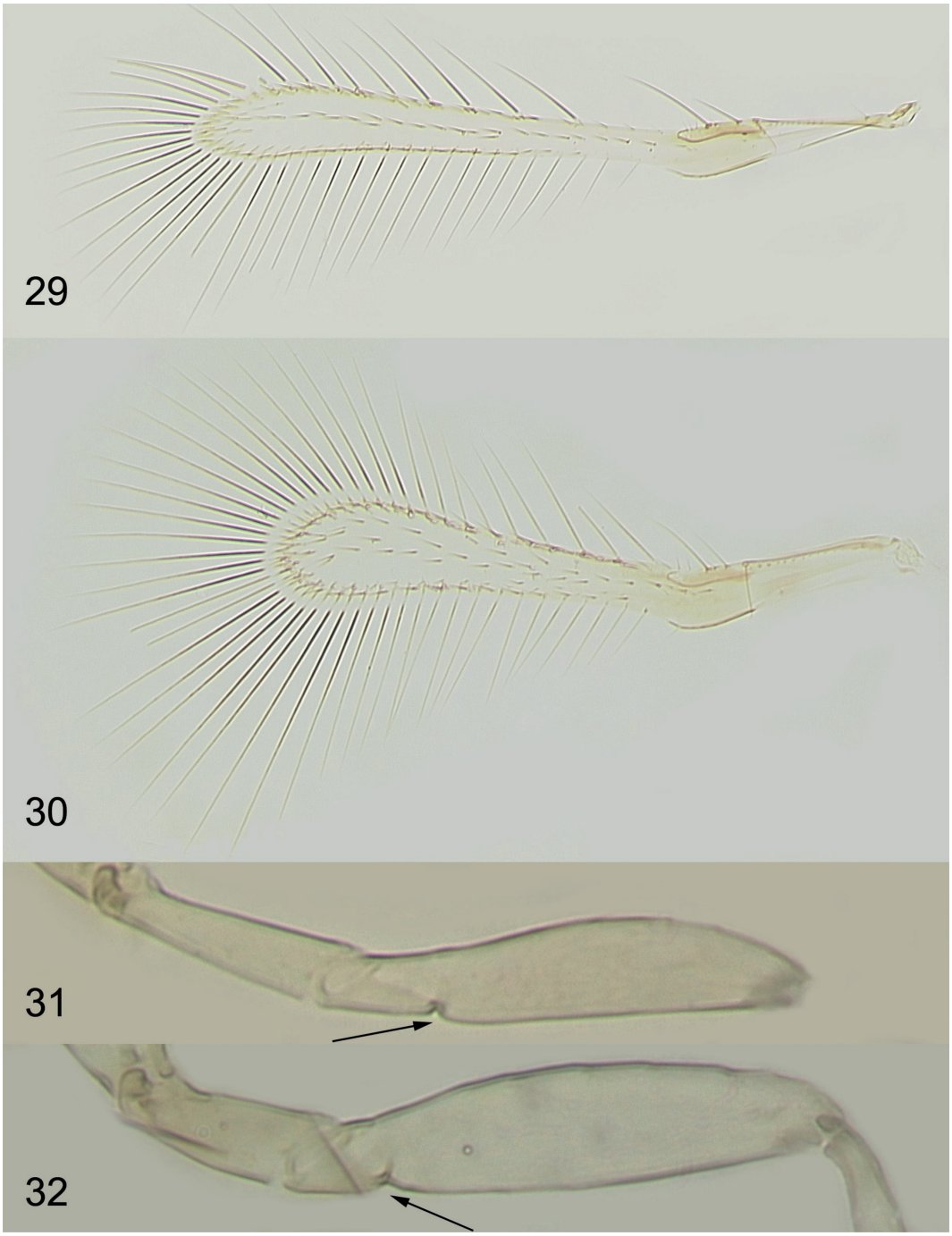
Important references: Chiappini (1989) – redescription; Triapitsyn & Berezovskiy (2004) – distribution, host associations, comments.

Anagrus (*Anagrus*) *columbi*
Perkins, 1905

Coded redescription: 1 Smoky yellow except head, F4-F6, clava and mesonotum darker; 2a (4.4: 2.0: 1: 3.0: 2.5: 2.5: 2.5: 2.6: 5.2); 2b (0, usually 0 but occasionally 1, 1, 1, 2, 5); 3 (-); 4a (9.0); 4b (-); 4c (4-5); 5a (2.7); 5b (3); 5c (7); 6 (+).

Distribution: Oceania: ?Hawaiian Islands (Triapitsyn & Beardsley, 2000); Nearctic: Mexico (Moya-Raygoza & Becerra-Chiron, 2014) and USA (Perkins, 1905; Chiappini *et al.*, 1996).

Material examined: Mexico, Jalisco, Zapopan, 20°44'N 103°30'W, 1662 m, 20.iv.2013, G. Moya-Raygoza (from eggs of *Dalbulus maidis* (DeLong) on *Zea mays* ssp. *mays*) [1 female, CZUG]. USA: Arizona, Cochise Co., Chiricahua Mountains, Rucker Lake, 29.viii.1979, J. LaSalle [1 female, UCRC]. California: El Dorado Co., Barsotti Ranch (near Camino), 15.viii.1995, M. S. Moratorio, S. V. Triapitsyn (on grasses in pear orchard) [1 female, UCRC]. Fresno Co., Parlier, 5.iv.1973, R. L. Doutt [1 female, EMEC]. Madera Co., Madera, Radoicich Vineyard, 9.iv.1996, K. M. Daane [2 females, UCRC]. San Bernardino Co., Cajon Junction, 4.x.1984, T. Miklasiewicz (from leafhopper egg on *Baccharis* sp.) [1 female, UCRC]. Tuolumne Co., Yosemite National Park, Tioga Road, Smoky Jack Campground, 5.vii.1946, S. D. Mulaik [1 female, EMEC]. Colorado, Mesa Co., Palisade, 13-15.vii.2005, S. V. Triapitsyn (on grapevine) [1 female, UCRC]. North Dakota, Grand Forks Co., 15 km W of Grand Forks on Hwy. 2, 5-15.vi.1998, J. T. Cronin (from eggs of



Figures 29–32. *Anagrus* spp., females. (29) *A.* (*Anagrus*) *lineolus* Triapitsyn, fore wing (Uruaçu, Goiás, Brazil); (30) *A.* (*Anagrus*) *takeyanus* Gordh, fore wing (Lansdale, Montgomery Co., Pennsylvania, USA); (31) *A.* (*Paranagrus*) *optabilis* (Perkins), metatrochanter and metafemur (Blundells Creek, Australian Capital Territory, Australia); (32) *A.* (*Anagrus*) *incarnatus* Haliday, metatrochanter and metafemur (Uppsala, Uppsala Co., Sweden). In Figs 31 and 32, arrows point to the trochantellus incision.

Prokelisia crocea (Van Duzee) in leaves of prairie cordgrass, *Spartina pectinata*) [2 females, 2 males, UCRC]. Ohio, Wayne Co., Snyder Farm, v-vi.1992, T. Miklasiewicz [1 male, CNC]. Wyoming, Sheridan Co., Story, 3.viii.1983, G. Gordh [1 female, UCRC].

Hosts: *Dalbulus maidis* (DeLong) (Cicadellidae) (Moya-Raygoza & Becerra-Chiron, 2014), «?*Liburnia* sp.» (Perkins, 1905) and *Prokelisia crocea* (Van Duzee) (Cronin, 2003) (Delphacidae), and also an unknown Coenagrionidae (Odonata: Zygoptera) of the tentatively identified specimens from the Hawaiian Islands (Triapitsyn & Beardsley, 2000).

Important references: Chiappini *et al*. (1996) – redescription; Triapitsyn & Beardsley (2000) – redescription, illustrations.

Anagrus (*Anagrus*) *daanei*
Triapitsyn, 1998

Coded redescription: 1 Yellow or very light brown except head, anterior part of mesoscutum and base of metasoma (dorsally) darker (brown to dark brown), appendages light brown, antennomeres darkening gradually towards dark brown clava; 2a (4.4: 2.1: 1: 2.4: 2.3: 2.6: 2.4: 2.7: 5.8); 2b (0, 0-1, 1-2, 0-1, 1-2, 5); 3 (+); 4a (7.2-7.9); 4b (+); 4c (1-3); 5a (1.8-2.2); 5b (2 [rarely 3]); 5c (9-15); 6 (+).

Distribution: Nearctic: Canada and USA (Triapitsyn, 1998a; Lowery *et al*., 2007).

Hosts: ?*Dikrella* spp., *Edwardsiana rosae* (Linnaeus), *Erasmoneura variabilis* (Beamer), *Erythroneura anfracta* Beamer, *Erythroneura bistrata* McAtee, *Erythroneura comes* (Say), *Erythroneura elegantula* Osborn, *Erythroneura ziczac* Walsh, and ?*Zonocyba pomaria* (McAtee) (Cicadellidae) (Triapitsyn, 1998a; Triapitsyn *et al*., 2010).

Important references: Trjapitzin (1995) [as *Anagrus* sp. «A»] – correction of previous misidentifications of *A. epos* Girault; Triapitsyn *et al*. (2010) – distribution, molecular characterization.

Anagrus (*Anagrus*) *delicatus*
Dozier, 1936

Coded redescription: 1 Light brown (body paler ventrally) except scape, pedicel and F1 pale; 2a (3.5: 1.7: 1: 3.8: 3.3: 3.0: 2.7: 2.7: 4.6); 2b (0, 0, 1, 1, 2, 5); 3 (-); 4a (9.5-9.8); 4b (- or +); 4c (2-3); 5a (4.6-4.8); 5b (2); 5c (3.3-3.5); 6 (+).

Distribution: Nearctic: USA (Chiappini *et al*., 1996).

Hosts: Unknown.

Important reference: Chiappini *et al*. (1996) – redescription.

Anagrus (*Anagrus*) *empanadus*
Triapitsyn, 2011

Coded redescription: 1 Face and vertex yellow except trabeculae and stemmaticum dark brown, scape and pedicel light brown, flagellum brown, pronotum pale, mesoscutum brown, anterior scutellum light brown, frenum of scutellum lemon yellow, propodeum yellow except brown medially, legs mostly light brown, median and apical gastral terga yellow, remainder of gastral terga brown, ovipositor sheaths light brown; 2a (5.2: 2.3: 1: 3.2: 2.5-2.6: 2.9: 2.7: 3.05: 5.9); 2b (0, 0, 1, 0, 2, 5); 3 (+); 4a (10.1–10.7); 4b (+); 4c (1); 5a (4.4); 5b (2); 5c (2.7-2.8); 6 (+).

Distribution: Neotropical: Argentina (Triapitsyn *et al*., 2011).

Host: *Megamelus scutellaris* Berg (Delphacidae) (Triapitsyn *et al*., 2011).

Anagrus (*Anagrus*) *empoascae*
Dozier, 1932

Coded redescription: 1 Pale yellow except head, F2-F6, clava, anterior part of mesoscutum and metasoma darker; 2a (4.1: 1.9: 1: 2.3: 2.3: 2.5: 2.4: 2.7: 5.0); 2b (0, 1, 1, 1, 2, 5); 3 (+); 4a (7.8-8.7); 4b (+); 4c (3-5); 5a (2.2-2.4); 5b (3); 5c (6-9); 6 (+).

Distribution: Nearctic: Mexico and USA; Neotropical: Argentina, Brazil, Haiti, Honduras, Mexico, Trinidad and Tobago, Venezuela [also an unconfirmed record from Cuba (Noyes, 2015)]; Oceania: Hawaiian Islands (Triapitsyn, 1997, 2002a; Triapitsyn & Beardsley, 2000).

Material examined: Mexico, Chiapas: Palenque, 23.vii.1984, G. Gordh [1 female, UCRC]. Guerrero, 30 km N of Acapulco, 6.viii.1984, G. Gordh [1 female, UCRC]. Morelos: Amatlán de Quetzalcóatl, 29.x.1982, J. T. Huber [1 female, UCRC]. Tlayacapan, 29.x.1982, A. González-Hernández [1 female, UCRC]. Nuevo León: 5 km W of Bustamante, 13.vii.1983, A. González-Hernández [1 female, UCRC]. Municipio El Carmen, San Juan, Río San Juan, 14.vii.1983, M. A. Rodríguez-Pérez [1 female, UCRC]. Municipio Santiago, El Cercado, Hacienda Las 3 Blanquitas, 9.vii.1983, F. Reyes-Vélez [3 females, UCRC]. Sinaloa: 3 mi. NW of Guamúchil, 23.x.1982, A. González-Hernández, J. T. Huber [1 female, UCRC]. 50 km N of Los Mochis, 11.viii.1984, G. Gordh [2 females, UCRC]. 12 mi. N of Mazatlán, 25.x.1982, J. T. Huber [2 females, UCRC]. Veracruz: 3 mi. N of Cardel by Río Actopan, 31.x.1982, J. T. Huber, A. González-Hernández [2 females, UCRC]. Fortín de las Flores, 30.x.1982, J. T. Huber, A. González-Hernández [2 females, UCRC]. 33 mi. S of Nautla, 31.x.1982, J. T. Huber, A. González-Hernández [1 female, UCRC].

Hosts: *Empoasca erigeron* DeLong, *E. fabalis* DeLong, *E. kraemeri* Ross & Moore, and *Empoasca* spp. (Cicadellidae), and *Halticus bractatus* (Say) (Miridae) (Triapitsyn, 1997, 2002a).

Important references: Triapitsyn (1997) – redescription; Triapitsyn & Beardsley (2000) – illustrations.

Anagrus (*Anagrus*) *ensifer*
Debauche, 1948 (Fig. 34)

Coded redescription: 1 Light brown with head and metanotum darker and pedicel lighter; 2a (2.7: 1.5: 1: 2.3: 2.3: 2.2: 2.1: 2.0: 3.5); 2b (0, 0, 1, 2, 2, 5); 3 (+); 4a (9.9); 4b (-); 4c (4-5); 5a (3.9-4.0); 5b (2-3); 5c (2.7-3.0); 6 (-).

Distribution: Palearctic: Belgium, Denmark, France, Germany, Greece, Italy, Russia, Sweden, and UK (Triapitsyn & Berezovskiy, 2004).

Hosts: *Conomelus anceps* (Germar) and *Muellerianella fairmairei* (Perris) (Delphacidae) (Triapitsyn & Berezovskiy, 2004).

Important references: Chiappini (1989) – redescription; Triapitsyn & Berezovskiy (2004) – distribution, host associations.

Anagrus (*Anagrus*) *epos*
Girault, 1911

Coded redescription: 1 Bright yellow except head, flagellum, and sometimes mesoscutum and metasomal terga darker; 2a (5.2: 2.3: 1: 2.6: 2.5: 2.5: 2.6: 3.1: 5.9); 2b (0, 1 [usually, occasionally without], 1, 1, 2, 5); 3 (+); 4a (7.9-8.6); 4b (+); 4c (1-3); 5a (2.8-3.1); 5b (3); 5c (5-10); 6 (+).

Distribution: Nearctic: USA (Triapitsyn *et al.*, 2010).

Hosts: *Cuerna fenestella* Hamilton as well as *Homalodisca vitripennis* (Germar) under laboratory conditions only (Cicadellidae) (Triapitsyn, 2006; Triapitsyn *et al.*, 2010).

Important references: Chiappini *et al.* (1996) – redescription, comments; Triapitsyn (1998a) – redescription; Triapitsyn *et al.* (2010) – diagnosis, corrections on distributional records and host associations, molecular characterization.

Anagrus (*Anagrus*) *fennicus*
Soyka, 1956

Coded redescription: 1 Black with head and antenna dark brown except apex of scape, pedicel and F1 lighter, and a yellow median spot along posterior margin of scutellum and a bright yellow frenum of scutellum; 2a (2.8: 1.2: 1: 1.9: 1.8: 1.75: 1.7: 1.6: 2.9); 2b (0, 2, 2, 2, 2, 5); 3 (+); 4a (9.0); 4b (-); 4c (6-7); 5a (2.1); 5b (3); 5c (- or 10); 6 (+).

Distribution: Afrotropical: *South Africa (Heqvist, 1960 [as *A. capensis* Heqvist]); Palearctic: Belgium, Finland, Italy, Kyrgyzstan, Russia, Sweden, UK (England, Wales) (Triapitsyn & Berezovskiy, 2004).

Host: *Cicadella viridis* (Linnaeus) (Cicadellidae) (Chiappini *et al.*, 1999).

Important references: Chiappini (1989) – redescription; Triapitsyn & Berezovskiy (2004) – distribution, brief diagnosis.

Anagrus (*Anagrus*) *fisheri*
Donev, 1998

Coded redescription: Light brown except head, F2-F6, clava, mesoscutum and metasomal terga darker, legs, scape, pedicel and F1 yellowish; 2a (3.5: 2.0: 1: 2.9: 2.3: 2.6: 2.4: 2.6: 5.2); 2b (0, 0, 1, 1, 2, 5); 3 (-); 4a (9.3); 4b (-); 4c (4-5); 5a (4.0-5.3); 5b (3); 5c (4.1); 6 (-).

Distribution: Palearctic: Bulgaria, Greece, Italy, and Russia (Far East) (Triapitsyn & Berezovskiy, 2004).

Material examined: Greece, Central Macedonia, Lake Kerkini, Kerkini Marsh, 41°13'32.8"N 23°05'04.2"E, 45 m, 25.iv-1.v.2007, G. Ramel [1 female, UCRC].

Hosts: Unknown.

Anagrus (*Anagrus*) *flaveolus*
Waterhouse, 1913

Coded redescription: 1 Yellow-brown except scape, pedicel, F1 and scutellum yellow; 2a (4.8: 2.6: 1: 3.6: 2.6-3.4: 3.6: 2.6-3.4: 3.6: 6.0); 2b (0, 0, 1, 0-1, 2, 5); 3 (+); 4a (8.3-8.4); 4b (-); 4c (3-5); 5a (2.2-2.4); 5b (3); 5c (7-10); 6 (+).

Distribution: Nearctic: Mexico, USA; Neotropical: Argentina, Bahamas, Barbados, Belize, Brazil, Cuba, Grenada, Guadeloupe, Guyana, Haiti, Jamaica, Mexico, Peru, Puerto Rico (USA), Trinidad and Tobago, and Venezuela (Triapitsyn, 1997, 2002a; Noyes, 2015).

Material examined: Mexico: Nuevo León, Municipio de Guadalupe, Rincón de la Sierra, 11.vii.1983, A. González-Hernández [1 female, UCRC]. Nayarit, 250 km S of Mazatlán (Sinaloa), 10.viii.1984, G. Gordh [1 female, UCRC]. Sinaloa, 11 mi. N of La Concha, La Muralla 2, 25.x.1982, J. T. Huber [1 female, UCRC]. Veracruz, 3 mi. N of Cardel by Río Actopan, 31.x.1982, J. T. Huber, A. González-Hernández [1 female, UCRC].

Hosts: *Amplicephalus simpliciusculus* Linnavuori, *Dalbulus maidis* (DeLong), and *Exitianus obscurinervis* (Stål) (Cicadellidae), *Chionomus haywardi* (Muir), *Delphacodes kuscheli* Fennah, *Delphacodes* sp., *Metadelphax propinqua* (Fieber), *Peregrinus maidis* (Ashmead), *Pissonotus* sp., *Saccharosydne saccharivora* (Westwood), *S. subandina* Marino de Remes Lenicov & Rossi Batiz (Delphacidae) (Luft Albarracin *et al.*, 2009; Triapitsyn, Logarzo *et al.*, 2010).

Important references: Chiappini *et al.* (1996) – redescription, discussion; Triapitsyn (1997, 1998a, 2002a) – comments, distribution, host associations.

Anagrus (*Anagrus*) *fragranticus*
Triapitsyn, 2003

Coded redescription: 1 Body mostly yellow with orange-yellow markings on mesoscutum (anteriorly) and axilla, appendages pale or very light brown except F2-F6 and clava brown; 2a (4.9: 2.25: 1: 2.4: 2.1: 2.6: 2.1: 2.4: 6.25); 2b (0, 0, 1-2, 0-1, 2-3, 5); 3 (-); 4a (5.2-5.5); 4b (+); 4c (3-4); 5a (1.8-2.0); 5b (1-2); 5c (15-20); 6 (+).

Distribution: Palearctic: China (Triapitsyn, 2003).

Hosts: Unknown.

Anagrus (*Anagrus*) *gonzalezae*
Triapitsyn, 1997

Coded redescription: 1 Dark brown except scape, pedicel, F1, distal part of mesosoma, legs and apex of metasoma light brown or brown; 2a (4.5: 2.0: 1: 2.6: 2.7: 2.8: 2.8: 2.9: 5.3); 2b (1 [usually, occasionally 0], 1-2, 2, 2, 2, 5); 3 (-); 4a (7.3-7.8); 4b (- [usually, but sometimes a narrow, indistinct bare area may be present]); 4c (4-5); 5a (2.3-2.4); 5b (3); 5c (8-12); 6 (+).

Distribution: Nearctic: *Mexico; Neotropical: Guyana, Honduras, *Mexico, Panama, Trinidad and Tobago (Triapitsyn, 1997).

Material examined: Mexico: Nuevo León, San Juan, Río San Juan, 14.vii.1983, F. Reyez-Vélez [1 female, UCRC]. Sinaloa, 50 km N of Los Mochis, 11.viii.1984, G. Gordh [1 female, UCRC]. Veracruz, 3 mi. N of Cardel by Río Actopan, 31.x.1982, J. T. Huber, A. González-Hernández [1 female, UCRC].

Host: *Empoasca kraemeri* Ross & Moore (Cicadellidae) (Triapitsyn, 1997).

Anagrus (*Anagrus*) *incarnatus* Haliday, 1833 (Figs 27, 32)

Coded redescription: 1 Yellow to reddish-brown or brown with a lighter frenum of scutellum; 2a (3.9: 1.8: 1: 2.7: 2.6: 2.6: 2.5: 2.4: 4.4); 2b (0, 1, 1, 1-2, 2, 5); 3 (-); 4a (8.0-10.0); 4b (-); 4c (4-5); 5a (1.9-3.2); 5b (3); 5c (- or 10-20); 6 (+).

Distribution: Australasia: New Zealand; Nearctic: USA; Palearctic: Austria, Belgium, Bulgaria, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Kyr-

Figures 33–35. *Anagrus* (*Anagrus*) spp., females. (33) *A. armatus* (Ashmead), metasoma in lateral view (University of Central Florida MacKay Tract, Orlando, Orange Co., Florida, USA); (34) *A. ensifer* Debauche, mesosoma and metasoma (Fryazevo, Moskovskaya oblast', Russia); (35) *A. breviphragma* Soyka, metasoma (Castelporziano Presidential Estate, Roma Province, Lazio, Italy); arrows pointing to setae on the second valvifer (= external plate of the ovipositor).

gyzstan, Macedonia, Netherlands, Poland, Romania, Russia, Serbia, Spain, Sweden, Switzerland, Turkmenistan, UK (Triapitsyn & Berezovskiy, 2004). The record from Juan Fernández Islands (Chile), listed in Noyes (2015), needs verification.

Hosts: *Cicadella viridis* (Linnaeus) (Cicadellidae), *Conomelus anceps* (Germar), *C. lorifer dehneli* Nast, *Dicranotropis hamata* (Boheman), *Muellerianella fairmairei* (Perris), *Megamelus notula* (Germar), *Stenocranus major* (Kirschbaum), *S. minutus* (Fabricius) (Delphacidae); *Asciodema obsoleta* (Fieber) (Miridae); ?*Epiophlebia superstes* (Selys) (Odonata: Epiophlebiidae), and unidentified Coenagrionidae (Odonata) (Triapitsyn, 1997; Triapitsyn & Berezovskiy, 2004).

Important references: Chiappini (1989) – redescription; Triapitsyn (1997) – synonymy, comments; Triapitsyn & Berezovskiy (2004) – distribution, host associations, discussion; Viggiani (2014) – discussion.

Anagrus (*Anagrus*) *insularis*
Dozier, 1936

Coded redescription: 1 Brown except pedicel, F1, and sometimes scape light brown; 2a (3.9: 2.0: 1: 2.4: 2.3: 2.3: 2.1: 2.3: 4.9); 2b (0, 0-1, 1-2, 1, 2, 5); 3 (+); 4a (8.6-9.0); 4b (-); 4c (4-5); 5a (2.1-2.3); 5b (3); 5c (6-13); 6 (+).

Distribution: Oceania: Hawaiian Islands (Dozier, 1936; Triapitsyn & Beardsley, 2000).

Host: ?*Megalagrion* sp. (Coenagrionidae) (Triapitsyn & Beardsley, 2000).

Important reference: Triapitsyn & Beardsley (2000) – redescription.

Anagrus (*Anagrus*) *iti*
Triapitsyn, 2013

Coded redescription: 1 Body pale to yellowish except frenum of scutellum white, basal gastral terga and exserted part of ovipositor sheaths brown, scape, pedicel, and legs yellowish, flagellum brownish; 2a (3.9: 1.9: 1: 2.75: 2.6: 2.4: 2.3: 2.3: 4.3); 2b (0, 1, 1, 1-2, 2, 5); 3 (+); 4a (8.3-8.8); 4b (+); 4c (3); 5a (3.0); 5b (3); 5c (6); 6 (+).

Distribution: Oceania: French Polynesia (Tahiti Island) (Triapitsyn, 2013b).

Host: *Homalodisca vitripennis* (Germar) (Cicadellidae) (Triapitsyn, 2013b).

Anagrus (*Anagrus*) *lineolus*
Triapitsyn, 2000 (Fig. 29)

Coded redescription: 1 Brown except scape, pedicel, F1 and pronotum light brown; 2a (3.9: 2.3: 1: 2.0: 2.1: 2.8: 2.9: 3.3: 6.4); 2b (0, 0, 1, 1, 2, 5); 3 (+); 4a (9.0-12.0); 4b (+); 4c (1); 5a (1.9-2.1); 5b (2); 5c (10-15); 6 (+).

Distribution: Neotropical: Argentina, Brazil, Mexico, Peru; Nearctic: USA (Triapitsyn, 2000a, 2002a).

Hosts: *Chlorotettix fraterculus* (Berg) and *Plesiommata mollicella* (Fowler) (Cicadellidae) (Luft Albarracin *et al.*, 2009).

Anagrus (*Anagrus*) *minutus* Chiappini & Lin, 1998

Coded redescription: 1 Yellow except anterior half of mesoscutum, legs and antenna (except pedicel) light brown; 2a (3.9: 2.3: 1: 1.4: 1.4: 1.6: 1.5: 1.8: 5.4); 2b (0, 0, 1, 1, 2, 5); 3 (+); 4a (10); 4b (+); 4c (2); 5a (2.7-3.0); 5b (2); 5c (-); 6 (+).

Distribution: Oriental: China (Chiappini & Lin, 1998).

Hosts: A rice planthopper (Delphacidae), probably *Sogatella furcifera* (Horváth) (Chiappini & Lin, 1998).

Anagrus (*Anagrus*) *miriamae*
Triapitsyn & Virla, 2004

Coded redescription: 1 Body and appendages more or less uniformly light brown to brown except scape, pedicel and F1 pale; 2a (3.8: 1.95: 1: 2.85: 2.6: 2.55: 2.5: 2.6: 5.2); 2b (0, 1, 1, 1-2, 2, 5); 3 (+); 4a (8.4-9.3); 4b (-); 4c (3-4); 5a (2.5-2.9); 5b (3); 5c (7-10); 6 (+).

Distribution: Neotropical: Argentina (Triapitsyn & Virla, 2004).

Hosts: *Dalbulus maidis* (DeLong) (Cicadellidae) (Virla *et al.*, 2013) and *Delphacodes sitarea* Marino de Remes Lenicov & Tesón (Delphacidae) (Triapitsyn & Virla, 2004).

Anagrus (*Anagrus*) *naulti*
Triapitsyn & Moya-Raygoza, 2015

Coded redescription: 1 Head mostly brown, rest of body mostly light brown except anterior half or so of mesoscutum brown, often also pronotum medially as well as base and apex of gaster brown, scape, pedicel and F1 light brown, rest of flagellum brown, legs yellowish to light brown; 2a (4.55: 2.2: 1: 3.55: 3.4: 3.3: 3.2: 3.2: 5.8); 2b (0, 1-2, 1-2, 2, 2, 5); 3 (+); 4a (8.0-8.5); 4b (+); 4c (3); 5a (3.2-3.5); 5b (3); 5c (5.0-7.7); 6 (+).

Distribution: Nearctic: Mexico (Moya-Raygoza & Triapitsyn, 2015).

Host: *Dalbulus quinquenotatus* DeLong & Nault (Cicadellidae) (Moya-Raygoza & Triapitsyn, 2015).

Anagrus (*Anagrus*) *nigriceps*
(Smits van Burgst, 1914)

Coded redescription: 1 Mostly yellow to light brown except head and anterior part of mesoscutum darker; 2a (3.7: 1.9: 1: 2.7: 2.6: 2.4: 2.4: 2.3-2.4: 4.4); 2b (0, usually 1 but occasionally 2, 1-2, 2, 2, 5); 3 (+); 4a (8.1-8.5); 4b (-); 4c (4); 5a (1.9-3.0); 5b (3); 5c (- or 9-12); 6 (+).

Distribution: Nearctic: Greenland, USA; Palearctic: *Austria, Belgium, *Bulgaria, China, France, *Germany, *Greece, Iran, Ireland, Israel, Italy, Kyrgyzstan, Netherlands, *Romania, Russia, *Spain, Sweden, UK (England) (Triapitsyn & Berezovskiy, 2004; Noyes, 2015; Thuróczy & O'Connor, 2015 [also as *A. dilatatus* Soyka, *A. holci* I. Walker, *A. longus* Soyka, *A. obvius* Soyka, and *A. similis* Soyka]).

Material examined: Germany, Baden-Württemberg, Heilbronn, Jagsthausen, K. Schrameyer (from eggs of *Orius majusculus* (Reuter) on maize [5 males, UCRC].

Hosts: *Dicranotropis hamata* (Boheman) (Delphacidae) (Walker, 1979 [as *A. holci*]) and *Orius majusculus* (Reuter) (Hemiptera: Anthocoridae).

Important references: Chiappini *et al*. (1996) – redescription; Triapitsyn & Berezovskiy (2004) – distribution.

Anagrus (*Anagrus*) *nigriventris*
Girault, 1911

Coded redescription: Yellow or light brown except head, F2-F6, pronotum, metasoma (at least partly) dark brown or black, clava and mesoscutum brown; 2a (4.0: 2.1: 1: 2.6: 2.7: 2.7: 2.6: 2.7: 4.8); 2b (0, 1, 1, 1, 2, 5); 3 (+); 4a (7.0-8.8); 4b (-); 4c (5-7); 5a (2.1-2.7); 5b (3); 5c (5-12); 6 (+).

Distribution: Nearctic: Canada, Mexico, USA; Neotropical: Argentina, Brazil, Chile, Mexico, Peru, Trinidad and Tobago; Oceania: Hawaiian Islands (Chiappini *et al*., 1996; Triapitsyn, 1997, 2002a; Noyes 2015).

Material examined: Mexico: Morelos: Amatlán de Quetzalcóatl, 29.x.1982, J. T. Huber, A. González-Hernández [4 females, UCRC]. Tlayacapan, 29.x.1982, J. T. Huber, A. González-Hernández [4 females, UCRC]. Nuevo León: Municipio Allende, Lazarillos de Abajo, 9.vii.1983, A. González-Hernández [1 female, UCRC]. Municipio El Carmen, San Juan, Río San Juan, 14.vii.1983, F. Reyez-Vélez [1 female, UCRC]. Municipio Santiago, El Cercado, Hacienda Las 3 Blanquitas, 9.vii.1983, G. Gordh [3 females, UCRC]. Sinaloa: 3 mi. NW of Guamúchil, 23.x.1982, J. T. Huber, A. González-Hernández [1 female, UCRC]. 50 km N of Los Mochis, 11.viii.1984, G. Gordh [1 male, UCRC]. 12 mi. N of Mazatlán, 25.x.1982, J. T. Huber [2 females, UCRC]. Veracruz, Fortín de las Flores, 30.x.1982, J. T. Huber, A. González-Hernández [4 females, UCRC].

Hosts: *Aceratagallia* spp., *Circulifer tenellus* (Baker), *Dalbulus maidis* (DeLong), *Empoasca abrupta* DeLong, *Empoasca fabae* (Harris), *Empoasca solana* DeLong, *Empoasca* spp., *Erythroneura comes* (Say), *Scaphytopius nitridus* (DeLong) (Cicadellidae), and *Pycnoderes quadrimaculatus* Guérin-Méneville (Miridae) (Triapitsyn, 1997; Triapitsyn & Moratorio, 1998; Luft Albarracin *et al*., 2006; Noyes, 2015).

Important reference: Chiappini *et al*. (1996) – redescription.

Anagrus (*Anagrus*) *nilaparvatae* Pang & Wang, 1985

Coded redescription: 1 Yellow-brown except scape, pedicel, F1 and frenum of scutellum yellow; 2a (4.6: 2.2: 1: 3.6: 3.2: 2.9: 2.8: 2.8: 5.5); 2b (0, 0-1, 1, 1, 2, 5); 3 (-); 4a (9.0); 4b (-); 4c (4-5); 5a (2.75-3.2); 5b (3); 5c (5.8-10.0); 6 (+).

Distribution: Afrotropical: Mauritius; Oceania: Hawaiian Islands, Northern Mariana Islands (Guam Island); Oriental: Bangladesh, China, India, Indonesia, Malaysia, Nepal, Pakistan, Philippines, Sri Lanka, Taiwan, Thailand; Palearctic: China, Japan, Republic of Korea, and Russia (Far East) (Triapitsyn & Berezovskiy, 2004).

Hosts: Various rice leafhoppers and planthoppers (Cicadellidae and Delphacidae) (Chiappini & Lin, 1998; Triapitsyn & Berezovskiy, 2004; Noyes, 2015).

Important references: Chiappini *et al*. (1996) – discussion; Chiappini & Lin (1998) – redescription, discussion; Triapitsyn & Berezovskiy (2004) – distribution and discussion; Triapitsyn (2013a) – discussion.

Anagrus (*Anagrus*) *oahuensis* Triapitsyn & Beardsley, 2000

Coded redescription: 1 Pale except appendages, mesoscutum and base and apex of metasoma brown; 2a (4.2: 1.9: 1: 2.7: 2.5: 2.6: 2.4: 2.5: 5.1); 2b (0, 1, 1-2, 1, 2, 5); 3 (+); 4a (9.0-10.0); 4b (+); 4c (1-3); 5a (3.0-3.4); 5b (2); 5c (4-5); 6 (+).

Distribution: Oceania: Hawaiian Islands (Triapitsyn & Beardsley, 2000); Neotropical: Mexico (Triapitsyn, 2002a).

Hosts: Unknown.

Anagrus (*Anagrus*) *obscurus* Förster, 1861

Coded redescription: 1 Brown; 2a (3.0: 1.5: 1: 2.0: 2.0: 1.9: 1.8: 1.7: 3.2); 2b (0, 1-2, 1-2, 2, 2, 5); 3 (+); 4a (7.0); 4b (-); 4c (6); 5a (2.3-2.4); 5b (3); 5c (-); 6 (+).

Distribution: Palearctic: Austria, Bulgaria, Greece, Italy, Kyrgyzstan, Macedonia, Republic of Korea, Russia, Spain, Switzerland, UK (England) (Triapitsyn & Berezovskiy, 2004).

Hosts: *Anakelisia fasciata* (Kirschbaum) (Delphacidae) and *Cicadella viridis* (Linnaeus) (Cicadellidae) [the latter under laboratory conditions only] (Chiappini *et al*., 1999).

Important references: Chiappini (1989) – redescription; Chiappini *et al*. (1999) – genetic identity; Triapitsyn & Berezovskiy (2004) – distribution, comments.

Anagrus (*Anagrus*) *ogloblini* Triapitsyn, 2000

Coded redescription: 1 Light brown to brown except clava white; 2a (4.1: 2.4: 1: 3.4: 3.5: 3.4: 3.3: 3.4: 7.4); 2b (0, 1, 1, 1, 2, 5); 3 (+); 4a (10.4); 4b (+); 4c (1); 5a (1.7); 5b (?); 5c (10.0); 6 (+).

Distribution: Neotropical: Argentina (Triapitsyn, 2000a).

Hosts: Unknown.

Anagrus (*Anagrus*) *paranagrosimilis* Chiappini & Lin, 1998

Coded redescription: 1 Brown except frenum of scutellum, metanotum, propodeum, legs, pedicel and F3-F5 light yellow, F2 and F6 also light yellow but a little infuscate respectively basally and apically; 2a (2.5: 1.1: 1: 1.5: 1.6: 1.4: 1.4: 1.3: 3.4); 2b (0, 1, 1, 1, 2, 5); 3 (-); 4a (8-9); 4b (+); 4c (1); 5a (3.3); 5b (2); 5c (3); 6 (-).

Distribution: Oriental: China (Chiappini & Lin, 1998).

Hosts: Unknown.

Anagrus (*Anagrus*) *puella* Girault, 1911 (Fig. 28)

Coded redescription: 1 Dark brown except scape, pedicel and F1 slightly lighter, fore wing slightly infumate basally; 2a (4.7: 1.8: 1: 2.6: 2.5: 2.6: 2.4: 2.4: 5.0); 2b (0-1, 1, 1, 2, 2, 5); 3 (+); 4a (5.7-6.7); 4b (-); 4c (10-12); 5a (2.6-3.1); 5b (3); 5c (7-10); 6 (+).

Distribution: Nearctic: *Canada and USA (Girault, 1911a; Chiappini *et al*., 1996).

Material examined: Canada, Alberta, Livingstone Ranger Station, vi.1980, D. Williams [1 female, CNC]. USA: California: Alameda Co., Niles, 7.iv.1948 [1 female, EMEC]. El Dorado Co.: Big Meadow Creek

(7 km S of Meyers), 21.viii.1998, S. L. Heydon [3 males, UCRC]. Grass Lake (7 km SE of Meyers), 21.viii.1998, S. L. Heydon [1 female, UCRC]. Imperial Co., 5 mi. W of Ocotillo, 7.i.1987, J. D. Pinto [1 female, UCRC]. Mendocino Co., 5 km N of Westport, 7.vii.1997, S. L. Heydon [1 male, UCRC]. Napa Co., Quail Ridge Reserve (7 km NE of Moscowite Corners), 39°29'N 122°09'W, 200 m, 10.v.1997, L. S. Kimsey [1 female, UCRC]. San Bernardino Co., Sugarloaf Trailhead, 34°13'08'N 116°48'24"W, 2275 m, 10.vi.2005, E. F. Drake [1 female, UCRC]. San Mateo Co., Belmont, Hidden Canyon Park, 12.iv.1999, J. D. Pinto [2 males, UCRC]. Santa Barbara Co., Montecito, 3.vii.1975 [1 female, EMEC]. Sonoma Co., Rio Nido: 1.v.1947 [4 females, 1 male, EMEC; 2 females, 2 males, MLPA]; 28.v.1947 (on willow) [2 females, 1 male, EMEC]. Yolo Co., Knights Landing, 10.iv.1947 [1 female, 1 male, EMEC]. Nevada, Washoe Co., near Mt. Rose Summit (5 km NE of Incline Village), 38°18'N 119°54'W, 2680 m, 29.vi.2003, S. L. Heydon [1 female, UCRC]. Kentucky, Breckenridge Co., Axtel, Rough River Lake, 30.v-2.vi.2003, A. Ray, M. Buffington [1 male, UCRC].

Hosts: Unknown.

Important reference: Chiappini *et al*. (1996) – redescription.

Anagrus (*Anagrus*) *raygilli*
Triapitsyn, 2000

Coded redescription: 1 Body and appendages light brown except clava and anterior half or so of mesoscutum brown; 2a (5.3: 2.5: 1: 1.7: 1.8: 2.7: 2.7: 3.2: 7.0); 2b (0, 0, 1-2, 0, 2, 5); 3 (+); 4a (6.9-8.2); 4b (+); 4c (2-3); 5a (2.2-2.5); 5b (2); 5c (8-12); 6 (+).

Distribution: Oceania: Hawaiian Islands (Triapitsyn, 2003); Nearctic: Mexico and USA; Neotropical: Dominican Republic, Guatemala, Mexico, Venezuela (Triapitsyn, 2000c, 2002a, 2003).

Host: *Idona minuenda* (Moznette) (Cicadellidae) (Triapitsyn, 2000c).

Important references: Triapitsyn (2002a) – distribution; Triapitsyn (2003) – comments.

Anagrus (*Anagrus*) *sophiae*
S. Trjapitzin, 1995

Coded redescription: Light brown except head, F2-F6, clava, mesoscutum and gastral terga darker; 2a (3.7: 2.1: 1: 2.7: 2.3: 2.4: 2.2: 2.6: 4.9); 2b (0, 0, 0, 0-1, 2, 5); 3 (+); 4a (10.0); 4b (-); 4c (3-5); 5a (2.7-3.8); 5b (3); 5c (5-15); 6 (+).

Distribution: Nearctic: USA (Trjapitzin & Strong, 1995).

Material examined: USA: California, Solano Co., Mare Island, 9.x.2009, M. Segoli (on *Spartina* sp.) [1 female, UCRC]. Florida, Wakulla Co., 25.v.1988, P. Stiling (from *Prokelisia* sp. eggs on *Spartina alterniflora*) [17 females, 10 males, CNC].

Hosts: *Prokelisia dolus* Wilson and *P. marginata* (Van Duzee) (Delphacidae) (Trjapitzin & Strong, 1995).

Anagrus (*Anagrus*) *striatus*
Chiappini & Lin, 1998

Coded redescription: 1 Light brown except pedicel, scutellum and middle terga of metasoma yellow; 2a (3.1: 1.4: 1: 1.9: 1.6: 1.8: 1.7: 1.8: 3.2); 2b (0, 1, 2, 2, 2, 5); 3 (+); 4a (9.0); 4b (+); 4c (1); 5a (1.9); 5b (3); 5c (-); 6 (-).

Distribution: Oriental: China (Chiappini & Lin, 1998); Palearctic: China (Chiappini & Lin, 1998) and Republic of Korea (Triapitsyn & Berezovskiy, 2004).

Hosts: Unknown.

Anagrus (*Anagrus*) *subfuscus*
Foerster, 1847

Coded redescription: 1 Brown; 2a (3.3: 1.5: 1: 2.5: 2.3: 2.2: 2.0: 1.9: 3.8); 2b (0, 1, 1-2, 1-2, 2, 5); 3 (+); 4a (8.0-8.6); 4b (-); 4c (6-8); 5a (3.0-3.4); 5b (3); 5c (3.8-5.0); 6 (+).

Distribution: Nearctic: Canada, USA; Neotropical: Argentina; Palearctic: Belgium, Bulgaria, Denmark, France, Germany, Greece, Italy, ?Japan, *Poland (Soyka, 1956 [as *A. supremosimilis* Soyka]); Romania, Russia, Spain, Switzerland, UK (Triapitsyn & Berezovskiy, 2004).

Hosts: *Cicadella viridis* (Linnaeus) (Cicadellidae); ?unidentified Gyrinidae (Co-

leoptera); *Mesovelia furcata* Mulsant & Rey (Hemiptera: Mesoveliidae), *Asciodema obsoleta* (Fieber), *Heterocordylus tibialis* (Hahn), *Orthotylus concolor* (Kirschbaum) and *O. virescens* (Douglas & Scott) (Miridae); *Calopteryx virgo* (Linnaeus), *Calopteryx* sp. (Odonata: Calopterygidae); *Coenagrion pulchellum* (Van der Linden) (Coenagrionidae); *Lestes disjunctus* Selys, *L. unguiculatus* Hagen, and *Lestes* sp. (Odonata: Lestidae), and possibly some other damselflies (Odonata: Zygoptera) (Triapitsyn & Berezovskiy, 2004).

Important references: Debauche (1948) – redescription; Chiappini (1989) – redescription; Triapitsyn & Berezovskiy (2004) – comments on host associations.

Anagrus (*Anagrus*) *takeyanus* Gordh, 1977 (Figs 13, 30)

Coded redescription: 1 Dark except scape, F1, pedicel, scutellum, metanotum, mesosomal sterna, propodeum and legs straw-colored; 2a (3.8: 2.6: 1: 1.7: 1.7: 2.9: 2.6: 3.1: 6.0); 2b (0, 0, 2, 0-1-2, 2, 5); 3 (-); 4a (6.3); 4b (+); 4c (3-5); 5a (1.9-2.0); 5b (1-3); 5c (-); 6 (-).

Distribution: Nearctic: USA (apparently accidentally introduced); Palearctic: Japan (Chiappini *et al.*, 1996).

Material examined: Japan, Nara, Nara, T. Morio (from *Stephanitis takeyai* Drake & Maa): 12.iv.1990 [4 females, CNC]; 10.v.1990 [8 females, CNC]; 27.vi.1990 [14 females, CNC]. USA, Pennsylvania, Montgomery Co., Lansdale, 40°14'12"N 75°18'47"W, 19-26.viii.2000, R. Kaufhold [1 female, UCRC].

Hosts: *Stephanitis pyrioides* (Scott) and *S. takeyai* Drake & Maa (Tingidae) (Chiappini *et al.*, 1996).

Important references: Chiappini *et al.* (1996) – redescription; Triapitsyn (2003) – illustrations.

Anagrus (*Anagrus*) *tretiakovae* Triapitsyn, 1998 (Figs 2, 14, 19)

Coded redescription: 1 Light brown except anterior part of mesoscutum and metasomal terga darker (brown to dark brown), appendages brown except pedicel and F1 lighter, flagellomeres darkening towards dark brown clava; 2a (4.6: 2.4: 1: 2.3: 2.1: 2.8: 2.8: 3.1: 6.6); 2b (0, 0-1, 1, 1, 2, 5); 3 (+); 4a (7.2-8.6); 4b (+); 4c (2-4); 5a (1.8-2.2); 5b (2); 5c (10-20); 6 (+).

Distribution: Nearctic: Mexico and USA (Triapitsyn, 1998a; Triapitsyn *et al.*, 2010).

Hosts: ?*Dikrella cockerellii* (Gillette), *Erasmoneura variabilis* (Beamer), *Erythridula plena* (Beamer), *Erythroneura bistrata* McAtee, *Erythroneura comes* (Say), *Erythroneura elegantula* Osborn, and *Erythroneura ziczac* Walsh (Cicadellidae) (Triapitsyn, 1998a; Triapitsyn *et al.*, 2010).

Important reference: Triapitsyn *et al.* (2010) – key, diagnosis, distribution, molecular characterization.

Anagrus (*Anagrus*) *urichi* Pickles, 1932

Coded redescription: 1 Brown to dark brown except scape, pedicel, frenum of scutellum and legs lighter (pale to light brown); 2a (4.9: 2.5: 1: 2.6: 2.6: 3.05: 2.9: 3.2: 6.4); 2b (0, 0, 2, 2, 2-3, 5); 3 (+); 4a (9.0-9.5); 4b (+); 4c (1); 5a (2.5-2.6); 5b (2-3); 5c (4.9-5.3); 6 (+).

Distribution: Neotropical: Brazil, Guyana, Trinidad and Tobago, Venezuela (Triapitsyn, 2002a).

Material examined: Brazil, Mato Grosso, Campo Grande, EMBRAPA, Beef Cattle Research Center, v.2002, J. R. Valério, from eggs of *Notozulia entreriana* (Berg) [numerous females and males, UCRC and USNM].

Hosts: *Aeneolamia flavilatera* (Urich), *A. varia saccharina* (Distant), *Deois flavopicta* (Stål), *Mahanarva fimbriolata* (Stål), *Notozulia entreriana* (Berg), and «*Tomaspis* sp.» (Cercopidae) (Triapitsyn, 2002a; Noyes, 2015).

Important reference: Triapitsyn (2002a) – redescription, illustrations.

Anagrus (*Anagrus*) *virginiae* Triapitsyn & Puttler, 2006

Coded redescription: 1 Body mostly brown to dark brown except frenum of scutellum yellow or brownish yellow and

anterior scutellum, metanotum and propodeum light brown, legs and antenna pale or very light brown except F2-F6 and clava brown; 2a (5.0: 2.6: 1: 2.1: 2.0: 2.6: 2.5: 2.9: 6.5); 2b (0, usually 0 but rarely 1 on one antenna only, 1, 0-1, 1-2, 5); 3 (+); 4a (6.1-6.6); 4b (+); 4c (2); 5a (2.2-2.6); 5b (2); 5c (9-15); 6 (+).

Distribution: Nearctic: USA (Puttler & Triapitsyn, 2006).

Host: *Corythucha marmorata* (Uhler) (Hemiptera: Tingidae) (Puttler & Triapitsyn, 2006).

Anagrus (*Anagrus*) *vulneratus* Triapitsyn, 2010

Coded redescription: 1 General body color yellow to light brown except transverse trabecula, stemmaticum, anterior half of mesoscutum and basal metasomal terga notably darker (brown), scape, pedicel and F1 light brown, the remaining flagellar segments brown, legs light brown; 2a (5.0: 2.4: 1: 2.85: 2.8: 3.3: 3.1: 3.3: 7.1); 2b (0, 0 or 1 on one antenna only, 1, 1, 2, 5); 3 (+); 4a (6.3-6.7); 4b (+ or -); 4c (3-4); 5a (2.5-2.7); 5b (2-3); 5c (7-9); 6 (+).

Distribution: Nearctic: USA (Triapitsyn *et al.*, 2010).

Host: *Erasmoneura vulnerata* (Fitch) (Cicadellidae), most likely (Triapitsyn *et al.*, 2010).

Anagrus (*Anagrus*) *yawi* Fullaway, 1944

Coded redescription: Dark brown except scape, pedicel, F1-F3 and distal part of mesosoma light brown; 2a (3.2: 1.8: 1: 2.1: 2.1: 2.3: 2.2: 2.2: 4.3); 2b (1, 2, 2, 2-3, 2-3, 5); 3 (+); 4a (7.0); 4b (+); 4c (5-7); 5a (1.7-2.2); 5b (3); 5c (6-10); 6 (+).

Distribution: Nearctic: USA; Neotropical: Argentina, Haiti, Honduras, Mexico; Oceania: Hawaiian Islands (introduced) (Triapitsyn, 1998a, 2002a; Triapitsyn & Beardsley, 2000).

Material examined: Mexico: Michoacán, 30 km N of Lázaro Cárdenas, 7.viii.1984, G. Gordh [1 female, UCRC]. Sinaloa, 12 mi. N of Mazatlán, 25.x.1982, J. T. Huber [1 female, UCRC]. Veracruz: 3 mi. N of Cardel by Río Actopan, 31.x.1982, J. T. Huber, A. González-Hernández [1 female, UCRC]. 11 mi. N of La Concha, La Muralla 2, 25.x.1982, J. T. Huber [1 female, UCRC].

Hosts: *Empoasca kraemeri* Ross & Moore and *Erythroneura comes* (Say) (Cicadellidae), *Tenthecoris bicolor* Scott and *Pycnoderes quadrimaculatus* Guérin-Méneville (Hemiptera: Miridae) (Triapitsyn, 1997, 1998a, 2002a; Triapitsyn & Beardsley, 2000).

Important reference: Triapitsyn & Beardsley (2000) – redescription.

DISCUSSION

Even though this revision would hopefully be a useful tool for the recognition of *Anagrus* species worldwide, it was very difficult to account for intraspecific variation of many morphological features both in the dichotomic key and the coded redescriptions, although I tried my best to indicate it when known. Particularly prone to at least some intraspecific variability are body color, proportions of the antennal segments (please note that in most cases those are indicated only for a single specimen, preferring the primary type when its measurements were available), number of mps on funicle segments, proportions of the fore wing and its chaetotaxy, relative length of the ovipositor and degree of its protrusion beyond the gastral apex. Presence or absence of mps on a funicle segment in the same species or even on different antennae in the same specimen often may affect that funicle segment's length: it could be relatively longer when mps is (are) present and otherwise. In some cases, particularly in the *A. atomus* complex, occasional (but yet not uncommon) presence of a mps on F4 on just one antenna and its absence on the other antenna in the same specimen makes it impossible to identify it morphologically as either *A. atomus* or *A. parvus* (= *A. ustulatus sensu* Chiappini, 1989).

Although being aware of the existence of many undescribed species in this genus, at

least 30 and perhaps as many as about 50 (see Triapitsyn, 2002b for a brief discussion), I hope that this communication will not promote a flurry of random new species descriptions at least not in a revisionary (ecozone-wide) context unless these are reared from known hosts or are strikingly different from all the described species worldwide and can be diagnosed properly. The latter involves checking type material, studying intraspecific variation based on a statistically significant number of specimens, and a general knowledge of the world fauna of the genus because many species of *Anagrus* tend to have wide distribution ranges and can be easily accidentally introduced to new countries and continents as parasitized eggs of their hosts inside plant tissue with trade, etc.

Some of the remaining problems to be resolved in *Anagrus* are as follows:

1. A need for regional revisions including descriptions of new taxa, when clearly justified. At least 20 new species are known to me from the Afrotropical region, particularly from its tropical part. The Afrotropical fauna is dominated by species from the *atomus* species group of the nominal subgenus, as defined by Chiappini *et al.* (1996). Such a revision is also urgently needed for the entire Oriental ecozone, where single species descriptions from a single country should be particularly avoided to prevent bringing chaos to the taxonomy of *Anagrus* in a region where it is already poorly known. In the New World, where species from the *incarnatus* species group of the nominal subgenus clearly dominate (I am not even sure if there is a single native species from the *atomus* species group in the Neotropical region), a number of new species are also known, particularly from the tropical areas of the Neotropics. Even in Europe, where the *Anagrus* fauna is relatively well known and keys are available (Chiappini, 1989; Chiappini *et al.*, 1996; Triapitsyn & Berezovskiy, 2004), a few new taxa await to be described. Members of the subgenus *A.* (*Anagrella*) are more speciose in the hot, humid environments of the Afrotropical, Neotropical, and Oriental regions from where a number of undescribed species are known (e.g., one from tropical Africa with a strongly darkened fore wing disc and a very long ovipositor which is notably longer than the body, Figs 3, 4), particularly from the first two ecozones.

2. Host associations of *Anagrus* species. These are of particular interest to many biological control specialists, ecologists, taxonomists, other researchers, and also farmers. These include members of various Hemiptera (Anthocoridae, Cercopidae, Cicadellidae, Cixiidae, Delphacidae, Mesoveliidae, Miridae, Tingidae), some Odonata (mainly Zygoptera), and possibly also a few Gyrinidae (Coleoptera) and Psocoptera. However, despite the fact that among the Mymaridae host associations of *Anagrus* species are relatively better documented, a lot of unconfirmed, unreliable, and outright wrong host records are still listed in various catalogs and databases and are often cited in various publications without a critical analysis. In this review, I tried to indicate only the more or less reliable host records; all other published host records are thus intentionally omitted. Earlier, Chiappini *et al.* (1996) and Triapitsyn (2002a, 2014) corrected some erroneous records from the Oriental region (of the New World species *A. armatus*, *A. columbi*, *A. empoascae* and *A. flaveolus*), Triapitsyn (2001) indicated the incorrect records of some *Anagrus* species in Australia and New Zealand, while Trjapitzin (1995), Triapitsyn (1998a) and Triapitsyn *et al.* (2010) clarified the identities of some *Anagrus* species which are egg parasitoids of the grape leafhoppers in North America.

For many of both described and undescribed species of *Anagrus*, however, host associations are unknown. Therefore, establishing such associations by rearing egg parasitoids from known hosts is highly desirable although often very difficult because eggs of the hosts are concealed in plant tissue. Particularly useful for that are sentinel eggs of known host species that can be exposed for parasitization in the agricultural, natural, and other environments (e.g., Luft Albarracin *et al.*, 2006; Virla *et al.*, 2013; Moya-

Raygoza *et al.*, 2014; Moya-Raygoza & Triapitsyn, 2015).

3. Similarity of the already named taxa within some species complexes, especially in *A. atomus*, *A. brocheri*, *A. epos*, and *A. incarnatus* ones. Earlier, de León *et al.* (2008), Nugnes & Viggiani (2014) and Viggiani (2014) commented on the morphological and molecular similarities and differences between *A. atomus*, *A. erythroneurae* and *A. parvus* (= *A. ustulatus sensu* Chiappini, 1989), Triapitsyn *et al.* (2010) investigated the species related to *A. daanei* and *A. epos*, and Triapitsyn & Berezovskiy (2004) and Triapitsyn (2013a) discussed problems with the identities of *A. incarnatus* and *A. nilaparvatae*. On the other hand, some of the recognized species (like, for instance, *A. breviphragma* which is known from different hosts in the New and Old Worlds) may eventually turn out to be complexes of morphologically indistinguishable cryptic species.

CHECKLIST OF *ANAGRUS* SPECIES

The higher taxon in which a species was originally described is given in parentheses if this differs from the nominate subgenus of *Anagrus*. Also indicated are the sources of new combinations and synonymies not proposed herein.

VALID *ANAGRUS* SPECIES INCLUDED IN THE KEY

A. (*Anagrus*) *aegyptiacus* Soyka, 1950: 123–124.

A. (*Anagrus*) *ainu* Triapitsyn & Berezovskiy, 2004: 8–10.

A. (*Anagrella*) *albiclava* Chiappini & Lin, 1998: 554–555.

A. (*Anagrus*) *amazonensis* Triapitsyn, Querino & Feitosa, 2008: 682–684.

A. (*Anagrus*) *antipodus* Triapitsyn, 2001: 284–286.

A. (*Anagrus*) *armatus* (Ashmead, 1887): Ashmead, 1887: 193 (*Litus*); Girault, 1911a: 277, 289.

= *Eustochus xanthothorax* Ashmead, 1887: 193–194; Girault, 1911a: 289, 300.

A. (*Anagrus*) *atomus* (Linnaeus, 1767): 941 (*Ichneumon atomos*); Haliday, 1833: 347; Chiappini & Triapitsyn, 2007: 1–5 (neotype).

= *A. bartheli* Tullgren, 1916: 8–11; Graham, 1982: 199–200; Chiappini, 1987: 95.

= *A. minimus* Menozzi, 1942: 38–39; Chiappini, 1987: 94.

= *A. tullgreni* Heqvist, 1954: 272–273; Graham, 1982: 199–200.

= *A. devius* Soyka, 1956: 25; Chiappini, 1989: 102–103.

= *A. gabitzi* Soyka, 1956: 25; Chiappini, 1989: 102–103.

= *A. hundsheimensis* Soyka, 1956: 24; Chiappini, 1989: 102–103.

= *A. kressbachi* Soyka, 1956: 25; Chiappini, 1989: 102–104.

= *A. lemonicolor* Soyka, 1956: 24; Chiappini, 1989: 102–103.

= *A. levis* Soyka, 1956: 25; Chiappini, 1989: 102–103.

= *A. proscassellatii* Viggiani & Jesu, 1995: 95, syn. nov.

= *A. spiritus* Girault, 1911b: 209–210, syn. nov.

= *A. stammeri* Soyka, 1956: 24; Chiappini, 1989: 102–103.

= *A. varius* Soyka, 1956: 24; Chiappini, 1989: 102–103.

A. (*Anagrus*) *avalae* Soyka, 1956: 24; oldest available replacement name for *A. nigriceps* Girault, 1915: 276 (*A. armatus* var. *nigriceps*); Burks, 1979: 1023, *nec* Smits van Burgst, 1914: 125–127; Chiappini & Triapitsyn, 1999: 120–124.

= *A. arcuatus* Soyka, 1956: 24; Chiappini & Triapitsyn, 1999: 120–124.

= *A. diversicornis* Soyka, 1956: 24; Chiappini, 1989: 108.

= *A. oregonensis* Triapitsyn in Chiappini *et al.*, 1996: 578–579, as replacement name for *A. nigriceps* Girault, 1915: 276 (*A. armatus* var. *nigriceps*); Burks, 1979: 1023, *nec* Smits van Burgst, 1914: 125–127; Chiappini & Triapitsyn, 1999: 120–124.

= *A. valkenburgensis* Soyka, 1956: 24; Chiappini & Triapitsyn, 1999: 120–124.

A. (*Anagrus*) *baeri* Girault, 1912: 155.

A. (*Anagrus*) *bakkendorfi* Soyka, 1946: 40.

= *A. latipennis* Soyka, 1956: 24; Chiappini, 1989: 106–107.

= *A. incarnatus* ssp. *fuscus* Boţoc, 1963: 95–109; Triapitsyn & Berezovskiy, 2004: 29.

A. (*Anagrus*) *brasiliensis* Triapitsyn, 1997: 3–4.

A. (*Anagrus*) *breviclavatus* Jesu & Viggiani, 2007: 73–74.

A. (*Anagrus*) *brevifuniculatus* Viggiani & Jesu, 1995: 93–95.

A. (*Anagrus*) *breviphragma* Soyka, 1956: 25.

= *A. longigaster* Soyka, 1956: 25; Chiappini, 1989: 105–106.

= *A. ovipositor* Soyka, 1956: 25; Chiappini, 1989: 105–106.

= *A. silwoodensis* I. Walker, 1979: 200; Chiappini, 1989: 105–106.

= *A. supremus* Soyka, 1956: 25; Chiappini, 1989: 105–106.

= *A. vacuipennis* Soyka, 1956: 25; Chiappini, 1989: 105–106.

A. (*Anagrella*) *brevis* Chiappini & Lin, 1998: 554.

A. (*Anagrus*) *brocheri* Schulz, 1910: 192–193.

= *A. andreae* Soyka, 1956: 26; Chiappini, 1989: 110–111 (as *A. andrease* Soyka, lapsus).

= *A. latior* Soyka 1956: 25; Chiappini, 1989: 110–111.

A. (*Anagrus*) *columbi* Perkins, 1905: 198.

A. (*Anagrus*) *daanei* Triapitsyn, 1998a: 93–98.

A. (subgenus *incertae sedis*) *dalhousieanus* Mani & Saraswat, 1973: 104–105.

A. (*Anagrus*) *delicatus* Dozier, 1936: 175–176.

A. (*Anagrus*) *elegans* Chiappini, 2002: 237–240.

A. (*Anagrus*) *empanadus* Triapitsyn in Triapitsyn *et al.*, 2011: 180–183.

A. (*Anagrus*) *empoascae* Dozier, 1932: 86–87.

A. (*Anagrus*) *ensifer* Debauche, 1948: 136–137.

A. (*Anagrus*) *epos* Girault, 1911a: 292.

A. (*Anagrus*) *erythroneurae* S. Trjapitzin & Chiappini, 1994: 137–140.

A. (*Anagrus*) *fennicus* Soyka, 1956: 26.

= *A. capensis* Heqvist, 1960: 426–427, syn. nov.

A. (*Anagrus*) *fisheri* Donev, 1998: 76–77.

A. (*Anagrus*) *flaveolus* Waterhouse, 1913: 87–88.

= *A. flavescens* Waterhouse; Dash, 1916: 39 (lapsus).

A. (*Anagrus*) *flaviapex* Chiappini & Lin, 1998: 562–564.

A. (*Anagrus*) *fragranticus* Triapitsyn, 2003: 121–123.

A. (*Anagrus*) *frequens* Perkins, 1905: 198.

= *A. armatus* var. *australiensis* Girault, 1912: 158; Trjapitzin, 1996: 106–107.

= *A. cicadulinae* Ferrière, 1930: 40; Triapitsyn & Beardsley, 2000: 32–33.

= *A. toyae* Pang & Wang, 1985: 179–181; Triapitsyn, 2001: 278.

A. (*Anagrella*) *funebris* Mathot, 1968: 270–271.

A. (*Anagrus*) *gonzalezae* Triapitsyn, 1997: 5–6.

A. (*Anagrella*) *hirashimai* Sahad, 1982: 198–201.

A. (*Anagrella*) *humicola* Mathot, 1968: 269–270.

A. (*Anagrus*) *incarnatus* Haliday, 1833: 347.

= *A. danicus* Soyka, 1956: 26; Chiappini, 1989: 113–115.

= *A. incarnatus incarnatus* Haliday *sensu* Debauche; Debauche, 1948: 132–135.

= *A. incarnatosimilis* Soyka, 1956: 25; Triapitsyn, 1997: 7–8.

= *A. mutans* I. Walker, 1979: 199; Chiappini, 1989: 113–115; Triapitsyn, 1997: 7–8.

= *A. neopallidus* Soyka, 1956: 26; Chiappini, 1989: 112–113.

= *A. pallidior* Soyka, 1956: 26; Chiappini, 1989: 112–113.

= *A. pallidus* Foerster sensu Soyka, 1956: 26; Chiappini, 1989: 112–113.

= *A. pulcher* Soyka, 1956: 25; Chiappini, 1989: 113–115; Triapitsyn, 1997: 7–8.

= *A. pulcherrimus* Soyka, 1956: 26; Chiappini, 1989: 113–115; Triapitsyn, 1997: 7–8.

= *A. stenocrani* I. Walker, 1979: 198; Chiappini, 1989: 113–115; Triapitsyn, 1997: 7–8.

= *A. varicolor* Soyka, 1956: 26; Chiappini, 1989: 113–115; Triapitsyn, 1997: 7–8.

A. (*Anagrus*) *insularis* Dozier, 1936: 175–176.

A. (*Anagrus*) *iti* Triapitsyn, 2013: 290–292.

A. (*Anagrus*) *japonicus* Sahad, 1982: 201–203.

A. (*Anagrella*) *kashtanka* Triapitsyn, 2009: 6–8.

A. (*Anagrus*) *klop* Triapitsyn, 2001: 276–277.

A. (*Anagrus*) *kvas* Triapitsyn & Berezovskiy, 2004: 10–12.

A. (*Anagrus*) *lindberginae* Nugnes & Viggiani, 2014: 66–71.

A. (*Anagrus*) *lineolus* Triapitsyn, 2000a: 217–218.

A. (*Anagrus*) *longifrangiatus* Jesu & Viggiani, 2007: 74–76.

A. (*Anagrus*) *longitibialis* Donev in Chiappini *et al.*, 1996: 568–569.

A. (*Anagrus*) *minutus* Chiappini & Lin, 1998: 564–566.

A. (*Anagrus*) *miriamae* Triapitsyn & Virla, 2004: 383–385.

A. (*Anagrus*) *mockfordi* Triapitsyn, 2000b: 296–298.

A. (*Anagrella*) *mymaricornis* (Bakkendorf, 1962): Bakkendorf, 1962: 372–376 (*Anagrella mymaricorne*); Viggiani, 1970: 139.

A. (*Anagrus*) *naulti* Triapitsyn & Moya-Raygoza in Moya-Raygoza & Triapitsyn, 2015: 291–293.

A. (*Anagrus*) *nigriceps* (Smits van Burgst, 1914): Smits van Burgst, 1914: 125–127 (*Litus*); Graham, 1982: 200–201.

= *A. dilatatus* Soyka, 1956: 25, syn. nov.

= *A. flavus* Foerster *sensu* Soyka, 1956: 25; Chiappini, 1989: 111.

= *A. holci* I. Walker, 1979: 198; Chiappini, 1989: 111, syn. nov.

= *A. longus* Soyka, 1956: 26; Chiappini, 1989: 110, syn. nov.

= *A. obvius* Soyka, 1956: 26, syn. nov.

= *A. similis* Soyka, 1956: 26, syn. nov.

A. (*Anagrus*) *nigriventris* Girault, 1911a: 291 (*A. armatus* var. *nigriventris*); Burks, 1979: 1023.

= *A. armatus* (Ashmead) *sensu* Girault, 1911a: 289–290 (in part).

= *A. armatus armatus* (Ashmead) *sensu* Peck, 1963: 35–36 (in part).

= *A. armatus nigricentris* Girault; Thompson, 1958: 566 (lapsus).

= *A. giraulti* Crawford, 1913: 259–260; Chiappini *et al.*, 1996: 581–583.

A. (*Anagrus*) *nilaparvatae* Pang & Wang, 1985: 176–178.

A. (*Anagrus*) *oahuensis* Triapitsyn & Beardsley, 2000: 38–39.

A. (*Anagrus*) *obscurus* Förster, 1861: 43; Chiappini, 1989: 111–112 (neotype).

A. (*Anagrus*) *ogloblini* Triapitsyn, 2000a: 216–217.

A. (*Paranagrus*) *optabilis* (Perkins, 1905): Perkins, 1905: 199 (*Paranagrus*); Annecke & Doutt, 1961: 7–8.

= *A. osborni* (Fullaway, 1919): Fullaway, 1919: 53 (*Paranagrus*); Triapitsyn & Beardsley, 2000: 28–29.

= *A. panicicolae* Sahad, 1984 in Sahad & Hirashima, 1984: 68–71; Triapitsyn & Beardsley, 2000: 28–29.

= *A. paranilaparvatae* Pang & Wang, 1985: 178–179; Triapitsyn, 2001: 273.

= *A. prouniliniaris* Viggiani & Jesu, 1995: 96–97, syn. nov.

A. (*Anagrus*) *paranagrosimilis* Chiappini & Lin, 1998: 564.

A. parvus Soyka, 1956: 24; Viggiani, 2014: 399 (*de facto* resurrected from the previous synonymy under *A.* (*Anagrus*) *ustulatus* Haliday by Chiappini, 1989: 104).

= *A. debilis* Foerster *sensu* Soyka, 1956: 25; Chiappini, 1989: 104 (= *A.* (*Anagrus*) *ustulatus* Haliday).

= *A.* (*Anagrus*) *ustulatus* Haliday *sensu* Chiappini, 1989: 104; Viggiani, 2014: 399.

A. (*Paranagrus*) *perforator* (Perkins), 1905: 199 (*Paranagrus*).

= *A. longitubulosus* Pang & Wang, 1985: 181–182; Triapitsyn, 2001: 275.

A. (*Anagrus*) *puella* Girault, 1911a: 293–294.

A. (*Anagrella*) *quasibrevis* Triapitsyn, 2001: 271–272.

A. (*Anagrus*) *raygilli* Triapitsyn, 2000c: 90–94.

A. (*Anagrella*) *rilensis* Donev in Chiappini *et al.*, 1996: 564.

A. (*Anagrus*) *scassellatii* Paoli, 1930: 235–244.

A. (*Anagrella*) *semiglabrus* Chiappini & Lin, 1998: 555–557.

A. (*Anagrus*) *sensillatus* Viggiani & Jesu, 1995: 97–98.

A. (*Anagrus*) *setosus* Chiappini & Lin, 1998: 562.

A. (*Anagrus*) *sophiae* S. Trjapitzin in Trjapitzin & Strong, 1995: 200–202.

A. (*Anagrus*) *stethynioides* Triapitsyn, 2002a: 216–217.

A. (*Anagrus*) *striatus* Chiappini & Lin, 1998: 566.

A. (*Anagrus*) *subfuscus* Foerster, 1847: 214–215; Debauche, 1948: 135 (*A. incarnatus subfuscus*); Chiappini, 1989: 108–109 (neotype).

= *A. supremosimilis* Soyka, 1956: 26, syn. nov.

A. (*Anagrus*) *takeyanus* Gordh in Gordh & Dunbar, 1977: 85–90.

A. (*Anagrus*) *tretiakovae* Triapitsyn, 1998a: 89–93.

A. (*Paranagrus*) *unilinearis* Soyka, 1950: 124–125.

A. (Anagrus) urichi Pickles, 1932: 204–206.

A. (*Anagrus*) *vilis* Donev, 1989: 153–155.

A. (*Anagrus*) *virginiae* Triapitsyn & Puttler in Puttler & Triapitsyn, 2006: 26–29.

A. (*Anagrus*) *vulneratus* Triapitsyn in Triapitsyn *et al.*, 2010: 10–12.

A. (*Anagrus*) *yawi* Fullaway, 1944: 57.

Nomina dubia (valid *Anagrus* species not included in the key)

A. debilis Foerster, 1847: 214. Stat. rev. (from the previous synonymy under *A. incarnatus* Haliday by Bakkendorf, 1926: 268). Type material lost.

A. elongatus (Risbec, 1950): Risbec, 1950: 623–624 (*Anaphes*); Ghesquière, 1951: 344. Type material lost.

A. flavus Foerster, 1847: 214. Stat. rev. (from the previous synonymy under *A. incarnatus* Haliday by Bakkendorf, 1926: 268). Type material lost.

A. foersteri (Ratzeburg, 1848): Ratzeburg, 1848: 141 (*Anaphes försteri*); Huber, 1992: 77. Type material lost.

= *Anaphes forsteri* Ratzeburg; Thompson, 1958: 568 (lapsus).

A. hydrophilus Ashmead, 1905: 213–214. Stat. rev. (from the previous synonymy under *A. incarnatus* Haliday by Bakkendorf, 1926: 269). Type material lost.

A. pallidus Foerster, 1847: 213–214. Stat. rev. (from the previous synonymy under *A. incarnatus* Haliday by Bakkendorf, 1926: 268 and Chiappini, 1989: 112). Type material lost.

A. pallipes Förster, 1861: 43. Stat. rev. (from the previous synonymy under *A. incarnatus* Haliday by Bakkendorf, 1926: 268). Type material lost.

= *A. pallidipes* Dalla Torre, 1898: 423 (unjustified emendation for *A. pallipes*).

A. putnamii (Packard, 1864): Packard, 1864: 137 (*Pteratomus, Packardiella*); Annecke & Doutt, 1961: 7–8. Type material lost (Chiappini *et al.*, 1996: 587).

A. (*Anagrus*) *ustulatus* Haliday, 1833: 346; Graham 1982: 201 (lectotype); Chiappini, 1989: 104; Viggiani, 2014: 397–400 (male lectotype unrecognizable).

Nomina nuda (unavailable names)

A. albiscapus Walker, 1846: 51; see Triapitsyn, 1998b: 144.

A. atricapillus Walker, 1846: 51; see Triapitsyn, 1998b: 144.

A. concinnus Walker, 1846: 51; see Triapitsyn, 1998b: 144.

A. dilatatus Enock; Herting, 1972: 6.

A. lestini Yoshimoto; Laplante, 1975: 291.

A. shortitubulosus Pang & Wang; Mao *et al.*, 1999: 46.

Species transferred from *Anagrus* to other genera of Chalcidoidea or synonymized under valid species in other genera

A. io Girault, 1911a: 294–296. Transferred to *Erythmelus* Enock as *E. io* (Girault); Girault, 1929: 8.

A. khandalus Mani & Saraswat, 1973: 105–107. Synonym of *Narayanella thornypoda* (Narayanan & Subba Rao); Subba Rao, 1976: 89 [as *Narayana thornypoda* (Narayanan & Subba Rao)].

A. lutulentus Girault, 1911c: 135–137. Trjapitzin, 1996: 105 (genus *incertae sedis*, removed from *Anagrus*). Transferred to *Cleruchus* Enock as *C. lutulentus* (Girault); Triapitsyn, 2001: 267–289.

A. niveiscapus Morley, 1950: 47–48. Transferred to *Trichogramma* Westwood (Hymenoptera: Trichogrammatidae) as *T. niveiscapus* (Morley); Graham, 1982: 201–202.

A. noeli Dozier, 1932: 87–88. Transferred to *Erythmelus* as *E. noeli* (Dozier); Dozier, 1936: 177.

A. ovijentatus Crosby & Leonard, 1914: 181–182. Synonym of *Anaphes iole* Girault; Girault, 1929: 14.

A. porteri Brèthes, 1917: 82–84 (*A. Porteri*). Transferred to *Polynema* as *P. porteri* (Brèthes); Triapitsyn, 1997: 11.

A. saga Girault, 1911a: 296–297. Transferred to *Polynema* as *P. saga* (Girault); Girault, 1929: 17.

ACKNOWLEDGMENTS

I am indebted to Elisabetta Chiappini (Istituto di Entomologia e Patologia vegetale, Università Cattolica del Sacro Cuore, Piacenza, Italy) for cooperation on the earlier draft of the key, joint examination of specimens including some primary types, and valuable discussions. I also thank Gennaro Viggiani (Dipartimento di Entomologia e Zoologia Agraria «Filippo Silvestri», Università degli Studi di Napoli «Federico II», Portici, Italy) for providing important information on some species and John T. Huber (CNC) for advice. Curators of many museums kindly helped with loans of specimens and access to the collections under their care during my visits. Gustavo Moya-Raygoza (Universidad de Guadalajara, Zapopan, Jalisco, Mexico) checked my translation of the abstract to Spanish.

LITERATURE CITED

Annecke D. P., Doutt R. L. 1961. The genera of the Mymaridae. Hymenoptera: Chalcidoidea. *Entomological Memoirs*, Department of Agricultural Technical Services, Republic of South Africa, 5: 1-71.

Ashmead H. H. 1887. Studies of the North American Proctotrupidae with descriptions of new species from Florida. Canadian Entomologist, 19: 192-198.

Ashmead H. H. 1905. Two new Mymaridae from Russian Turkestan. Entomological News, 16: 213-214.

Bakkendorf O. 1926 (1925). Recherches sur la biologie de l'*Anagrus incarnatus* Haliday. Annales de Biologie Lacustre, 14: 249-270.

Bakkendorf O. 1962. Descriptions of a new subterranean genus of Mymaridae (Hymen.). Schweizerische Entomologische Gesellschaft, Mitteilungen, 34: 372-376.

Baquero E., Jordana R. 1999. Species of *Anagrus* Haliday, 1833 (Hymenoptera, Chalcidoidea, Mymaridae) in Navarra (Spain). Miscellània Zoològica, 22 (2): 39-50.

Boţoc M. 1963. Noi contribuţii la studiul calcidoidelor di R.P.R. (VIII). Studia Universitatis Babeş-Bolyai, Series Biologia, [1963], 1: 95-109.

Brèthes J. 1917. Description d'un Mimaridæ (Hyménoptères) nouveau du Chili. Revista Chilena de Historia Natural, 21: 82-84.

Burks B. D. 1979. Family Mymaridae. In: K. V. Krombein, P. D. Jr. Hurd, D. R. Smith & B. D. Burks (eds.), Catalog of Hymenoptera in America North of Mexico. Smithsonian Institution Press, Washington D. C., pp. 1022-1033.

Chiappini E. 1987. Ricerche sulla variabilità di *Anagrus atomus* (L.) (Hymenoptera Mymaridae) e di una specie affine presente sul rovo. Bollettino di Zoologia Agraria e di Bachicoltura, Serie II, 19: 71-97.

Chiappini E. 1989. Review of the European species of the genus *Anagrus* Haliday (Hymenoptera Chalcidoidea). Bollettino di Zoologia Agraria e di Bachicoltura, Serie II, 21: 85-119.

Chiappini E. 2002. *Anagrus elegans* (Hymenoptera, Mymaridae) a new egg parasitoid of the rice-feeding planthoppers (Homoptera, Delphacidae) in the Orient. Bollettino di Zoologia Agraria e di Bachicoltura, Serie II, 34 (2): 235-241.

Chiappini E., Lin N.-Q. 1998. *Anagrus* (Hymenoptera: Mymaridae) of China, with descriptions of nine new species. Annals of the Entomological Society of America, 91 (5): 549-571.

Chiappini E., Triapitsyn S. V. 1999 (1997). Redescription of *Anagrus avalae* Soyka (Hymenoptera: Mymaridae), with new synonymies. Frustula Entomologica, n. s., 20 (33): 119-126.

Chiappini E., Triapitsyn S. V. 2007. Neotype designation for *Anagrus atomus* (Linnaeus) (Hymenoptera: Mymaridae). Journal of Hymenoptera Research, 16 (1): 1-6.

Chiappini E., Triapitsyn S. V., Donev A. 1996. Key to the Holarctic species of *Anagrus* Haliday (Hymenoptera Mymaridae) with a review of the Nearctic and Palearctic (other than European) species and descriptions of new taxa. Journal of Natural History, 30 (4): 551-595.

Chiappini E., Soressi L., Fogher C., Zanirato M. 1999. Genetic identity and relationship between four *Anagrus* species (Hymenoptera: Mymaridae) using RAPD analysis. European Journal of Entomology, 96: 393-400.

Crawford J. C. 1913. Descriptions of new Hymenoptera. Proceedings of the U.S. National Museum, 45: 241-260.

Cronin J. T. 2003. Patch structure, oviposition behavior, and the distribution of parasitism risk. Ecological Monographs, 73 (2): 283-300.

Crosby C. R., Leonard M. D. 1914. An egg-parasite of the tarnished plant bug, *Lygus pratensis* L. The Canadian Entomologist, 46: 181-182.

Dalla Torre C. G. de [K. W. von]. 1898. Catalogus Hymenopterorum hucusque descriptorum systematicus et synonymicus. Volumen V: Chalcididae et Proctotrupidae. Guilelmi Engelmann, Lipsiae [Leipzig], 598 pp.

Dash J. S. 1916. Report of the assistant superintendent of agriculture on the entomological and mycological work carried out during the season under review. Report of the Department of Agriculture, Barbados, 1914-1915: 38-44.

Debauche H. R. 1948. Etude sur les Mymarommidae et les Mymaridae de la Belgique (Hymenoptera Chalcidoidea). Mémoires du Musée Royal d'Histoire Naturelle de Belgique, 108: 1-248.

de León J. H., Triapitsyn S. V., Matteucig G., Viggiani G. 2008. Molecular and morphometric analyses of *Anagrus erythroneurae* Trjapitzin et Chiappini and *Anagrus ustulatus* Haliday (Hymenoptera: Mymaridae). Bollettino del Laboratorio di Entomologia agraria «Filippo Silvestri», Portici, 62: 19-32.

Donev A. 1989. A new species of *Anagrus* Haliday from Bulgaria (Insecta, Hymenoptera, Chalcidoidea: Mymaridae). Reichenbachia, 26: 153-155.

Donev A. D. 1998. Descriptional data about the species of genus *Anagrus* Haliday (Hymenoptera, Mymaridae) in the Balkan Peninsula with description of a new species. Acta Zoologica Bulgarica, 50 (1): 71-78.

Dozier H. L. 1932. Descriptions of new Mymarid egg parasites from Haiti and Puerto Rico. The Journal of the Department of Agriculture of Puerto Rico, 16: 81-92.

Dozier H. L. 1936. Several undescribed mymarid egg-parasites of the genus *Anagrus* Haliday. Proceedings of the Hawaiian Entomological Society, 9: 175-178.

Ferrière C. 1930. On some egg-parasites from Africa. Bulletin of Entomological Research, 21: 33-44.

Foerster A. 1847. Ueber die Familie der Mymariden. Linnaea Entomologica, 2: 195-233.

Förster A. 1861. Ein Tag in den Hoch-Alpen, eine entomologische Glizze. [Neue Spezies der Chalcidoidae und Proctotrypoidae enthaltend]. Programm der Realschule zu Aachen, 1860-1861, F. F. Beaufort, Aachen, 44 pp.

Fullaway D. T. 1919. Description of *Paranagrus osborni* n. sp. (Hymenoptera, Mymaridae). Proceedings of the Hawaiian Entomological Society, 4: 53.

Fullaway D. T. 1944. Description of a new mymarid egg parasite collected at Los Mochis, Sinaloa, Mexico. Proceedings of the Hawaiian Entomological Society, 12: 57.

Ghesquière J. 1951. Bibliographies sélectionnées 9495. Revue Internationale de Botanique Appliquée et d'Agriculture Tropicale, 31: 343-344.

Gibson G. A. P. 1997. Chapter 2. Morphology and terminology. In: G. A. P. Gibson, J. T. Huber & J. B. Woolley (eds.), Annotated keys to the genera of Nearctic Chalcidoidea (Hymenoptera). NRC Research Press, Ottawa, Ontario, Canada, pp. 16-44.

Girault A. A. 1911a. Descriptions of North American Mymaridae with synonymic and other notes on described genera and species. Transactions of the American Entomological Society, 37: 253-324.

Girault A. A. 1911b. A supposed occurrence of *Anagrus incarnatus* Haliday in the United States (Hym.). Entomological News, 22 (5): 207-210.

Girault A. A. 1911c. Synonymic and descriptive notes on the Hymenoptera Chalcidoidea with descriptions of several new genera and species. Archiv für Naturgeschichte, 77 (Band 1, Supplementheft 2): 119-140.

Girault A. A. 1912. Australian Hymenoptera Chalcidoidea. II. The family Mymaridae with descriptions of new species. Memoirs of the Queensland Museum, 1: 117-175.

Girault A. A. 1915. Some new chalcidoid Hymenoptera from North and South America. Annals of the Entomological Society of America, 8 (3): 272-284.

Girault A. A. 1929. North American Hymenoptera Mymaridae. Privately printed, Brisbane, 29 pp.

Gordh G., Dunbar D. M. 1977. A new *Anagrus* important in the biological control of *Stephanitis takeyai* and a key to the North American species. The Florida Entomologist, 60: 85-95.

Graham M. W. R. de V. 1982. The Haliday collection

of Mymaridae (Insecta, Hymenoptera, Chalcidoidea) with taxonomic notes on some material in other collections. Proceedings of the Royal Irish Academy, B82 (12): 189-243.

Haliday A. H. 1833. An essay of the classification of the parasitic Hymenoptera of Britain, which correspond with the *Ichneumones minuti* of Linnaeus. Entomological Magazine, London, 1: 333-350.

Heqvist K.-J. 1954. Zwei neue Mymariden (Hym.) aus Schweden. Entomologisk Tidskrift, 75: 272-275.

Heqvist K.-J. 1960. Hymenoptera (Chalcidoidea) Mymaridae. South African Animal Life, 7: 424-433.

Herting B. 1972. Homoptera. A catalogue of parasites and predators of terrestrial arthropods. Section A. Host or Prey/Enemy. Commonwealth Agricultural Bureaux, Slough, England, 2: 1-210.

Huber J. T. 1992. The subgenera, species groups and synonyms of *Anaphes* (Hymenoptera: Mymaridae) with a review of the described Nearctic species of the *fuscipennis* group of *Anaphes* s.s. and the described species of *Anaphes* (*Yungaburra*). Proceedings of the Entomological Society of Ontario, 123: 23-110.

Huber J. T. 1997. Chapter 14. Mymaridae. In: G. A. P. Gibson, J. T. Huber & J. B. Woolley (eds.), Annotated keys to the genera of Nearctic Chalcidoidea (Hymenoptera). NRC Research Press, Ottawa, Ontario, Canada, pp. 499-530.

Huber J. T. 2015. World reclassification of the *Gonatocerus* group of genera (Hymenoptera: Mymaridae). Zootaxa, 3967 (1): 1-184.

Jesu R., Viggiani G. 2007 (2006). The *Anagrus* Haliday (Hymenoptera: Mymaridae) from Yemen, with description of two new species and note on *Gonatocerus vanharteni* Jesu et Viggiani. Bollettino del Laboratorio di Entomologia agraria «Filippo Silvestri», Portici, 61: 71-77.

Laplante J.-P. 1975. Observations sur la ponte de quatre odonates du genre *Lestes* (Zygoptera: Lestidae) au Québec. Le Naturaliste Canadien, 102 (3): 279-292.

Lin N.-Q., Huber J. T., La Salle J. 2007. The Australian genera of Mymaridae (Hymenoptera: Chalcidoidea). Zootaxa, 1596: 1-111.

Linnaeus C. 1767. Systema Naturae. Editio duodecima reformata 1 (2). Holmiae, 533-1327 [1-37].

Lowery D. T., Triapitsyn S. V., Judd G. J. R. 2007. Leafhopper host plant associations for *Anagrus* parasitoids (Hymenoptera: Mymaridae) in the Okanagan Valley, British Columbia. Journal of the Entomological Society of British Columbia, 104: 9-15.

Luft Albarracin E., Triapitsyn S. V., Virla E. G. 2009. Annotated key to the genera of Mymaridae (Hymenoptera: Chalcidoidea) in Argentina. Zootaxa, 2129: 1-28.

Luft Albarracin E., Virla E. G., Triapitsyn S. V. 2006. A new host record for the egg parasitoid *Anagrus nigriventris* (Hymenopera: Mymaridae) of the corn leafhopper, *Dalbulus maidis* (Hemiptera: Cicadellidae). Florida Entomologist, 89 (2): 284-285.

Mani M. S., Saraswat G. G. 1973. Family Gonatoceridae. In: M. S. Mani, O. P. Dubey, B. J. Kaul & G. G. Saraswat (eds.), On some Chalcidoidea from India. Memoirs of the School of Entomology, St. John's College, 2: 78-125.

Mao R., Gu D., Zhang W., Zhang G. 1999. Egg parasitoids of the brown planthopper, *Nilaparvata lugens* (Stål). Natural Enemies of Insects, 21 (1): 45-47.

Mathot G. 1968. Mymaridae nouveaux d'Afrique Centrale (Hymenoptera: Chalcidoidea). Revue de Zoologie et de Botanique Africaines, 78: 265-276.

Matteucig G., Viggiani G. 2008. Fenologia e ospiti di *Anagrus* gruppo *atomus* (Linnaeus) (Hymenoptera: Mymaridae) in Campania. Bollettino del Laboratorio di Entomologia agraria «Filippo Silvestri», Portici, 62: 45-50.

Menozzi C. 1942. Animali e vegetali dannosi alla barbabietola da zucchero e mezzi per combatterli. Genova, pp. 38-39.

Morley C. 1950. A new parasite of the swallow-tailed butterfly. Transactions of the Suffolk Naturalists' Society, 7 (2): 47-48.

Moya-Raygoza G., Becerra-Chiron I. M. 2014. Overwintering biology of egg parasitoids of *Dalbulus maidis* (Hemiptera: Cicadellidae) on perennial grasses, volunteer maize, stubble, and drip-irrigated maize. Annals of the Entomological Society of America, 107 (5): 926-932.

Moya-Raygoza G., Triapitsyn S. V. 2015. Egg parasitoids (Hymenoptera: Mymaridae and Trichogrammatidae) of *Dalbulus quinquenotatus* (Hemiptera: Cicadellidae), with description of a new species of *Anagrus* (Mymaridae) from Mexico. Annals of the Entomological Society of America, 108 (3): 289-298.

Moya-Raygoza G., Renteria C I., Luft Albarracin E., Virla E. G. 2014. Egg parasitoids of the leafhoppers *Dalbulus maidis* and *Dalbulus elimatus* (Hemiptera: Cicadellidae) in two maize habitats. Florida Entomologist, 97 (1): 309-312.

Noyes J. S. 2015. Universal Chalcidoidea database. WWW publication. The Natural History Museum, London: http://www.nhm.ac.uk/research-curation/projects/chalcidoids/index.html (last accessed 5 May 2015).

Nugnes F., Viggiani G. 2014. Description and biological features of a new species of *Anagrus* Haliday (Hymenoptera, Mymaridae). Entomologia, 2 (197): 65-72.

Packard A. S. 1864. The bumble bees of New United Kingdom and their parasites, with notices of a new *Arthrophoribia* and a new genus of Proctrotrupidae. Proceedings of the Essex Institute, 4: 137-139.

Pang X., Wang Y. 1985. New species of *Anagrus* from south China (Hymenoptera: Mymaridae). Entomotaxonomia, 7: 175-184.

Paoli G. 1930. Un mimaride nuovo della Somalia (*Anagrus scassellatii* Paoli). Memorie della Società Entomologica Italiana, 9: 228-245.

Peck O. 1963. A catalogue of the Nearctic Chalcidoidea (Insecta: Hymenoptera). The Canadian Entomologist, Supplement, 30, 1-1092.

Perkins R. C. L. 1905. Leafhoppers and their natural enemies. VI. (Mymaridae, Platygasteridae). Bulletin of the Experiment Station of the Hawaiian Sugar Planters' Association, Entomological Series, 1: 187-205.

Pickles A. 1932. Notes on the natural enemies of the sugar-cane froghopper (*Tomaspis saccharina*, Dist.) in Trinidad, with descriptions of new species. Bulletin of Entomological Research, 23: 203-210.

Platner G. R., Velten R. K., Planoutene M., Pinto J. D. 1999. Slide-mounting techniques for *Trichogramma* (Trichogrammatidae) and other minute parasitic Hymenoptera. Entomological News, 110: 56-64.

Puttler B., Triapitsyn S. V. 2006. A new species of *Anagrus* (Hymenoptera: Mymaridae) from Missouri (U.S.A.), egg parasitoid of *Corythucha marmorata* (Hemiptera: Tingidae). Entomological News, 117 (1): 25-30.

Ratzeburg J. T. C. 1848. Die Ichneumonen der Forstinsecten in forstlicher und entomologischer Beziehung; ein Anhang zur Abbildung und Beschreibung der Forstinsecten. Zweiter Band, Berlin, 238 pp.

Risbec J. 1950. I. La faune entomologique des cultures au Sénégal et au Soudan français. II. Contribution à l'étude des Proctotrupoïdae. Travaux du Laboratoire d'Entomologie du Secteur Soudanais de Recherches Agronomiques, No. 1-2. Gouvernement Général de l'Afrique Occidentale Française, Dakar, 638 pp.

Sahad K. A. 1982. Descriptions of new species of *Gonatocerus* Nees and *Anagrus* Haliday from Japan (Hymenoptera, Mymaridae). Esakia, 19: 191-204.

Sahad K. A., Hirashima Y. 1984. Taxonomic studies on the genera *Gonatocerus* Nees and *Anagrus* Haliday of Japan and adjacent regions, with notes on their biology (Hymenoptera, Mymaridae). Bulletin of the Institute of Tropical Agriculture, Kyushu University, 7: 1-78.

Schulz W. A. 1910. Neuer Beitrag zur Kenntnis der Wasserimmen. Annales de Biologie Lacustre, 4: 187-193.

Smits van Burgst C. A. L. 1914. Een klein sluipwespje, *Litus nigriceps* n. sp. Entomologische Berichten, Amsterdam, 4: 125-127.

Soyka W. 1946. Revision einiger Mymaridengattungen. Zentralblatt für das Gesamtgebiet der Entomologie, 1: 33-40.

Soyka W. 1950. New and known Alaptids and Mymarids from Egypt (Hymenoptera Chalcidoidea). Bulletin de la Societé Fouad 1er d'Entomologie, 34: 121-131.

Soyka W. 1956 (1955). Überblick über das Genus *Anagrus* Haliday (Alaptidae – Mymaridae, Chalcidoidea, Hymenoptera). Entomologisches Nachrichtenblatt, Wien, 7: 23-26.

Subba Rao B. R. 1976. *Narayana*, gen. nov. from Burma and some synonyms (Hymenoptera: Mymaridae). Oriental Insects, 10: 87-91.

Thompson W. R. 1958. Mymarid, pp. 565-572. In: A catalogue of the parasites and predators of insect pests. Section 2. Host parasite catalogue. Part 5. Hosts of the Hymenoptera (Miscogasteridae to Trigonalidae), Lepidoptera and Strepsiptera. Commonwealth Institute of Biological Control, Ottawa, pp. 562-698.

Thuróczy C., O'Connor J. P. 2015. Eleven species of fairy fly (Hymenoptera, Chalcidoidea: Mymaridae) new to Ireland. Irish Naturalists' Journal, 34 (1): 55-60.

Triapitsyn S. V. 1997. The genus *Anagrus* (Hymenoptera: Mymaridae) in America south of the United States: a review. Ceiba, 38 (1): 1-12.

Triapitsyn S. V. 1998a. *Anagrus* (Hymenoptera: Mymaridae) egg parasitoids of *Erythroneura* spp. and other leafhoppers (Homoptera: Cicadellidae) in North American vineyards and orchards: a taxonomic review. Transactions of the American Entomological Society, 124 (2): 77-112.

Triapitsyn S. V. 1998b. The H. R. Debauche collection of *Anagrus* (Hymenoptera: Mymaridae): an annotated catalog. Bulletin and Annales de la Société Royale Belge d'Entomologie, 134: 139-146.

Triapitsyn S. V. 1999. Description of the male of *Anagrus flaviapex* (Hymenoptera: Mymaridae), with new distribution and host records. Entomological News, 110 (4): 237-239.

Triapitsyn S. V. 2000a (1999). A review of the species of *Anagrus* Haliday, 1833 (Hymenoptera: Mymaridae) collected by A. A. Ogloblin in Argentina. Russian Entomological Journal, 8 (3): 213-222.

Triapitsyn S. V. 2000b. A new *Anagrus* (*Anagrella*) (Hymenoptera Mymaridae), apparently associated with psocid eggs. Belgian Journal of Entomology, 2 (2): 295-298.

Triapitsyn S. V. 2000c. A new *Anagrus* (Hymenoptera: Mymaridae), egg parasitoid of *Idona minuenda* (Homoptera: Cicadellidae), a pest of avocado in Mexico. Folia Entomológica Mexicana, 110: 89-94.

Triapitsyn S. V. 2001. Review of the Australasian species of *Anagrus* (Hymenoptera Mymaridae). Belgian Journal of Entomology, 3 (2): 267-289.

Triapitsyn S. V. 2002a. Descriptive notes on a new and other little known species of *Anagrus* Haliday, 1833 (Hymenoptera: Mymaridae) from the New World tropics and subtropics. Entomotropica, 17 (3): 213-223.

Triapitsyn, S. V. 2002b. Species-level taxonomy of Mymaridae (Hymenoptera): current status and implications for biological control of leafhoppers of economic importance. In: G. Melika & C. Thuróczy (eds), Parasitic wasps: evolution, systematics, biodiversity and biological control. International Symposium: «Parasitic Hymenoptera: taxonomy and biological control» (14-17 May 2001, Köszeg, Hungary). Agroinform Kiadó és Nyomda Kft., Budapest, pp. 89-94.

Triapitsyn S. V. 2003. Description of a new species of *Anagrus* from China related to *A. takeyanus* (Hymenoptera Mymaridae). Belgian Journal of Entomology, 5 (1-2): 117-124.

Triapitsyn S. V. 2006. A key to the Mymaridae (Hymenoptera) egg parasitoids of proconiine sharpshooters (Hemiptera: Cicadellidae) in the Nearctic region, with description of two new species of *Gonatocerus*. Zootaxa, 1203: 1-38.

Triapitsyn S. V. 2009. A new species of *Anagrus* Haliday, 1833 (Insecta: Hymenoptera: Mymaridae) from Austria. Annalen des Naturhistorischen Museums in Wien, Serie B, 110B: 5-9.

Triapitsyn S. V. 2013a. Taxonomy and biology of egg parasitoids of Auchenorrhyncha of economic importance in Taiwan and adjacent countries, and of proconiine sharpshooters in the New World. In: C.-J. Chang, C.-Y. Lee & H.-T. Shih (eds), Proceedings of the 2013 International Symposium on Insect Vectors and Insect-Borne Diseases, Taichung, Taiwan, 6-8 August 2013. Special Publication of TARI No. 173, Council of Agiculture, Executive Yuan, Taiwan Agricultural Research Institute, Bureau of Animal and Plant Health Inspection and Quarantine, pp. 123-144.

Triapitsyn S. V. 2013b. A new species of *Anagrus* (Hymenoptera: Mymaridae) from Tahiti, with notes on egg parasitoids of proconiine sharpshooters (Hemiptera: Cicadellidae: Proconiini) in the world. Journal of Taiwan Agricultural Research, 62 (4): 289-299.

Triapitsyn S. V. 2014. Notes and corrections on some records of Mymaridae (Hymenoptera: Chalcidoidea) from India. Biosystematica, 7 (2): 39-41.

Triapitsyn S. V., Beardsley J. W. 2000. A review of the Hawaiian species of *Anagrus* (Hymenoptera: Mymaridae). Proceedings of the Hawaiian Entomological Society, 34: 23-48.

Triapitsyn S. V., Berezovskiy V. V. 2001. Review of the Mymaridae (Hymenoptera, Chalcidoidea) of Primorskii krai: genus *Mymar* Curtis. Far Eastern Entomologist, 100: 1-20.

Triapitsyn S. V., Berezovskiy V. V. 2004. Review of the genus *Anagrus* Haliday, 1833 (Hymenoptera: Mymaridae) in Russia, with notes on some extralimital species. Far Eastern Entomologist, 139: 1-36.

Triapitsyn S. V., Freebairn C. 2005 (2004). Taxonomy and host associations of *Anagrus baeri* Girault, 1912 (Hymenoptera: Mymaridae), an egg parasitoid native to Queensland, Australia. Russian Entomological Journal, 13 (3): 157-159.

Triapitsyn S. V., Huber J. T. 2000. [51 Fam. Mymaridae – mymarids]. In: P. A. Lehr (ed.), [Keys to the insects of Russian Far East in six volumes]. Vol. IV. Neuropteroidea, Mecoptera, Hymenoptera. Part 4. Dal'nauka, Vladivostok, pp. 603-614. [In Russian.]

Triapitsyn S. V., Moratorio M. S. 1998. Host associations of *Anagrus nigriventris* Girault (Hymenoptera: Mymaridae) and techniques for its rearing under insectary conditions. In: Egg parasitoids. 5th International Symposium. International Organization for Biological Control, Cali, Columbia, March 1998 (Hassan S. A., Ed.). Mitteilungen aus der Biologischen Bundesanstalt für Land- und Forstwirtschaft, Berlin-Dahlem, H. 356. Parey Buchverlag Berlin, pp. 185-191.

Triapitsyn S. V., Teulon D. A. J. 2002. On the identity of *Anagrus* (Hymenoptera: Mymaridae) egg parasitoids of Froggatt's apple leafhopper, *Edwardsiana crataegi* (Douglas) (Homoptera: Cicadellidae), in Christchurch, New Zealand. New Zealand Entomologist, 25: 91-92.

Triapitsyn S. V., Virla E. G. 2004. A new *Anagrus* from Argentina, an egg parasitoid of *Delphacodes sitarea* (Hemiptera: Archaeorrhyncha: Delphacidae). Florida Entomologist, 87 (3): 383-385.

Triapitsyn S. V., Logarzo G. A., Virla E. G. 2010. Egg parasitoid of *Saccharosydne subandina* (Hemiptera: Delphacidae) in Neuquén, Argentina. Boletín MIP (Manejo Integrado de Plagas) Nº 20 (Diciembre 2010), IMYZA-INTA, Argentina.

Triapitsyn S. V., Querino R. B., Feitosa M. C. B. 2008. A new species of *Anagrus* (Hymenoptera: Mymaridae) from Amazonas, Brazil. Neotropical Entomology, 37 (6): 681-684.

Triapitsyn S. V., Sosa A. J., Hernández M. C. 2011 (2010). Egg parasitoids of *Megamelus* spp. (Hemiptera: Delphacidae) in Argentina. Revista de la Sociedad Entomológica Argentina, 69 (3-4): 171-188.

Triapitsyn S. V., Rugman-Jones P. F., Jeong G., Morse J. G., Stouthamer R. 2010. Morphological and molecular differentiation of the *Anagrus epos* species complex (Hymenoptera: Mymaridae), egg parasitoids of leafhoppers (Hemiptera: Cicadellidae) in North America. Zootaxa, 2428: 1-21.

Trjapitzin S. V. 1995. The identities of *Anagrus* (Hymenoptera: Mymaridae) egg parasitoid of the grape and blackberry leafhoppers (Homoptera: Cicadellidae) in California. Pan-Pacific Entomologist, 71 (4): 250-251.

Trjapitzin S. V. 1996 (1995). Taxonomic notes on the Australian species of *Anagrus* (Hymenoptera Mymaridae). Russian Entomological Journal, 4 (1-4): 105-108.

Trjapitzin S. V., Chiappini E. 1994. A new *Anagrus* (Hymenoptera: Mymaridae), egg parasitoid of

Erythroneura spp. (Homoptera: Cicadellidae). Entomological News, 105 (3): 137-140.

Trjapitzin S. V., Strong D. 1995. A new *Anagrus* (Hymenoptera: Mymaridae), an egg parasitoid of *Prokelisia* spp. (Homoptera: Delphacidae). Pan-Pacific Entomologist, 71 (4): 199-203.

Tullgren A. 1916. Rosenstriten (*Typhlocyba rosae* L.) och en ny ägg-parasit pådensamma. Centralanstalten för Försöksvasendet pa Jordbruksomradet. Meddelanden, 132 (Entomol. Avd.) 24: 3-13.

Viggiani G. 1970. Description of the male of *Eustochus atripennis* Hal., 1833, and of new terricolous species of *Cleruchus* Enock, with remarks on *Anagrella* Bkdf. (Hym., Mymaridae) (XXIII. – Researches on the Hymenoptera Chalcidoidea). Mitteilungen der Schweizerischen Entomologischen Gesellschaft, 43 (2): 135-142.

Viggiani G. 2014. On the misidentification of *Anagrus ustulatus* Haliday (Hymenoptera: Mymaridae). Zootaxa, 3826 (2): 397-400.

Viggiani G., Jesu R. 1995 (1993). New species of Mymaridae from Cape Verde Islands (Hymenoptera: Chalcidoidea). Bollettino del Laboratorio di Entomologia agraria «Filippo Silvestri», Portici, 50: 93-107.

Virla E. G., Moya-Raygoza G., Luft-Albarracin E. 2013. Egg parasitoids of the corn leafhopper, *Dalbulus maidis*, in the southernmost area of its distribution range. Journal of Insect Science, 13: 1-7.

Walker F. 1846. VIII.—Descriptions of the Mymaridæ. The Annals and Magazine of Natural History, 18: 49-54.

Walker I. 1979. Some British species of *Anagrus* (Hymenoptera: Mymaridae). Zoological Journal of the Linnean Society, London, 67: 181-202.

Waterhouse C. O. 1913. On a new species of Mymaridae from Trinidad. Bulletin of Entomological Research, 4: 87-88.

Yoshimoto C. M. 1990. A review of the genera of New World Mymaridae (Hymenoptera: Chalcidoidea). Flora & Fauna Handbook No. 7, Sandhill Crane Press, Inc., Gainesville, Florida, 166 pp.