A REVIEW OF THE GENUS *RHOPALUM* IN AMERICA NORTH OF MEXICO (HYMENOPTERA: SPHECIDAE)

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ABSTRACT

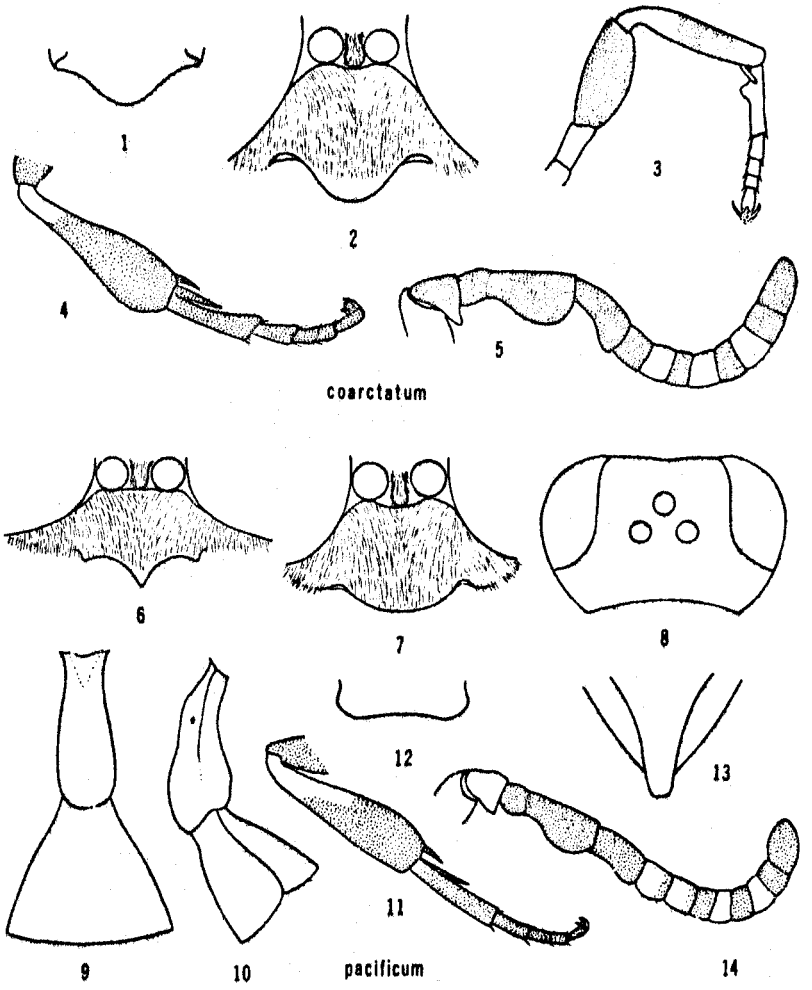
Six species of *Rhopalum* are treated, of which two are described as new. The latter are *atlanticum* from eastern United States and *pacificum* from the Pacific Coast. Synonymy additions include the placing of *carolina* Banks under *occidentale* (W. Fox); and *rubrocinctum* Peckham and *arapaho* (Pate) under *pedicellatum* Packard. A key to the nearctic species is given along with illustrations of key characters.

Key Words: *Rhopalum*, *Crabronini*, Sphecidae, wasp.

The large crabronine genus *Rhopalum* is cosmopolitan. As a rule, recognition characters are the pedunculate abdomen, absence of an omaulus on the mesopleuron, five segmented maxillary palpi along with three segmented labial palpi, and median position of the recurrent vein terminus on the submarginal cell. A discussion of the genus is given by Bohart and Menke (1975) who list four species as occurring in the United States and Canada. Two new species are described herein, bringing the total to six

Most species nest in twigs, canes, and reeds which they stock with flies and other small insects. The ease of transport of rosebush canes may account for the presence in our fauna of two European species, *clavipes* (Linnaeus) and *coarctatum* (Spinola). These two were not recorded by W. Fox (1895) and presumably arrived here after 1900. A few species are ground nesting and *occidentale* (W. Fox) may be an example, as indicated by the relatively broad and flattened female pygidial plate (fig. 16).

The nearctic *Rhopalum* have never been adequately treated although W. Fox (1895) and Pate (1947a, b) made important contributions. The present paper resulted in part from a request by R. W. Matthews and C. J. Kislow for identification of a species of *Rhopalum* whose biology they were studying. A small amount of research revealed the absence of reliable keys, some synonymy, and the presence of undescribed species.

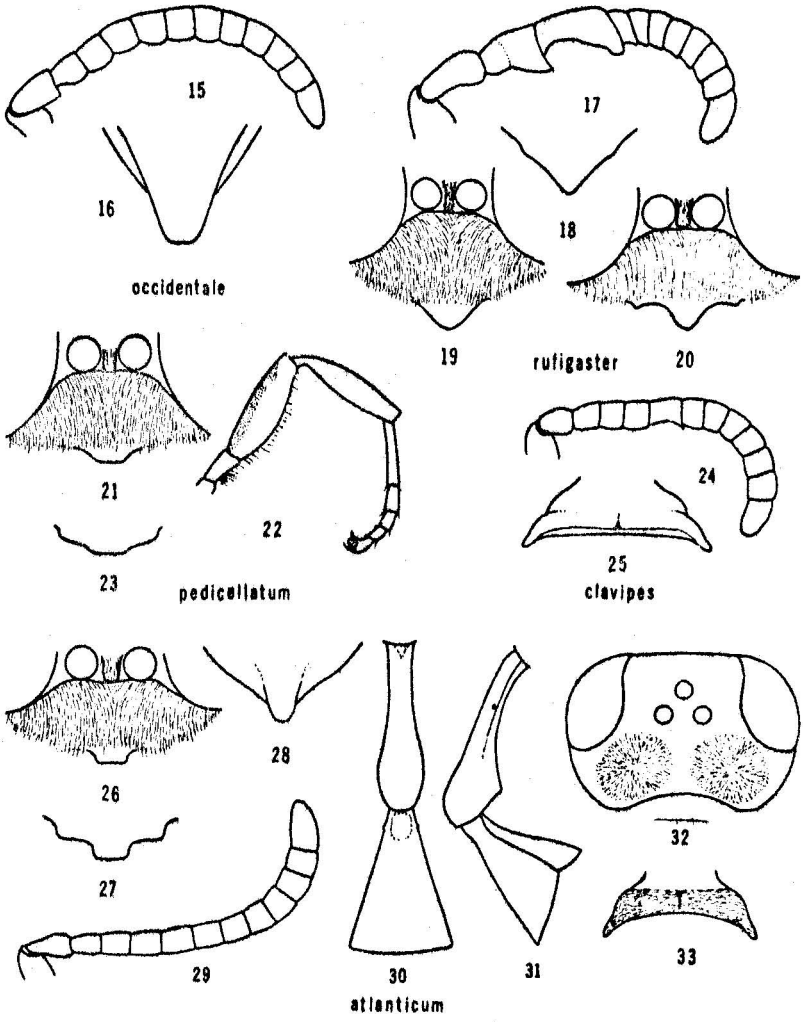


1. Male clypeal apex from below. 2. Male clypeus. 3. Male midleg. 4. Male hindleg. 5. Male antenna. 6. Female clypeus. 7. Male clypeus. 8. Top of head, male. 9. Male terga I-H, dorsal. 10. terga I-II, lateral. 11. Male hindleg. 12. Male clypeal apex from below. 13. Female pygidium. 14. Male antenna.

Material from many collections has been examined but a few have been particularly helpful: Cornell University (R. C. Miller), National Museum of Natural History (A. S. Menke, USNM), Academy of Natural Sciences of Philadelphia (W. Wayne Moss, ANSP), Museum of Comparative Zoology at Harvard (Ms. J. C. White, MCZ), University of Georgia (R. W. Matthews, U. Ga.), Oregon State University (P. Oman, OSU), and University of California, Davis (R. O. Schuster, UCD).

Key to *Rhopalum* of America north of Mexico

1. Seven visible abdominal terga, males 2
   Six visible abdominal terga, females 8
2. Flagellomere II not irregularly swollen (Figs. 15, 24), forebasitarsus nearly cylindrical, clypeal apex nearly truncate (Fig. 26) 3
   Flagellomere II irregularly swollen (Fig. 5), forebasitarsus flattened and expanded 5
3. Foretrochanter brown, hindtibia all dark, vertex normal, Pacific and Atlantic coastal states ..... *occidentale* (W. Fox)
   Foretrochanter yellow, hindtibia pale basally 4
4. Veritex with two large depressions (Fig. 32), Atlantic coastal states ..... *atlanticum* R. Bohart
   Vertex normal, not depressed; eastern and western U.S., Palearctic ..... *clavipes* (Linnaeus)
5. Flagellomere I-II sharply angled apicoventrally (Fig. 17), clypeal apex narrowly rounded (Fig. 19), North America east of 100th meridian ..... *rufigaster* Packard
   Flagellomere I-II rounded beneath (Fig. 5), clypeal apex broadly rounded (Figs. 2, 7) 6
6. Midbasitarsus strongly asymmetrical (Fig. 3), midtibia with dark markings, median lobe of clypeus in ventral view of head strongly protruding and distally rounded (Fig. 1), transcontinental in U. S. and Canada ..... *coarctatum* (Scopoli)
   Midbasitarsus nearly cylindrical (Fig. 22), midtibia all pale yellow, median lobe of clypeus less strongly protruding and truncate or incurved distally (Figs. 12, 23) 7
7. Median lobe of clypeus truncate distally as seen in ventral view of head (Fig. 23), U. S. west to Colorado ..... *pedicellatum Packard*
   Median lobe of clypeus broadly incurved distally (Fig. 12), Pacific coast ..... *pacificum* Bohart
8. Clypeus sharply pointed or very narrowly rounded distally (Fig. 6) 9
   Clypeus nearly truncate distally or broadly rounded (Fig. 20) 11
9. Midtibia extensively dark, scape with an inner dark spot ..... *coarctatum* (Scopoli)
   Midtibia all pale yellow, scape nearly always all pale 10
10. Tergum VI dark brown to dark reddish ..... *pedicellatum* Packard
    Tergum VI light reddish in contrast to dark brown of tergum V ..... *pacificum* Bohart
11. Pygidium closely shagreened, not at all polished, midtibia entirely pale 12



15. Male antenna. 16. Female pygidium. 17. Male antenna. 18. Male clypeal apex from below. 19. Male clypeus. 20. Female clypeus. 21. Male clypeus. 22. Male midleg. 23. Male clypeal apex from below. 24. Male antenna. 25. Female prothorax, dorsal. 26. Male clypeus. 27. Male clypeal apex from below. 28. Female pygidium. 29. Male antenna. 30. Male terga I-II, dorsal. 31. Male terga I-II, lateral. 32. Top of head, male. 33. Female prothorax, dorsal.

Pygidium partly or mostly polished, midtibia partly or all dark 13

12. Pronotum with a rounded transverse ridge followed by a short, grooved, polished area (Fig. 25) ..... *clavipes* (Linnaeus)
Pronotum with a distinct anterior edge followed by a longer, uncreased transversely microsculptured area (Fig. 33) ..... *atlanticum* R. Bohart

13. Scape dark in front except for a small basal spot, midtibia all black, palpi dark ..... *occidentale* (W. Fox)
Scape yellow in front, midtibia pale basally, palpi pale ..... *rufigaster* Packard

Rhopalum atlanticum Bohart, new species
(Figs. 26-33)

Male holotype: length 4.5 mm, dark brown with pale yellow as follows: scape, pedicel beneath, mandible mostly, palpi, fore and midlegs except midtarsomere V, hindcoxa and trochanter partly, hindfemur basoventrally, basal ring on midtibia, pronotal lobe, wing base partly; wings nearly clear, abdomen dark with basolateral reddish spots on terga III-IV, broadening ventrally to cover apex of sternum II and most of III-IV. Pubescence silvery on clypeus, orbital stripe and mesopleuron in front of episternal sulcus; pubescence pale and inconspicuous elsewhere except for rather long erect hair beneath foretrochanter. Punctures fine, about a diameter apart on frons, vertex and scutum, propodeum and mesopleuron polished and with weak punctation; terga with microsculpture and subshiny. Clypeus narrowly truncate apically (Fig. 26); antenna simple, flagellomere I distinct (Fig. 29); top of head with a pair of large conical depressions with dense micropubescence (Fig. 32); pronotum rather flattened above, front edge of collar distinct, surface of collar transversely and irregularly microridged, median notch weak (as in Fig. 33); propodeum longitudinally grooved, dorsolateral carina strong and complete; forebasitarsus slender and cylindrical; midtarsus simple; hindleg about as in Fig. 11; tergum I slender (Figs. 30, 31), 3.8 times as long as wide in dorsal view; tergum II about 1.45 times as broad as long in dorsal view and with an oval basal depression (Fig. 30).

Female: about as in male except: length about 5 mm, clypeal apex similar but a little broader and slightly concave, no vertex depressions; pygidial plate defined only toward apex where it converges moderately, surface microreticulate and subshiny.

Holotype male (USNM), Athens, Georgia, X-24-73 (reared by C. J. Kislow). Paratypes, 17 males, 53 females, same data as holotype but collected from September 13 to October 24. Other specimens: one topotype pair in Malaise trap, July, 1969 and 1970, one female, Atlanta, Georgia, VII-12-41 (P. W. Fattig, U. Ga.) one female, Flatbush, Long Island, New York, X-1-91 (Cornell). Paratypes have been distributed to institutions listed in the introduction.

This Atlantic Coast form is only slightly variable in markings. The red spots of terga III-IV sometimes join dorsally to form a narrow basal band. The large conical depressions on the male vertex are remarkable and diagnostic among species in this country. However, two similar species

are known from Central America: *calverti* Pate from Costa Rica and Panama and *grenadinus* Pate from the island of Grenada. In the former species, the depressions of the vertex are considerably smaller, separated from each other and from the eye margins by nearly their diameters. Females of *calverti* are best distinguished by the well defined and slipper shaped pygidial plate. I have studied the male holotype of *grenadinum* and the depressions on the vertex are similar to those of *atlanticum*. However, the clypeus of *grenadinum*, as figured by Pate (1947a), is weakly incised apically rather than produced and truncate. Also, the abdomen is much more slender, tergum II being nearly three times as long as broad in dorsal view compared with less than 1.5 times in *atlanticum* (Fig. 30). The simple male antenna and narrow female pygidial plate place *atlanticum* in the typical subgenus *Rhopalum* as it is currently understood.

Rhopalum clavipes (Linnaeus), 1758
(Figs. 24, 25)

This species is the type species. The rather simple antennae in both sexes, extensive pale leg markings, bluntly produced clypeus, simple male midtarsus, and microreticulate female pygidial plate all combine to differentiate this species in our fauna. Male flagellomere IV is slightly lengthened and concave beneath in contrast to that of *occidentale* (compare Figs. 15, 24).

Specimens have been examined from the Pacific Coast states and Idaho, as well as the Atlantic Coast states from Maryland to Maine. The species occurs also in Europe, and the U. C. Davis collection has material from Austria, Belgium and Switzerland.

Rhopalum coarctatum (Scopoli)
(Figs. 1-5)

The distorted basal midtarsomere (Fig. 3) distinguishes the species in the male. In many other respects and especially the peculiar form of the male antenna, it is much like *pacificum and pedicellatum* (Figs. 5, 14). This antennal type has been used as the principal feature of the subgenus *Corynopus*. The curvature of the basal hindtarsomere in the male is more exaggerated in *coarctatum* than in the other two (compare Figs. 4, 11). Also distinctive is the dark spot on the midtibia in both sexes (Fig. 3). The male clypeus is similar in its convexity and medial bulging to that of *pacificum* (Figs. 2, 7), but the latter has the apex less produced and concave when viewed from beneath (compare Figs. 1, 12).

I have seen more than 50 specimens of this holarctic species but none are from west of the Rocky Mountains.

Rhopalum occidentale (W. Fox)
(Figs. 15, 16)

Crabro occidentalis W. Fox, 1395:200. Lectotype ♀, Nevada, ANSP.
Rhopalum carolina Banks, 1921:17. Holotype ♀, North Fork Swannanoa River, Black Mts., North Carolina, MCZ. New synonymy.

The simple male antenna (Fig. 15), together with the rather broad female pygidial plate (Fig. 16) have led to the use of the subgenus *Alliognathus* by some workers. In my opinion, subgeneric lines are so weak

that they have little value when considered from a world standpoint. The pale markings of *occidentale* are more reduced than in any other of our species. It is the only one with all dark foretrochanter and hindtibia. *Rhopalum carolina* does not appear to have any valid distinguishing features.

About 20 specimens have been studied. These were from Maine, Connecticut, New York, Michigan, and North Carolina in the east; and Colorado, Wyoming, Oregon and California in the west. Western localities are all in mountainous areas above 4,500 feet elevation.

Rhopalum pacificum Bohart, new species
(Figs. 6-14)

Euplilus arapaho Pate of Parker and Bohart, 1966:94, misidentification.

Male holotype: length 4.5 mm, dark brown with pale yellow as follows: scape, pedicel, flagellomeres IV-V partly, VII and IX entirely, mandible mostly, palpi, tegula and wing base, fore and midleg beyond base of coxa except for weak upper basal mark on femur and midtarsal article V, hindcoxa mostly as well as trochanter, basal ring on tibia and weak basal marks on tarsomeres I-II; wings nearly clear; abdomen dark with dull red across apex of tergum II and over most of III, abdominal venter mostly dull pale beyond sternum II. Pubescence silvery on clypeus and in narrow orbital stripe, white and inconspicuous elsewhere, longest beneath femora. Punctures fine, about a diameter apart on frons, vertex and scutum, more spaced and polished between on scutum, propodeum and mesopleuron, terga closely and finely micropunctate. Clypeus somewhat convoluted, protuberant medially and broadly rounded at apex (Fig. 7) but a little concave as seen from below (Fig. 12); antenna (Fig. 14), flagellomere I weakly defined; top of head (Fig. 8); pronotum rounded and with a weak posterolateral transverse impression, median notch moderate; propodeum longitudinally grooved, dorsolateral carina fine, fading above; forebasitarsus somewhat enlarged, flattened and a little concave; midleg about as in Fig. 22, hindleg (Fig. 11); tergum I moderately stout (Figs. 9, 10), 2.6 times as long as wide in dorsal view, tergum II not depreseed basally, about as long as broad in dorsal view (Fig. 9).

Female: about as in male except: flagellum dark, simple, article I distinct, two-thirds as long as pedicel and half as long as II; clypeus rather sharply pointed (Fig. 6); pygidium pale reddish; pygidial plate polished, narrow, tapering to a narrowly rounded apex (Fig. 13).

Holotype male (UCD), Putah Canyon, Yolo Co., California, 1963 (reared from *Sambucus* stem by F. D. Parker). Paratypes, 6 males, 6 females, same data as holotype. Other specimens: 1 female, Davis, California, VI-5-49 (E. I. Schlinger, UCD); 2 females, Verdi, Nevada, reared from *Sambucus* stems 1963 (F. D. Parker, UCD); 1 male, Corvallis, Oregon, III-30-30 (H. A. Scullen, OSU); 1 male, Corbett Station, Multnomah Co., Oregon (G. Ferguson, OSU).

This Pacific Coast form is most similar to *pedicellatum* in the female, differing principally in the more reddish tergal markings. In the male, the combination of a broadly rounded clypeal apex (as in *coarctatum*) and simple midtarsus (as in *pedicellatum*) will distinguish it. The male antennal form places the species in the subgenus *Corynopus*.

A parasite recorded by Parker and Bohart (1966) is *Diomorus zabriskiei* Cresson (Torymidae). Paratypes have been distributed to institutions listed in the introduction.

Rhopalum pedicellatum Packard
(Figs. 21-23)

Rhopalum pedicellatum Packard, 1867:380. Lectotype ♀ (here designated), West Farms, New York ("*Crabro* 249 bred from *Spiraea* stem by J. Angus"), ANSP.

Rhopalum rubrocinctum Peckham and Peckham, 1898:43. Lectotype ♀ (here designated), Maitland, Wisconsin, USNM.

Euplilus arapaho Pate, 1947a:8. Holotype ♂, Poudre River Canyon, Larimer Co., Colorado, ANSP. New synonymy.

The male antennal form relates this species closely to *coarctatum* and *pacificum* (Figs. 5, 14). However, the truncate slypeus of the male as viewed from beneath will distinguish *pedicellatum* (Fig. 23). The simple basal midtarsomere (Fig. 22) also separates the male from that of *coarctatum* (Fig. 3). Females have a rather sharply pointed clypeus as in the other two species. The partly dark midtibia in *coarctatum* differentiates it. However, females of *pedicellatum* and *pacificum* are quite similar. In addition to the less reddish abdomen in the former, its integument is more polished, especially on the terga. The geographical ranges of the two species appear to be exclusive.

I have seen about 10 specimens of *pedicellatum* from Colorado, Minnesota, Wisconsin, and New York. It has also been reported from other northeastern states.

Rhopalum rufigaster Packard
(Figs. 17-20)

Rhopalum rufigaster Packard, 1867:382. Lectotype ♀, Illinois, ANSP.

Rhopalum lucidum Rohwer, 1909:324. Holotype ♀, Harrisburg, Pennsylvania, USNM.

The peculiar antenna of the male places the species in the subgenus *Corynopus*. Among related forms the sharply angled flagellomere III is distinctive (Fig. 17). The female is best identified by the clypeus which has the tip exposed, polished, and reddish (Fig. 20). The male clypeus is slightly broader (Fig. 19), but angles toward the apex as seen from beneath (Fig. 18).

Material studied has been about 25 specimens, all collected in eastern Canada and United States east of the 100th meridian.

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