

## A Revision of New World *Lyroda* Say, 1837 (Hymenoptera: Crabronidae)

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The North and South American *Lyroda* are revised and redescribed; the types of South American species are examined for the first time since their descriptions more than 150 years ago. A key for species identification is provided, including several previously unnoticed characters. Taxonomically important characters are illustrated, and a distribution map is provided for each species. The following new synonymies are established: *Morphota harpactoides* F. Smith, 1856 and *Morphota tridens* Taschenberg, 1870 = *Lyroda fasciata* (F. Smith, 1856); *Lyroda antillana* Genaro and Portuondo, 2001 = *Lyroda subita* Say, 1837. Neotypes are designated for *Lyroda subita* Say, 1837 and *Lyroda triloba* Say, 1837.

*Lyroda* Say, 1837, a genus of the Miscophini, includes 25 currently recognized species, but we reduce this number to 22. Originally described from the United States, the genus was subsequently found in South America, southeastern Asia (where most of the known species occur), Africa, and Australia. In the New World, two species were described from the United States by Say in 1837, three from Brazil by F. Smith in 1856, one from the same country by Taschenberg in 1870, and one from the Caribbean islands by Genaro and Portuondo in 2001. The South American species, in particular, have never been critically revised and remain unidentifiable, and are only mentioned in species lists by Kohl, 1885, Dalla Torre, 1897, Iwata, 1933, Bohart and Menke, 1976, and Amarante, 2002, in spite of the 150 or more years since their descriptions. This deplorable situation is corrected in the present paper.

Most members of *Lyroda* are easily recognized by its unique pronotal collar, whose lateral corner is separated by an impression from the median, obtuse projection (that narrows posteriorly), resulting in a trituberculate appearance (Fig. 1). These structures, however, are only inconspicuously expressed, barely perceptible, in some undescribed Australian species. Most species have three submarginal cells, but the Australian *L. errans* (R. Turner) and a few undescribed Australian species have two.

**MORPHOLOGICAL TERMINOLOGY.** The terminology used here follows Bohart and Menke (1976).

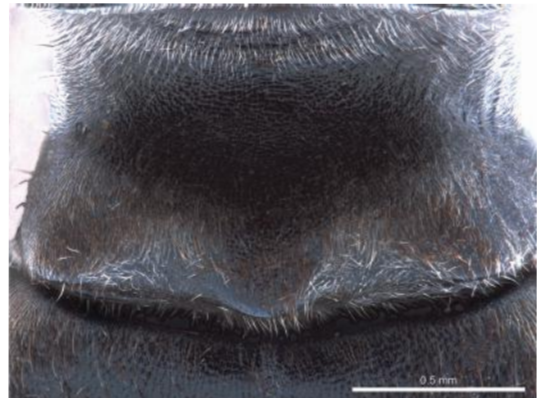


FIGURE 1. *Lyroda subita*: pronotum in dorsal view.

**ORIGIN OF MATERIAL.** The specimens examined or otherwise mentioned in the text are deposited in the institutions listed below. The institutions are referred to in the text by their respective capitalized abbreviations that precede their full names in the list below (the name of the person responsible for sending specimens is given in parentheses):

AMNH: American Museum of Natural History, New York, New York, USA (Christine LeBeau).

BISH: Bishop National Museum, Honolulu, Hawaii, USA (James H. Boone).

BMNH: The Natural History Museum, formerly British Museum (Natural History), London, United Kingdom (Gavin R. Broad).

CAS: California Academy of Sciences, San Francisco, California, USA.

CNC: Canadian National Collection of Insects, Arachnids, and Nematodes, Ottawa, Ontario, Canada (John T. Huber).

DZUP: Departamento de Zoologia, Universidade Federal de Paraná, Curitiba, Paraná, Brazil (Gabriel A.R. Melo, Brunno Rosa).

FSCA: Florida Department of Agriculture and Consumer Services, Gainesville, Florida, USA, formerly Florida State Department of Agriculture or Florida State Collection of Arthropods (Elijah J. Talamas).

HYMB: Coleção de Hymenoptera do Museu da Biodiversidade, Faculdade de Ciências Biológicas e Ambientais, Universidade Federal da Grande Dourados, Dourados, Mato Grosso do Sul, Brazil (Bhrenno M. Trad).

IML: Instituto de Entomología, Fundación Miguel Lillo, Tucumán, Argentina (Emilia Constanza Pérez).

MLUH: Zoologische Sammlung der Martin-Luther-Universität, Halle an der Saale, Germany (Karla Schneider).

MNHNC: Museo Nacional de Historia Natural de Cuba, Habana, Cuba.

UCD: Bohart Museum of Entomology, University of California, Davis, California, USA (Steve L. Heydon, Lynn S. Kimsey).

USNM: United States National Museum, Smithsonian Institution, Washington, D.C., USA (Seán Brady).

**NEOTYPE DESIGNATIONS.** The type material of both North American *Lyroda* described by Thomas Say (1837) was subsequently lost, together with the majority of his collection (Fox, 1902). No specimen of either species is present among the 71 surviving Say's type specimens at the Museum of Comparative Zoology, Cambridge, Massachusetts (Mawdsley, 1993). In order to assure nomenclatural stability, we therefore designate a neotype for each of the species.

Say's original descriptions do not contain many specifics to species recognition, but his reference to the wing color is significant. According to him, the wings are "purple-fuliginous, almost opaque" in *L. triloba*, and "at tip dusky" in *L. subita*. This difference has been used in the existing keys for the two species (Fox, 1894; H. Smith, 1908; Williams, 1914; Rohwer *in* Viereck, 1925).

*Lyroda subita* was described from an unspecified locality in Indiana, and *L. triloba* just from North America, without a state or locality, but certainly from the eastern USA, as the species range does not extend into Canada and does so only insignificantly beyond the 100<sup>th</sup> meridian (in South Dakota). Not having seen any specimen of *L. subita* from Indiana, we designate as a neotype of this species a female from Michigan (a state adjacent to Indiana): Cheboygan County, no specific locality, 19 July 1952, D.G. Shappirio collector (USNM). For *L. triloba*, we designate as a neotype a female from Arkansas: Hampstead County: no specific locality, 14 August 1954, no collector (CAS).

### Key to New World *Lyroda*

1. Gaster red basally (Fig. 6); tergum I with only a pair of basomedian carinae; forewing membrane in many specimens with dark, subapical, transverse fascia (Fig. 6), inconspicuous in male. South America . . . . . 2
  - Gaster all black; tergum I in vast majority of specimens with several smaller ridges in addition to pair of main basomedian carinae; forewing membrane without transverse fascia. North America and Caribbean islands . . . . . 3
2. Propodeal dorsum with 10–15 longitudinal ridges in at least two thirds of its length (Fig. 2); mesopleural setae not concealing integument . . . . . *concinna* (F. Smith)
  - Propodeal dorsum with well-defined median ridge and with smaller, irregular, variously shaped ridges on each side of it (Fig. 8), median carina and smaller ridges lacking in some specimens; mesopleural setae concealing sculpture, at least from certain angles and on selected parts of mesopleuron. [Female: scutellum in most specimens microsculptured (except basally) and with few sparse, minute punctures (Fig. 7), appearing unsculptured under lower magnifications, all punctate in some specimens, with all intermediates] . . . . . *fasciata* (F. Smith)
3. Propodeal side at most with evanescent ridges, with at least short, rudimentary spiracular groove (Fig. 12). Female: clypeus with three well-defined teeth on each side of lobe (Fig. 10); wing membrane all or largely translucent, except darkened in Floridian populations; clypeal setae silvery; vestiture of clypeus and propodeum silvery; gastral terga I-III with silvery pubescence on apical depressions. Male: clypeal free margin with obtuse median projection (Fig. 11) . . . . . *subita* Say
  - Propodeal side with well-defined ridges, without spiracular groove (Fig. 19). Female: clypeus with three pairs of inconspicuous (almost invisible) teeth on each side of lobe (Fig. 17); wing membrane dark; clypeal setae dark; vestiture of propodeum and gastral terga black. Male: clypeal free margin rounded mesally (Fig. 18) . . . . . *triloba* Say

### SPECIES DESCRIPTIONS

#### *Lyroda concinna* (F. Smith)

*Morphota concinna* F. Smith, 1856:294, ♀. Holotype by monotypy: Brazil: Pará: Tapajós River (BMNH), examined. — As *Lyroda concinna*: Kohl, 1885:267 (new combination, in checklist of world *Lyroda*); Dalla Torre, 1897:696 (in catalog of world Hymenoptera); Iwata, 1933:7 (in list of world *Lyroda*); R. Bohart and Menke, 1976:299 (in checklist of world Sphecidae); Nascimento and Overall, 1980:7 (Brazil, Peru, determination uncertain); Amarante, 2002:41 (in catalog of Neotropical Crabronidae); Rasmussen and Asenjo, 2009:11 (in checklist of Crabronidae of Peru, determination uncertain).

**RECOGNITION.** Like *Lyroda fasciata*, the gaster is red basally in *L. concinna*. It differs from that species in having 10–15 roughly parallel longitudinal ridges on the propodeal dorsum (Fig. 2) and the mesopleural vestiture not concealing the integument.

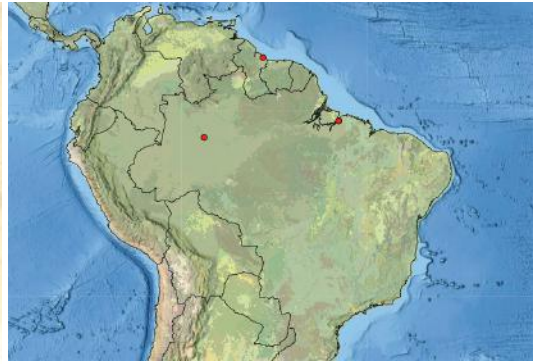
**DESCRIPTION.** Propodeal dorsum with 10–15 roughly parallel longitudinal ridges, mainly extending to the dorsum's apex (Fig. 2), but reaching only about two thirds of dorsum's length in male from Tefé (CAS); propodeal side unridged, without spiracular groove. Tergum I with only a pair of basomedian carinae. Mesopleural vestiture not concealing integument.

Body black, but gaster red basally; legs black or tibiae partly dark red. Forewing membrane in some specimens with slightly darkened, subapical, transverse fascia.

♀: Free margin of clypeal lobe with three teeth on each side of lobe. Length 7.6 mm.

♂: Free margin of clypeal lamella slightly arcuate to slightly weaving. Length 5.6–7.6 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 3). Northern South America.

FIGURE 2. *Lyroda concinna*: propodeal dorsum of male.FIGURE 3: Collecting localities of *Lyroda concinna*.

**RECORDS. BRAZIL:** Amazonas: Tefé (1 ♂, CAS). Pará: Belém: APEG [= Área de Pesquisa Ecológica do Guamá] Forest (1 ♂, CNC; 1 ♂, FSCA), Tapajós River (1 ♀, BMNH, holotype of *Morphota concinna*), no specific locality (1 ♂, CAS).

**GUYANA: Mahaica-Berbice:** Blairmont (1 ♂, BISH).

### *Lyroda fasciata* (F. Smith)

*Morphota fasciata* F. Smith, 1856:294, ♀. Holotype by monotypy: ♀, Brazil: Pará: Santarém (BMNH), examined. – **As *Lyroda fasciata*:** Kohl, 1885:267 (new combination, in checklist of world *Lyroda*); Dalla Torre, 1897:696 (in catalog of world Hymenoptera); Iwata, 1933:7 (in list of world *Lyroda*); R. Bohart and Menke, 1976:299 (in checklist of world Sphecidae); Nascimento and Overal, 1980:7 (Brazil); Amarante, 2002:41 (in catalog of Neotropical Crabronidae).

*Morphota harpactoides* F. Smith, 1856:294, ♀ (as *Harpactoides*, incorrect original capitalization). Holotype by monotypy: ♀, Brazil: no specific locality (BMNH), examined. **New synonym.** – **As *Lyroda harpactoides*:** Kohl, 1885a:267 (new combination, in checklist of world *Lyroda*); Dalla Torre, 1897:696 (in catalog of world Hymenoptera); Iwata, 1933a:7 (in list of world *Lyroda*); R. Bohart and Menke, 1976:299 (in checklist of world Sphecidae); Amarante, 2002:41 (in catalog of Neotropical Crabronidae).

*Morphota tridens* Taschenberg, 1870:8, ♀. Holotype by monotypy: ♀, Brazil: Minas Gerais: Lagoa Santa (Halle), examined. **New synonym.** – **As *Lyroda tridens*:** Kohl, 1885:267 (new combination, in checklist of world *Lyroda*); Dalla Torre, 1897:696 (in catalog of world Hymenoptera); Iwata, 1933:7 (in list of world *Lyroda*); R. Bohart and Menke, 1976:299 (in checklist of world Sphecidae); Nascimento and Overal, 1980:7 (Brazil); Amarante, 2002:41 (in catalog of Neotropical Crabronidae).

**RECOGNITION.** Like *Lyroda concinna*, this species has the gaster red basally, and the wing membrane in most specimens with slightly darkened, subapical, transverse fascia (Fig. 6), fascia inconspicuous in male. Unlike that species, the propodeal dorsum has at most one longitudinal carina and smaller, variously shaped ridges that are absent in some specimens (Fig. 7); also the mesopleural pilosity conceal the integument (at least from certain angles and at least on some mesopleuron parts). Many females are unique within the genus in having the scutellum punctate only basally, mostly microsculptured and with a few sparse, minute punctures (Fig. 8), appearing unsculptured under lower magnifications; there are all intermediates to all punctate scutellum.

**JUSTIFICATION OF NEW SYNONYMY.** In spite of some minor differences, the holotypes of *Lyroda fasciata* and of *Lyroda harpactoides* are certainly conspecific. Both species were described in the same paper. Acting as first revisers (Article 24.2.2 of the Code), we select *L. fasciata* as the valid name, and *L. harpactoides* as its junior synonym.



The holotype of *Morphota tridens* is just an average specimen of *Lyroda fasciata*, not differing from other specimens of this species by any particular feature. Consequently, we also synonymize these two names.

**TYPE LOCALITY OF *MORPHOTA TRIDENS*.** This species was described from Lagoa Santa in Brazil. There are two places of this name in Brazil: one in Goiás, the other in Minas Gerais. The one in Goiás, however, was established only on 1 January 2001, whereas the one in Minas Gerais did exist already in 1863–1866, when paleontological excavations were conducted there. The holotype of *Morphota tridens*, described in 1870, must have been collected there during that time.

**DESCRIPTION.** Propodeal dorsum with median ridge and smaller, irregular, variously shaped ridges on each side of it (Fig. 8), median carina and smaller ridges lacking in some specimens; propodeal side unridged, without spiracular groove. Tergum I with only a pair of basomedian carinae.

Body black except two or three first gastral terga red (Fig. 6); legs black or male tibiae partly or all red. Forewing membrane in many specimens with slightly darkened, subapical, transverse fascia (Fig. 6) that is inconspicuous in male.

♀: Free margin of clypeal lobe varying: mostly with three teeth on each side of the lobe (Fig. 4), but with two teeth in some specimens (on one or both sides), without teeth on right side in one specimen from Potrillos del Guneda National Park, Bolivia. Length 7.1–9.2 mm.

♂: Free margin of clypeal lamella varying from slightly convex to shallowly concave (Fig. 5). Length 6.0–8.3 mm.

**VARIATION.** In most females, the scutellum is microsculptured (Fig. 7), with a few sparse, minute punctures, appearing unsculptured under lower magnification. In the females from the three following localities, however, the scutellum is all or nearly all punctate: Bolivia: Potrillos del Guneda National Park (one of three specimens); Brazil: Lagoa Santa (holotype of *Morphota tridens*); Paraguay: Caaguazú (one of four specimens). Some other specimens are intermediate.

**GEOGRAPHIC DISTRIBUTION** (Fig. 9). South America except southern Argentina and Chile.

**RECORDS. ARGENTINA:** **Entre Ríos:** Liebig (13 ♀, 27 ♂, AMNH). **Salta:** Pocitos (3 ♂, AMNH).

**BOLIVIA:** **Santa Cruz:** Potrillos del Guneda National Park at 17°40'S 63°27'W (2 ♀, 7 ♂, UCD), Ciudad Santa Cruz (1 ♀, AMNH), no specific locality (1 ♀, CAS). **Santiago:** Santiago (1 ♀, AMNH).

**BRAZIL:** **Espírito Santo:** Santa Teresa (1 ♂, DZUP). **Goiás:** Jataí (1 ♀, CNC). **Mato Grosso:** Cáceres (1 ♀, 1 ♂, DZUP). **Mato Grosso do Sul:** Serra da Bodoquena National Park (2 ♂, HYMB), 7 mi. N Nioaque (1 ♂, HYMB). **Minas Gerais:** Pedra Azul National Park (1 ♀, CNC), Lagoa Santa (1 ♀, holotype of *Morphota tridens*, MLUH). **Pará:** Belém (1 ♀, BISH; 1 ♀, CNC), no specific locality (1 ♀, CAS). **Paraíba:** Mamanguape (1 ♀, HYMB). **Paraná:** Piraquara (1 ♀, DZUP), Vila Velha State Park (1 ♀, DZUP). **Piauí:** Corrente (1 ♂, CAS). **Rondônia:** Vilhena (1 ♀, 1 ♂, DZUP).

**GUYANA:** **Cuyuni-Mazaruni:** Kartabo (1 ♀, CAS). **Mahaica-Berbice:** Blairmont (1 ♀, FSCA).

**PARAGUAY:** Asunción (2 ♀, USNM), Caaguazú (4 ♀, 1 ♂ AMNH), Cororo: San Pedro Department: Río Ypane (1 ♀, AMNH).

**PERU:** **Madre de Dios:** Río Tambopata National Park at 12°50'S 69°20'W (2 ♀, CAS).

**SURINAM:** Zanderij (1 ♂, CAS).

**URUGUAY:** Río Negro 15 km S Paysandú (1 ♀, AMNH).



FIGURE 4. *Lyroda fasciata*: female clypeus and mandibles.



FIGURE 5. *Lyroda fasciata*: male clypeus and mandibles.



FIGURE 6. *Lyroda fasciata*: female body in lateral view.



FIGURE 7. *Lyroda fasciata*: scutellum of an average female.



FIGURE 8. *Lyroda fasciata*: propodeal dorsum of female.

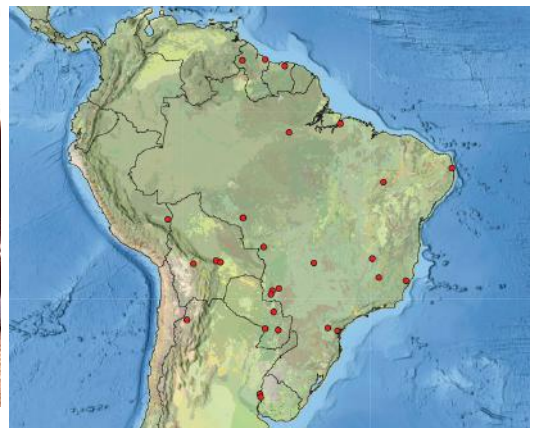


FIGURE 9. Collecting localities of *Lyroda fasciata*.

*Lyroda subita* Say

*Lyroda subita* Say, 1837:372, ♀. Holotype or syntypes: USA: Indiana: no specific locality (lost). Neotype: ♀, Michigan: Cheboygan County, no specific locality (USNM), **present designation**. – Le Conte, 1859:755 (original description copied); Patton, 1880:387 (in checklist of North American Larrinae); Provancher, 1882:49 and 1883:632 (original description translated into French); Kohl, 1885:267 (in checklist of world *Lyroda*); Cresson, 1887:277 (in catalog of North American Hymenoptera); W. Fox, 1892c:138 (does not belong to *Didineis*); Patton, 1892:90 (may belong to *Didineis*, prey carrying), 1893:202 (*Nemobius* prey is killed and not paralyzed); W. Fox, 1894:533 (in revision of North American Larrinae); Dalla Torre, 1897:696 (in catalog of world Hymenoptera); G. Peckham and E. Peckham, 1898:169 (nesting habits); Ashmead, 1899:250 (in checklist of North American Crabronidae); J. Smith, 1900:518 (in list of insects of New Jersey); Harrington, 1902:222 (Canada: Ontario: Ottawa); Adlerz, 1904:137 (known prey: gryllids); G. Peckham and E. Peckham, 1905:253 (nesting habits); Snow, 1906:134 (Arizona); H. Smith, 1908:374 (in revision of Nebraskan Sphecidae); J. Smith, 1910:684 (in new list of insects of New Jersey); F. Williams, 1914:174 (in revision of Larrinae of Kansas), 207 (nesting habits); Rohwer, 1916:683 (in catalog of Hymenoptera of Connecticut); Gahan and Rohwer, 1918:30 (Provancher's specimens not located); Mickel, 1918:408 (in catalog of Nebraskan Sphecidae); Rohwer *in* Viereck, 1925:683 (in key to Sphecidae of Connecticut; East Hartford, New Haven); J.Ch. Bradley, 1928:1010 (in catalog of New York Crabronidae); Hendrickson, 1930:159 (Iowa); Iwata, 1933:7 (in list of world *Lyroda*); Krombein, 1936:98 (New York: Buffalo; floral records); Brimley, 1938:443 (North Carolina: Fayetteville, Raleigh); Krombein, 1950:267 (North Carolina: Dare County), 1951a:143 (Virginia: Dunn Loring; visiting tulip-tree honeydew); Krombein *in* Muesebeck, Krombein, and Townes 1951:941 (in catalog of North American Hymenoptera); Krombein, 1952:93 (USA: Virginia: Westmoreland State Park); K. Cooper, 1953:33 (Massachusetts: Island of Penikese); Krombein, 1953:328 (North Carolina); Gittins, 1960:135 (Idaho); Kurczewski and Kurczewski, 1963:146 (Pennsylvania: Presque Isle State Park); Evans, 1964:281 (description of larva), 282 (nesting habits); Krombein, 1963:273 (Maryland: Plummers Island near Washington, D.C.); G. Bohart, Nye, and Hawthorn, 1970:48 (Utah: Logan, onion pollinator); Kurczewski and Kurczewski, 1971:132 (prey: *Nemobius carolinus* Scudder, a gryllid); Evans, 1975:265 (unsuccessful colonizer of a new habitat); R. Bohart and Menke, 1976:299 (in checklist of world Sphecidae); L. Davis, 1978:217 (North Carolina: Kill Devil Hills, data from Krombein, 1953); Krombein, 1979:1633 (in catalog of North American Hymenoptera); Finnermore, 1982:109 (in Sphecid Fauna of southern Quebec); Kurczewski and Peckham, 1982:149–155 (nesting habits); Kurczewski and Spofford, 1985:113 (unusual prey: Tridactylidae); Radović, 1985:65 (sting apparatus analyzed); Piek and Spanjer, 1986:185 (in list of Sphecidae with known prey); Steiner, 1986:104 (references to publications on nesting habits); Spofford, Kurczewski, and Downes, 1989:256, 259 (reference to publications on nest parasites *Metopia argyrocephala* (Meigen) and *Senotainia trilineata* (Wulp), miltogrammine flies), 257, 260 (nest parasites: *Metopia luggeri* Townsend, *Phrosinella aurifacies* Downes, *Senotainia rubriventris* Macquart, *Senotainia vigilans* Allen, miltogrammine flies, and undetermined miltogrammine species); Kurczewski and Acciavatti, 1990:60 (New York: Cayuga County); Spofford and Kurczewski, 1990:746, 747, 748, 749, 751 (nest parasites: *Metopia luggeri* (Townsend), *Phrosinella aurifacies*, *Senotainia rubriventris* Macquart, *Senotainia trilineata* (Van der Wulp), *Senotainia vigilans* Allen, and unknown species of Miltogrammini, Sarcophagidae); Kurczewski, 1991:203 (burrow construction from ground surface); Spofford and Kurczewski, 1992:997 (species of miltogrammine parasites listed), 1002 (counter-cleptoparasitic habits: freeze-stop and face-off, diversionary flight), 1005 (post-larvipositional counter-cleptoparasitic habits: abandon prey); Ahlstrom, 1995:109 (in checklist of insects of North Carolina); Kurczewski, 1998:250 (pine barrens in upstate New York); Sugar *et al.*, 1998:15 (Canada: southern Ontario); Buck, 2004:25 (Canada: in checklist of Crabronidae of Ontario); Giles and Ascher, 2006:231 (New York: Black Rock Forest Preserve). – **As *Tachytes subitus***: F. Smith, 1856:307 (new combination, in catalog of Hymenoptera in British Museum). – **As *Lyrops subita***: Cresson, 1862:238 (new combination, in catalog of North American Hymenoptera). – **As *Larrada subita***: Cresson, 1873:213 (new combination, Texas).

*Lyroda* sp.: Alayo Dalmau, 1973:176 and 1976:21, corrected to *Lyroda antillana* by Genaro and Portuondo, 2001:45.



*Lyroda antillana* Genaro and Portuondo, 2001:45, ♀. Holotype: ♀, Cuba: Guantánamo: El Imbano, Cuchillas de Baracoa (MNHN Habana). Paratypes: Dominican Republic (FSCA), one paratype examined. **New synonym.** – Portuondo and Fernández, 2004:135 (Cuba: Sierra Maestra and Nipe-Sagua-Baracoa mountains); Amarante, 2005a:5 (in addendum to his 2002 catalog of Neotropical Crabronidae and Sphecidae); Genaro, 2006:54 (in checklist of Cuban Sphecidae and Crabronidae; also: Hispaniola); Perez-Gelabert, 2008:240 (in list of arthropods of island of Hispaniola).

**RECOGNITION.** *Lyroda subita* resembles *L. triloba* in having a black gaster. Unlike that species, the propodeal side is at most inconspicuously ridged and has at least a short, rudimentary spiracular groove (Fig. 12), rather than with well-defined ridges and no spiracular groove. The female has three well defined teeth on each side of the clypeal lamella (Fig. 10), its wing membrane is mostly translucent except darkened in Floridian populations, the clypeal setae are silvery, and also silvery is the pubescence on the propodeum and the apical depressions of terga I-III (rather than the clypeal teeth inconspicuous, wing membrane dark, clypeal setae dark, and the pubescence of the propodeum and the gaster dark). In the male, the clypeal free margin has an obtuse, median projection (Fig. 11) rather than being rounded mesally.

**JUSTIFICATION OF NEW SYNONYMY.** Genaro and Portuondo, 2001 differentiated *Lyroda antillana* from *L. subita* by a single character: a more intensely sculptured propodeal dorsum in the former species. We have examined a female paratype of *L. antillana* from the Dominican Republic as well as two males from that country, and were unable to detect any other difference. The presence of a spiracular groove on the propodeum is as in *L. subita*. We have also noticed that the sculpture of the propodeal dorsum varies significantly: it is inconspicuous in many specimens from the continental North America (Fig. 13), but almost as conspicuous in some specimens from Florida (Fig. 14) as in the Dominican paratype examined (Fig. 15). Based on these observations we conclude that *Lyroda antillana* is no more than a Caribbean population of *L. subita*, and we synonymize these two names.

**DESCRIPTION.** Propodeal side at most with evanescent ridges, with spiracular groove that varies from short, inconspicuous to long, well defined. Clypeal setae silvery. Tergum I in vast majority of specimens with several smaller ridges in addition to pair of main basomedian carinae. Body black. Wings membrane mostly translucent except darkened in Floridian populations.

♀: Anterior margin of clypeus with three teeth on each side, truncate medially (Fig. 10). Gaster terga I-III with silvery pubescence on apical depressions. Length 10.0–13.0 mm.

♂: Free margin of clypeal lamella with obtuse prominence mesally (Fig. 11). Length 6.1–10.0 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 16). North America from southern Canada south to Jalisco State in Mexico, also Cuba and the Dominican Republic.

**RECORDS. CANADA: Alberta:** Writing-on-Stone Provincial Park (4 ♀, CAS). **Manitoba:** Aweme (1 ♀, CNC), Brandon (1 ♂, CNC), Carberry (2 ♀, CNC), 5 mi. W Carberry (2 ♀, CNC), 13 mi. N Glenboro: Bald Head Hills (1 ♀, CNC). **New Brunswick:** Kouchibouguac National Park (1 ♀, CNC), St. John (1 ♂, CNC). **Nova Scotia:** Kings Co. (1 ♀, CNC). **Ontario:** Belleville (1 ♀, 2 ♂ CNC), Brighton (1 ♀, 1 ♂, CNC), Dunrobin (1 ♀, CNC), Chatham (1 ♀, CNC), Jordan (1 ♀, CNC), Kearney (1 ♀, CAS), 15 mi. SE Kenora (1 ♂, CAS), Ottawa (2 ♀, 7 ♂, CNC), Point Pelee (3 ♀, CNC), Sant David (1 ♀, CNC), Spencerville (2 ♀, CNC), Strathroy (7 ♀, 1 ♂, CNC), Toronto (1 ♂, CNC), Vineland (1 ♀, CNC). **Quebec:** Aylmer (1 ♂, CNC), Harrington (1 ♂, CNC), Hemmingford (1 ♂, CNC), Hull (1 ♀, CNC). **Saskatchewan:** Fort Qu'Appelle (1 ♀, CNC).

**CUBA** (Genaro and Portuondo, 2001): **Guantánamo:** El Imbano: Cuchillas de Baracoa. **Santiago de Cuba:** Santa María de Loreto. **Holguín:** La Melba: Moa.

**DOMINICAN REPUBLIC: Hato Mayor:** Farm Mango Limpio 25 km NNW Hato Mayor





FIGURE 10. *Lyroda subita*: female clypeus and mandibles.



FIGURE 11. *Lyroda subita*: male clypeus and mandibles.

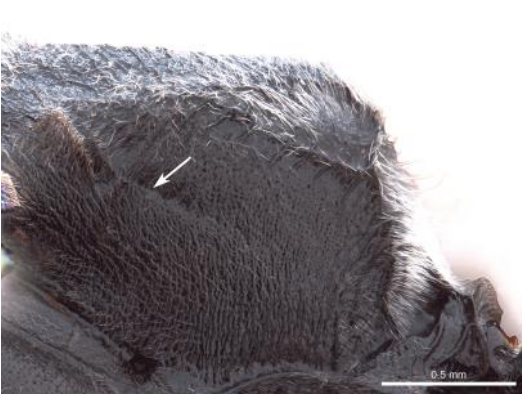


FIGURE 12. *Lyroda subita*: female propodeal side (arrow shows spiracular groove).



FIGURE 13. *Lyroda subita*: propodeal dorsum of female with average sculpture.



FIGURE 14. *Lyroda subita*: propodeal dorsum of female from Florida.



FIGURE 15. *Lyroda subita*: propodeal dorsum of a paratype female of *Lyroda antillana*.

(1 ♂, CAS). **Pedernales:** 21 km N Cabo Rojo (1 ♀, FSCA, paratype of *L. antillana*).

**MEXICO: Chihuahua:** 50 road km S Creel which is 27°46'S 107°39'W (1 ♀, CAS).

**Jalisco:** Teocaltiche (2 ♀, CAS).

**USA: Arizona:** Cochise Co.: 28 mi. N Douglas (1 ♀, UCD). **Arkansas:** Benton Co.: 2 mi. N Siloam Springs (1 ♂, USNM). **California:** Davis (12 ♀, 6 ♂, UCD), Fresno Co.: Firebaugh (1 ♀, USNM), Merced Co.: Dos Palos (1 ♀, AMNH), Hayward (1 ♂, FSCA), Riverside Co.: 18 mi. W Blythe, Hopkins Well (1 ♀, 6 ♂, CAS), Mendota (1 ♀, USNM), Orange Co.: Santa Ana (1 ♀, 1 ♂, USNM), Shasta Co.: 10 mi. N Redding (1 ♀, 1 ♂,



FIGURE 16: Collecting localities of *Lyroda subita*.

FSCA), Shasta Co.: 2 mi. W Shingletown (21 ♀, 2 ♂, FSCA), Kern Co.: 3 mi. SW Taft (1 ♀, UCD), Vacaville (1 ♂, UCD), Woodland (4 ♀, 1 ♂, UCD). **Colorado:** Boulder (2 ♀, USNM), Crook (1 ♀, AMNH), Larimer Co.: Fort Collins (2 ♀, CAS), Springs Co.: Fountain Valley (1 ♀, AMNH), Glenwood (1 ♀, AMNH), Yuma Co.: 4 mi. NE Idalia (2 ♀, AMNH), Shafter Co.: Kern (1 ♀, FSCA), White Rock (1 ♀, AMNH), no specific locality (3 ♀, USNM). **Connecticut:** East Haven (1 ♀, UCD), Hartford (1 ♀, UCD), North Canaan (1 ♀, AMNH), Saybrook (1 ♂, AMNH), Samford (1 ♀, USNM). **Delaware:** Dewey Beach (1 ♀, USNM). **District of Columbia:** Washington (5 ♀, 1 ♂, USNM). **Florida:** Austin Carey (2 ♂, FSCA), Jackson Co.: Florida Caverns (1 ♀, CNC), Gainesville (6 ♀, 9 ♂, FSCA), Interlachen (1 ♀, FSCA), Alachua Co.: 4 mi. N La Crosse (1 ♀, FSCA), Lake Placid (2 ♀, CAS), Quincy (14 ♀, 1 ♂, FSCA), Santa Rosa (1 ♀, FSCA), Tall Timbers (1 ♂, FSCA), Gulf Co.: Wewahitchka (1 ♂, FSCA), no specific locality (1 ♂, FSCA). **Georgia:** Clarke Co.: Athens (3 ♀, FSCA), Liberty Co.: St. Catherine Island (3 ♀, AMNH), Tartersville (1 ♀, FSCA, 1 ♂, FSCA), Clarke Co.: Whitehall Forest (1 ♂, FSCA). **Idaho:** Buhl (1 ♂, BISH), Notus (1 ♀, 1 ♂, UCD), Canyon Co.: Parma (1 ♀, UCD), Pingree (1 ♀, CNC). **Illinois:** Bellville (1 ♀, BISH), Chicago (1 ♀, USNM), Fort Sheridan (1 ♀, USNM), Scott Co.: Bluffs (3 ♀, UCD), Mason Co.: Farmer City (1 ♀, 2 ♂, CAS), Waukegan (1 ♀, AMNH), West Frankfort (1 ♀, UCD), no specific locality (1 ♀, AMNH). **Indiana:** Lafayette (1 ♀, USNM). **Iowa:** Ames (1 ♀, USNM), Ankeny (1 ♀, UCD), Bellevue (5 ♀, UCD), Sioux City (4 ♀, USNM), Clinton Co.: Clinton (1 ♀, 1 ♂, UCD), Coralville (1 ♀, CAS), Iowa City (1 ♀, UCD), Sioux (7 ♀, 1 ♂, CAS), Polk Co. (1 ♂, FSCA). **Kansas:** Baldwin (1 ♀, CAS, 3 ♀, USNM, 2 ♂, USNM), Dickson Co. (1 ♀, USNM), Douglas (1 ♀, CAS, 1 ♀, UCD, 1 ♂, USNM), Plainville (1 ♀, CNC), Rooks (1 ♀, CAS). **Louisiana:** Opelousas (3 ♂, USNM), Tallulah (1 ♀, AMNH), no specific locality (1 ♀, 2 ♂, USNM). **Maryland:** 4 mi. SW Ashton (2 ♀, USNM), Calvert Co. (2 ♀, USNM), Camp Springs (1 ♀, USNM), Beltsville (1 ♀, USNM), Burtonsville (2 ♀, CAS), Montgomery Co.: Colesville (1 ♀, UCD), Frederick Co. (1 ♀, USNM), Patuxent River: Rout 4 (1 ♀, USNM), Cecil Co.: Pleasant Hill (1 ♀, USNM), Plummers Island (1 ♂, CAS, 2 ♀, UCD, 1 ♀, 1 ♂, USNM), Montgomery Co.: Silver Spring (1 ♀, FSCA), no specific locality (1 ♂, UCD). **Massachusetts:** Billerica (2 ♀, CNC), Boston (2 ♀, UCD, 1 ♂, USNM), Forest Hills (8 ♀, CAS, 5 ♀, UCD, 1 ♀, USNM), Woods Hill (1 ♀, UCD). **Michigan:** Antrim Co. (1 ♀, AMNH), Cheboygan Co. (1 ♀, USNM), Detroit (1 ♂, UCD), Gratiot Co. (1 ♂, AMNH), Manistee Co. (1 ♂, IML), Mason Co. (1 ♂, AMNH), Menominee Co. (1 ♀, IML), Camp Miniwanka (1 ♀, FSCA), Montcalm Co. (1 ♂, AMNH). **Minnesota:** 6 mi. N Chillicothe (1 ♀, UCD), Nicollet Co.: Courtland (1 ♀,

CNC), Itasca State Park (1 ♀, AMNH). **Mississippi:** Yalobusha Co.: Water Valley (1 ♀, UCD, 1 ♀, FSCA). **Missouri:** Henry Co.: Clinton (1 ♀, UCD), Columbia (4 ♀, USNM), Marion Co.: Hannibal (4 ♀, UCD). **Montana:** Columbia Falls (8 ♀, UCD, 1 ♀, USNM), no specific locality (4 ♀, 2 ♂, UCD). **Nebraska:** Hooker Co.: 1.5 mi. N Mullen (1 ♂, USNM), 8 mi. N Ogallala (6 ♀, 1 ♂, AMNH), Valley (1 ♀, CAS). **New Hampshire:** Durham (2 ♂, USNM), Belknap Co.: Gilford-Alton (1 ♀, USNM), Nelson (1 ♀, USNM). **New Jersey:** Burlington Co.: Atsion (2 ♀, UCD), Browns Mills (1 ♀, 1 ♂, AMNH), Kearny (1 ♀, AMNH), Metuchen (3 ♀, 1 ♂, FSCA), 3 mi. E Medford Lakes (2 ♀, UCD), Mountain View (1 ♂, AMNH), Bergen Co.: Norwood (1 ♀, AMNH), Palmyra (1 ♀, AMNH, 1 ♀, USNM), Princeton (1 ♀, USNM), Riverton (1 ♂, USNM), South Orange (1 ♀, AMNH), Teaneck (1 ♂, CAS), no specific locality (1 ♀, UCD, 1 ♂, AMNH). **New Mexico:** McKinley Co.: 19 mi. N Gallup (2 ♀, AMNH). **New York:** Auburn (1 ♀, UCD, 1 ♀, USNM), Bear Mountain State Park (1 ♀, USNM), Bronx Co.: Bartow-Pell Mansion (1 ♀, AMNH), Batavia (1 ♀, 1 ♂, BISH), Bushnellsville (1 ♀, AMNH), Buffalo (1 ♀, CAS), Chaffee (1 ♀, UCD), Ulster Co.: Cherrytown (14 ♀, AMNH), Colden (1 ♀, CAS), Ellenville (1 ♂, FSCA), Orange Co.: Cornwall, Black Rock Forest (5 ♀, 2 ♂, AMNH), Croton Falls (1 ♀, UCD), Suffolk Co.: Gardiners Island (3 ♀, AMNH), Great Kills (1 ♀, AMNH), Huntington (1 ♀, UCD), Tompkins Co.: Ithaca: Kite Hill (1 ♀, CAS, 1 ♀, 2 ♂, CNC, 4 ♀, AMNH), Westchester Co.: Lewisboro (4 ♀, AMNH), Long Island: Huntington (8 ♀, 4 ♂, AMNH), Long Island: South Haven (1 ♀, AMNH), New Rochelle (1 ♀, AMNH), New York City: Brooklyn (1 ♀, 1 ♂, AMNH), New York City: Central Park (1 ♀, AMNH), New York City: Flatbush (4 ♀, AMNH), New York City: Floyd Bennett Field (1 ♀, AMNH), New York City: Van Cortland Park (1 ♀, AMNH), New York City: no specific locality (1 ♂, AMNH), North Fairhaven (1 ♀, USNM), Oswego (1 ♂, USNM), Tompkins Co.: Ringwood (1 ♀, CAS), Orange Co.: 5 mi. NW Tuxedo (3 ♂, AMNH), Bronx Co.: Van Cortland Park (1 ♀, 2 ♂, AMNH), Grand Island: Warrendale (1 ♀, USNM), no specific locality (1 ♀, USNM). **North Carolina:** Cumberland Co.: Fort Bragg (3 ♀, CAS), Kill Devil Hills (1 ♀, CAS, 2 ♀, USNM), Swain (1 ♀, CNC), Wilmington Co.: Tidewater (1 ♂, FSCA), Tuckasegee (1 ♀, CNC). **North Dakota:** Bottineau (1 ♀, USNM), Cannon Ball (2 ♀, AMNH), Fargo (1 ♀, AMNH), Slope Co.: Logging Camp Ranch (2 ♀, AMNH), Moffit (1 ♀, AMNH), Walcott (1 ♀, AMNH). **Ohio:** Garfield Co. (1 ♀, FSCA), Stark Co.: Massillon (1 ♀, UCD). **Oklahoma:** Garfield Co. (2 ♀, USNM), Fairmont (1 ♂, FSCA), Norman (1 ♀, CNC), 2 mi. E Lake Texoma (6 ♀, UCD). **Oregon:** Harney Co.: Borax Lake (1 ♀, USNM). **Pennsylvania:** 5 mi. NW Davidsburg (1 ♀, USNM), Jeanette (1 ♂, UCD), Northampton Co.: Portland (1 ♂, USNM), Presque Isle (1 ♀, UCD, 1 ♀, AMNH, 1 ♀, USNM), Westmoreland Co. (1 ♀, USNM). **Rhode Island:** Newport (1 ♀, CNC), Washington Co.: Westerly (1 ♀, AMNH). **Texas:** Travis Co.: Austin BFL [= Brackenridge Field Laboratory] (1 ♀, CAS), Fedor (1 ♀, USNM), Kleberg Co.: 20 mi. SE Kingsville (1 ♀, CAS), Salmon (1 ♀, FSCA), Shenandoah (1 ♀, AMNH), Victoria (1 ♂, USNM), no specific locality (1 ♀, USNM). **Utah:** Cornish (1 ♀, CNC), Delta (2 ♀, UCD, 1 ♂, CAS), Flowell (1 ♂, CAS), Newton (1 ♀, UCD), Pahvant Range (1 ♀, UCD), Provo (1 ♂, AMNH), Box Elder Co.: 10 mi. SW Tremonton (1 ♂, AMNH). **Vermont:** Fairfax Co.: near, Annandale (1 ♀, CAS, 1 ♀, USNM), Rutland Co.: Pico (1 ♂, FSCA). **Virginia:** Alexandria at 38°49'10.9"N 77°06'59.9"W (10 ♀, CAS), Arlington (1 ♀, USNM), Dunn Loring (1 ♂, USNM), Williamsburg (1 ♀, UCD), Isle of Wight Co.: 6 km S Zuni (1 ♀, USNM). **West Virginia:** Park Hardy Co.: Lost River (1 ♀, CNC). **Wisconsin:** Cranmoor (1 ♀, USNM), Waukesha Co.: Pine Lake (4 ♀, CAS), Clark Co.: Worden Township (6 ♀, 25 ♂, AMNH). **Illegible:** (2 ♀, USNM).



*Lyroda triloba* Say

*Lyroda triloba* Say, 1837:372, sex not indicated. Holotype or syntypes: North America: no specific locality (lost). Neotype: ♀, Arkansas: Hampstead County: no specific locality (CAS), **present designation**. – Le Conte, 1859:755 (original description copied); Patton, 1880:387 (in checklist of North American Larrinae); Provancher, 1882:49 and 1883:631 (original description translated into French); Kohl, 1885:267 (in checklist of world *Lyroda*); Cresson, 1887:277 (in catalog of North American Hymenoptera); Ashmead, 1890:33 (in checklist of Hymenoptera of Colorado); W. Fox, 1894:534 (in revision of North American Larrinae); Dalla Torre, 1897:696 (in catalog of world Hymenoptera); Ashmead, 1899:250 (in checklist of North American Crabronidae); Bridwell, 1899:209 (Kansas: no specific locality); J. Smith, 1900:518 (in list of insects of New Jersey); H. Smith, 1908:374 (in revision of Nebraskan Sphecidae); J. Smith, 1910:684 (in new list of insects of New Jersey: Camden County); F. Williams, 1914:174 (in revision of Larrinae of Kansas); Rohwer, 1916:683 (in catalog of Hymenoptera of Connecticut); Mickel, 1918:408 (in catalog of Nebraskan Sphecidae); Rohwer *in* Viereck, 1925:683 (in key to Sphecidae of Connecticut; Branford); Iwata, 1933:7 (in list of world *Lyroda*); Krombein *in* Muesebeck, Krombein and Townes, 1951:941 (in catalog of North American Hymenoptera); R. Bohart and Menke, 1976:299 (in checklist of world Sphecidae); Krombein, 1979:1633 (in catalog of North American Hymenoptera). – **As *Tachytes trilobus***: F. Smith, 1856:307 (new combination, in catalog of Hymenoptera in British Museum). – **As *Lyrops triloba***: Cresson, 1862:238 (new combination, in catalog of North American Hymenoptera). – **As *Larrada triloba***: Cresson, 1873:213 (new combination, Texas). *Lyrops caliptera* Say, 1837:373. Nomen nudum or lapsus for *Lyroda triloba*. – Patton, 1880:387 (in checklist of North American Larrinae); Kohl, 1885:267 (in checklist of world *Lyroda*).

**RECOGNITION.** *Lyroda triloba* differs from its New World congeners in having the propodeal side with well-defined ridges (Fig. 19), the wing membrane dark, particularly in the female, and the large size (length of female 15.2–16.2 mm). In the other species, the propodeal side is either not ridged (most specimens) or (some *L. subita*) has inconspicuous ridges, the wings are light colored (except dark in Floridian populations of *L. subita*) and the female length does not exceed 13 mm. Unlike *L. subita*, the male of *L. triloba* has no median projection on the clypeal free margin (Fig. 18).

**DESCRIPTION.** Propodeal side with well-defined ridges (Fig. 19), without spiracular groove. Tergum I in vast majority of specimens with several smaller ridges in addition to pair of main baso-median carinae. Body deep black. Wing membrane uniformly dark, particularly in female.

♀: Free margin of clypeus with three pairs of inconspicuous (almost invisible) teeth on each side of lamella (Fig. 17). Clypeal setae dark. Pubescence of gastral terga all black. Length 15.2–16.2 mm.

♂: Clypeal free margin inconspicuously, roundly arcuate mesally (Fig. 18). Clypeal setae silvery. Length 9.6–13.8 mm.

**GEOGRAPHIC DISTRIBUTION** (Fig. 20). Eastern North America, extending west beyond the 100<sup>th</sup> meridian only in South Dakota.

**RECORDS. USA: Arkansas:** Conway (1 ♀, CAS, 1 ♀, USNM), Hempstead (1 ♀, CAS, 2 ♀, USNM). **Georgia:** Hiawassee (1 ♀, CNC), Putnam Co. (5 ♀, USNM). **Kansas:** no specific locality (1 ♂, CAS). **Louisiana:** Tallulah (1 ♂, CAS). **Maryland:** Beltsville (2 ♀, USNM), Hudson (3 ♀, FSCA). **North Carolina:** Stafford (1 ♂, CAS), Washington Co. (1 ♀, FSCA). **South Dakota:** Butte Co. (1 ♂, USNM). **Texas:** McKinney (1 ♀, USNM), no specific locality (1 ♀, USNM). **Virginia:** Chance (1 ♀, USNM), Norfolk (1 ♀, USNM).



FIGURE 17. *Lyroda triloba*: female clypeus and mandiblesFIGURE 18. *Lyroda triloba*: male clypeus and mandible.FIGURE 19. *Lyroda triloba*: propodeal side of female.FIGURE 20. Collecting localities of *Lyroda triloba*.

#### ACKNOWLEDGMENTS

We sincerely thank the persons who provided the specimens for this study, particularly Gavin Broad (London, United Kingdom) and Karla Schneider (Halle, Germany) who sent the type specimens under their care. We are most grateful to Robert L. Zuparko (California Academy of Sciences) who carefully reviewed the manuscript and made a number of improvements, and for comments by Arnold S. Menke and Michael Ohl, who kindly served as external reviewers.

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