SUBFAMILY ROGADINAE
M. J. SHARKEY1, D. L. J. QUICKE2, S. R. SHAW3, C. VAN ACHERBERG4,
1. Hymenoptera Institute, 116 Franklin Ave., Redlands, California, USA, msharkey@uky.edu
2. Department of Biology, Faculty of Life Sciences, Chulalongkorn University, Bangkok, Thailand.
3. Department of Ecosystem Science and Management, University of Wyoming, , Laramie, WY USA
4. Naturalis Biodiversity Center, Postbus 9517, 2300 RA Leiden, The Netherlands

INTRODUCTION. There are 16 genera in the New World treated here and about twice that number occur worldwide.

PHYLOGENY. The subfamily is now formally split into five tribes: Aleiodini, Betylobraconini, Clinocentrini, Rogadini, Stiropiini (corresponding to the Stiropius group of the 1997 key) and Yeliconini (Quicke and Butcher, 2015). Betylobraconinae (in part, specifically Betylobraconini) are now treated as a tribe of Rogadinae based on morphological and molecular evidence (Butcher and Quicke, 2015). The Betylobraconini was until recently known only from the Old World, but a ‘Gondwanan’ representative was recently described (Quicke and Butcher, 2015). The tribe Facitorini of the original Betylobraconinae have also been transferred to the Rogadini where they are currently treated as a subtribe (Facitorina) within the Yeliconini (Belokobylskij et al., 2008).

BIOLOGY. Rogadinae are koinobiont endoparasitoids, mostly of exposed-feeding macrolepidopteran larvae (M. Shaw, 1983). However, the Stiropius group (Stiropius, Choreborogas Whitfield, Polystenidea Viereck) parasitizes leaf-mining lyonetiid and gracillariid larvae (Whitfield, 1988, 1990). The vast majority of rogadine species are solitary parasitoids, but a few gregarious species are known (e.g. Aleiodes stigmator (Say)). Pupation is internal, within the shrunken and mummified remains of the host caterpillar. Species of Rogas, for which rearing records exist, parasitize Limacodidae, Zygaenidae, Lycaenidae, and Riodinidae (the hosts of most Rogas species are not known). In Rogas, the host mummy is usually not glued down by the parasitoid larva, and the emergence hole is ragged and irregular (Smith et al., 1955 as Pelecystoma Wesmael). Species of Aleiodes parasitize a wide array of macrolepidopteran hosts; however, the Noctuoidea, Geometroidea, and Sphingoidea (as defined by Hodges et al., 1983) are most commonly utilized (M. Shaw, 1983). In Aleiodes, the host mummy is often glued down by the parasitoid larva through a hole chewed in the bottom of the host's prothorax, consequently the host mummies are commonly found stuck to a leaf or twig. Emerging Aleiodes adults normally cut an even, less jagged (as compared with Aleoides), and more circular emergence hole at the posterior end of the mummified caterpillar. Most rogadine adults are nocturnally active, and are among the most common braconids attracted to lights at night. More complete reviews of rogadine biology are provided by M. Shaw (1983, 1994), M. Shaw and Huddleston (1991) and S. Shaw (1993, 1995).

With the exception of M. Shaw’s (1981) study of Clinocentrus gracilipes (Thompson), the physiological mechanism underlying the mummification process has not yet been determined, and would be an interesting topic for further investigation. The mummy appears to have an outer larval cuticle, supported by an underlying pupal cuticle, which on the inside is lined lightly by silk produced by the pupating parasitoid larva. However, the parasitoid's cocoon is often
extremely thin, and it appears that the main support for the mummy comes from the cuticular layer produced by the host larva. Since in many species the mummy is produced during a penultimate larval instar, it appears that the parasitoid larva in some way manipulates the normal physiology of the host to induce a premature metamorphosis and production of pupal cuticle. Thus, the mummification process might be due to the destruction of the host's corpora allatum (eliminating the source of juvenile hormone), although this hypothesis has not been tested. It is, however, supported by the observation that early feeding by the rogadine larva is localized in the prothoracic region, where the "glue hole" is formed to attach the mummy to the substrate. Excellent observations on European species are provided by M. Shaw (1983).

**COMMON GENERA.** *Aleiodes* and *Triraphis* are both common. *Aleiodes* is more common in the Nearctic and *Triraphis* is more common in the Neotropics; however, both are common in the Neotropics.

**DISTRIBUTION.** Worldwide.

**DISTINGUISHING FEATURES.** All Rogadinae appear to mummify their host larvae. All are cyclostome and the first metasomal tergum has a pair of lateral carinae that converge medially. They lack spines or pegs on the foretarsus and have complete occipital carina. Many species are nocturnal as evidenced by their pale yellowish brown color.
Key to the New World genera of Rogadinae

Note: *Macrostomion* is not included in this key as it was in the last version of the Manual (Shaw, 1997) and is not known from the Nearctic. *Bioalfa* and *Hermosomastax*, new genera described here, are similar and belong to the same genus group.

1. A. Body length (not including appendages) less than 3 mm. ................................. 2
   B. Body length more than 3 mm. ........................................................................ 7

2(1). A. Metasoma with sclerotized carapace formed by terga 1-3; Chile. *Gondwanocentrus*
   B. Metasoma with sclerotized carapace formed by terga 1-4. Widespread. ............. 3
   C. Metasoma lacking sclerotized carapace; five or more sclerotized terga visible in dorsal view; CC. rarely 4th and 5th terga desclerotized but fully exposed; Neotropical 5
3(2).  
A. r-m crossvein of forewing present (though often weak), closing second submarginal cell .......................................................................................................................... *Stiropius*
B. r-m crossvein of forewing absent, second submarginal cell of forewing not closed apically......................................................................................................................... 4

4(3).  
A. Malar space (distance between base of mandible and eye) relatively short and malar suture present between eye and mandible; Neotropical. ...................... *Choreborogas*
B. Malar space relatively long and malar suture absent; Nearctic. ............ *Polystenidea*

5(2).  
A. Second submarginal cell of forewing present; apical abscissa of forewing vein M relatively straight ..................................................................................................................... 6
B. Second submarginal cell of forewing absent; apical abscissa of forewing vein M sinuate; Neotropical and recently discovered in Papua New Guinea (Braet, 2016)..... ................................................................................................................................. *Jannya*
6(5).  A. Antenna not emanating from a protruding shelf; eyes emarginate; head wider than long. ............................................................................................................. *Bulborogas*

B. Antenna emanating from a protruding shelf; eyes not emarginate; head at least as long as wide ............................................................................................................. *Conobregma*

7(1).  A. Tarsomeres 2–4 of front and middle legs reduced and compact; tarsomeres 2–4 each as short as or shorter than wide, 5th tarsomere as long as or longer than tarsomeres 2–4 combined.................................................................................................................. 8

B. Tarsomeres 2–4 of front and middle legs not reduced and compact; tarsomeres 2–4 each longer than wide, 5th tarsomere shorter than tarsomeres 2–4 combined ......... 9

8(7).  A. Hind wing vein R much longer than high and RS weakly curved or absent; widespread. ..................................................................................................................... *Yelicones*

B. Hind wing vein R much higher than long and RS strongly curved; Neotropical. ......... ..................................................................................................................... *Pseudoyelicones*
9(7).  
A. Membrane of forewing first submarginal evenly setose; widespread. .................... 10
B. Membrane of forewing first submarginal with a distinct windowlike patch devoid of setae; Neotropical. ................................................................. Cystomastax

10(9).  
A. m-cu crossvein of hind wing long and conspicuous and directed towards base of wing; ovipositor as long as middle tibia or longer............................................ Clinocentrus
B. m-cu crossvein of hind wing absent or if present then shorter and not directed towards the base of the wing; ovipositor usually shorter than middle tibia (variable in Triraphis) .................................................................................................................................. 11

11(10).  
A. 2RS of forewing nearly parallel with r-m, thereby forming a roughly rectangular or subquadrate second submarginal cell ................................................................. 12
B. 2RS of forewing angled towards base of wing posteriorly, thereby forming a roughly trapezoidal second submarginal cell ................................................................. 13
12(11). **A.** Second submarginal cell of forewing about as long as high. **AA.** Hind trochantellus elongate, 2 or more times longer than trochanter in ventral view; tarsal claws without pectination; Neotropical, rare. ...............................................................

**Heterogamus**

**B.** Lacking one or more of the above characters; most specimens are as follows: second submarginal cell longer than high. **BB.** Hind trochantellus not elongate, less than 2 times longer than trochanter in ventral view; tarsal claws usually with pectination; widespread, common. ................................................................. **Aleiodes** (most species, ~90%)

13(11). **A.** Hind tibial spurs mostly lacking setae and curved. **AA.** Hypopygium large; Neotropical, rare. ...............................................................................................................14

**B.** Hind tibial spurs setose and relatively straight. **BB.** Hypopygium normal; widespread, common. ..................................................................................................................15
14(13).  A. Tarsal claws simple, swollen basally but lacking a distinct lobe. AA. Hind femur swollen apically. .......................... *Hermosomastax* n. gen.  
B. Tarsal claws with a squared or slightly acute basal lobe. BB. Hind femur not swollen apically.......................................................... *Bioalfa* n. gen.

15(13).  A. Tarsal claws lacking basal lobe, but often with basal pectin-like row of short spines .......................................................... *Aleiodes* (~10% of species)  
B. Tarsal claws with well-defined sharp tooth or teeth ........................................... *Triraphis*
**Aleiodes** Wesmael, 1838

**Diagnosis.** Tarsal claw without a large, blunt basal lobe or tooth; basal portion of tarsal claw rounded, with or without a pectin of sharp accessory spines of variable size (usually these can be seen under high power with light microscopy). Inner margin of hind tibia without a distinct fringe of flattened setae (98% of species), or (more rarely) fringe present. Sternum of mesopleuron not foveate, either smooth or indicated only by shallow rugose sculpture. Median carina of propodeum complete to end of segment, or (more rarely) absent, but never diverging posteromedially into an areola. Fore wing m-cu arising distinctly basad 2RS, thus (RS+M)b long; 2RS nearly parallel with r-m, forming a roughly rectangular or subquadrate second submarginal cell.

**Biology.** Parasitoids of various macrolepidoptera, especially Noctuoidea, Geometroidea, and Sphingoidea but also including numerous other families (M. Shaw, 1994; van Achterberg & Shaw, 2016; van Achterberg et al. 2020).

**Diversity.** Hundreds of species described and probably several thousand undescribed.

**Distribution.** Cosmopolitan

**Publications.** Van Achterberg (1991), S. Shaw et al. (1997, key to species-groups). *Tetrasphaeropyx*, which was treated as a separate genus from *Aleiodes* in the 1997 Manual key, is now treated as the *pilosus* species group within *Aleiodes* (Fortier 2006). Braet and van Achterberg (2011) described two new small, *Aleiodes*-like species from French Guiana in their new genus *Athacryvac* Braet & van Achterberg. Molecular data at the time suggested they were potentially a sister-group of *Aleiodes*. However, whilst they are derived quite basally *Athacryvac* appears, in the light of the discovery of additional species, as well as additional morphological and molecular evidence, to be nested within *Aleiodes* and accordingly Shimbori et al. (2016) treat it as a subgenus of *Aleiodes*.

The North American species of *Aleiodes* have been extensively studied and revised in a series of papers by Marsh and S. Shaw (1998, 1999, 2001, 2003), S. Shaw (2006), Shaw and Marsh (2004), Fortier (2009), and Shaw et al. (1997, 1998a, 1998b, 2006, 2012). These papers follow the species-group arrangement proposed by Shaw et al. (1997) and cover all the North American species-groups of *Aleiodes*, with the exception of the *circumscriphtus* and *gastritor* groups, which are still being revised. However, some of the most common species of the *circumscriphtus* and *gastritor* groups are covered in Shaw (2006). The *seriatus* species-group as treated in the New World literature (Marsh and S. Shaw 1998) appear on the basis of molecular data to not be closely related to the West Palaearctic *A. seriatus* and may be a polyphyletic assemblage (van Achterberg and M. Shaw, 2016). Other recent papers have greatly expanded our knowledge of Neotropical *Aleiodes* species and their host records (Shimbori et al., 2016), especially from Ecuador (Townsend and S. Shaw, 2009a; Shimbori and S. Shaw, 2014) and Brazil (Shimbori et al., 2015). Garro et al. (2016) revised the *A. compressor* species group and described four new species from Mexico and South America, and Garro et al. (2017) revised the *A. apicalis* species group and described four new Neotropical species.

Several recent studies have provided high-quality biological data and demonstrated the utility of distinctive host caterpillar-mummy forms for identifying *Aleiodes* species (S. Shaw, 2006; Townsend and S. Shaw, 2009a; Shimbori and S. Shaw, 2014). S. Shaw (2006) provides color photos of the mummified host-remains of all common *Aleiodes* in the eastern USA.
Figure 1. *Aleiodes* sp.
**Bioalfa** Sharkey, 2020

**Diagnosis.** Morphologically, the new genus displays a mixture of character states associated with the *Colastomion*-Cystomastax group of genera, i.e., the curved, glabrous tibial spurs, and the enlarged hypopygium. *Bioalfa* differs from all other genera in this group by the presence of squared to slightly acute basal lobes on the tarsal claws.

**Biology.** Caterpillar hosts are known for two species, which are both external leaf-feeders in the family Uraniidae (Sharkey et al., 2020).

**Diversity.** Three described species, fewer than 20 predicted as undescribed.

**Distribution.** Neotropical rainforest, Costa Rica and Amazonian Colombia and Peru.

**Publications.** Sharkey et al. (2020) described three species and erected the genus.

---

Figure 2. *Bioalfa pedroleoni*, holotype.
**Bulborogas** van Achterberg, 1995

**Diagnosis.** Antenna not emanating from a protruding shelf. Eyes emarginate. Second submarginal cell of forewing present. Metasoma lacking sclerotized carapace; five or more sclerotized terga visible in dorsal view

**Biology.** Unknown.

**Diversity.** Three described species, fewer than 10 predicted as undescribed.

**Distribution.** Neotropical, Brazil, Peru, Panama, Ecuador.


Figure 3. *Bulborogas* sp.
Choreborogas Whitfield, 1990

**Diagnosis.** Malar space relatively short and malar suture present between eye and mandible. Second submarginal cell of forewing absent. Metasoma with sclerotized carapace formed by terga 1-4. Body length less than 3 mm.

**Biology.** Parasitoids of Lyonetiidae (Whitfield 1990).

**Diversity.** Nine described species, many more undescribed.

**Distribution.** Texas and Mexico to Peru.


![Image of Choreborogas sp.]

Figure 4. *Choreborogas* sp.
**Clinocentrus** Haliday, 1833

**Diagnosis.** Crossvein m-cu of hind wing long and conspicuous and directed towards base of wing. Ovipositor as long as middle tibia or longer. Membrane of fore wing first submarginal evenly setose. Tarsomeres 2-4 each longer than wide.

**Biology.** Parasitoids of web-inhabiting and other concealed microlepidoptera, especially Tortricidae.

**Diversity.** 45 described species, 5 from the New World, probably as many undescribed.

**Distribution.** Cosmopolitan.

**Publications.** Martinez (2008) described two new species from Argentina.

---

Figure 5. *Clinocentrus* sp.
Conobregma van Achterberg, 1995

**Diagnosis.** Antenna emanating from a protruding shelf. Eyes not emarginate. Head at least as long as wide. Second submarginal cell of forewing present.

**Biology.** Unknown.

**Diversity.** Six described species Two described species, fewer than 10 predicted as undescribed.

**Distribution.** Cosmopolitan, principally tropical and subtropical.


Figure 6. Conobregma sp.
**Cystomastax** Szépligeti, 1904

**Diagnosis.** Membrane of fore wing first submarginal cell with a distinct window-like clear patch that is devoid of setae. Large species, 9-14 mm in length.

**Biology.** All of relatively few host records are from Erebidae (Zaldivar-Riverón et al., 2008; unpublished observations).

**Diversity.** Relatively uncommon; 6 described species.

**Distribution.** Neotropical.

**Publications.** Species descriptions are scattered in the literature.

Figure 7. *Cystomastax* sp.
**Gondwanocentrus** Quicke & Butcher, 2015

**Diagnosis.** Body length less than 3 mm. Metasoma with sclerotized carapace formed by terga 1-3. Chile

**Biology.** Unknown.

**Diversity.** One described species, rare.

**Distribution.** Chile.

**Publications.** The Betylobraconini were unknown from the New World until 2015, but its presence there was reported by Quicke and Butcher (2015) based on the discovery and description of a new genus, *Gondwanocentrus* Quicke & Butcher, from Chile. It is effectively impossible to assign most Betylobraconinae *s.l.* to either Rogadinae: Yeliconini: Facitorini or Rogadinae: Betylobraconini based on morphology alone (Butcher and Quicke, 2015), but importantly, they are readily separated using DNA sequence data.

![Image of Gondwanocentrus Humphriesi](image)

Figure 8. *Gondwanocentrus humphriesi.*
**Hermosomastax** Quicke, 2020

**Diagnosis.** The curved glabrous tibial spurs suggest an affinity with the *Colastomion-Cystomastax* group of genera; however, it lacks the curved forewing vein m-cu and the elongate and basally narrowed first metasomal tergite that is characteristic of other members of that group. The swollen hind femur is also diagnostic.

**Biology.** Unknown.

**Diversity.** One described species, rare.

**Distribution.** Only known from type specimen of the type species from tropical rainforest in Ecuador.

**Publications.** The genus and sole species were described in Sharkey et al. (2020).

![Figure 9. *Hermosomastax clavifemorus*, holotype.](image)
**Heterogamus** Wesmael, 1838

**Diagnosis.** Second submarginal cell of forewing about as long as high. Hind trochantellus elongate, 2 or more times longer than trochanter in ventral view. Tarsal claws without pectination. Pronotum elongate medially.

**Biology.** Unknown. As reported in Zaldívar-Riverón et al. (2008), “the hosts of *Heterogamus* … remain unknown, old published records, … repeated in Fortier and Shaw (1999) are almost certainly erroneous and have never been repeated.”

**Diversity.** About 23 species worldwide, only two in the neotropics.

**Distribution.** Cosmopolitan, except the Nearctic.

**Publications.** The genus *Heterogamus* was treated as a synonym of *Aleiodes*, often separated as the *A. dispar* species-group, but they are now considered to be separate genera and only anciently related. Both are cosmopolitan genera with similar morphology but are abundantly distinct especially on the basis of DNA sequence data, but they are also morphologically fairly easily separable (Butcher *et al.*, 2012; van Achterberg and M. Shaw, 2016). *Aleiodes* is by far the larger of the two genera.

Figure 10. *Heterogamus* sp.
**Jannya** van Achterberg, 1995

**Diagnosis.** Antennal sockets protruding. Second submarginal cell of forewing absent; apical abscissa of forewing vein M sinuate.

**Biology.** Unknown.

**Diversity.** Two described species, fewer than 10 predicted as undescribed.

**Distribution.** Neotropical, Costa Rica to Ecuador.

**Publications.** Van Achterberg (1995) erected the genus and described the known species.

*Figure 11. Jannya sp.*
**Polystenidea** Viereck, 1911

**Diagnosis.** Antennal sockets protruding and distally acutely angulate in profile. Scape very short and distinctive, flared dorsally and ventrally.

**Biology.** Parasitoids of Lyonetiidae.

**Diversity.** Two described Nearctic species. Many more undescribed.

**Distribution.** Widespread in the New World, but no Neotropical species described.


Figure 12. *Polystenidea* sp.
**Pseudoyelicones** van Achterberg, Pentiado-Dias, and Quicke, 1997

**Diagnosis.** The hind wing venation is unique among the Braconidae.

**Biology.** There are unpublished records of Pyralidae as hosts (Sharkey et al, in prep.).

**Diversity.** Five described species, fewer than 20 predicted as undescribed.

**Distribution.** Neotropical, Costa Rica and Brazil.


**Figure 13.** *Pseudoyelicones* sp.
**Stiropius** Cameron, 1911

**Diagnosis.** Body length less than 3 mm. Metasoma with sclerotized carapace formed by terga 1–4. Second submarginal cell of forewing present.

**Biology.** Parasitoids of Lyonetiidae and Gracillariidae Whitfield (1988).

**Diversity.** 19 described species, dozens more undescribed.

**Distribution.** Restricted to the New World. U.S.A. and Canada to Argentina, including the Caribbean.


---

Figure 14. *Stiropius* sp.
**Triraphis** Ruthe, 1855

**Diagnosis.** Tarsal claws with well-defined sharply pointed basal lobe. Hind tibial spurs setose and relatively straight. Hypopygium normal not greatly expanded.

**Biology.** Parasitoids of sluggish and slug-like macrolepidoptera including Dalceridae, Limacodidae, Megalopygidae, Zygaenidae, Lycaenidae, and Riodinidae (van Achterberg 1991; Valerio and Shaw 2015).

**Diversity.** About 30 species described in the New World with several thousand undescribed.

**Distribution.** Widespread all over the New World but much more diverse in the neotropics.

**Publications.** There are no revisions for New World species.

**Notes.** New World species formerly classified as *Rogas* were reassigned to *Triraphis* Ruthe (e.g. Zaldívar-Riverón *et al.*, 2008); true *Rogas* is an Old World genus that probably does not occur in the New World. The limits of *Triraphis* are still unclear, with uncertainty over whether the New World species are congeneric with the Old World ones despite great morphological similarity. The type species is European.

Figure 15. *Triraphis* sp.
**Yelicones** Cameron, 1887

**Diagnosis.** Tarsomeres compressed. RS of hind wing weakly curved or absent. Claws strongly pectinate.

**Biology.** Parasitoids of Pyralidae.

**Diversity.** 126 described species, 4 Nearctic and 86 Neotropical. Many more undescribed.

**Distribution.** Cosmopolitan, principally tropical and subtropical.


![Figure 16. Yelicones nigromarginatus](image)
References


Butcher BA, Quicke DLJ, Shreevihar S, Ranjith AP. 2016. Major range extensions for two genera of the parasitoid subtribe Facitorina, with a new generic synonymy (Braconidae, Rogadinae, Yeliconini). *Zookeys* 584: 109-120.


Martinez JJ. 2009. Two new species of Clinocentrus Haliday (Hymenoptera: Braconidae) from Argentina, with notes on South American species. *Journal of Natural History* 43: 43-44.


