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A synopsis of the genus *Triacanthagyna* (Odonata: Aeshnidae)

Natalia von Ellenrieder[1] & Rosser W. Garrison[2]
[1,2]Research Associate, Natural History Museum of Los Angeles County, Exposition Boulevard 900, CA 90007, USA.
[1]<odo_nata@hotmail.com>; [2]<rwgarrison@earthlink.net>

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Abstract

This synopsis of adult *Triacanthagyna* includes the revalidation of two species thought to be synonyms (*T. nympha* and *T. obscuripennis*), the description of a new species (*T. williamsoni*; type locality: Peru, Tingo María), keys to both sexes, illustrations of diagnostic characters, and distribution maps of all species. A phylogenetic assessment of the nine species is included, using outgroup comparison and parsimony algorithm. The cladistic analysis shows *Triacanthagyna* to be partitioned into two monophyletic groups: (1) two species lacking humeral, interpleural and metapleural dark stripes on pterothorax and with male cerci narrowing gradually at tip (*T. septima* and *T. obscuripennis*), and (2) six species with male cerci bearing subbasal teeth (*T. satyrus, T. caribbea, T. ditzleri, T. williamsoni, T. nympha* and *T. trifida*).

Introduction

The exclusively New World genus *Triacanthagyna* was established by Selys (1883) for the reception of *Gynacantha trifida* Rambur, originally described from two males and one female (see below) from Cuba ("Collection de M. Serville"). The latest and most thorough treatment of the genus was by Williamson (1923) who included five species, two of which were described as new. Two other species, *G. nympha* Navás, and *Coryphaeschna dentata* Geijskes have subsequently been included in *Triacanthagyna* since Williamson's seminal treatment of the genera *Triacanthagyna* and *Gynacantha* Rambur. Although members of the genus are familiar to odonatists, correct application of names and synonymy has remained unclear. The unique coloration of the thorax and shape of the abdomen of *T. septima* (Selys in Sagra) has allowed this species to be the only member in the genus that is easily identifiable. All other names are associated with species that have some degree of striping on the thorax and possess a greater constriction at the base of the abdomen compared to *T. septima*. An example of the troubles faced in applying names to this genus is exemplified by Williamson (1923)

who associated at least four names to a series of 32 specimens in the Selys collection labeled as *T. trifida*.

Discrimination between *Triacanthagyna* and *Gynacantha* has also presented problems. Original diagnoses were based on the easily seen trifid (*Triacanthagyna*) vs bifid (*Gynacantha*) condition of the subgenital plate of the female. Males in these two genera have been difficult to reliably diagnose as exemplified by Williamson's allocation of 11 lines of text per couplet in his key.

We became interested in this genus when we independently identified two species we thought were new. Our analysis of all names associated with this genus has convinced us that these two species represent previously described but poorly known taxa. Here, we revalidate these two species, describe a new species, illustrate diagnostic characters, present keys, and provide a cladogram for all *Triacanthagyna* species.

There is controversy regarding the correct application of the names *Triacanthagyna* and *Gynacantha*. Rambur (1842) described *trifida* under *Gynacantha* together with another six species without designating a type species. Selys (1883) included only *G. trifida* in his new genus *Triacanthagyna* which made it the type species. Kirby (1890), with no explanation, placed *trifida* back in *Gynacantha*, designated it as type species, and created the genus *Acanthagyna* for the previous *Gynacantha* species. The argument stems from Cowley (1934) and has been recently re-opened by Hedge and Crouch (2000) who state that *Triacanthagyna* is therefore a junior objective synonym of *Gynacantha* Rambur. Although this could be considered correct according to the nomenclature rules, we believe that the synonymy of *Gynacantha* and *Triacanthagyna* was unjustified, and that this change would greatly upset nomenclature. Consequently we follow McLachlan (1896), Kimmins (1936), and Fraser (1961) in treating *Triacanthagyna* as a valid genus. In order to formalize the current usage of *Triacanthagyna* we are making this a case to the ICZN (application 3294).

History

Blanchard (1845) described *Aeschna obscuripennis* from "… les forêts entre les provinces de Chiquitos et de Mojos (Bolivia)" based on one female whose abdomen possessed a trifid subgenital plate ("… abdominis articulo ultimo trispino"). Selys in Sagra (1857) described *Gynacantha septima* from "Jamaïque et Brésil" and briefly redescribed *G. trifida* noting its distribution from "Cuba (collection Serville), Jamaïque". Kirby (1890) transferred *A. obscuripennis* to *Gynacantha* (= *Triacanthagyna* according to his classification system). Martin (1909) reviewed all members of the genus and described two new species, *T. needhami* and *T. satyrus* (this last one as *Gynacantha*).

Williamson (1923) monographed the genus and described *T. caribbea* and *T. ditzleri*, suggested synonymy between *T. trifida* and *T. needhami* and between *T. septima* and *T. obscuripennis*. In his paper, Williamson (1923) was well aware that problems remained with his *trifida* group of which he recognized four species (*T. caribbea*, *T. ditzleri*, *T. satyrus*, and *T. trifida*). For example, he stated, "The study of this material [32 specimens in the Selys collection labeled *T. trifida*] also causes me to think I have included two species under *T. ditzleri*, but at this time adequate characters for separating

the two are not discernable. The small specimens from Central America and Northern South America will probably be found to be specifically distinct from the similar but larger specimens from southern Brazil".

Little is known about the biology of the *Triacanthagyna* species; the most complete account is that given by Williamson (1923) in his monograph.

Navás (1933) described *G. nympha* based on one male from "Brazil: Porto Alegre", and Geijskes (1943) described *Coryphaeschna dentata* from one male from Surinam.

Material and methods

For each species synonymy, diagnosis, and distribution are provided. Synonymies include only references that incorporate descriptions, redescriptions, illustrations or new distribution records.

All specimens were examined to establish variability of characters. All characters were illustrated with the aid of a camera lucida and drawings are not to scale except where indicated. Measurements are in mm. 'Hamules' refers to the anterior pair of hamules. Wing terminology follows Riek & Kukalová-Peck (1984). We found the following characters useful in evaluating specific status:

Head: The color of the occipital triangle is black for *Triacanthagyna dentata* but pale for all the other species. The extension of the black T-spot of the frons is too variable intraspecifically to be of value as a diagnostic character (Table 2, Figs 9-17).

Thorax: Presence/absence of dark stripes on pterothorax (Figs 18-21) is diagnostic. Color pattern of legs can be used as diagnostic character only for some species. Wing venation provides no specific characters.

Abdomen: Genital lobe may be denticulate (Fig. 23) or smooth (Fig. 24), and the hamule may possess a long (Fig. 31) or short (Fig. 33) anterior process. Ventral terga (delimited by inner and outer lateroventral longitudinal and posteroventral transverse carinae) may be narrow (Fig. 66) or wide (Fig. 65) anterior to the transverse carina, and the lateral carinae may be parallel (Fig. 63) or slightly convergent at the level of the transverse carina (Fig. 65). A subbasal tooth on the cerci in males may be present (Fig. 89) or absent (Fig. 81). The angular portion of the inner margin of the cercus at its basal 0.30 is called the heel; it may be prominent (Fig. 93) to not prominent (Fig. 90). The blades of the cercus may be parallel (Fig. 101) or converging gradually before tip (Fig. 103) in mediodorsal view. Characters from the female cerci are not used because they are broken or lacking in most specimens. Medial prong of female process of sternum X can be slightly longer than or as long as twice the length of lateral prongs. Color pattern (terminology after Walker 1912) is of no diagnostic value.

The following acronyms are used under species accounts, Fr: frons, Th: pterothorax, Te: ventral terga, Ge: genital fossa, Gl: genital lobe, Ha: hamules, Ce: cerci, Ve: vesica spermalis distal segment, and Mp: map.

Full locality data are given only for new or revalidated species; for remaining species only country, state, and repository are indicated under the distribution accounts (asterisks indicate material that has been illustrated); full locality data for these species are available from the authors. Maps represent distribution records from collections and reli-

able references. Maps were created electronically from the Digital Chart of the World (1:1,000,000) using ArcView 3.1. Elevation data and longitude/latitude coordinates were culled from the Global Gazetteer website <http://www.calle.com/world/> and placed into a Microsoft FoxPro Data base linked to ArcView.

Acronyms used for collections are as follows:

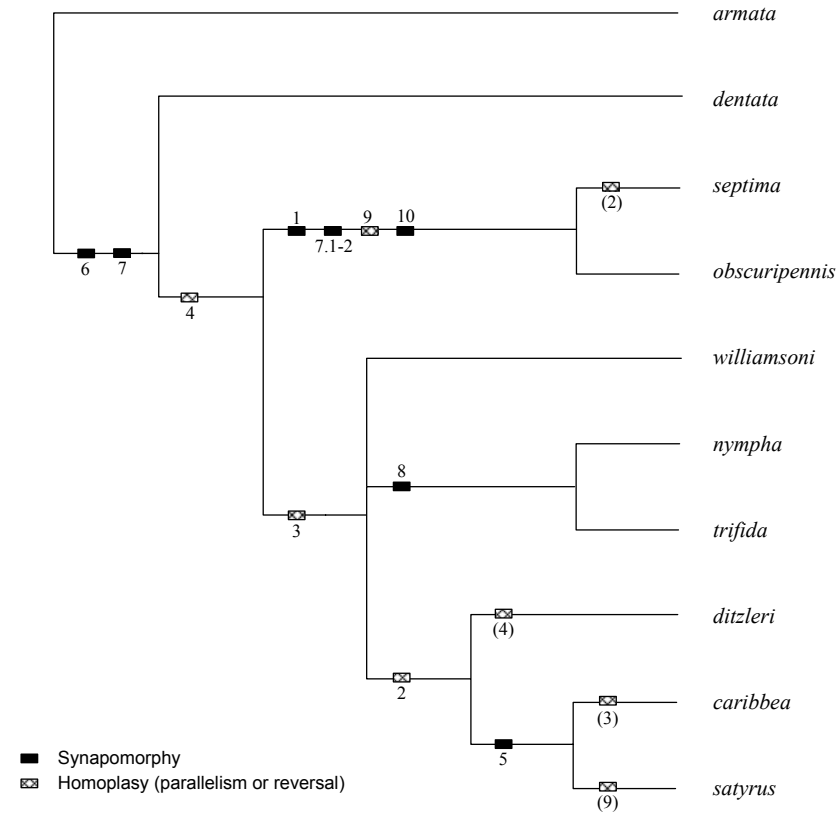
DRP – D.R. Paulson personal collection, Tacoma, WA, USA.
IRSNB – Institut Royal des Sciences Naturelles de Belgique, Brussels, Belgium.
JJD – J.J. Daigle personal collection, Tallahassee, TE, USA.
MIZA – Museo del Instituto de Zoología Agrícola "Francisco Fernández Yépez", Maracay, Venezuela.
MACN – Museo Argentino de Ciencias Naturales "Bernandino Rivadavia", Buenos Aires, Argentina.
NML – Nationaal Natuurhistorisch Museum Leiden, Leiden, The Netherlands.
MRJ – Museu Nacional do Rio de Janeiro, Rio de Janeiro, Brazil.
RWG – R.W. Garrison personal collection, Azusa, CA, USA.
TWD – T.W. Donnelly personal collection, Binghamton, NY, USA.
UMMZ – University of Michigan, Museum of Zoology, MI, USA.
USNM – U.S. National Museum, Washington D.C., USA.

We performed a cladistic analysis of the nine known *Triacanthagyna* species in order to determine phylogenetic relationships using the implicit enumeration command (ie*) in Hennig86 (version 1.5, Farris 1988). According to von Ellenrieder (2002) *Oplonaeschna armata* Selys constitutes the sister group of Gynacanthini, but the relationships within this clade are still unresolved, with *Triacanthagyna* included in a basal polytomy along with *Racenaeschna* Calvert, *Plattycantha* Förster, and *Agyrtacantha* Lieftinck. As we do not know which is the sister group of *Triacanthagyna*, we performed the analysis using two different outgroups, *Oplonaeschna* Selys (Fig. 111) and *Plattycantha* (Fig. 112). We did not use *Racenaeschna* because the male is unknown, and for the characters used here, *Agyrtacantha* and *Plattycantha* are identical in character scoring. Autapomorphies of terminal taxa were excluded from the analysis. Character matrix is shown in Table 1.

Characters using *Plattycantha acuta* Lieftinck as outgroup:

1. Pterothorax: (0) pale with dark stripes (Fig. 19); (1) pale with only middorsal dark stripes (Figs 18, 20); (2) pale without any dark markings (Fig. 21).
2. Ventral terga III of females anterior to transverse carina: (0) narrower than 0.5 of its posterior width (Figs 66-67, 70-71, 75-76, 79-80); (1) wider than 0.5 of its posterior width (Figs 63, 65, 68-69, 72-73, 77-78).
3. Genital lobes: (0) with denticles (Figs 22-23, 27-28); (1) smooth with hairs (Figs 24-25, 29-30). In some specimens of *T. caribbea* (42%) there are some small denticles (Fig. 22); the character was scored as (1) for this species, and the presence of denticles is interpreted as a reversal.
4. Anterior process of hamules in ventral view: (0) long (Figs 31, 34-39); (1) short (Figs 32-33). Note: polarity for this character reversed when using *Oplonaeschna armata* as outgroup.
5. Anterior process of hamules in lateroventral view: (0) short (Figs 41-44, 46-48); (1) long (Figs 40, 45).

Most Parsimonius Tree using *Oplonaeschna armata* as outgroup
[length 17, CI 76, RI 71]

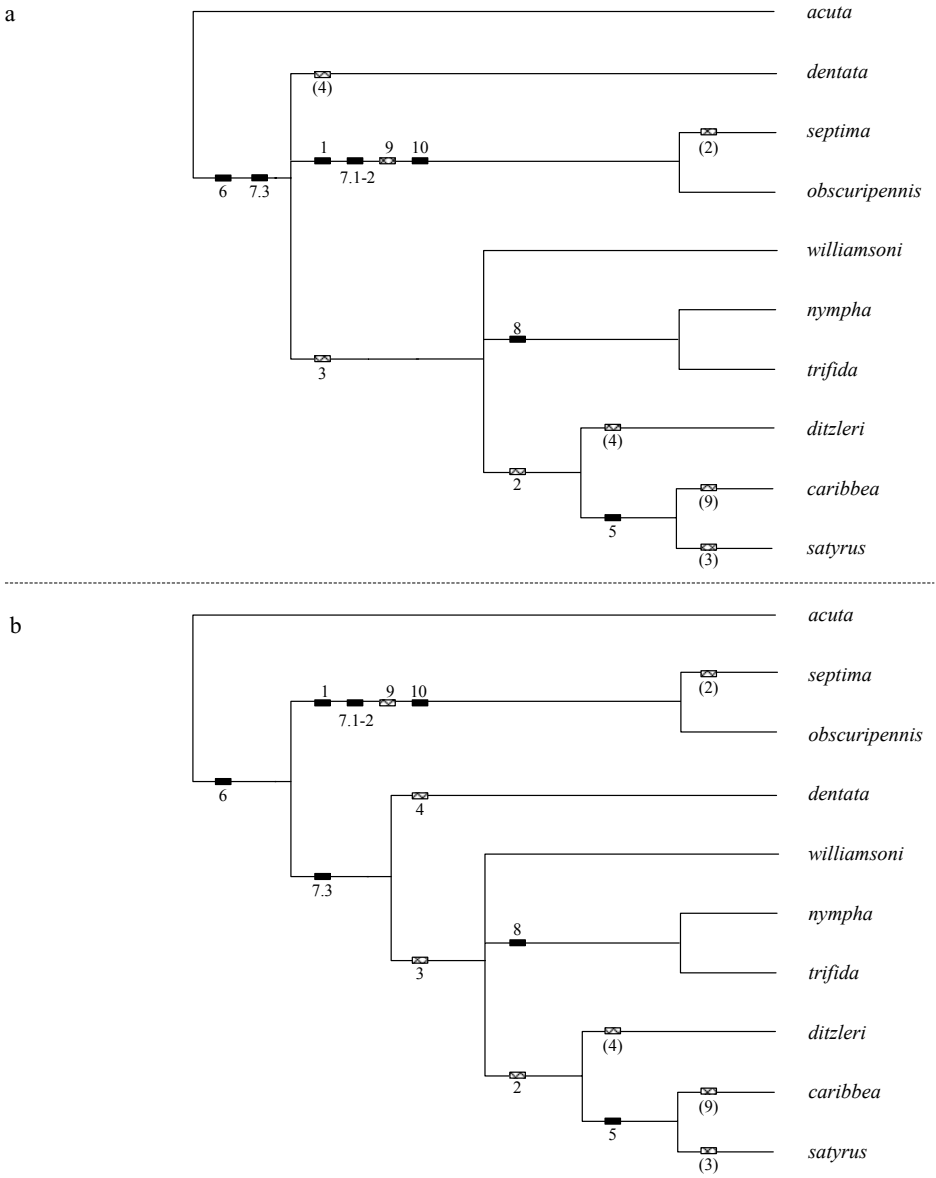


Synapomorphies:

1. Pterothorax lacking lateral dark stripes
2. Ventral terga III of females anterior to transverse carina wider than 0.5 of its posterior width
3. Genital lobes without denticles
4. Anterior process of anterior hamules in ventral view long [*]
5. Anterior process of anterior hamules in lateroventral view long
6. Lateral lobes of vesica spermalis IVth segment unfolded
7. 7. Ventral surface of vesica spermalis IVth segment with membranous tube
   7.1-2. Membranous tube with long sclerotized apical process
8. Heels of male cerci prominent in dorsal view
9. Male cerci with subbasal tooth
10. Blades of cerci narrowed gradually before tip in dorsal view

[*] Polarity of this character (4) reversed when using *Plattycantha acuta* as outgroup.

Figure 111. Most Parsimonious Tree, obtained using *Oplonaeschna armata* as outgroup [length 17, CI 76, RI 71].



Figures 112a, b. Most Parsimonious Trees, obtained using *Plattycantha acuta* as outgroup [length 17, CI 76, RI 79].

Table 1. Data matrix of ten characters for nine ingroup taxa of the genus *Triacanthagyna* and the outgroup *Plattycantha acuta*.

	1	2	3	4*	5	6	7	8	9	10
Plattycantha	0	0	0	0	0	0	0	0	0	0
caribbea	0	1	1	0	0	1	3	0	1	0
dentata	0	0	0	1	1	1	3	0	0	0
ditzleri	0	1	1	1	1	1	3	0	0	0
nympha	0	0	1	0	1	1	3	1	0	0
obscuripennis	1	0	0	0	1	1	2	0	1	1
satyrus	0	1	0	0	0	1	3	0	0	0
septima	2	1	0	0	1	1	1	0	1	1
trifida	0	0	1	0	1	1	3	1	0	0
williamsoni	0	0	1	0	1	1	3	0	0	0

* The polarity of this character is reversed when using *Oplonaeschna armata* as outgroup.

6. Lateral lobes of vesica spermalis distal segment: (0) with basal fold (as in Figs 5-6); (1) unfolded (Figs 7-8).
7. Ventral surface of vesica spermalis IVth segment: (0) with no membranous tube; (1) with membranous tube bearing long slender process (Fig. 49); (2) with membranous tube bearing flat bifid process (Figs 50, 52); (3) with membranous tube bearing short simple process (Figs 51, 53).
8. Heel of male cercus in dorsal view: (0) not prominent (Figs 90-92, 94-96, 98); (1) prominent (Figs 93, 97).
9. Subbasal tooth of male cerci: (0) absent (Figs 81, 85, 87, 99, 103, 105); (1) present (Figs 82-83, 86, 89, 100, 102, 104, 106-107).
10. Blades of cercus in dorsal view: (0) approx. parallel sided to tip (Figs 90-93, 95, 97-98); (1) narrowed gradually before tip (Figs 94, 96).

The analysis using *O. armata* as outgroup resulted in one most parsimonious tree (length 17, CI 76, RI 71, Fig. 111). The analysis using *P. acuta* as outgroup resulted in two most parsimonious trees (length 17, CI 76, RI 69, Fig. 112). In both analyses *Triacanthagyna* is partitioned into two monophyletic groups: (1) two species lacking humeral, interpleural and metapleural dark stripes on pterothorax, sclerotized process of distal segment of vesica spermalis long, and male cerci narrowing gradually at tip (*T. septima* and *T. obscuripennis*), and (2) six species (the Trifida-group of Williamson 1923) with male cerci bearing a subbasal teeth (*T. satyrus, T. caribbea, T. ditzleri, T. williamsoni, T. nympha* and *T. trifida*). The only difference between these two analyses is the position of *T. dentata*; using *Oplonaeschna* as outgroup *T. dentata* is considered as the sister group of all other *Triacanthagyna* species (Fig. 111); using *Plattycantha* its position appears unresolved, being placed at a basal polytomy with the Septima- and

Trifida-groups (Fig. 112a) or as the sister group of the Trifida-group (Fig. 112b).

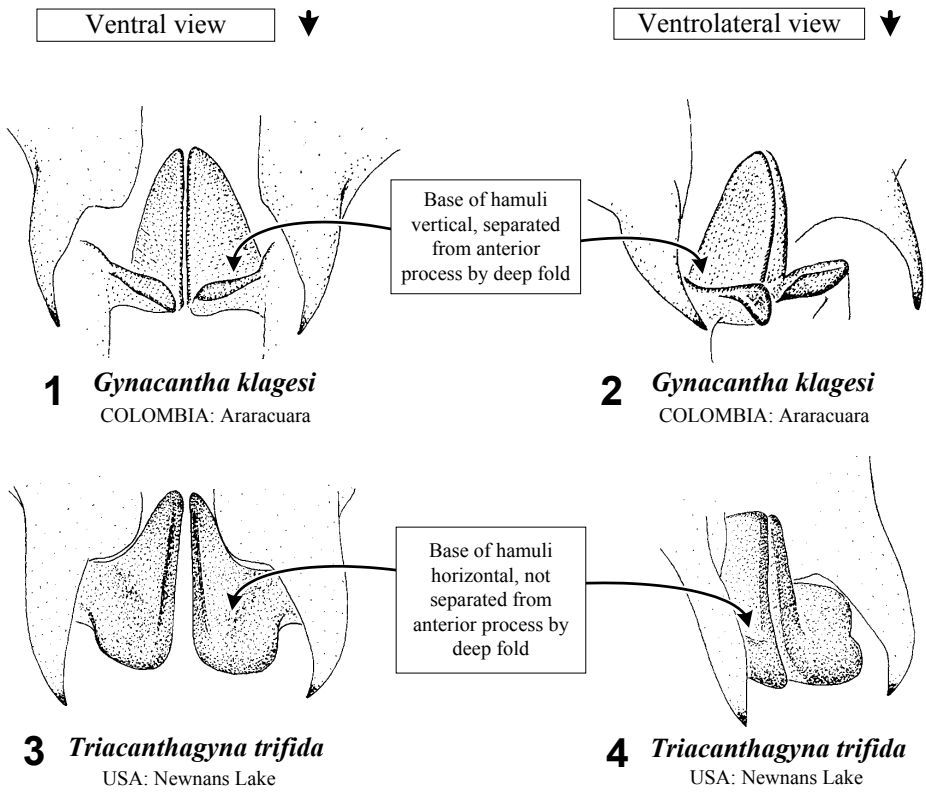
The only difference in these two analyses is in the polarity assigned to character states of anterior process of hamulus in ventral view (character 4) which is long in *Oplonaeschna* and short in *Plattycantha*. The same process is long in several other more basal genera of Aeshnidae (i.e. *Gomphaeschna* Selys, *Limnetron* Förster, *Epiaeschna* Hagen, *Nasiaeschna* Selys) thus indicating a plesiomorphic state for *Oplonaeschna*. For this reason we consider that the relationship of *T. dentata* to the other *Triacanthagyna* species as shown in Figure 111 is more likely.

Triacanthagyna Selys, 1883

Triacanthagyna Selys, 1883: 745 (description of genus); — McLachlan (1896): 411, Kimmins (1936): 74-75, and Fraser (1961): 119-120 (invalidation of synonymy of *Triacanthagyna* and *Gynacantha*; — Williamson (1923): 1-74 (revision of genus).
Gynacantha Rambur, 1842: 210 (description of genus including *T. trifida*); — Kirby (1890): 94 (synonymyzed *Triacanthagyna* with *Gynacantha*); — Kirby (1897): 615; — Hedge & Crouch (2000): 46.

Triacanthagyna is included in the tribe Gynacanthini together with *Agyrtacantha, Austrogynacantha* Tillyard, *Gynacantha, Heliaeschna* Selys, *Neuraeschna* Hagen, *Plattycantha, Racenaeschna, Staurophlebia* Brauer and *Subaeschna* Martin (von Ellenrieder 2002). The diagnostic character proposed by Selys (1883) for the genus was the trifid subgenital plate of the female. This character allows the distinction of all females of *Triacanthagyna* from the remaining New World aeshnids and it is shared only by the oriental genus *Agyrtacantha*. The only autapomorphy of *Triacanthagyna* is in the male vesica spermalis: the ventral surface (when the vesica is extended) of the distal segment bears a tubular membranous structure, curved from right to left, with a sclerotized distal projection (Figs 49-53). The genus is also characterized by having the eyes in contact for a greater distance than postfrons and occipital triangle combined (shared with *Gynacantha, Subaeschna, Neuraeschna* and *Heliaeschna*), the absence of basal folds in the lateral lobes of distal segment of vesica spermalis (shared within Gynacanthini with *Neuraeschna*, *Heliaeschna* and *Staurophlebia*, Figs 7-8), and the hamular anterior process in the same plane as its basal attachment (Figs 3-4, shared with remaining Gynacanthini except for *Gynacantha, Subaeschna* and *Austrogynacantha*, in which it is perpendicular to its base, Figs 1-2).

Males of *Gynacantha* and *Triacanthagyna* are superficially similar in color and external morphology but are easily differentiated by structures of the hamules (Figs 1-4) and vesica spermalis (Figs 5-8). Williamson (1923) suggested several diagnostic characters between *Gynacantha* and *Triacanthagyna* including the shape of vesica spermalis and hamules but he did not illustrate these characters. Because he erroneously considered the distal segment of the vesica (fourth) as the third segment and the third as the second, his description of these structures was flawed and unclear. Other characters he included in his key characterizing males of *Triacanthagyna* are variable, i.e. two rows of cells between RP1 and RP2 beginning under Pt (under Pt or proximal to it in *Gynacantha*), IRP2 fork near proximal end of Pt in Fw (except in *T. trifida*), and more basal in Hw (basal to Pt in Fw, more basal in Hw in *Gynacantha*), genital ligula relatively long and narrow, sub-



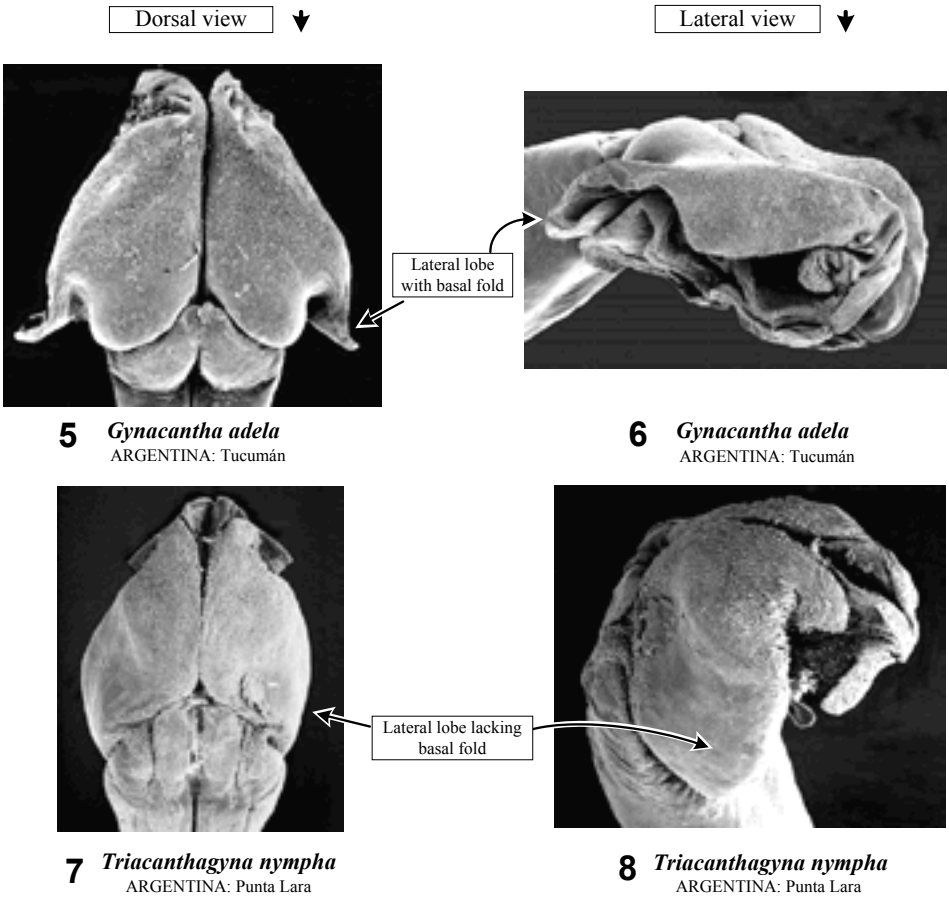
Figures 1-4. Anterior hamules.

equal in width in ventral view (relatively shorter, wider caudally, not subequal in width in ventral view in *Gynacantha*; the ligula shape is variable in *Gynacantha*), and shape of cerci (variable in *Gynacantha*).

Larvae have been described for *T. caribbea* (Santos 1973), *T. nympha* (described as *T. ditzleri*, Carvalho 1988), *T. dentata* (De Marmels 1992), *T. septima* (Calil & Carvalho 1999), and *T. trifida* (Needham & Westfall 1955). They share with *Gynacantha* and *Agyrtacantha* the presence of a row of setae on the labial palpi, unique within the Aeshnidae.

Keys to the species of Triacanthagyna

Comparison with illustrations and diagnoses is advised, especially when identifying poorly preserved or incomplete material (i.e. specimens with bad color preservation or broken cerci).



Figures 5-8. Distal segment of vesica spermalis.

Key to males

1. S3 slightly constricted (Fig. 60); distal segment of vesica spermalis with a long slender sclerotized acute process (Fig. 49); pterothorax lacking dark stripes (Fig. 21); legs pale brown; Mexico to Brazil (Fig. 109) . . . . . ***septima***

1'. S3 strongly constricted (Figs 54-59, 61-62); distal segment of vesica spermalis with a short flat sclerotized process (Figs 50-53); pterothorax with dark stripes (Figs 18-20); legs reddish brown or black **2**

2. Pterothorax with only a middorsal dark stripe (Figs 18, 20); distal segment of vesica spermalis with a bifid sclerotized process (Figs 50, 52); Panama, Peru and Bolivia (Fig. 110) . . . . . ***obscuripennis***

2'. Pterothorax with dark middorsal stripe and humeral, interpleural, and metapleural stripes (Fig. 19); distal segment of vesica spermalis with a simple sclerotized process (Figs 51, 53) **3**

3. Occipital triangle black; legs black; cercus wide, blade (Fig. 91: A) wider than 0.5 of base width (B); Mexico to Brazil (Fig. 110) . . . . . ***dentata***
3'. Occipital triangle pale; legs reddish-brown and black; cercus narrow, blade (Fig. 90: B) narrower than 0.5 of base width (Figs 90: A, 92-98) **4**

4. Genital lobe with a distal group of 10-20 strong denticles (Fig. 27); Venezuela to Peru (Fig. 109) . . . . . ***satyrus***
4'. Genital lobe smooth (Figs 24-25, 29-30) or with 6 or less weakly-formed denticles (Fig. 22) **5**

5. Sub-basal tooth between base and heel of cercus well developed (Figs 101-102, 106-107); genital lobe always lacking denticles (Figs 24-25, 29-30); anterior process of hamules short in ventrolateral view (Figs 42-43, 47-48) **6**
5'. Sub-basal tooth between base and heel of cercus vestigial or absent (Fig. 99); genital lobe smooth or with a distal group of 1-6 minute denticles (Fig. 22); anterior process of hamules long in ventrolateral view (Fig. 40); Mexico to Brazil and Bolivia (Fig. 109) . . . . . ***caribbea***

6. Heel of cercus in dorsal view prominent (Figs 93, 97) **7**
6'. Heel of cercus in dorsal view not prominent (Figs 92, 98) **8**

7. Distal spine of cercus in dorsal view directed postero-externally (Fig. 97); heel weakly pronounced in dorsal and mediodorsal view (Figs 88, 97); Antilles and SE USA (Fig. 110) . . . . . ***trifida***
7'. Distal spine of cercus in dorsal view directed externally (Fig. 93); heel strongly pronounced in dorsal and mediodorsal view (Figs 84, 93); SE Brazil, Paraguay to NE Argentina (Fig. 108) . . . . . ***nympha***

8. Hamular anterior process relatively long in ventral view (Figs 39); Peru to Bolivia (Fig. 108) . . . . . ***williamsoni***
8'. Hamular anterior process relatively short in ventral view (Fig. 33); Mexico to Bolivia (Fig. 108) . . . . . ***ditzleri***

Key to females

Comparison of doubtful specimens of *Triacanthagyna* to diagnostic illustrations and diagnoses should enable specific identification. Caution should be exercised when identifying specimens in couplet 6. We have been unable to find reliable morphological characters that will allow identification between *T. caribbea* and *T. satyrus*.

1. Occipital triangle black; legs entirely black; central prong of three pronged ventral process on S10 twice the length of lateral prongs; Mexico to Brazil (Fig. 110) . . . . . ***dentata***
1'. Occipital triangle pale; legs black and brown; central prong of three pronged ventral process on abdominal segment X slightly longer than the lateral prongs **2**

2. Pterothorax lacking dark stripes (Fig. 21); legs pale brown; Mexico to Brazil (Fig. 109) . . . . . ***septima***
2'. Pterothorax with *at least* a middorsal dark stripe (Figs 18-20); legs reddish brown and black **3**

3. Pterothorax with *only* a dark middorsal stripe (Figs 18, 20); Panama, Peru and Bolivia (Fig. 110) . . . . . ***obscuripennis***
3'. Pterothorax with dark middorsal stripe and humeral, interpleural, and metapleural stripes (Fig. 19) **4**

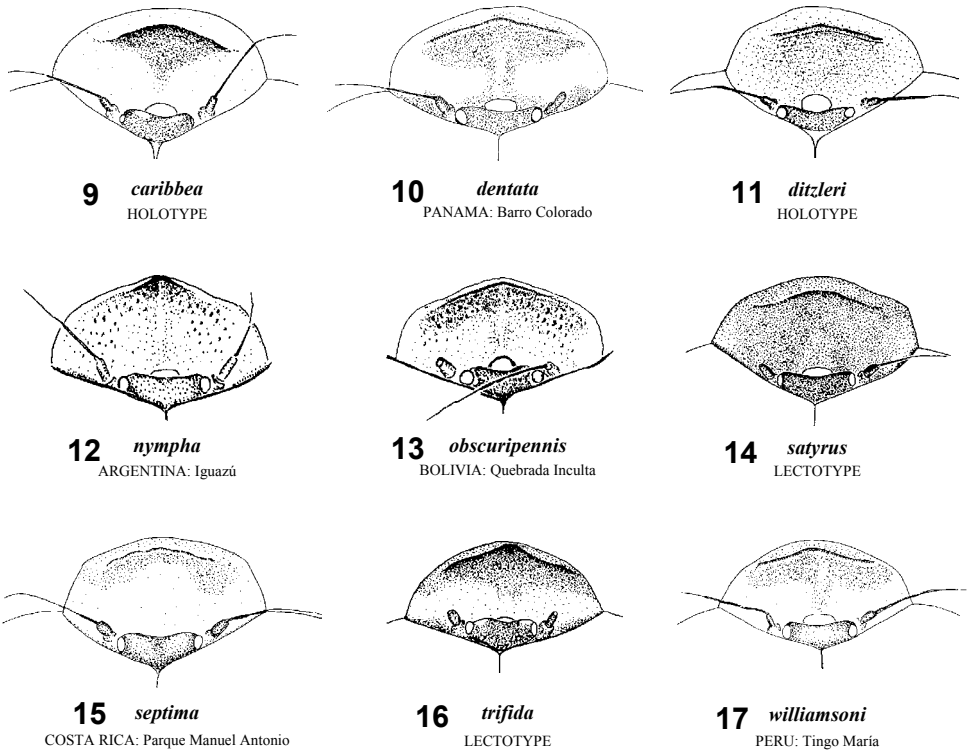
4. Ventral tergum of S3 anterior to transverse carina wider than half of distal width (Figs 63, 65, 68-69) **5**
4'. Ventral tergum of S3 anterior to transverse carina narrower than half of distal width (Figs 66-67, 70-71) **7**

5. Ventral tergum of S3 wider at anterior and posterior ends than at medial third; outer ventral carina concave at level of transverse carina (Figs 65, 73a-h); Mexico to Bolivia (Fig. 108) . . . . . ***ditzleri***
5'. Margins of ventral tergum of S3 approximately parallel; outer ventral carina approximately linear at level of transverse carina (Figs 63, 72a-e) **6**

6. Femora and tibiae I-III of about the same color (reddish brown with apical portion of femora and basal portion of tibiae black); Mexico to Brazil and Bolivia (Fig. 109) . . . . . ***caribbea***
6'. Femur and tibia I darker than II-III; Venezuela to Peru (Fig. 109) . . . . ***satyrus***

7. Ventral tergum of S3 abruptly constricted at about half of S3 length (Figs 70, 79a-c); Antilles and SE USA (Fig. 110) . . . . . ***trifida***
7'. Ventral tergum of S3 gradually constricted at anterior to half of S3 length (Figs 66, 71, 75a-f, 80a-b) **8**

8. Ventral terga of S4-5 slightly constricted at anterior fifth (Fig. 66); SE Brazil, Paraguay to NE Argentina (Fig. 108) . . . . . ***nympha***
8'. Ventral terga of S4-5 approximately parallel sided (Fig. 71); Peru to Bolivia (Fig. 108) . . . . . ***williamsoni***



Figures 9-17. Frons – dorsal view.

Triacanthagyna caribbea Williamson, 1923
(Figs 9-Fr, 22-Tg, 31, 40-Ha, 54, 63,72-Te, 81, 90, 99-Ce, 109-Mp)

Triacanthagyna caribbea Williamson, 1923: 13, 22-24, table, figs 3, 15, 18, 23 (description of ♂ and ♀); — Santos (1973): 53-54, figs 1-7 (description of larva).
Gynacantha trifida Rambur. — Calvert (1905): 189-191 (at least in part, records from Mexico, Honduras, Costa Rica, Colombia, Surinam, Brazil); — Calvert (1919): 37 (Guatemala).
Triacanthagyna trifida (Rambur). — Martin (1909): 149 (records from Brazil in part).
Triacanthagyna ditzleri Williamson, 1923: 21 (in part, ♀ from Colombia, Puerto Berrio).

Type locality: Palma Sola, Falcon, Venezuela. Type status: holotype ♂. Type depository: UMMZ. Type specimens examined: holotype ♂, allotype ♀, paratypes ♂, ♀ (UMMZ; RWG). Total number of specimens examined: 61 ♂, 73 ♀.

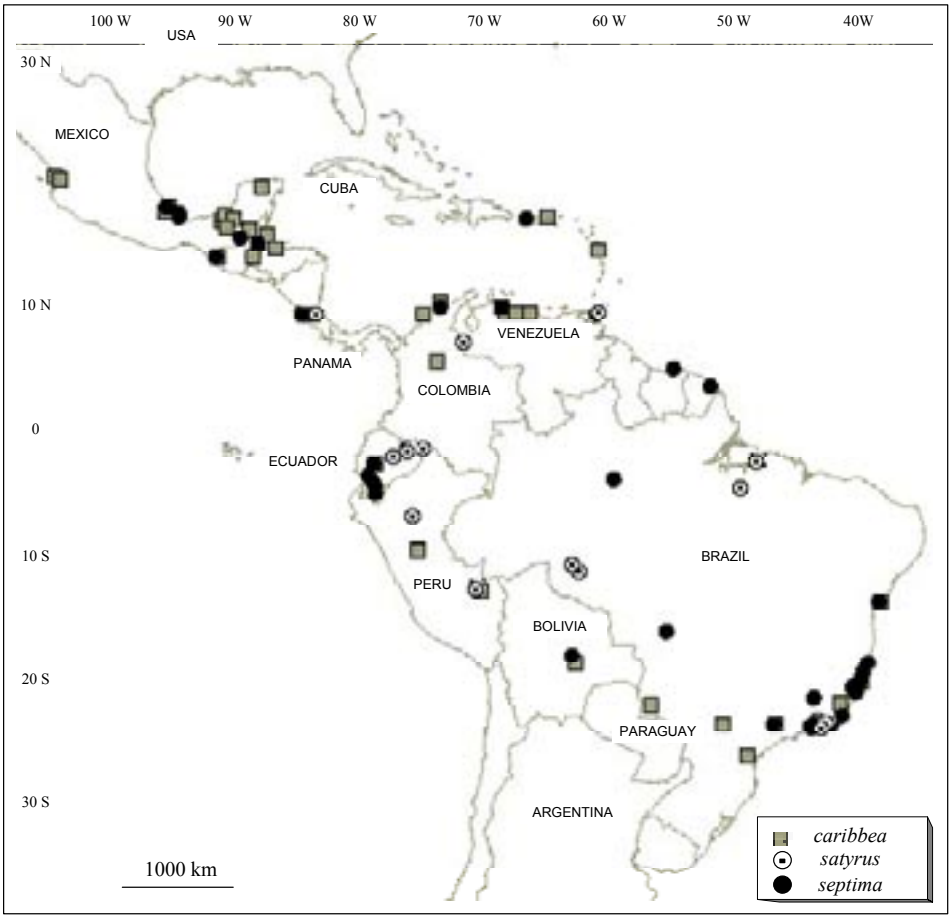


Figure 109. Distribution area of *Triacanthagyna caribbea*, *T. satyrus* and *T. septima*.

Diagnosis

T. caribbea shares with *T. dentata*, *T. ditzleri, T. nympha, T. satyrus*, *T. trifida* and *T. williamsoni* the flat, short and simple sclerotized process of the distal segment of vesica spermalis (Figs 51, 53) and the thoracic color pattern with dark middorsal, humeral, interpleural, and metapleural stripes (Fig. 19). Within this group the female of *T. caribbea* shares only with *T. satyrus* the approximately parallel sided ventral terga of S3 (Figs 63, 68, 72, 77); they seem to differ only in the color pattern of the legs (three pairs of legs same color pattern in *T. caribbea*, I darker than II-III in *T. satyrus*). The male of *T. caribbea* can be distinguished from all these species by lacking a subbasal tooth or with only a vestigial one between base and heel (Figs 81, 99), a character state shared only with *T. obscuripennis* and *T. septima* (Figs 85, 87, 103, 105). In addition to the thoracic color pattern *T. caribbea* can be distinguished from *T. obscuripennis* and *T. septima* by

Table 2. Variation of head color pattern in *Triacanthagyna*. Values are percentages of total number of specimens examined (*n*).

Species	Sex	*n*	Figure								
			9	10	11	12	13	14	15	16	17
caribbea	♂	61	50	17	-	11	-	-	11	-	11
	♀	73	66	8	8	18	-	-	-	-	-
dentata	♂	4	-	25	-	-	-	75	-	-	-
	♀	2	-	100	-	-	-	-	-	-	-
ditzleri	♂	20	9	32	32	-	9	13.5		4.5	-
	♀	22	-	-	5	40	-	-	0	25	-
nympha	♂	11	-	36	-	-	-	64	-	-	-
	♀	8	-	-	-	100	-	-	-	-	-
obscuripennis	♂	6	-	-	-	17	33	50	-	-	-
	♀	1	-	-	-	100	-	-	-	-	-
satyrus	♂	12	-	7.7	-	-	-	92.3	-	-	-
	♀	6	-	-	-	-	-	20	60	20	-
septima	♂	32	100	-	-	-	-	-	-	-	-
	♀	25	100	-	-	-	-	-	-	-	-
trifida	♂	95	-	-	-	-	-	-	-	100	-
	♀	80	-	-	-	-	-	-	-	70	30
williamsoni	♂	5	-	-	-	-	-	60		-	40
	♀	2	-	-	-	-	-	-	100	-	-

the shape of the cercus blade in dorsal view (blade of cercus parallel in *T. caribbea*, Fig. 90; converging gradually before tip in *T. obscuripennis* and *T. septima*, Figs 94, 96).

Distribution

25°S-21°N, 38-105°W, 0-966 m a.s.l. (Fig. 109). — Mexico: Veracruz (DRP, RWG, USNM), Campeche (UMMZ), Chiapas (UMMZ), Tabasco (DRP, USNM), Nayarit (UMMZ*), Yucatán (UMMZ). — Guatemala: El Peten (RWG*, UMMZ), Zacapa (UMMZ). — Belize (UMMZ, USNM). — Costa Rica: Guanacaste (USNM). — Honduras: Atlantida (UMMZ). — Puerto Rico: Río Grande (RWG). — Dominica (USNM*). — Venezuela: Distrito Federal (Williamson 1923), Carabobo (UMMZ), Falcon (UMMZ*), Yaracuy (UMMZ), Barinas (DRP). — Colombia: Magdalena (RWG*, UMMZ, USNM), Bolivar (UMMZ*, USNM), Antioquia (UMMZ, USNM). — Ecuador: Los Rios (UMMZ). — Peru: Madre de Dios (RWG*, USNM), Huanuco (UMMZ). — Brazil: Para (IRNSB), Bahia (MRJ), Espirito Santo (MRJ), Rio de Janeiro (MRJ, Williamson 1923), São Paulo

(MRJ), Parana (MRJ), Mato Grosso (UMMZ). — Bolivia: Santa Cruz (IRSNB), Beni (DRP).

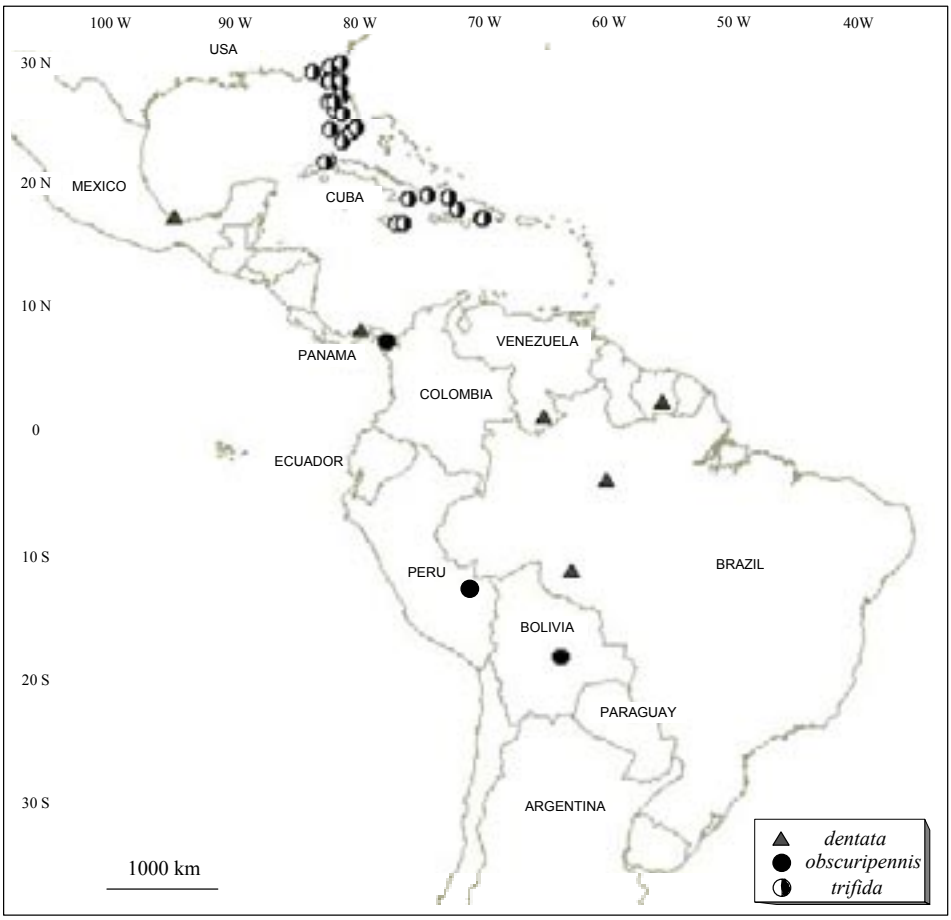


Figure 110. Distribution area of *Triacanthagyna dentata*, *T. obscuripennis* and *T. trifida*.

Triacanthagyna dentata (Geijskes, 1943)
(Figs 10-Fr, 23-Tg, 32, 41-Ha, 55, 64, 74-Te, 82, 91, 100-Ce, 110-Mp)

Coryphaeschna dentata Geijskes, 1943: 63-68, fig. 1 (description of ♂).
Triacanthagyna dentata (Geijskes). — Donnelly (1992): 85 (change of genus); — De Marmels (1992): 65 (description of ♀ and larva).

Type locality: Julu (Joeloe), Paloemeu River, Surinam. Type status: holotype ♂. Type depository: NML. Type specimens examined: none. Total number of specimens examined: 4 ♂.

Diagnosis

Both sexes of *T. dentata* are easily identifiable by the black occipital triangle and legs. The broad blade of male cercus (blade wider than half of base width, Fig. 91), and condition of the three-pronged ventral process on S10 of female (central prong twice the length of lateral prongs) are also unique.

Distribution

3°S-18°N, 55-95°W, 62-160 m a.s.l. (Fig. 110). — Mexico: Veracruz (RWG). — Panama: Canal Zone (RWG*). — Venezuela: Amazonas (MIZA*). — Surinam: Marowijne (Geijskes 1943). — Brazil: Amazonas (RWG*, USNM).

Triacanthagyna ditzleri Williamson, 1923
(Figs 11-Fr, 24-Tg, 33, 42-Ha, 56, 65, 73-Te, 83, 92, 101-Ce, 108-Mp)

Triacanthagyna ditzleri Williamson, 1923: 13, 19-21, table, figs 2, 13, 17, 22 (description of ♂ and ♀).
Triacanthagyna trifida (Rambur). — Martin (1909): 149 (records from Brazil and Panama in part).
Gynacantha trifida Rambur. — Calvert (1919): 37 (Guatemala).
Gynacantha septima Selys in Sagra. — Calvert (1919): 37 (Guatemala).

Type locality: La Fria, Venezuela. Type status: holotype ♂. Type depository: UMMZ. Type specimens examined: holotype ♂, allotype ♀, paratypes ♂, ♀ (UMMZ). Total number of specimens examined: 20 ♂, 22 ♀.

Diagnosis

The male of *T. ditzleri* is similar to *T. caribbea, T. nympha* and *T. williamsoni* in color pattern and size but it differs from those species in the anterior process of the hamule in ventral view: short in *T. ditzleri*, long in the other three species. In addition *T. ditzleri* can be distinguished from these three species by the presence of a subbasal tooth between base and heel of cercus (absent in *T. caribbea*), moderate development of heel of cercus in mediodorsal view (strongly prominent in *T. nympha*), and distal spine of cercus directed postero-externally (externally in *T. nympha*). The male of *T. ditzleri* shares only with *T. dentata* the short anterior hamular process in ventral view, but it can be easily differentiated from that species by its much smaller size (Hw ♂ 34-38.5, ♀ 35-41 vs Hw ♂ 43.5-50, ♀ 49-50.5 in *T. dentata*), pale occipital triangle, black and brown legs (black in *T. dentata*), and narrow blade of cercus (wide in *T. dentata*).

The female of *T. ditzleri* shares with *T. caribbea, T. satyrus* and *T. septima* the condition of ventral tergum of S3 anterior to transverse carina (wider than half of distal width, Figs 66-67, 70-71). It can be distinguished from *T. caribbea* and *T. satyrus* by the inner and outer carinae becoming slightly convergent medially (approximately parallel sided in *T. caribbea* and *T. satyrus*), and from *T. septima* by the color pattern of thorax (without dark stripes in *T. septima*).

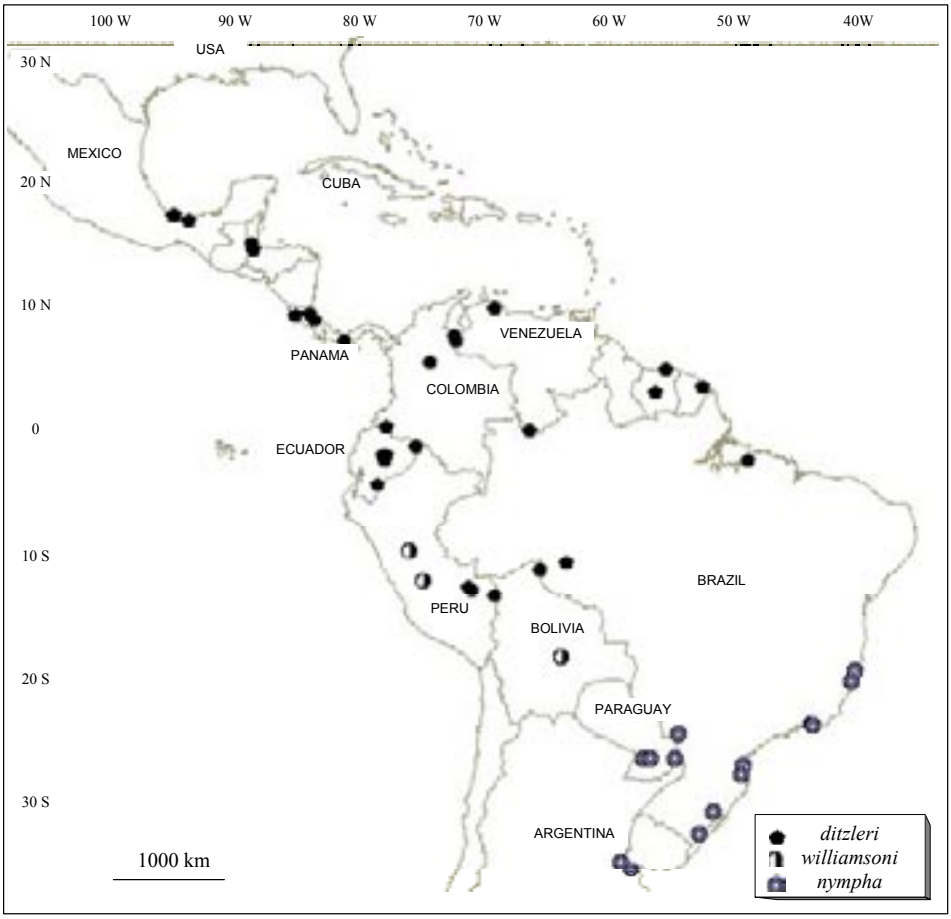


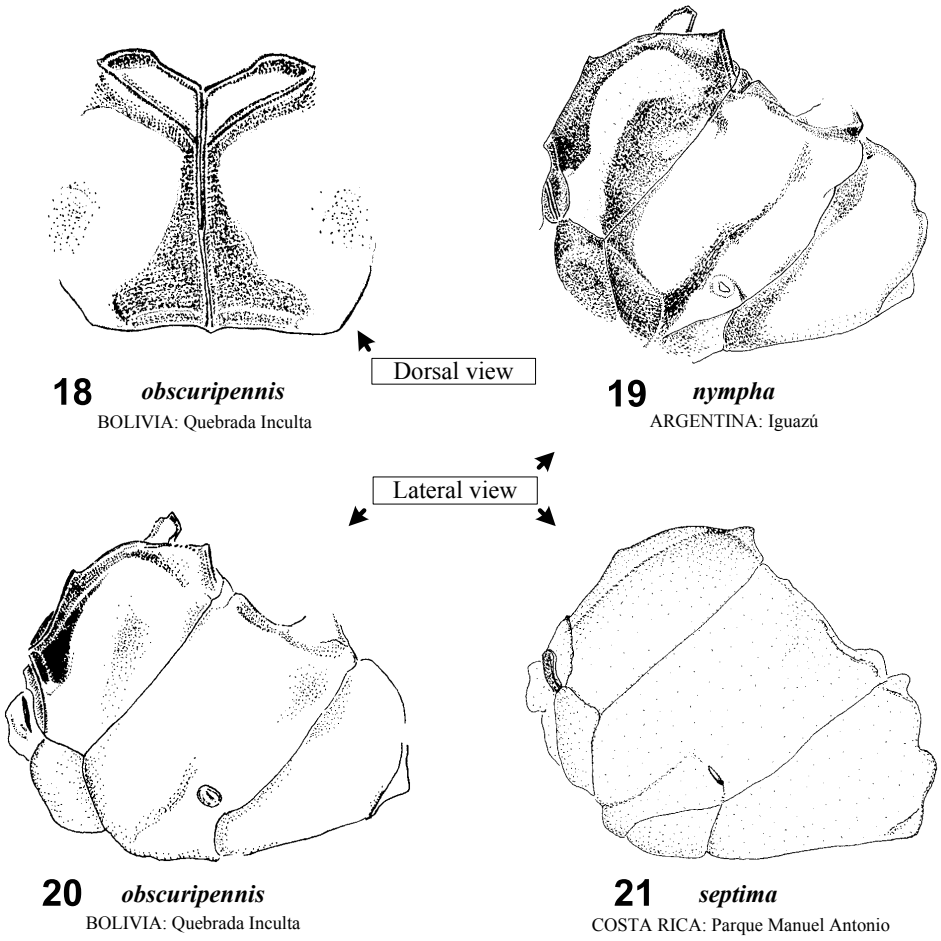
Figure 108. Distribution area of *Triacanthagyna ditzleri*, *T. nympha* and *T. williamsoni*.

Distribution

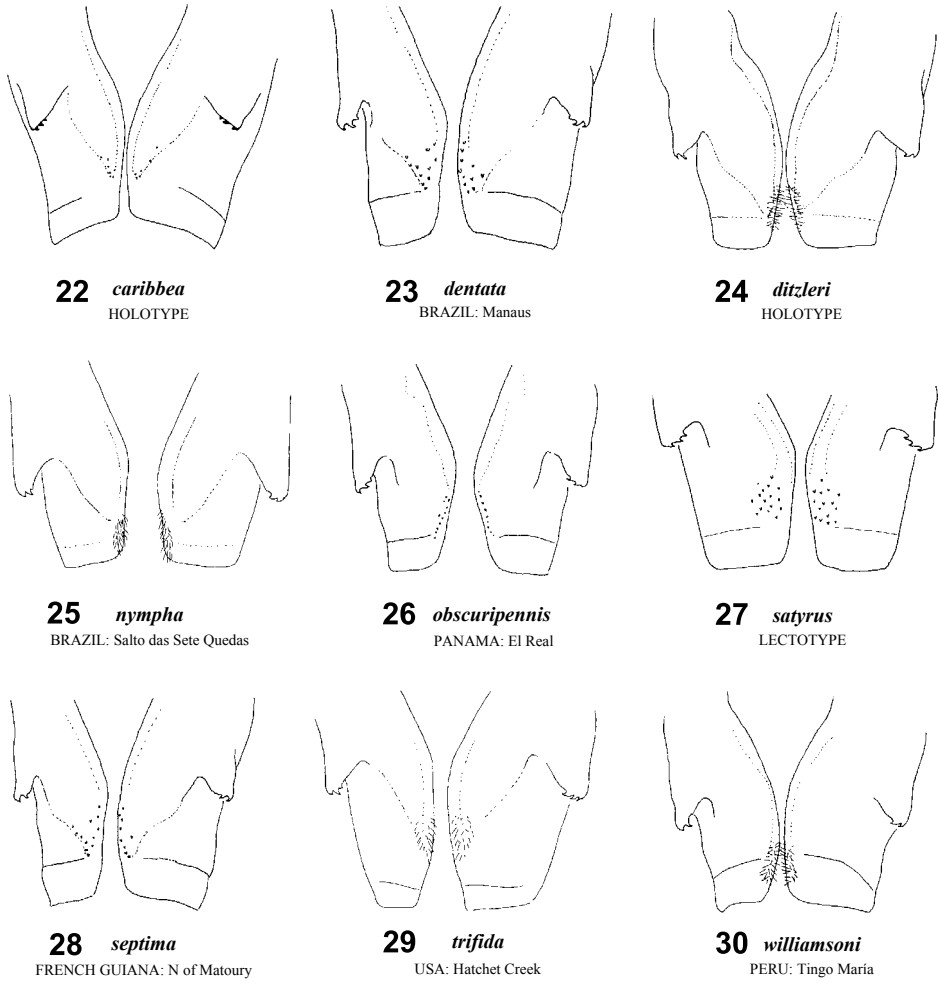
17°S-18°N, 48-95°W, 0-1,100 m a.s.l. (Fig. 108). — Mexico: Veracruz (RWG*), Tabasco (DRP). — Guatemala: Izabal (Williamson 1923). — Belize (UMMZ, Williamson 1923). — Panama (USNM). — Costa Rica: Heredia (DRP, USNM), Cártago (USNM), Guanacaste (RWG*). — Venezuela: Falcon (UMMZ), Zulia (UMMZ), Táchira (RWG, UMMZ*), Territorio Federal Amazonas (USNM). — Surinam: Surinam (Williamson 1923), Brokopondo (UMMZ). — French Guiana: Cayenne (RWG*). — Colombia: Antioquía (UMMZ, USNM). — Ecuador: Napo-Pastaza (UMMZ), Morona-Santiago (USNM). — Peru: Napo (RWG*), Madre de Dios (USNM*), Junin (UMMZ), Loreto (DRP). — Brazil: Para (UMMZ), Rondonia (UMMZ*) Bolivia: Santa Cruz (UMMZ).

Triacanthagyna nympha (Navás, 1933)
(Figs 7, 8, 51-Ve, 12-Fr, 19-Th, 25-Tg, 34, 43-Ha,
57, 66, 75-Te, 84, 93, 102-Ce, 108-Mp)

Gynacantha nympha Navás, 1933: 193-194, fig. 13 (description of ♂).
Triacanthagyna trifida (Rambur). — Martin (1909): 149 (records from Brazil in part); — Ris (1913): 77; — Rodrigues Capítulo (1992): 58; — Donnelly et al. (1998): 116; — Muzón & von Ellenrieder (1998): 24; — von Ellenrieder (2001): 41, 44, 53.
Triacanthagyna ditzleri Williamson, 1923: 21 (in part, records from Santa Catarina and Rio Grande do Sul); — Carvalho (1988): 223-226, figs 1-9 (description of larva); — Costa et al. (2001): 439.
Gynacantha trifida Rambur. — Fraser (1947): 434.



Figures 18-21. Thorax.



Figures 22-30. S2 – ventral view.

Type locality: Porto Alegre, Rio Grande do Sul, Brazil. Type status: holotype ♂ (lost?). Type depository: unknown. Type specimens examined: none. Total number of specimens examined: 11 ♂, 8 ♀.

Diagnosis

The externally directed distal spines and the strongly prominent heel of the cercus characterize the male of *T. nympha*. Further differentiation from *T. caribbea* and *T. ditzleri* is given under those species.

The female shares the narrow ventral terga with *T. dentata, T. obscuripennis, T. tri-*

fida and *T. williamsoni*; it is easily distinguished from *T. dentata* by the pale occipital triangle (black in *T. dentata*), from *T. obscuripennis* by the thoracic dark stripes (only middorsal dark stripe in *T. obscuripennis*), from *T. trifida* by the gradual constriction of the ventral tergum posterior to the transverse carina (abrupt in *T. trifida*), and from *T. williamsoni* by the contour of the S4 ventral terga (constricted at anterior 0.33 in *T. nympha*, approximately parallel sided in *T. williamsoni*).

Remarks

Navás (1933) based his description of *G. nympha* on a male from Southern Brazil ("Porto Alegre"). The holotype is apparently lost; it is not in the Institut Royal de Sciences Naturelles in Brussels, Museum National d'Histoire Naturelle, Paris (P. Machet pers. comm.), Museo de Zoología de Barcelona (G. Masó pers. comm.) or Museo Nacional de Ciencias Naturales, Madrid (C. Martín pers. comm.).

Based on the original description, P. Machet (1990 in litt.) suggested that Navás' *G. nympha* corresponded to a *Triacanthagyna* and that it would probably be a junior synonym of *T. ditzleri*.

In his description of *G. nympha*, Navás (1933) included a drawing of the male cerci in dorsal view and we have associated the name with this species based on his illustration. His drawing shows the externally directed distal spines and the strongly prominent heels of cerci that uniquely characterize this species. We have identified the female by association with the male. The morphology of the hamules and vesica spermalis of the male and the three-pronged process of the female confirm the generic placement of the species in *Triacanthagyna*.

This species has been reported from Argentina as *T. trifida* and from Brazil as *T. ditzleri*. Williamson (1923) indicated that *T. trifida* was restricted to the Caribbean, and considered all the South American records of *T. trifida* as *T. ditzleri*. He noticed however that there were some differences between the northern smaller individuals and southern larger representatives of his *T. ditzleri* and suggested the possibility that two species were involved (Williamson 1923: 9); these southern specimens correspond to *T. nympha*.

Distribution

18-34°S, 39-58°W, 0-260 m a.s.l. (Fig. 108). — Brazil: Espirito Santo: Conceição da Barra (mata), Nova Lombardia (18°35'S, 39°45'W), 0 m (MRJ); Linhares, Estr. Linhares-Regencia, km 4 (mata) (19°25'S, 40°04'W), 16 m (MRJ). Rio de Janeiro: Rio de Janeiro (22°54'S, 43°14'W), 0 m (UMMZ); same data except Parque Chico Mendez, Recreio dos Bandeirantes, Lagoa das Taxas, (MRJ); same data except wooded hills, base of Mt. Corcovado, near Rua S. Clemente (UMMZ); Copacabana (22°58'S, 43°11'W), 0 m (IRSNB). Parana: Salto das Sete Quedas (23°45'S, 54°03'W), 217 m (MRJ*). Santa Catarina: Joinvile (26°18'S, 48°50'W), 123 m (MRJ*); Blumenau (26°56'S, 49°03'W), 150 m (UMMZ*). Rio Grande do Sul: Pelotas (31°46'S, 52°20'W), 3 m (RWG); Porto Alegre (30°02'S, 51°12'W), 54 m (Navás 1933). — Paraguay: Paraguari: Sapucay (25°40'S, 56°55'W), 194 m (USNM*). Guaira: Villarica (25°45'S, 56°26'W), 125 m (RWG*). Central: Areguá (25°18'S, 57°25'W), 164 m (DRP); along Río Paraguay

(DRP). — Argentina: Misiones: Parque Nacional Iguazú, Sendero Macuco (25°40'08"S, 54°27'09"W), 250 m (TWD*). Buenos Aires: Punta Lara (34°49'S, 57°59'W), 4 m (MACN*); Delta del Paraná (34°07'51"S, 58°49'08"W) (MACN*).

Triacanthagyna obscuripennis (Blanchard, 1845)
(Figs 13-Fr, 18, 20-Th, 26-Tg, 35, 44-Ha, 50, 52-Ve, 58, 67, 76-Te, 85, 94, 103-Ce, 110-Mp)

Aeschna obscuripennis Blanchard, 1845: 217, fig. 3 (description of ♀).
Gynacantha obscuripennis (Blanchard). — Kirby (1890): 94.
Triacanthagyna obscuripennis (Blanchard). — Martin (1909): 151-152, fig. 15.
Triacanthagyna septima (Selys in Sagra). — Williamson (1923): 9 (suggested synonymy).

Type locality: forests between provinces of Mojos and Chiquitos, Bolivia. Type status: holotype ♀ (lost?). Type depository: Unknown. Type specimens examined: none. Total number of specimens examined: 7 ♂, 1 ♀.

Diagnosis

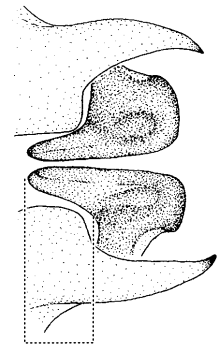
Both sexes of *T. obscuripennis* are characterized by their thoracic color pattern which is pale green with *only* a middorsal well defined dark stripe (Figs 18, 20). The long and flat bifid process of male vesica spermalis is also unique (Figs 50, 52).

Remarks

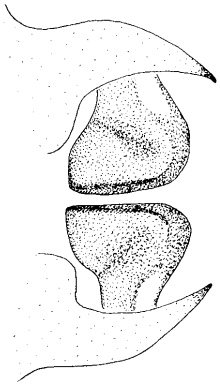
This species was described and illustrated by Blanchard (1845) based on one female. Martin (1909) included the species under *Triacanthagyna* in his revision but, based on his description, we believe that his specimens were probably *T. septima*. The specimens from the Selys' Collection that Martin (1909) examined are probably lost (we found only labels without specimens associated at the IRSNB collection). He did not mention dark stripes in the thorax in his redescription: "Thorax light brown with two long green antehumeral stripes, the sides yellowish without apparent stripes. Legs light yellow or yellowish brown." His illustrations of the cerci could well correspond to *T. septima*.

Based on the specimens studied by Martin, Williamson (1923) suggested that *T. obscuripennis* could be a synonym of *T. septima*. However, in the original description Blanchard (1845) mentioned and illustrated *only* a middorsal black stripe which is absent in *T. septima*. All other species also have additional lateral dark stripes, and this character led us to associate the name with our specimens. The type is apparently lost; it has not been found at the Museum National d'Histoire Naturelle in Paris (P. Machet in litt., 1990) nor in the Institut Royal de Sciences Naturelles in Brussels.

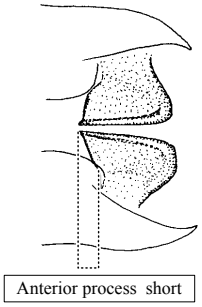
We have seen specimens from only three widely separated localities, one specimen from Bolivia, one from Peru and a small series from Panama. The apparently disjunct distribution may be due to the species being rare and we believe that more thorough collecting will show it to occur in intermediate localities.



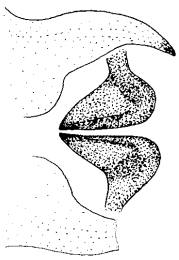
31 ***caribbea***
COLOMBIA: Santa Marta



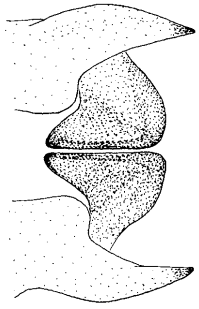
32 ***dentata***
PANAMA: Barro Colorado



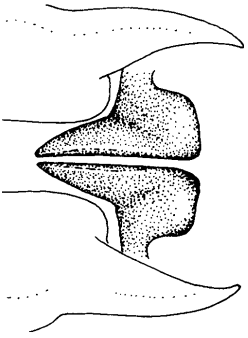
33 ***ditzleri***
FRENCH GUIANA: N of Matoury



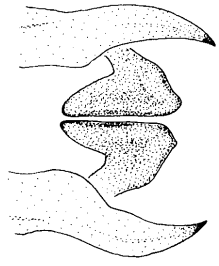
34 ***nympha***
ARGENTINA: Punta Lara



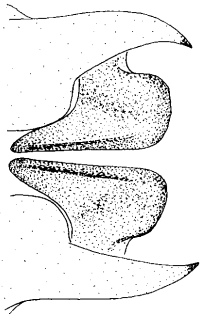
35 ***obscuripennis***
PANAMA: El Real



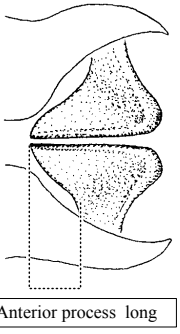
36 ***satyrus***
LECTOTYPE



37 ***septima***
MEXICO: Veracruz

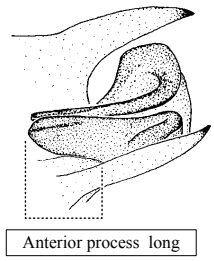


38 ***trifida***
USA: Newnans Lake

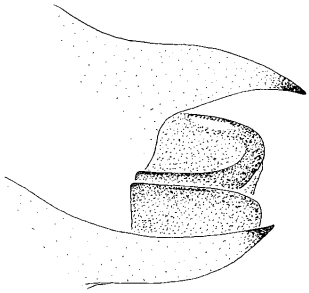


39 ***williamsoni***
PERU: Tingo María

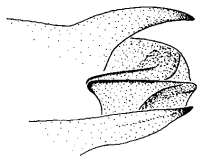
Figures 31-39. Anterior hamules – ventral view.



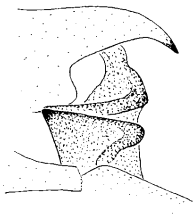
40 ***caribbea***
COLOMBIA: Santa Marta



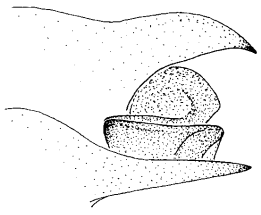
41 ***dentata***
PANAMA: Barro Colorado



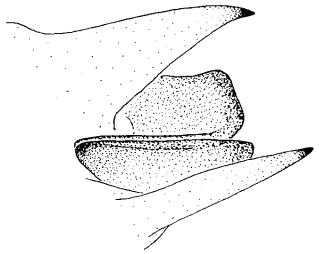
42 ***ditzleri***
FRENCH GUIANA: N of Matoury



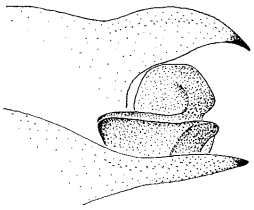
43 ***nympha***
ARGENTINA: Punta Lara



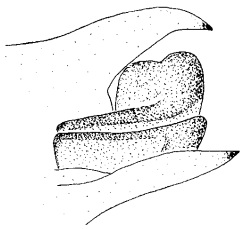
44 ***obscuripennis***
PANAMA: El Real



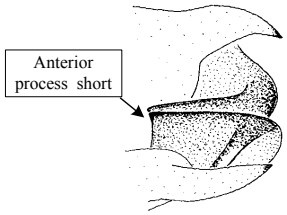
45 ***satyrus***
BRAZIL: Rondonia



46 ***septima***
MEXICO: Veracruz



47 ***trifida***
USA: Newnans Lake



48 ***williamsoni***
PERU: Tingo María

Figures 40-48. Anterior hamules – ventrolateral view (to scale).

Distribution

17°S-8°N, 63-77°W, 16-361 m a.s.l. (Fig. 110). — Panama: Darien, Río Tuira at El Real (08°08'S, 77°43'W), 16 m (RWG*, USNM*). — Peru: Madre de Dios: sandbar on Río Manu (at dusk), 250 m a.s.l. (12°15'S, 70°57'36"W) (RWG). — Bolivia: Santa Cruz: Ichilo, Quebrada Inculta, 4 km S of Buena Vista (17°27'S, 63°40'06"W), 361 m (JJD*).

Triacanthagyna satyrus (Martin, 1909)
(Figs 14-Fr, 27-Tg, 36, 45-Ha, 59, 68, 77-Te, 86, 95, 104-Ce, 109-Mp)

Gynacantha satyrus Martin, 1909: 177-178 (description of ♂).
Triacanthagyna trifida (Rambur). — Martin (1909): 149 (records from Brazil in part).
Triacanthagyna satyrus (Martin). — Williamson (1923): 11, 13, 25-26, table, figs 20, 25 (designation of lectotype, description of ♀).

Type locality: Para, Brazil. Type status: lectotype ♂. Type depository: IRSNB. Type specimens examined: lectotype ♂, paralectotypes ♂. Total number of specimens examined: 12 ♂, 6 ♀.

Diagnosis

The male of *T. satyrus* can be distinguished from *T. ditzleri, T. caribbea, T. nympha, T. trifida* and *T. williamsoni* males by the genital lobe with a distal group of 10-20 strong denticles (Figs 22-30). *T. dentata*, *T. obscuripennis* and *T. septima* males have also strong denticles on the genital lobe but *T. dentata* has a black occipital triangle (pale in *T. satyrus*); in *T. obscuripennis* the denticles are located in a row (Fig. 26) (in a group in *T. satyrus,* Fig. 27) and *T. obscuripennis* has only a middorsal dark stripe on the pterothorax (Fig. 20); *T. septima* (Fig. 21) has an entirely pale pterothorax and *T. satyrus* has dark lateral stripes as in Figure 19.

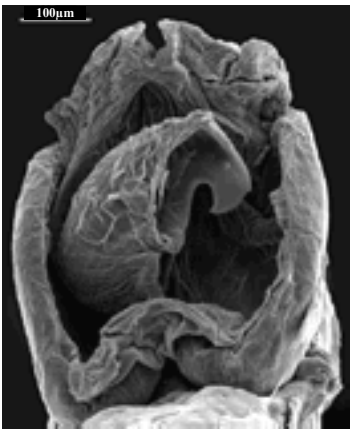
In addition to the differences in thoracic markings, the female of *T. satyrus* can be distinguished from the female of *T. dentata* by the color of occipital triangle and from females of *T. dentata, T. nympha*, *T. trifida* and *T. williamsoni* by the broader ventral terga (Fig. 68) (narrower in these species, Figs 63-71). Females of *T. ditzleri* also have broad ventral terga, but they have a concave outer ventral carina (Fig. 65) (approximately linear in *T. satyrus*, Fig. 68). Females of *T. caribbea* seem to differ from those of *T. satyrus* solely in the color pattern of the legs: three pairs of legs are reddish-brown with apical portion of femora and basal portion of tibiae black in *T. caribbea*, whereas leg I is darker than II-III in *T. satyrus*.

Distribution

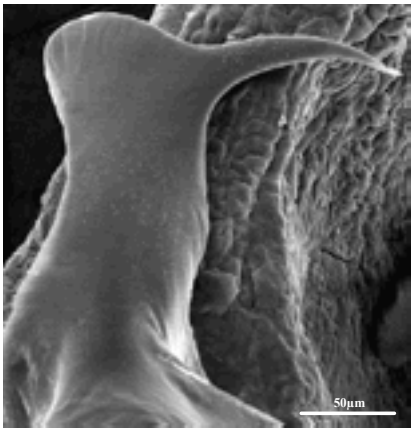
22°S-10°N, 42-84°W, 0-522 m a.s.l. (Fig. 109). — Belize (Williamson 1923). — Costa Rica: Heredia (DRP, RWG, Williamson 1923). — Trinidad (RWG*, UMMZ*). — Venezuela: Tachira (UMMZ). — Ecuador: Sucumbios (RWG), Napo (DRP, USNM). — Peru: Napo (RWG), Madre de Dios (DRP, RWG*, USNM), Loreto (IRSNB). — Brazil: Rondonia (RWG*), Para (IRSNB*, MRJ), Rio de Janeiro (RWG*).

49 ***septima***
MEXICO: Catemaco

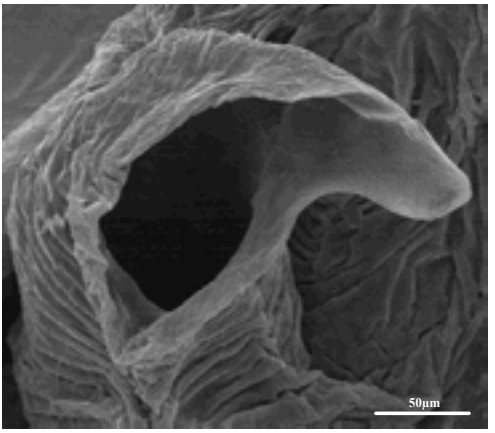
50 ***obscuripennis***
PANAMA: El Real



51 ***nympha***
PARAGUAY: Villarica



52 ***obscuripennis***
PANAMA: El Real

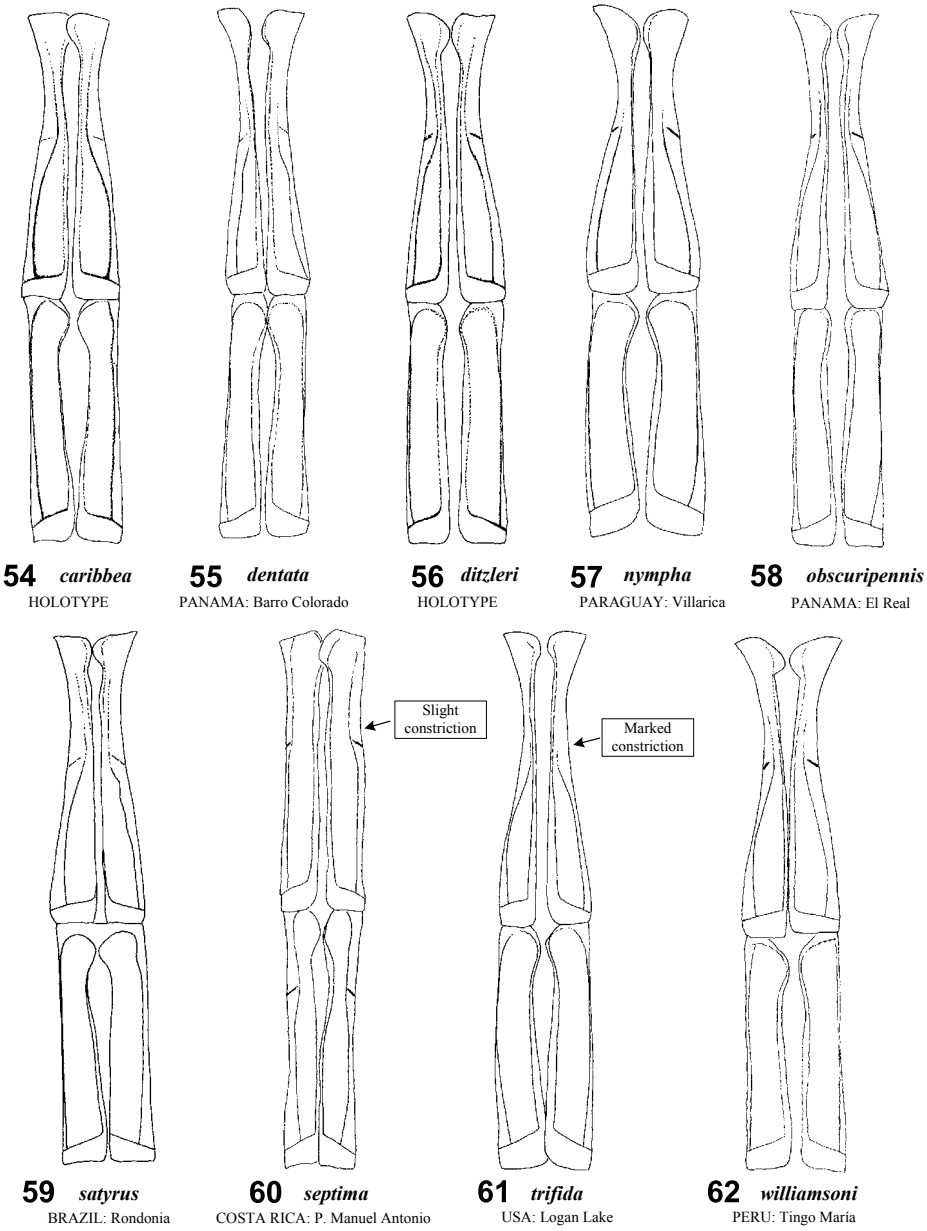


53 ***trifida***
USA: Newnans Lake

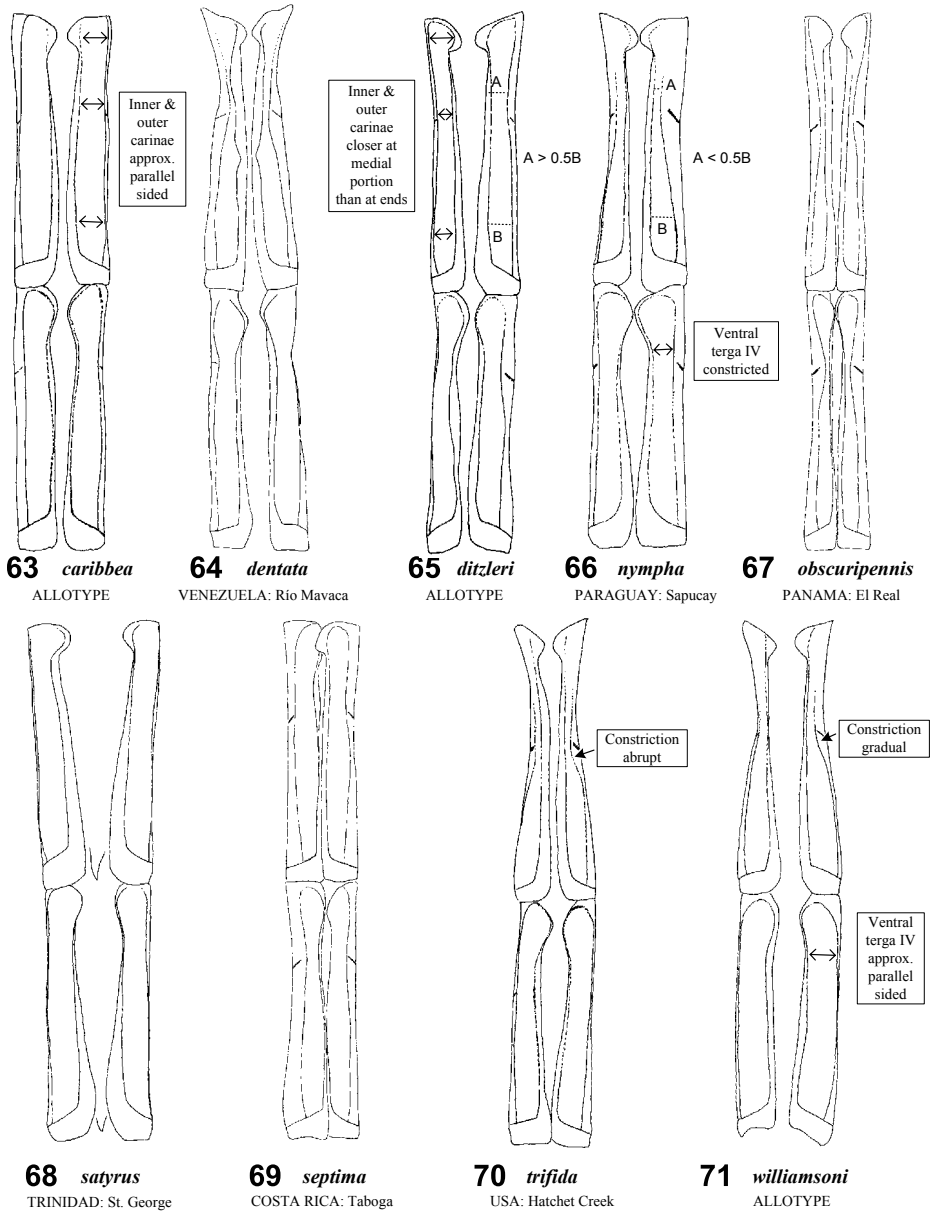
Figures 49-53. Top: distal segment of vesica spermalis – ventral view; bottom: detail sclerotized process of vesica distal segment – ventral view.

Triacanthagyna septima (Selys in Sagra, 1857)
(Figs 15-Fr, 21-Th, 28-Tg, 37, 46 Ha, 49-Ve, 60, 69, 78-Te, 87, 96, 105-Ce, 109-Mp)

Gynacantha septima Selys in Sagra, 1857: 460 (description).
Triacanthagyna septima (Selys in Sagra). — Martin (1909): 150-151 (in part), — Williamson (1923): 9-12, 16-19, tables, figs 1, 21; — Calil & Carvalho (1999): 78-83, figs 1-13 (description of larva, redescription of ♂ and ♀).
Triacanthagyna obscuripennis (Blanchard). — Martin (1909): 151-152, fig. 150.
Gynacantha satyrus Martin, 1909: 178 (in part, paralectotype ♂ from Brazil).



Figures 54-62. ♂ S3-4 – ventral view.



Figures 63-71. ♀ S3-4 – ventral view.

Type locality: Jamaica and Brazil. Type status: Unknown. Type depository: Unknown. Type specimens examined: none. Total number of specimens examined: 32 ♂, 25 ♀.

Diagnosis

T. septima is the most easily recognized species because of its pale pterothorax (Fig. 21) and legs, male S3 slightly constricted (Fig. 60) and distal segment of vesica spermalis with a long slender acute sclerotized process (Fig. 49). All of these characters are unique.

Distribution

23°S-19°N, 38-96°W, 0-2,713 m a.s.l. (Fig. 109). — Mexico: Veracruz (RWG*, UMMZ), Chiapas (UMMZ), Campeche (DRP), Nayarit (DRP). — Guatemala: El Peten (UMMZ). — Belize (UMMZ). — Puerto Rico (UMMZ). — Costa Rica: Puntarenas (RWG*), Guanacaste (RWG*), Alajuela (DRP), Heredia (DRP). — Honduras: Tela (UMMZ). — Trinidad (UMMZ). — Venezuela: Falcon (IRSNB). — Surinam: Surinam (Calil & Carvalho 1999). — French Guiana: Cayenne (RWG*). — Colombia: Magdalena (UMMZ). — Ecuador: Loja (MRJ), Esmeraldas (UMMZ), Los Rios (UMMZ*), Guayas (UMMZ*), Azuay (IRSNB). — Brazil: Amazonas (MRJ), Bahia (Calil & Carvalho 1999), Espirito Santo (MRJ*), Minas Gerais (Calil & Carvalho 1999), Rio de Janeiro (Calil & Carvalho 1999, Martins Costa & Santos 1999), São Paulo (UMMZ), Mato Grosso (MRJ). — Bolivia: Santa Cruz (UMMZ*), Beni (DRP).

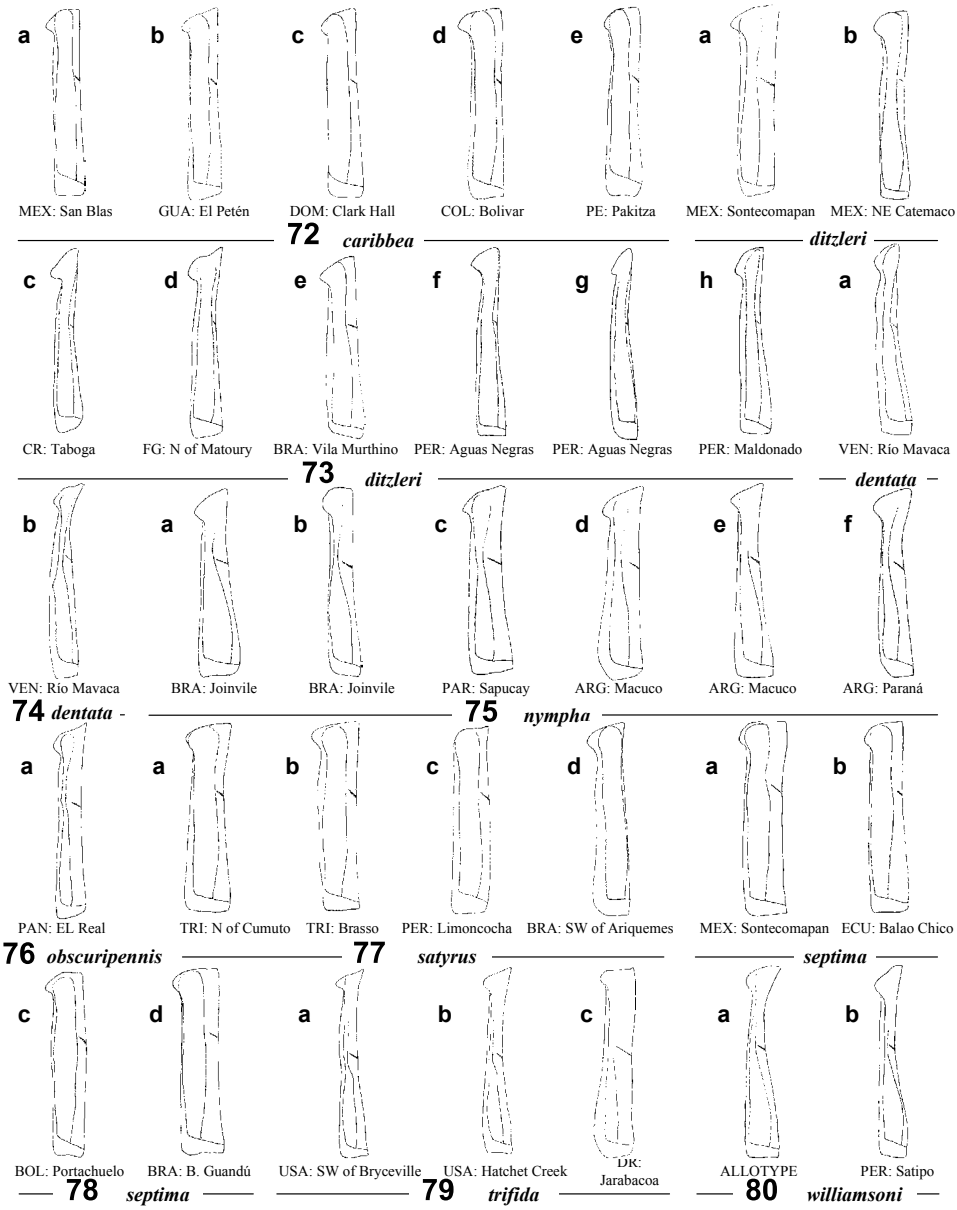
Triacanthagyna trifida (Rambur, 1842)
(Figs 16-Fr, 29-Tg, 3-4, 38, 47-Ha, 53-Ve, 61, 70, 79-Te, 88, 97, 106-Ce, 110-Mp)

Gynacantha trifida Rambur, 1842: 210-211 (description of ♂ and ♀); — Calvert (1905: 189-191 (in part, records from USA).
Triacanthagyna trifida (Rambur). — Martin (1909): 148-149, fig. 147 (in part); — Williamson (1923): 9-12, 24-25, Tabs., figs 14, 19, 24; — Needham & Westfall, (1955): 325, fig. 200 (in part, records from USA and Antilles; description of young larva).
Triacanthagyna needhami Martin, 1909: 149-150, fig. 148.
Gynacantha satyrus Martin, 1909: 178 (in part, ♂ paralectotype from Santo Domingo).

Type locality: Cuba. Type status: lectotype ♂. Type depository: IRSNB. Type specimens examined: lectotype ♂, paralectotypes ♂, ♀. Total number of specimens examined: 95 ♂, 80 ♀.

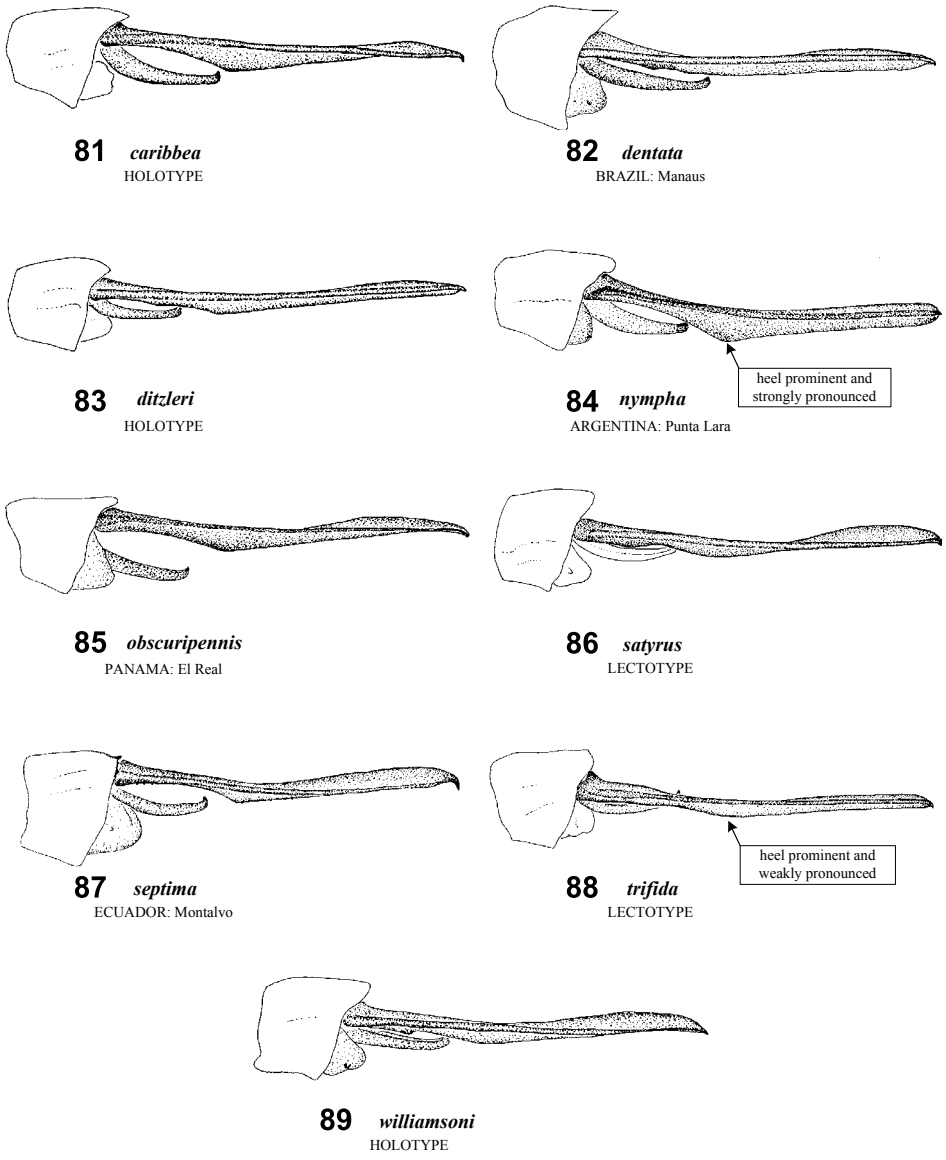
Diagnosis

T. trifida shares with *T. caribbea, T. dentata*, *T. ditzleri*, *T. nympha*, *T. satyrus*, and *T. williamsoni* the flat, short and simple sclerotized process of the distal segment of vesica spermalis (Figs 51, 53), and the thoracic color pattern with dark middorsal, humeral, interpleural, and metapleural stripes (Fig. 19). *T. trifida* can be distinguished from *T. caribbea* by its cercus with a subbasal tooth between base and heel (Fig. 88) (without subbasal tooth in *T. caribbea*, Fig. 81), from *T. dentata* by its pale occipital triangle (dark in *T. dentata*), from *T. satyrus* by its genital lobe without denticles (Fig. 29) (with a distal group of strong denticles in *T. satyrus*, Fig. 27), from *T. ditzleri*



Figures 72-80. ♀ S3 – ventral view of left side.

by its long anterior process of hamules (Fig. 38) (short in *T. ditzleri*, Fig. 33), from *T. williamsoni* by the cercus heel prominent (Fig. 106) (not prominent in *T. williamsoni*,



Figures 81-89. ♂ cerci – lateral view.

Fig. 107), and from *T. nympha* by the cercus distal spine directed postero-externally (Fig. 97) and heel not strongly pronounced (Fig. 106) (externally directed spine, Fig. 93, and strongly pronounced heel in *T. nympha*, Fig. 102).

Females of *T. trifida* can be easily distinguished from the remaining species of *Triacanthagyna* with dark lateral stripes in pterothorax and pale occipital triangle by the narrow ventral tergum of S3 abruptly constricted at about half of S3 length (Figs 70, 79a-c).

Remarks

T. trifida, the type species of the genus, was described from specimens from Cuba (Rambur 1842). Martin (1909) described *T. needhami* from specimens from Florida. Although the mainland specimens of *T. trifida* are larger than the Antillean specimens (Table 3), we have not found any other consistent difference that would justify considering them as two different species, and we therefore agree with the synonymy suggested by Williamson (1923).

Table 3. Measurements [mm] of *Triacanthagyna trifida* specimens from mainland and Antilles.

T. trifida		Sex	*n*	Range	Average	s.d.
USA	Hw length	♂	15	40.0-43.5	41.96	1.19
		♀	12	44.0-45.5	44.62	0.53
Antilles		♂	9	39.5-43.0	41.01	1.33
		♀	3	41.5-44.0	42.66	1.25
USA	Cerci length	♂	15	6.45-7.0	6.64	0.20
Antilles		♂	7	5.4-6.2	6.04	0.18
USA	Total length	♂	15	62.5-69.0	65.80	1.92
Antilles		♂	7	57.0-65.0	60.66	3.02

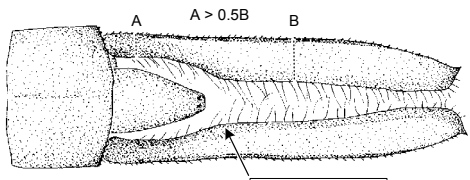
Distribution

17-31°N, 69-83°W, 0-266 m a.s.l. (Fig. 110). — USA: Georgia (UMMZ), Florida (DRP, JJD, RWG*, UMMZ*, USNM). — Bahamas: San Salvador (DRP). — Dominican Republic (IRSNB, JJD*, USNM). — Cuba: La Havana (IRSNB*), Pinar del Rio (Williamson 1923), Oriente (Williamson 1923). — Haiti (Williamson 1923). — Jamaica (IRSNB).

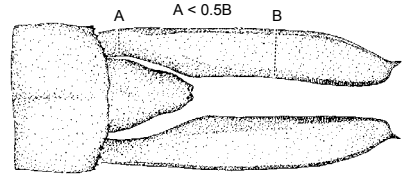
***Triacanthagyna williamsoni* sp. nov.**

(Figs 17-Fr, 30-Tg, 39, 48-Ha, 49-Ve, 62, 71, 80-Te, 89, 98, 107-Ce, 108-Mp)

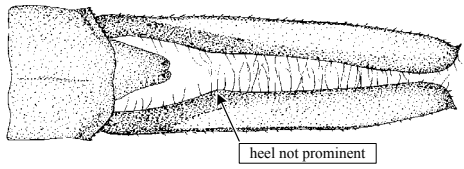
Type locality: Tingo Maria (premontane rain forest), Huanuco, Peru. Type status: holotype ♂. Type depository: USNM. Type specimens examined: holotype ♂, allotype ♀, paratypes ♂, ♀. Total number of specimens examined: 5 ♂, 2 ♀.



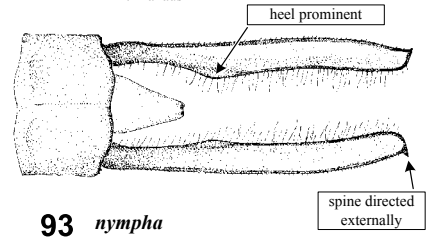
90 ***caribbea***
HOLOTYPE



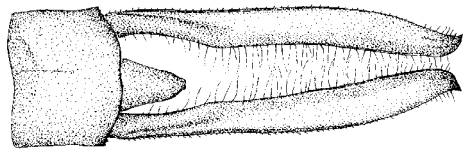
91 ***dentata***
BRAZIL: Manaus



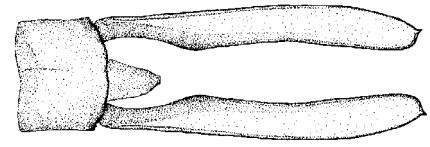
92 ***ditzleri***
HOLOTYPE



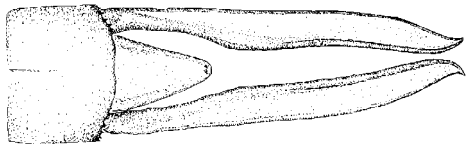
93 ***nympha***
ARGENTINA: Punta Lara



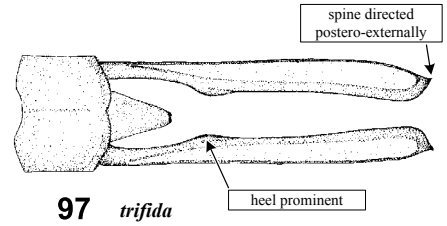
94 ***obscuripennis***
PANAMA: El Real



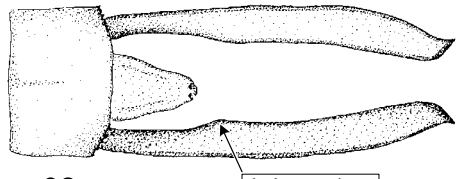
95 ***satyrus***
LECTOTYPE



96 ***septima***
ECUADOR: Montalvo

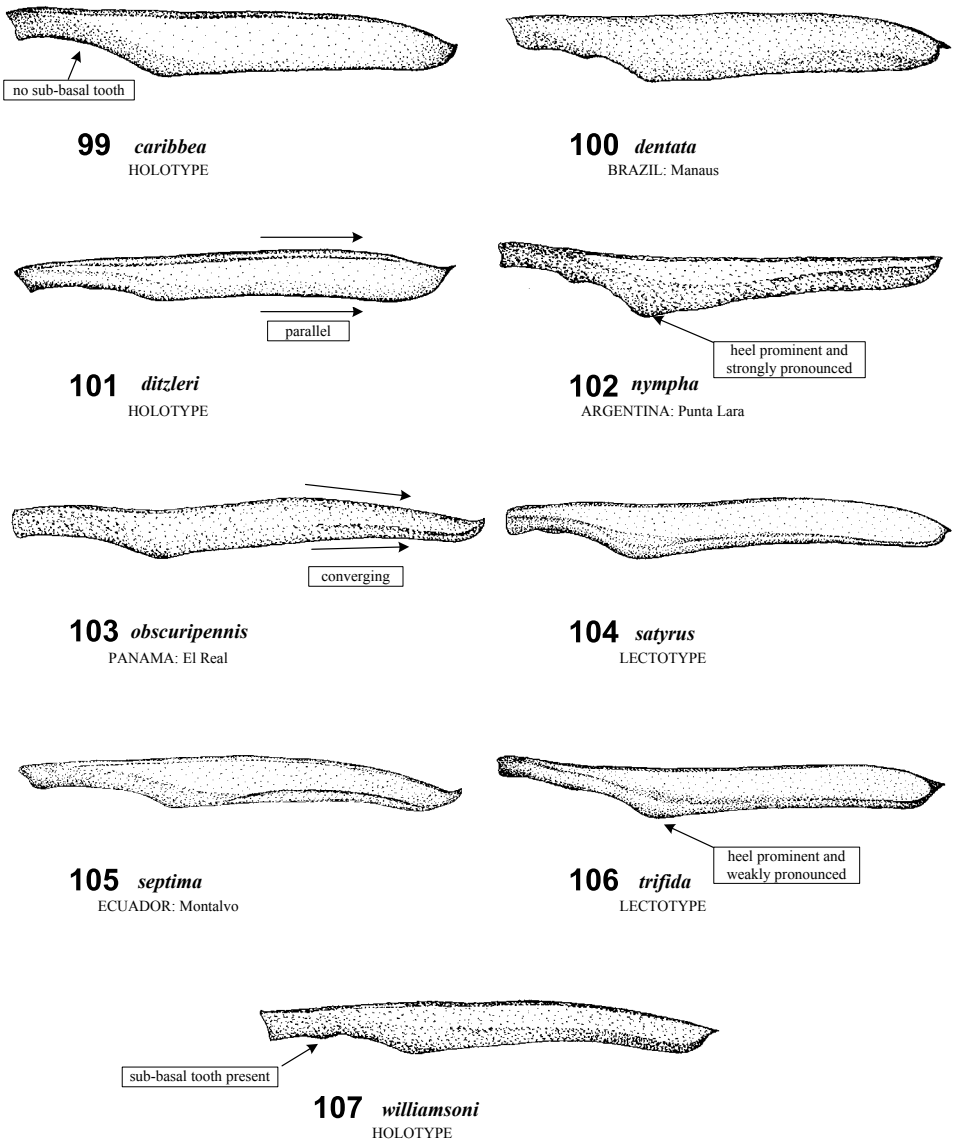


97 ***trifida***
USA: Newnans Lake



98 ***williamsoni***
HOLOTYPE

Figures 90-98. ♂ cerci – dorsal view.



Figures 99-107. ♂ right cercus – mediodorsal view.

Etymology

Named in honor of Edward Bruce Williamson, prolific worker in the Neotropical Odonata and author of the latest revision of this genus.

Description

Holotype ♂ (variation of male paratypes in square brackets)
Head: Labium and labrum pale brown. Clypeus and antefrons green, postfrons with black T-spot, area lateral to T-spot stem green; T-stem as wide as vertex [narrower than vertex]; vertex dark reddish brown [with central area green]; occipital triangle pale green.
Thorax: Pterothorax pale green with middorsal, humeral, interpleural, and metapleural dark stripes (as Fig. 19). Legs reddish brown with femoro-tibial articulation black [black]. Wings infumated [hyaline in one paratype]. Wing venation: Ax Fw: 21 right, 20 left [20-24]; Hw: 12 right, 14 left [12-16]; Px Fw: 14 right, 15 left [13-15]; Hw: 17 right, 14 left [14-18]; triangle cells Fw: 6 [6-7]; Hw: 6 [5-7]; supratriangle crossveins Fw: 4 [4-6]; Hw: 6 [4-6]; subtriangle cells Fw: 2; Hw: 2; cu-A space crossveins Fw: 5 [4-5]; Hw: 3; cells anal triangle: 3 [3-4]; cells anal loop: 4 right, 5 left [4-11].
Abdomen: Dark reddish brown to black with green spots as follows: latero-ventral area of S1-2, anterolateral spot of S3, and mediodorsal and posterodorsal spots of S3-8. Genital lobe with a tuft of hairs at distal portion, without denticles (as Fig. 30). Anterior process of hamule long in ventral view (as in Fig. 39, paratype) and short in ventrolateral view (as in Fig. 48, paratype). Distal segment of vesica spermalis with a simple short and flat sclerotized process (as in Fig. 51, paratype). S3 constricted. Cercus with subbasal tooth between base and heel (Figs 89, 107), heel not prominent and distal spine directed postero-externally (Figs 98, 107).

Allotype (variation of paratype female in square brackets)
As holotype except frons pale brown, T-spot stem of frons interrupted at base and central area of vertex green (as in Fig. 16, paratype). Wings infumated; wing venation: Ax Fw: 24 right, 22 left [20-25]; Hw: 15 right, 14 left; Px Fw: 16 [13]; Hw: 19 right, 17 left [14-16]; triangle cells Fw: 7 [6-7]; Hw: 6; supratriangle crossveins Fw: 6 right, 5 left [4-6]; Hw: 6 [4]; subtriangle cells Fw: 2; Hw: 2; cu-A space crossveins Fw: 6 right, 5 left [5]; Hw: 4 [3]; cells anal loop: 6 right, 5 left [6-7]. S3 constriction marked. Ventral terga of S3 (Figs 71, 80) anterior to transverse carina narrower than half of distal width; constriction gradual, anterior to half of S3 length; ventral terga of S4-5 approximately parallel sided (Fig. 71).

Dimensions (average; range in square brackets; types in parentheses)
Head width, ♂: 8.47 [8-9.7] (8), ♀: 7.95 [7.9-8] (7.9); Hw length, ♂: 39.2 [38-40] (38.5), ♀: 40.25 [40-40.5] (40.5); Hw Pt length, ♂: 3.34 [3.2-3.5] (3.3), ♀: 3.75 [3.7-3.8] (3.7); cerci length, ♂: 5.44 [4.9-5.8] (5.3), ♀: broken; total length, ♂ (excluding cerci): 54.9 [53.2-56.5] (53.2), ♀ (excluding cerci): 59 [58-60] (58).

Diagnosis

T. williamsoni is easily distinguished from *T. obscuripennis* and *T. septima* by the dark lateral thoracic stripes (Fig. 19) (absent in these two species, Figs 20-21), from *T. dentata* by the pale occipital triangle and legs (black in *T. dentata*), and from *T. satyrus* by the absence of denticles on genital lobe in male (Fig. 30) (present in *T. satyrus*, Fig. 27) and the narrower ventral terga in female (Fig. 71) (wider in *T. satyrus*, Fig. 68). The male of *T. williamsoni* differs from that of *T. ditzleri* by the long anterior process (Fig. 39) of hamule in ventral view (short in *T. ditzleri*, Fig. 33), from *T. caribbea* by the presence of a subbasal tooth (Fig. 107) between base and heel of cercus (absent in *T. caribbea*, Fig. 99), from *T. nympha* by the distal spine of cercus (Fig. 98) directed postero-externally (externally in *T. nympha*, Fig. 93), and from *T. nympha* and *T. trifida* by the moderate development of heel of cercus (Fig. 107) in mediodorsal view (prominent in *T. nympha* and *T. trifida*, Figs 102, 106).

The female of *T. williamsoni* shares the narrow ventral terga with *T. nympha* and *T. trifida*; it is easily distinguished from *T. trifida* by the gradual constriction of the ventral terga posterior to the transverse carina (Fig. 71) (abrupt in *T. trifida*, Fig. 70), and from *T. nympha* by the ventral terga IV approximately parallel sided (Fig. 71) (constricted at anterior 0.30 in *T. nympha*, Fig. 66).

Distribution

8-17°S, 63-75°W, 670-714 m a.s.l. (Fig. 108). — Peru: Huanuco: holotype ♂ (USNM*), paratype ♂ (RWG*), Tingo Maria (premontane rain forest), 02 iv 1980 (8°58'S, 75°50'W), 670 m, J.B. Heppner leg.; allotype ♀ (RWG*), same except Monson Valley, E.I. Schlinger & E.S. Ross leg., 11 iii 1954; Junín: paratype ♀ (UMMZ*), Satipo (11°16'S, 74°40'W), 714 m, P. Paprzycki leg., 01 i 1941; same except one paratype ♂ (UMMZ), 12 vii 1940. — Bolivia: Santa Cruz: paratypes ♂ (JJD), Ichilo, Lagunas Curichi, 3.5 km S of Buena Vista, (17°26'S 63°40'W), J.J. Daigle leg., 02 ix 2001; Ichilo, Quebrada Inculta, 4 km S of Buena Vista, J.J. Daigle leg., 02 ix 2001.

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