

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. obivius* 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 redescrición 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 sinonimias: *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. obivius* 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, parasitoides oófilos, 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, *Ly-*

maenon 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.

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 di-

versity. 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*) *erythroneuræ* S. Trjapitzin & Chiappini, female (paratype, Baja California, Mexico). Habitus.

sian species, Triapitsyn (2002a) keyed the Neotropical species, and Triapitsyn & Berzovskiy (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 red-descriptions 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 red-descriptions. 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 red-descriptions for most of the species, and adding the discussion, checklist, and references, etc.

The coded redescrptions 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 redescrptions (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 exerted beyond gastral apex (-) or, if exerted, ratio of its total length to length of its exerted 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 (*).

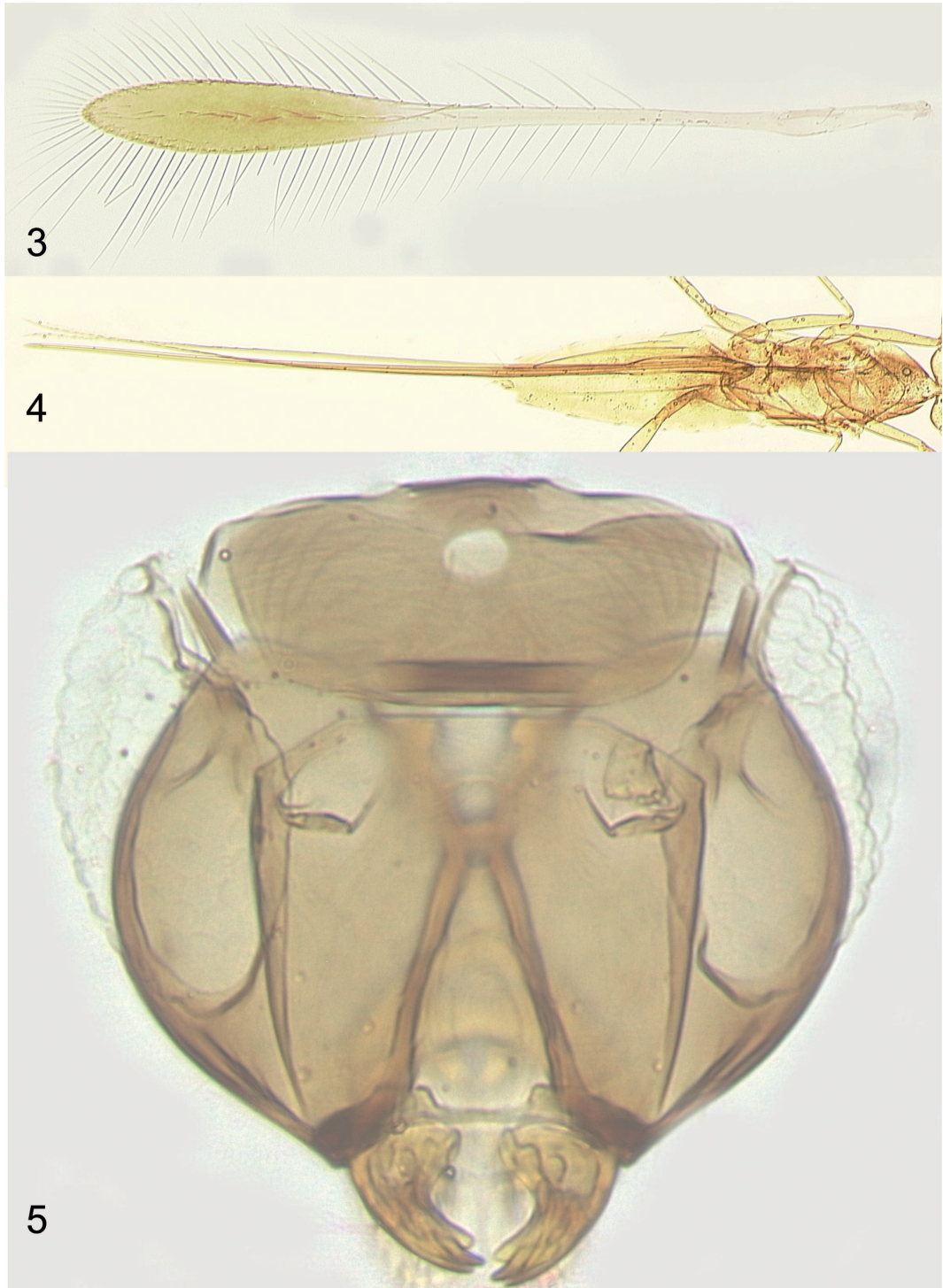
Abbreviations used for specimen depositories are: BMNH – The Natural History Museum, London, England, UK; CNC – Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa, Ontario, Canada; CZUG – Centro de Estudios en Zoología, Universidad de Guadalajara, Las Agujas, Zapopan, Jalisco, Mexico; 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

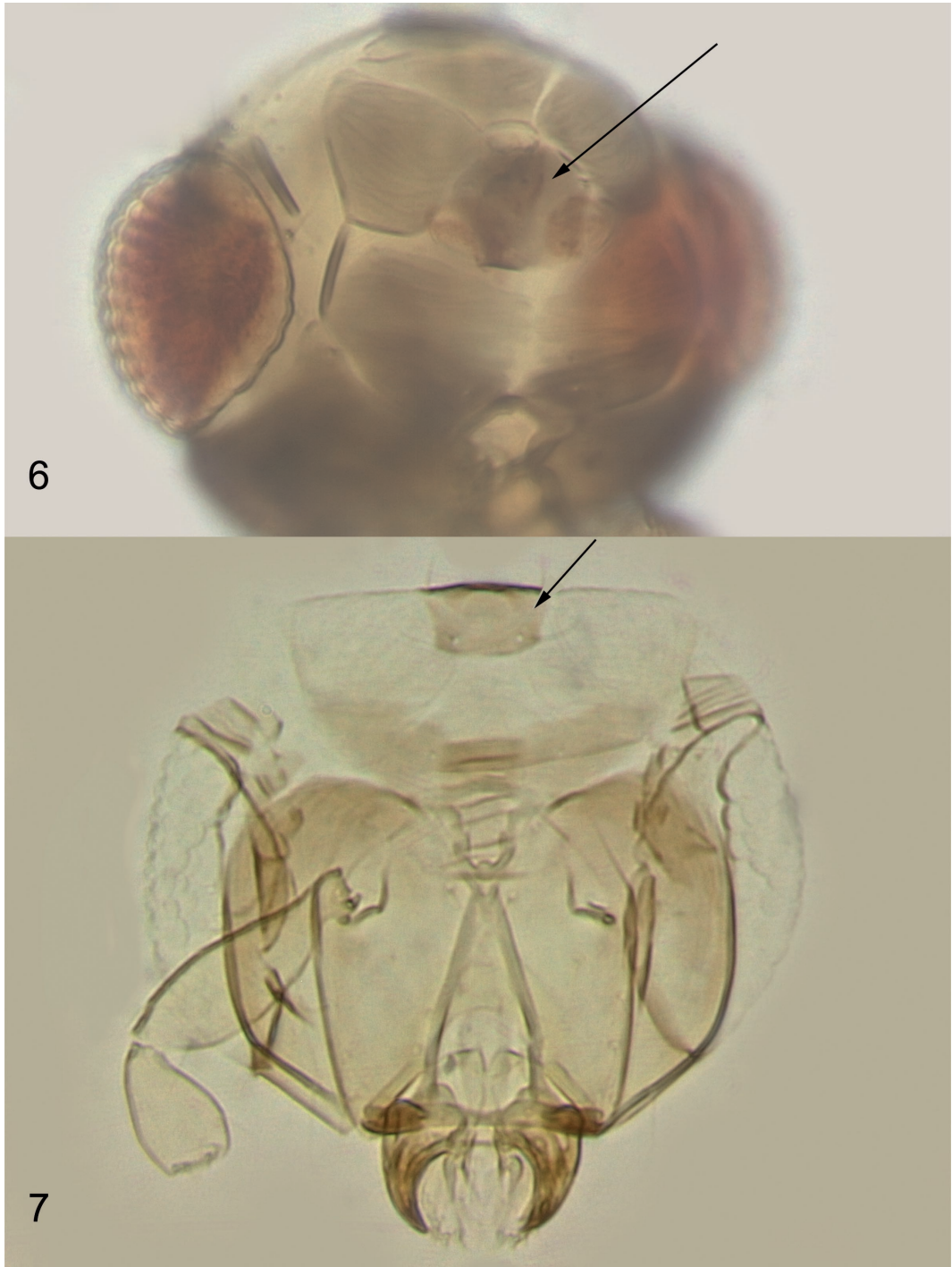
- | | |
|-------|--|
| 1 | Ocelli on a stemmaticum (as in Figs 6, 7; best observed on dry-mounted, critical point dried specimens, but often difficult to see in slide-mounted specimens) 2 |
| – | Ocelli not on a stemmaticum (as in Fig. 5) [subgenus <i>A. (Anagrella)</i> Bakkendorf] 4 |
| 2 (1) | Mesoscutum without notauli (see Fig. 3, p. 553 in Chiappini & Lin, 1998)
.... <i>Anagrus dalhousieanus</i> 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 <i>A.</i> (<i>Paranagrus</i> 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) [nominated subgenus, <i>A.</i> (<i>Anagrus</i> Haliday) <i>sensu stricto</i>] 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) <i>Anagrus</i> (<i>Anagrella</i>) <i>humicola</i> Mathot		
6 (5)	F5 with 1 mps, fore wing hyaline <i>Anagrus</i> (<i>Anagrella</i>) <i>brevis</i> Chiappini & Lin		
-	F5 with 2 mps, fore wing infusate <i>Anagrus</i> (<i>Anagrella</i>) <i>quasibrevis</i> Triapitsyn		
7 (4)	Fore wing disc without setae <i>Anagrus</i> (<i>Anagrella</i>) <i>albiclava</i> 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) <i>Anagrus</i> (<i>Anagrella</i>) <i>hirashimai</i> Sahad		
-	F2 shorter than clava; F3, F4 and F5 together shorter than clava <i>Anagrus</i> (<i>Anagrella</i>) <i>mockfordi</i> Triapitsyn		
10 (8)	Fore wing with almost parallel margins and reduced (Fig. 20) <i>Anagrus</i> (<i>Anagrella</i>) <i>mymaricornis</i> (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 exerted part about 8 <i>Anagrus</i> (<i>Anagrella</i>) <i>rilensis</i> 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 exerted 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 <i>Anagrus</i> (<i>Anagrella</i>) <i>funebri</i> Mathot		
13 (12)	Fore wing disc with median row of at least 6 setae in apical third <i>Anagrus</i> (<i>Anagrella</i>) <i>semiglabrus</i> Chiappini & Lin		
-	Fore wing disc with median row of just 2 setae in apical third <i>Anagrus</i> (<i>Anagrella</i>) <i>kashtanka</i> Triapitsyn		
14 (3)	F3 and F4 without mps <i>Anagrus</i> (<i>Paranagrus</i>) <i>unilinearis</i> 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 <i>Anagrus</i> (<i>Paranagrus</i>) <i>perforator</i> (Perkins)		
-	Ovipositor not projecting or at most slightly projecting beyond apex of gaster; ovipositor: protibia ratio at most 2.5 <i>Anagrus</i> (<i>Paranagrus</i>) <i>optabilis</i> (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) (<i>stethynioides</i> species group) <i>Anagrus</i> (<i>Anagrus</i>) <i>stethynioides</i> 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) (<i>atomus</i> species group) 18
-	Clava with 5 mps (as in Fig. 14) (<i>incarnatus</i> 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 <i>Anagrus</i> (<i>Anagrus</i>) <i>scassellatii</i> Paoli
-	Mesoscutum without adnotaular setae; fore wing disc without a hairless area <i>Anagrus</i> (<i>Anagrus</i>) <i>sensillatus</i> 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 <i>Anagrus</i> (<i>Anagrus</i>) <i>baeri</i> Girault		
23 (22)	F4 and F5 each with 2 mps <i>Anagrus</i> (<i>Anagrus</i>) <i>setosus</i> Chiappini & Lin		



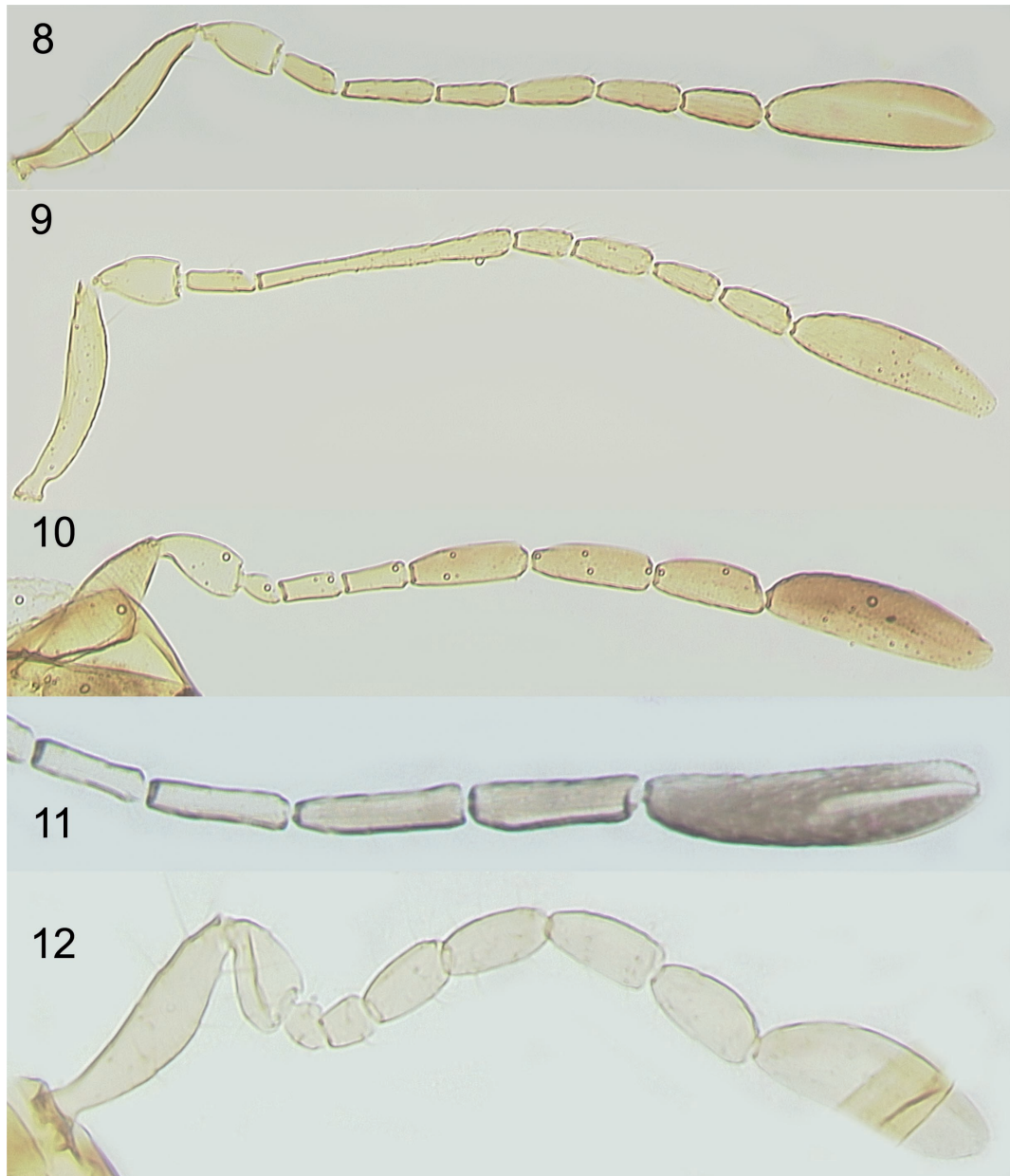
Figures 3-5. *Anagrus* (*Anagrella*) spp., females. (3) *A.* (*Anagrella*) sp., fore wing (Isecheno Nature Reserve, Kakamega District, Kenya); (4) Same specimen, mesosoma and metasoma; (5) *A.* (*Anagrella*) *hirashimai* Sahad, head in frontal view (Gornotayozhnoye, Primorskiy kray, Russia).

- F4 and F5 each with 1 mps mps *Anagrus (Anagrus) brevifuniculatus*
 *Anagrus (Anagrus) breviclavatus* Jesu & Viggiani
- 24 (21) F4 with 2 mps 37 (35) Fore wing disc with a hairless area 38
 *Anagrus (Anagrus) flaviapex* Chiappini & Lin - Fore wing disc without a hairless area
 *Anagrus (Anagrus) kvas* Triapitsyn & Berezovskiy
- F4 with 1 mps 25
- 25 (24) Ovipositor:protibia ratio at most 1.6 38 (37) Hairless area on fore wing disc occupying
 *Anagrus (Anagrus) longitibialis* Donev its whole posterior half; FWL:FWW more
 - Ovipositor:protibia ratio at least 2.0 26 than 10.5 39
 - Hairless area only at broadest part of fore
 26 (25) Ovipositor:protibia ratio less than 3.0 27 wing disc; FWL:FWW at most 10.0
 - Ovipositor:protibia ratio more than 3.0 *Anagrus (Anagrus) atomus* (Linnaeus)
- .. *Anagrus (Anagrus) elegans* Chiappini (part) 39 (38) Ovipositor:protibia ratio less than 3.0
 27 (26) F5 with 1 mps; FWL:FWW at least 10.5 *Anagrus (Anagrus) frequens* Perkins (part)
- .. *Anagrus (Anagrus) frequens* Perkins (part) - Ovipositor/protibia ratio more than 3.0
 - F5 with 2 mps; FWL:FWW at most 8.2 *Anagrus (Anagrus) elegans* Chiappini (part)
- *Anagrus (Anagrus) ainu* 40 (17) Ovipositor anteriorly broadly rounded (with a
 Triapitsyn & Berezovskiy large basal loop) (Fig. 33)
 28 (20) F4 without mps (as in Fig. 11) 29 *Anagrus (Anagrus) armatus* (Ashmead)
- F4 with mps 35 - Ovipositor not as above (without a large basal
 loop) 41
- 29 (28) Mesoscutum with adnotaular setae 41 (40) Ovipositor markedly exerted beyond apex of
 *Anagrus (Anagrus) vilis* Donev gaster (as in Fig. 34), ratio of total ovipositor
 - Mesoscutum without adnotaular setae 30 length to length of its exerted part at
 30 (29) Ovipositor:protibia ratio at least 3.0 most 3.5 42
 *Anagrus (Anagrus) aegyptiacus* Soyka - Ovipositor either not exerted or, if exerted,
 - Ovipositor:protibia ratio at most 2.5 31 then ratio of total ovipositor length to length
 31 (30) Fore wing disc with only 1 more or less of its exerted part more than 3.5 46
 complete row of setae 42 (41) F3 with 1 mps *Anagrus*
 *Anagrus (Anagrus) klop* Triapitsyn (*Anagrus) paranagrosimilis* Chiappini & Lin
 - Fore wing disc with at least 2 complete rows F3 without mps 43
 of setae 32 43 (42) Mesoscutum without adnotaular setae
 32 (31) Fore wing disc without a hairless area *Anagrus (Anagrus) delicatus* Dozier
 *Anagrus (Anagrus) longifrangiatus* - Mesoscutum with adnotaular setae 44
 Jesu & Viggiani 44 (43) Fore wing disc sparsely setose, with only 1
 - Fore wing disc with a hairless area 33 row of setae 45
- 33 (32) Ovipositor:protibia ratio at most 1.6 - Fore wing disc uniformly covered with setae
 *Anagrus (Anagrus) lindberginae* arranged in more than 1 row
 Nugnes & Viggiani *Anagrus (Anagrus) ensifer* Debauche
- Ovipositor:protibia ratio at least 1.7 (usually 45 (44) F4 with 2 mps, F5 with 1 mps
 1.8-2.2) 34 *Anagrus (Anagrus) antipodus*
 34 (33) Palearctic (probably unintentionally introduced Triapitsyn (part)
 from Europe to Argentina, Chile and New - F4 with 1 mps, F5 without mps
 Zealand) *Anagrus (Anagrus) parvus* Soyka (*sensu* Viggiani, 2014) *Anagrus (Anagrus) empanadus* Triapitsyn
- Nearctic (possibly unintentionally introduced 46 (41) Clava about as long as combined length of 3
 from North America to New Zealand) preceding funicle segments
 *Anagrus (Anagrus) erythroneurae* .. *Anagrus (Anagrus) minutus* Chiappini & Lin
 S. Trjapitzin & Chiappini - Clava notably shorter than combined length
 35 (28) F2 and F3 together about as long as F6 or of 3 preceding funicle segments 47
 or just slightly longer 36 (46) F2 subglobular, about as long as F1 (Fig. 12)
 - F2 and F3 together much longer than F6, at *Anagrus (Anagrus) brasiliensis* Triapitsyn
 least by almost 1/2 of their combined length F2 cylindrical, longer than F1 48
 37 48 (47) Clava white
 36 (35) F5 and F6 together as long as clava; F4 with *Anagrus (Anagrus) agloblini* Triapitsyn
 2 mps *Anagrus (Anagrus) japonicus* Clava differently colored 49
 Sahad - Both F2 and F3 notably shorter than follo-
 - F5 and F6 together markedly shorter than wing funicle segments (as in Figs 13, 14) ...
 clava (by about 1/4 of its length); F4 with 1 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 infusate, 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) <i>Anagrus (Anagrus) nilaparvatae</i>	
	Pang & Wang	
76 (72)	F4 without mps <i>Anagrus (Anagrus)</i>	
	<i>sophiae</i> S. Triapitzin	
-	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..... <i>Anagrus (Anagrus) subfuscus</i>	
	Foerster	
-	Ovipositor:protibia ratio less than 2.5	
 <i>Anagrus (Anagrus) fennicus</i> Soyka	
79 (77)	Body color contrastingly black and yellow (at	
	least part of mesosoma)	
 <i>Anagrus (Anagrus) nigriventris</i> Girault	
-	Body more or less uniformly colored, from	
	yellow to dark brown (<i>A. brocheri</i> 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]	
	... <i>Anagrus (Anagrus) flaveolus</i> Waterhouse	
-	General body color brown or dark brown	
 82	
82 (81)	Ovipositor:protibia ratio 2.1-2.3 [Hawaiian	
	Islands] <i>Anagrus (Anagrus) insularis</i>	
	Dozier (part)	
-	Ovipositor:protibia ratio about 2.6 [Palearctic]	
 <i>Anagrus (Anagrus) brocheri</i> Schulz	
83 (80)	FWL:FWW about 7.0 [Palearctic]	
 <i>Anagrus (Anagrus) obscurus</i> Förster	
-	FWL:FWW at least 8.0 84	
84 (83)	Neotropical <i>Anagrus</i>	
	(<i>Anagrus miriamae</i> Triapitsyn & Virla	
-	Not Neotropical 85	
85 (84)	Holarctic <i>Anagrus</i>	
	(<i>Anagrus nigriceps</i> (Smits van Burgst)	
-	Known only from the Hawaiian Islands	
 <i>Anagrus (Anagrus) insularis</i> 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 *Echmeptryx 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 Kőszeg, 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: 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) semiglabus

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 (Triapitzin & 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 (Soy-

ka, 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 (-).

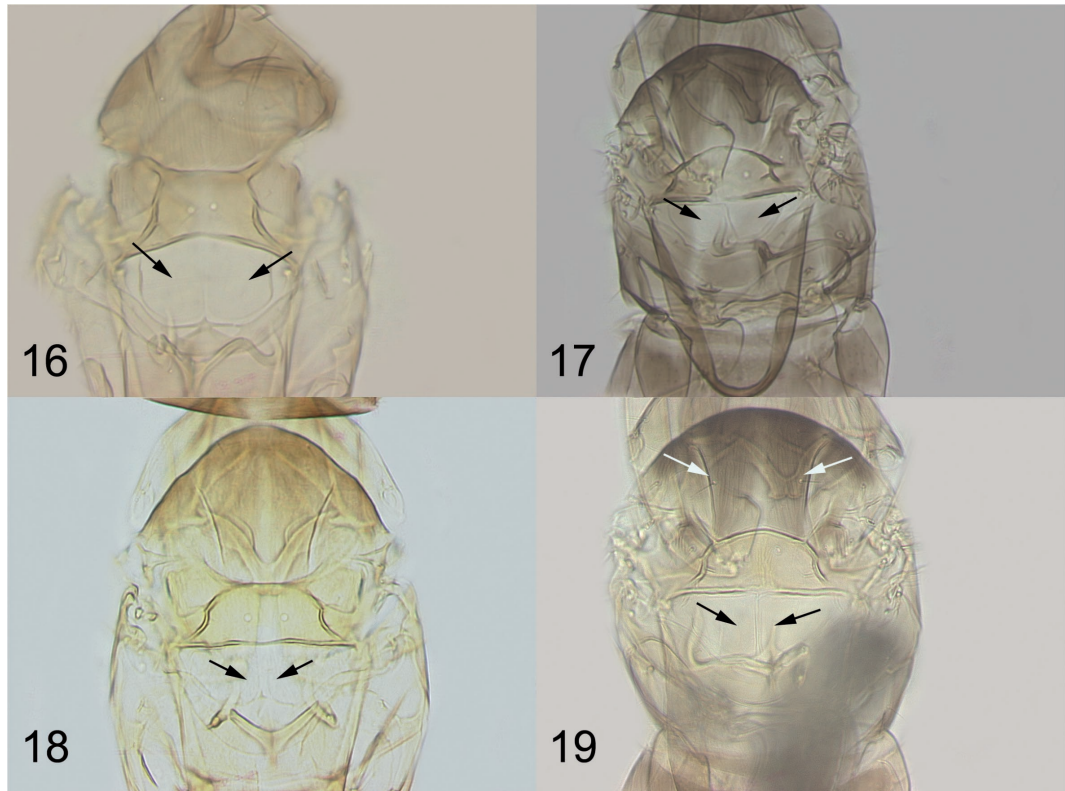
Distribution: Palearctic: Russia (Far East) (Triapitsyn & Berezovskiy, 2004).

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) erythroneuræ* S. Trjapitzin & Chiappini, female (paratype, Baja California, Mexico); [18] *A. (Anagrus) breviphragma* Soyka, female (Castelporziano Presidential Estate, Roma Province, Lazio, Italy); [19] *A. (Anagrus) tretiakovæ* 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 alfalvae* (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) erythroneuræ

S. Trijapitzin & Chiappini, 1994

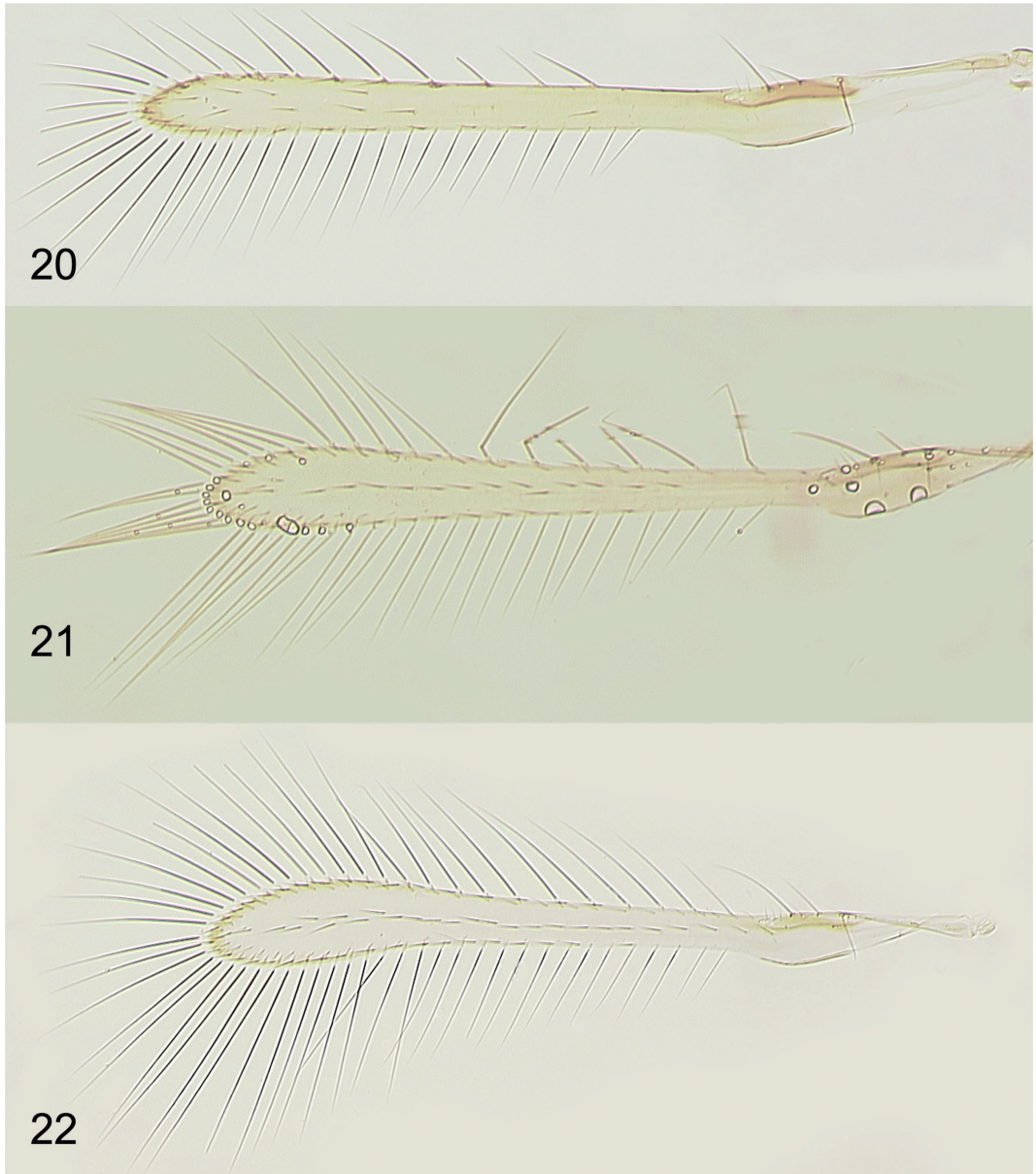
(Figs 1, 11, 17)

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 (Trijapitzin & 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* (Bakken-dorf) (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, Docheok, 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 ?*Watarara 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

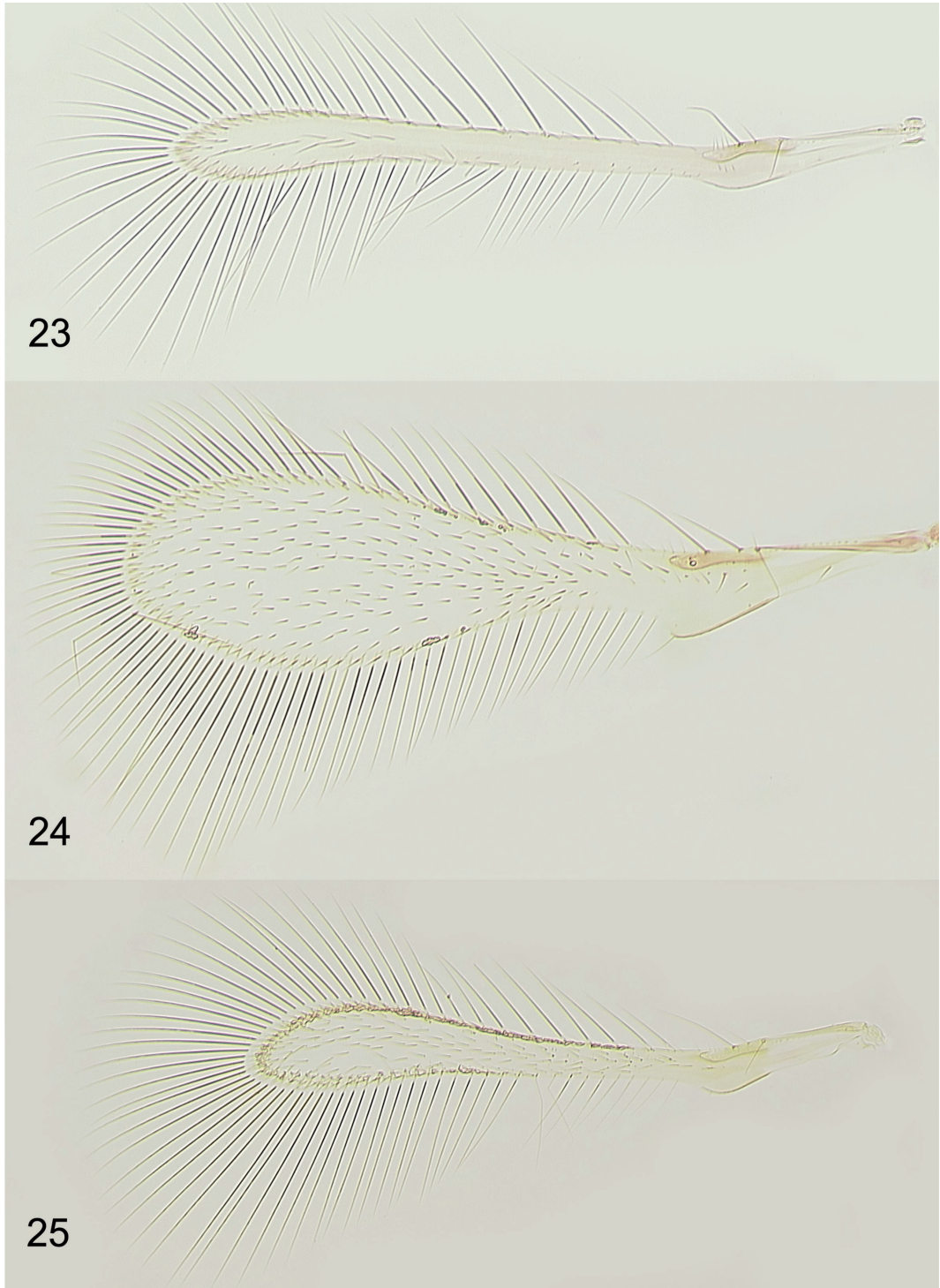
Coded redescription: 1 Yellow or brownish-yellow with F2-F6 and clava light brown or brown; 2a (4.2-4.3: 2.2-2.4: 1: 2.8-3.1: 2.4-2.6: 2.6: 2.8: 2.6-2.8: 5.3-5.8); 2b (0, 0-1, 1, 1, 2, 3); 3 (-); 4a (10.5-12); 4b (+); 4c (2); 5a (2.3-2.7); 5b (1); 5c (5-15); 6 (+).

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) longifrangiatius

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)

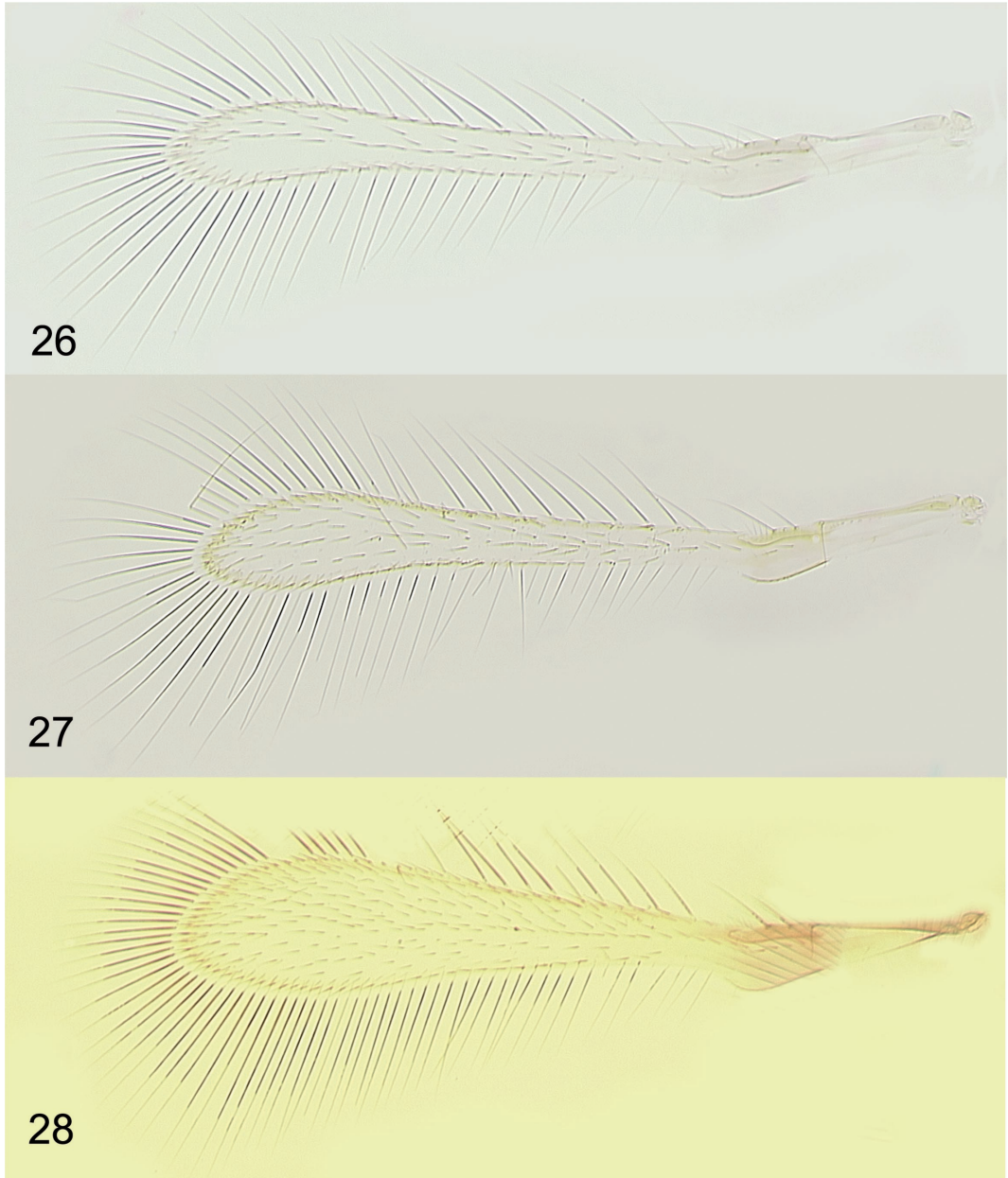
Coded redescription: 1 Brown; 2a (3.5: 2.0: 1: 2.1: 1.8: 2.1: 2.4: 2.6: 5.2); 2b (0, 0, 0, 1, 2, 3); 3 (-); 4a (6.9-9.8); 4b (+); 4c (3-5); 5a (1.7-2.5); 5b (1); 5c (-); 6 (+).

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, 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, 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 & Bere-

zovskiy, 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-red-dish 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).

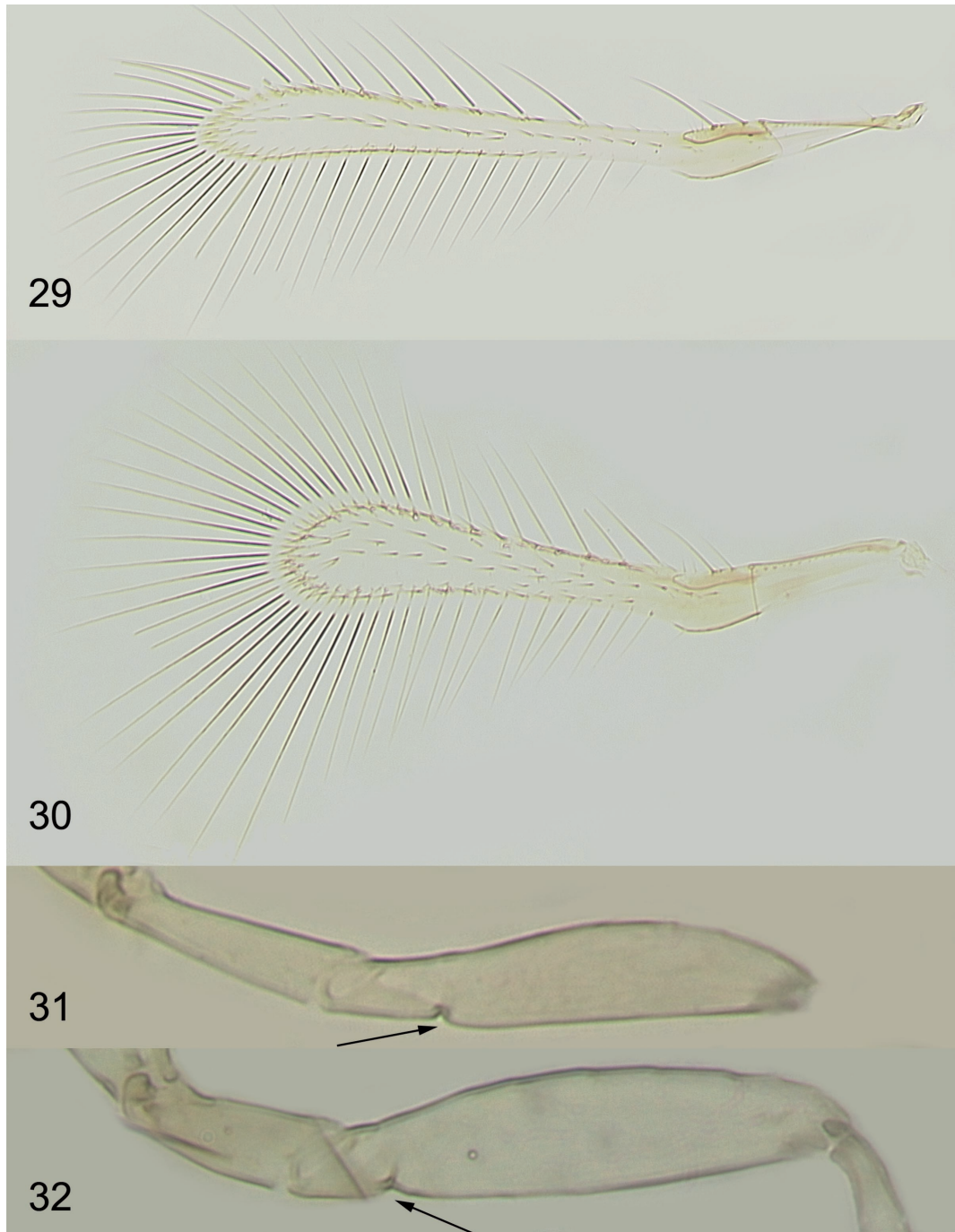
Important references: Chiappini (1989) – redescription; Triapitsyn & Berezovskiy (2004) – distribution, host associations, comments.

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. Doult [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: Triapitsyn (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) empoasca
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: *Amplipcephalus simpliciusculus* Linnavuori, *Dalbulus maidis* (DeLong), and *Exitanus 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. Reyéz-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 dehnelli* 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 exerted 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. obivius* 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 Blancitas, 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-Ménéville (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); *Mesovelina 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 mesosomal 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 fe-

male, 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 redescrptions, 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 Albarraçin *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. gabitzii* 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* Bořoc, 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. andreae* 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 & Berzovskiy, 2004: 10–12.
- A. (Anagrus) lindberginae* Nugnes & Viggiani, 2014: 66–71.
- A. (Anagrus) lineolus* Triapitsyn, 2000a: 217–218.
- A. (Anagrus) longifrangiatius* 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 & Virila, 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 & Doult, 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) semiglabus 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 forsteri*); 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*); Anneck & Douth, 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 Enoch; 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.

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