

**GEOGRAPHICAL VARIATION IN *MICRATHYRIA MENGERI* RIS,
WITH A DESCRIPTION OF *M. MENGERI WATSONI* SSP. NOV.
(ANISOPTERA: LIBELLULIDAE)**

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M. m. watsoni ssp.n. (holotype ♂: Costa Rica, Heredia prov., 2.5 km S Puerto Viejo; FSCA, Gainesville) ranges from Belize to Colombia and W Venezuela, while *M. m. mengeri* ranges from Trinidad to E Venezuela and Brazil. Male of the new ssp. has cerci each with a row of ventral denticles, but no other ventral or medial projections, while in the nominate ssp. there are ventral and medial projections on each of the cerci. The females are very similar, but the occiput of *watsoni* is more convex posteriorly. The relationship between the 2 taxa and their biology are discussed.

INTRODUCTION

Micrathyrta mengeri was described by RIS (1919) on pages 1149-1151 of his monumental monograph on Libellulidae. CALVERT (1920) in a review of that work noted that although pages 1043-1278 were printed in 1916, they were not distributed until 1919, thus the 1919 date cited above. The specimens used in RIS' (1919) description included 1 ♂ 1 ♀ from Rockstone, British Guiana (now Guyana), 1 ♂ from Brazil, and 10 ♂ 2 ♀ from Guatemala. Ris described under category A the male from Guyana in detail, then briefly characterized the female from Guyana, followed by a brief description of the male from Brazil. He noted that the Brazilian male was not fully mature ("nicht völlig ausgefärbt"), but otherwise agreed "... mit der Type von Rockstone durchaus überein ...". Ris then briefly described under category B the specimens from Guatemala. Rosser Garrison (pers. comm.), during one of his visits to the University of Michigan Museum of Zoology (UMMZ) where the Guyanan *M. mengeri* specimens are stored, found an English translation (rather freely made) of Ris' German description of *M. mengeri*, written in Ris' own handwriting. This translation was apparently done as a cour-

tesy for E.B. Williamson. In that translation Ris stated "The specimens from Brit. Guiana (a) are considered as typical, those from Guatemala being certainly of the same species, although slightly different in male appendages (b). " In view of the above, especially Ris' use of the word "Type", I regard the male from Guyana as the holotype of *M. mengeri*, the female from Guyana as the allotype.

Since the original description, *M. mengeri* has been mentioned infrequently in the literature. The swampy habitat of these dragonflies is invaded only by the most intrepid collectors, and they are almost never taken by the casual collector. As specimens slowly accumulated in collections several odonatologists including myself have long thought that the Central American form was a different species from that occupying most of South America. After a study of 150 specimens, for reasons stated in the discussion, I now believe the relationship between these forms is best expressed nomenclatorially as subspecies.

E t y m o l o g y. — The new subspecies is named in honor of the late J.A.L. (Tony) Watson, expert Australian odonatologist and genial friend.

MICRATHYRIA MENGERI WATSONI SSP.NOV.

Figures 1, 4, 5, 7, 10

M a t e r i a l examined. — Abbreviations: DNW = D.N. Westfall; DRP = D.R. Paulson; EBW = E.B. Williamson; ESM = E.S. Morton; FSCA = Florida State Collection of Arthropods, Gainesville; IORI = International Odonata Research Institute, Gainesville; JHW = J.H. Williamson; JJD = J.J. Daigle; MAO = M.A. Ortiz B.; MJW = M.J. Westfall; OSF = O.S. Flint; RWG = R.W. Garrison; SWD = S.W. Dunkle; TWD = T.W. Donnelly; UMMZ = University of Michigan Museum of Zoology, Ann Arbor; USNM = United States National Museum; WFM = W.F. Mauffray; WHD = W.H. Ditzler.

Holotype ♂: Costa Rica, Heredia prov., 2.5 km S Puerto Viejo, Finca La Selva, 10°26'N 85°59'W, 60 m, 1-VII-1967, MJW & DNW, FSCA. — **Allotype** ♀: Costa Rica, Guanacaste, Taboga, 10°20'N 85°13'W, 80 m, 27/29-VI-1967, OSF & MAO, USNM. — **Paratypes**: BELIZE: Toledo dist., swampy slough 5.8 km S Swasey River on S Hwy near Santa Rosita, 3-VI-1993, SWD, 10 ♂, 1 ♀, SWD Coll.; same but JJD, 9 ♂, JJD Coll.; same but WFM, 2 ♂, FSCA; same but 2 ♂, IORI; same but borrow pits 3.4 km N Bladen River, 4 ♂, SWD, SWD Coll.; same but JJD, 2 ♂, JJD Coll.; same but WFM, 1 ♂, FSCA; same but 1 ♂, IORI; — Blue Creek, 5-VI-1993, JJD, 2 ♂, JJD Coll.; — Punta Gorda, VI-1993, J.J. White, 1 ♂, FSCA. — GUATEMALA: Isabel Dept., Limones, C.A. 9 at km 282, 16/18-VIII-1965, OSF & MAO, 1 ♂, USNM. — Zacapa Dept., Gualan, 12-VI-1909, EBW, 1 ♂, USNM. — NICARAGUA: Chontales, La Flor, Rt 7 at km 159, 6.8 km W Acoyapa jct., 29-VII-1967, OSF & MAO, 1 ♂, USNM. — COSTA RICA: Alajuela prov., Los Chiles, 35 m, 19-VII-1966, 1 ♂, DRP, FSCA; same but 31-VII-1966, 1 ♂; same but 13-X-1966, 5 ♂; — Guanacaste prov., Taboga, 35 m, 29-VI-1967, MJW & DNW, 1 ♂, FSCA; same but OSF & MAO, 1 ♂, RWG Coll.; same but DRP, 2-VI-1967; same but 25/29-VII-1967, OSF & MAO, 10 ♂, USNM; same but 2.5 km S Potrerillos, 27/28-VII-1967, OSF & MAO, 4 ♂, USNM; — pond 2 km N Los Angeles, 20-VI-1962, TWD, 1 ♂, TWD Coll.; — Heredia prov., 2.5 km S Puerto Viejo, Finca La Selva, 60 m, 1/2-VII-1967, DRP & M.L. Paulson, 5 ♂, FSCA; same but 23-IX-1966, 1 ♂; same but 1-VII-1967, MJW & DNW, 6 ♂. — PANAMA: Canal Zone, 1915, D.E. Harrower, 1 ♂, FSCA; same but Gatun River marsh, 27-VIII-1950, R.B. Cumming, 2 ♂; same but Madden Dam, Chagres Valley, 3 ♂, 1 ♀, UMMZ; same but 4-VIII-1979, RWG & J.A. Garrison, 1 ♂, RWG Coll.; same but Ocelot Pond, 2.5 km SE Gamboa, 30-V-1974, M.L. May, 2 ♂, K.J. Tennessen Coll.; — 5 km E Tocumen Airport, 12-VIII-1970, TWD & ESM, 1 ♂, FSCA, 1 ♀, TWD Coll.; — ponds at Pedro Miguel, 10-VIII-1970, TWD & ESM, 1 ♂, TWD Coll.; — Chiriqui, Rio Galique,

8.1 km N Las Lajas, 5-VII-1967, OSF & MAO, 1 ♂, USNM, 1 ♂, TWD Coll. — COLOMBIA: Puerto Berrio, 31-I-1917, EBW & JHW, 1 ♂, UMMZ; same but 8-II-1917, 2 ♂, FSCA. — VENEZUELA: Falcon state, Palma Sola, 8-III-1920, EBW, JHW, & WHD, 1 ♂, UMMZ; — Zulia state, Encontrados, 25-IV-1920, EBW, JHW, & WHD, 1 ♂, FSCA; same but El Guayabo, 20-IV-1920, 11 ♂, 1 ♀; same but 20/22-IV-1920, 11 ♂, UMMZ.

DIAGNOSIS. — A small black dragonfly, in life with brilliant green eyes and pale green markings, the male abdomen slightly clubbed, the cerci without projections, straight in side view but widely divergent in dorsal view.

MALE (holotype). — **D i m e n s i o n s** (mm): Total length including cerci 32.0; — abdomen 21.5; — hindwing 23.0.

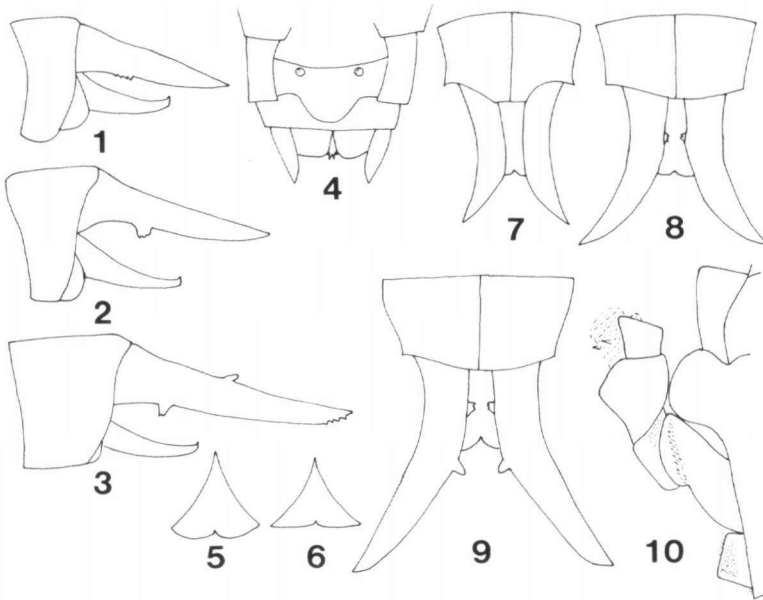
H e a d. — Labium and face yellowish white, labial palps and labrum narrowly edged black, prementum with median black line. Vertex and top of frons black with metallic blue gloss, antennae black. Vertex slightly bifid. Occiput black dorsally, pale posteriorly, slightly tumid posteriorly with a median sagittal groove (female similar, see Fig. 5). Rear of head black with a small pale spot on each postgena.

T h o r a x. — Prothorax dark brown except anterior lobe pale green, posterior lobe fringed with long pale setae. Synthorax with each mesepisternum black marked with pale green, including a spot adjacent to upper end of the midsagittal carina, an undulate humeral stripe which at its dorsal end extends medially below antearlar ridge (thus like an upside-down L), and halfway between spot and L an antehumeral stripe extends from near mesospiracle 2/3 distance to antearlar ridge. Antehumeral sinus pale green, between wings pruinose gray. Sides of synthorax pale green with complex mottled pattern, dark stripes forming an irregular WV pattern with V on metepimeron. Underside of thorax brown but gray pruinose. Legs black except profemur pale ventrally in basal half.

Wings. — Membrane hyaline, venation and pterostigmata black. Arculus slightly closer to level of second antenodal crossvein (AN) than to level of first AN. Bridge crossveins 2, 2 crossveins posterior to pterostigma. Medial planates not developed, radial planates with 1 cell row. Triangles 1-celled, forewing (FW) subtriangles 2-celled, 2 cell rows between subtriangle and FW hind margin, 2 rows of cells beyond FW triangle to level of nodus, 3 rows beyond. FW AN 7 1/2, FW postnodal crossveins (PN) 7-8, HW AN 6, HW PN 8. Field of cells beyond hindwing (HW) triangle with 1 cell row for 3-4 cells, then diverging widely to HW margin. Anal loop expanded distally, slightly foot-shaped, 3 cells across the sole, no ankle cells, 1 cell between posterior angle of HW triangle and midrib of anal loop, 2 cell rows between loop and HW margin.

A b d o m e n. — Black with dorsolateral pale green spots on segment 2, and streaks on 3-6, progressively reduced to a vestige on 6. Segment 7 with large 2/3 length dorsolateral spots, each straight-edged basally, rounded distally. Segments 7-10 thickened, slightly clubbed.

Terminalia. — Cerci as long as abdominal segments 9+10, in dorsal view curved



Figs 1-10. *Micrathyria mengeri* (1-9 drawn at $7\times$, 10 drawn at $18\times$). (1) Holotype δ , *M. m. watsoni*, Costa Rica, abdomen tip, left lateral view; - (2) Intermediate δ , central Venezuela, same view; - (3) *M. m. mengeri* δ , - Rondonia, Brazil, same view; - (4) Allotype δ , *M. m. watsoni*, abdomen tip, ventral view; - (5) Same, occiput, dorsal view; - (6) *M. m. mengeri* δ , Rondonia, Brazil, same view; - (7) Holotype δ , *M. m. watsoni*, abdomen tip, dorsal view; - (8) Intermediate δ of Fig. 2, abdomen tip, dorsal view; - (9) *M. m. mengeri* δ of Fig. 3, abdomen tip, dorsal view; - (10) *M. m. watsoni* δ , Belize, secondary genitalia, right lateral view.

laterally, divergent, with a)(shape (Fig. 7), in side view with a row of 4-5 ventral denticles at $1/3$ length (Fig. 1). Epiproct in ventral view $2/3$ length of cerci, tip narrower than a cercus at that level, tip slightly bifid (Fig. 7).

Secondary genitalia. - Anterior lamina flat and smooth, hamule as long as genital lobe, hand-shaped, with a short, hooked, thumb-like medial branch and a wide, flat, blunt lateral branch (Fig. 10). Penis with base of distal segment strongly sclerotized, in ventral view widest distally, in lateral view with wide blade-like sclerotized lateral lobes enclosing membranous tip (Fig. 10).

FEMALE (allotype). - Dimensions (mm): Total length including cerci 31.0; - abdomen 20.0; - hindwing 23.0.

Remarkably similar to male except in abdominal structure.

Head. - Like male except dark areas of top of head dark glossy brown, tip of vertex pale. Structure identical to male, including occiput.

Thorax. - Like male but as usual extent of pale areas slightly greater, the pale para-carinal spots connected with L-shaped humeral stripe above. Legs and wings including venation like male but parts of right HW missing.

A b d o m e n. — Thicker, less clubbed than in male, pale stripes of segments 2-6 as usual slightly longer than in male. Genitalia typical for *Micrathyria*, sternum of 8 extending as straight-edged subgenital plate 1/3 length of 9, almost touching the large styli (Fig. 4). Cerci brown, conically pointed, longer than 10 but shorter than 9.

Table I

Hindwing length (mm) of male *Micrathyria mengeri watsoni* and *M. m. mengeri* — [The difference between the means of the two populations is significant (t test, 0.05 confidence level)]

Locality	N	Range	Mean
<i>M. m. watsoni</i>			
Belize	34	21-25	23.4
Guatemala	2	25	25.0
Nicaragua	1	22	22.0
Costa Rica	38	21-24	23.0
Panama	13	21-25	22.4
Colombia	3	23-26	24.7
W. Venezuela	23	22-25	23.6
	114	21-26	23.2
<i>M. m. mengeri</i>			
Trinidad	6	23-24	23.3
E. Venezuela	1	23	23.0
E. Ecuador	3	23-25	23.7
E. Peru	6	24-25	24.3
W. Brazil	13	23-26	24.9
	29	23-26	24.2

PARATYPE VARIATION. — Dimensions: Hindwing length of males 21-26 mm, geographical variation shown in Table I. Female hindwings the same, 21-24 mm (N = 5).

H e a d. — Eyes in life brilliant metallic green in both sexes. Dark top of frons varies from sharply-edged anteriorly to diffusely-edged, and from black to brown. Rear of occiput varies from all pale to being divided into right and left spots.

T h o r a x. — Dark pattern of sides of synthorax varies from WV to WU to WY or rarely NY by fusion of stripes. In some Costa Rican males (both Atlantic and Pacific lowlands) thorax is almost entirely black, only some of lower pale areas remaining, and covered with thin gray pruinosity.

Wings. — Usually 2 bridge crossveins, occasionally 3. FW triangle usually 2-celled, sometimes 3-celled, rarely 1-celled. Hindwing triangle usually 1-celled, rarely 2-celled. Anal loop occasionally with 4 sole cells or 1 ankle cell.

A b d o m e n. — Segments 1-2 often pruinose gray. Pale stripes or spots on 2, 5, and 6 often absent, but spots of 2 may be joined dorsally. Spot of 7 may be notched along dorsal margin, and/or straight-edged ventrally, producing a posterior point on spot. In side view ventral denticles of cerci occur on a low carina in some males.

BIOLOGY

The habitats and behavior of both subspecies of *M. mengeri* are the same, so far as known. Both inhabit shaded, swampy, lentic habitats, including swamps, ponds, lakes, and sloughs, in lowland tropical rainforest, where they perch rather high on twig tips, about 1-3 m over the water. The highest elevation recorded on specimen labels was 187 m (Brazil). Both forms probably fly all year. Records for

watsoni include every month but November and December, but only the months of June to August and November are chronicled for *M. m. mengeri*.

I examined a pair of *M. m. mengeri* collected in tandem at 1145 in Brazil. PAULSON (1969) watched two female *watsoni* oviposit in "open marshes" in Costa Rica by perching on the edges of floating leaves and curling their abdomens to deposit eggs on the underside. The eggs were deposited under an *Alisma* and a *Nymphaea* leaf in batches of 1000, 40 double rows of 25 eggs each. I watched a *watsoni* female, apparently guarded by a hovering male, oviposit on the underside of a floating blade of grass in a swampy slough in Belize. Those eggs hatched in about 13 days. A similar batch of eggs on the same leaf began hatching 6 days earlier and produced larvae with a different color pattern; the latter were probably *M. didyma* (Selys), the only other *Micrathyria* seen or collected at that place. No mites or other parasites were seen on the specimens examined.

DISCUSSION

The known range of *Micrathyria m. watsoni* is from southern Belize through Colombia to western Venezuela. It occurs in both the Atlantic and Pacific lowlands of Costa Rica and Panama. *M. m. mengeri* is found in French Guiana (GEIJSKES, 1971), Guyana (RIS, 1919), Surinam (D.R. Paulson, 1983, unpublished list), Minas Gerais state Brazil (SANTOS & MACHADO, 1983), and I examined specimens from Trinidad, Ecuador, Peru, and Rondonia state Brazil. Both forms easily key to *Micrathyria* in BORROR (1945), and males are easily distinguished from other *Micrathyria* by their conspicuously divergent cerci. A good "field mark" for the females is the pale spots adjacent to the mesepisternal carina. *M. m. watsoni* usually appears smaller in size than *M. m. mengeri*, but Table I shows that there is only about a 5% difference between them, although this difference is significant (t test). The main difference between males of these forms is in the cerci. In *M. m. mengeri*, the cerci are proportionately longer, as long as abdominal segments 8+9 (9+10 in *watsoni*), more widely divergent, each with a blunt medial tooth (Fig. 9), a few ventral denticles near the tip, and with the basal ventral denticles mounted on a large ventral projection (Fig. 3). The latter projection is present in the holotype of *M. mengeri* (R. Garrison, pers. comm.) but was not shown in RIS' (1919) figure. In ventral view the epiproct of male *M. m. mengeri* is wider and more bifid at the tip than in *watsoni* (Fig. 9). The occiput of *watsoni* is slightly more tumid posteriorly in both sexes (Fig. 5) than in *M. m. mengeri* (Fig. 6), and this is the only difference I could find between the females of these forms.

I believe the relationship between *M. m. watsoni* and *M. m. mengeri* is best given by subspecific status because: (1) The two forms are parapatric, but are not known to occur together anywhere. — (2) The only major difference between the

forms that I could find is in the male cerci. I could see no significant differences in the penes, the backs of the females' heads, or other structures. — (3) The morphological variation from North to South is cline-like, but with a rather sharp break in central Venezuela. Southward from Central America, the body size increases, but the male cerci increase proportionately more by allometric growth relative to the rest of the body including the epiproct. — (4) A male from Ciudad Bolivar, Bolivar state, on the Orinoco River in east-central Venezuela (FSCA), appears to be intermediate because he lacks the medial teeth of the cerci as in *watsoni*, but has the ventral projection of the cerci as in *M. m. mengeri*. The length of the cerci relative to the epiproct is also intermediate (Figs 2, 8). Specimens from the western Venezuelan states of Falcon and Zulia are *M. m. watsoni*, but a male from eastern Venezuela, Bolivar state, 50 km SE Tumeremo (TWD Coll.) is typical *M. m. mengeri*. Unfortunately *M. mengeri* seems rare in Venezuela because Jürg De Marmels stated (pers. comm., 2 May 1994) "I'm also surprised that neither Racenis nor myself have ever caught *Micrathyrta mengeri* in Venezuela." Probably the differences between *M. m. watsoni* and *M. m. mengeri* evolved when the Panamanian Isthmus was underwater, and presently the most likely area of intergradation would extend from central Venezuela westward along the northern edge of the Amazon Basin. It will be most interesting in the future to discover the relationships between these dragonflies in that zone.

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