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THE SUBSPECIES OF *ISCHNURA POSITA* (HAGEN, 1861), WITH DESCRIPTION OF *I.P. ATEZCA* SSP. NOV. (ZYGOPTERA: COENAGRIONIDAE)

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The *I. posita*-complex is revised. *I. acicularis* Donnelly, 1965 is considered a ssp. of *posita*, and *I. p. atezca* ssp. n. is described and figured (holotype ♂, allotype ♀: Mexico, Hidalgo, Molango, Laguna de Atezca, alt. 1400 m; 13-III-1988; deposited at Insectario, Univ. Xochimilco, Mexico).

INTRODUCTION

Since HAGEN's original description of *Ischnura posita* in 1861, this species has been recorded mainly from the Atlantic Coast of the United States of America. One hundred and four years later, DONNELLY (1965) described a closely related species from the Petén region in Guatemala, which he named *I. acicularis*. He indicated that "there is one good morphological distinction between males: the absence of the penile spines found in *posita*". More recently, while one of us was studying Odonata from Quintana Roo State, Mexico (NOVELO et al., 1988), specimens of *I. acicularis* that did have penile spines were found. At the same time, while collecting odonates in Hidalgo State, Mexico, we found a population of *I. posita* at the Laguna de Atezca. We sent some specimens to Dr Donnelly to confirm our determination. In a letter Dr Donnelly informed us that the specimens he used for the description of *I. acicularis* apparently had the penile spines broken off or absent, so that he now thinks that *I. acicularis* is

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structurally indistinguishable from *I. posita*. Nevertheless, he suggests that populations from Quintana Roo, Mexico and Petén, Guatemala, and those from Hidalgo, Mexico, constitute two good subspecies, distinct from those of the USA. In this article we follow his suggestion.

ISCHNURA POSITA POSITA (HAGEN, 1861)

Figures 4-5, 9-10

Agrion positum HAGEN, 1861, p. 77.

Material examined. — UNITED STATES, Florida: Alachua Co., Gainesville, Bivens Arm, 1♂, 27-I-1973, J.B. Heppner leg.; — Hatchet Creek at Rte 26, 2 ♂, 8-III-1981, S.W. Dunkle leg.; — Newman's Lake, 1 ♂, 1 ♀, 7-IV-1983, S.W. Dunkle leg.; — Glades Co., Fisheating Creek at Rte 27, 2 ♂, 1 ♀, 4-V-1981, S.W. Dunkle leg.; — Okeechobee Co., Ft Drum Service Plaza on Fla Turnpike, 1 ♂, 1 ♀, 20-II-1981, S.W. Dunkle leg.; — Georgia: Screvin Co., Floodplain Savannah River at US 301, 1 ♂, 24-VI-1962, F.W. Mead leg.; — Cook Co., Reed Bingham State Park, 1 ♀, 1-IV-1983, S.W. Dunkle leg.; — New Jersey: Burlington Co., Rte 563, 7.8 mi N of Rte 563 Spur, 1 ♀, 25-VIII-1960, J.A. Harshaw leg.; — North Carolina: Mitchell Co., Bearwallow Gap on Blue Ridge Pkwy., 1 ♂, 12-IX-1964, D.R. & M.L. Paulson leg.; — Moore Co., Lakeview, 1 ♂, 14-IV-1976, R.D. Cuyler leg.; — Craven Co., Batchelder's Creek, Tuscarora, 1 ♂, 23-IV-1976, R.D. Cuyler leg.; — Durham Co., Durham (s.w.), 1 ♂, 29-V-1976, R.D. Cuyler leg.; — Oklahoma: Johnston Co., Tishimingo Fish Hatchery, 1 ♂, 1 ♀, 14-VII-1967, M.W. Brewer leg.; — Tennessee: Obion Co., Reelfoot Lake, 1 ♂, 2-VI-1960, R.P. Trogdon leg.

There are some differences among specimens analyzed by us and those described by HAGEN (1865). The principal one is the coloration on the dorsum of male abdominal segment 9. Hagen did not mention any pale spot on the dorsum of 9, although he described "a blue pruinose, quadrangular spot" on the dorsum of the last segment. In our material, there are four males (two from North Carolina and two from Florida) that exhibit blue spots of different size and shape on the dorsum of segment 9, whereas none of the 14 males available has any pale spot on the dorsum of 10. Only one male, from Florida (Alachua Co., Hatchet Creek), has the dorsum of the superior abdominal appendages slightly more obscure (smoky) than the other males. Twelve individuals show a clear difference in color between pterostigmata of fore and hind wings, those of the fore wings being more obscure; the remaining two males have pterostigmata of the same color in both wing pairs. In the females there are several features not described by Hagen. One of them is the slightly more pale coloration of the prenodal venation. Two females (from Oklahoma and Georgia) have the cerci entirely pale, but in another four (from New Jersey and Florida) the cerci are tinged with pale brown. The female from Oklahoma exhibit the antehumeral stripe entire and constricted as in the *I p. atezca* females, whereas the other five females have it divided as in the males. In this respect, JOHNSON (1972) comments that "infrequent individuals (males) of *I. posita* occur with the spots connected resulting in a medially constricted (antehumeral) stripe".

Dimensions (mm). — Males: hind wing 10.1-14.8; — abdomen 17.5-24.5; — anterior band of antehumeral stripe 0.7-1.6; — space between this band and posterior spot 0.2-0.9. — Females: hind wing 12.1-15.4; — abdomen 18.0-21.9.

ISCHNURA POSITA ACICULARIS DONNELLY, 1965, COMB. NOV.

Figure 11

Ischnura acicularis DONNELLY, 1965, pp. 57-63, figs 1-6.

Material examined. — MEXICO, Quintana Roo, La Unión, 4 ♂, 1 ♀, 26-VII-1984, R. Novelo leg.; — 1 ♂, 1 ♀, 1-V-1985, J. Camal leg.; — Puerto Morelos, 1 ♂, 30-IV-1985, J. Camal leg.; — Laguna del Padre, 1 ♂, 3-V-1985, R. Novelo leg. — GUATEMALA, El Petén, Flores, 1 ♂, 1 ♀, 17/18-VII-1983, T.W. Donnelly leg. This material is deposited in the collection of Aquatic Insects of the Universidad Autónoma Metropolitana-Xochimilco, Insectario-DCBS, DPAA, México, D.F.

DONNELLY's (1965) original description is excellent and well illustrated, therefore we only record some variations of specimens from Quintana Roo. The location of holotype, allotype and paratypes was also stated there.

MALE. — Wings: In some individuals M_2 arises between 2nd and 3rd postnodals in fore wings. In all specimens examined the pterostigmata of fore wings are clearly more obscure than those of hind wings.

Abdomen: One specimen has the lateral black dash on segment 8 interrupted, so that it appears divided by the color blue of that segment; six individuals lack the lateral black dash on 9, with the entire tergite blue (including one specimen from Guatemala).

Genitalia: With a pair of erected spines on 2nd segment of penis. (Fig. 11).

FEMALE. — Two females have M_2 arising between 3rd and 4th postnodals in fore wings; another three have this vein arising at 4th postnodal in fore wings and at 3rd in hind wings. All of them have the pterostigmata of all wings of the same color. The young females have the pale color of head and thorax bluish-yellow rather than greenish-yellow as the males.

Dimensions (mm). — Males: hind wing 8.5-9.5; — abdomen 15.5-17. — Females: hind wing 10-11; abdomen 15-17.

ISCHNURA POSITA ATEZCA SSP. NOV.

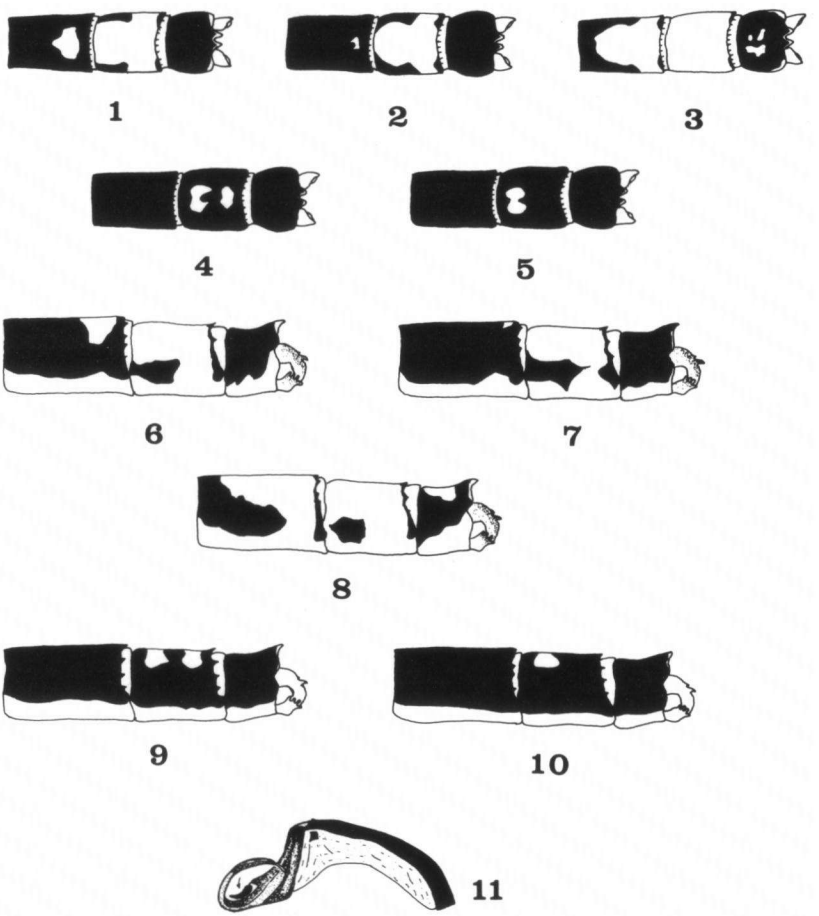
Figures 1-3, 6-8

Material examined. — **Holotype** ♂ and **allotype** ♀: MEXICO, Hidalgo, Molango, Laguna de Atezca, alt. 1400 m, 13-III-1988, R. Novelo leg. — **Paratypes:** Laguna de Atezca, 2 ♂, 14/15-X-1983, J. Peña leg.; — 2 ♂, 16-XI-1985, J. Peña & R. Novelo leg.; — 3 ♂, 9-II-1986, J. Peña leg.; — 4 ♂, 4 ♀, 13-III-1988, R. Novelo leg. — The holotype, allotype and nine paratypes are deposited in the collection of Aquatic Insects of the Universidad Autónoma Metropolitana-Xochimilco, Insectario-DCBS, DPAA, México, D.F. Two paratypes will be deposited in the collection of the Instituto

de Biología, UNAM, Mexico, two others will be sent to the Florida State Collection of Arthropods, Gainesville, and two more will be donated to Dr T.W. Donnelly, New York.

Etymology. — The name is derived from the type locality (Laguna de Atezca). In Náhuatl language "atezca" means *"water mirror"*.

MALE **(holotype).** — Color: Legs and sides of abdominal segments 3-10 yellow; head, thorax and abdominal segments 1-2 greenish-yellow; dark areas black or iridescent red.



Figs 1-11. *Ischnura posita,* male abdominal segments 8-10 and penis: (1, 6) *I. p. atezca* ssp. n., holotype: dorsal and lateral views, showing the pale color on segments 8-9; — (2-3, 7-8) same, in paratypes; — (4-5, 9-10) *I. p. posita* (Hagen), dorsal and lateral views in two specimens; — (11) *I. p. acicularis* Donnelly, penile spine (arrow) on the 2nd segment. — [Figures not to scale].

Head: Labrum pale, with a black basal line, which widens at sides and a central black depressed spot; anteclypeus pale; postclypeus dark, shining; gena and frons pale; vertex and dorsal area of head black, this color limited anteriorly at the level of antennae which are themselves dark, except the distal end of scape which has a pale ring; postocular pale spots, small; mandibles, labium, occiput and postgenae mainly pale.

Thorax: Prothorax dorsally dark, except for a broad, transverse pale band on fore lobe and small spots at the extremities of the hind lobe; sides pale.

Pterothorax: dark on dorsum, with each antehumeral pale stripe divided into two parts: an isolated, subtriangular posterior spot and an anterior stripe which narrows posteriorly, with blunt end; this stripe reaches the tips of the mesostigmal laminae. Pleura mainly pale, with a black line on the second lateral suture. Sterna pale.

Legs pale, dorsa of femora black, shining; tibiae of all legs with a well-defined, obscure line on dorsal surface, tapering apically; tarsi and claws pale with apical dark rings.

Wing veins light brown: pterostigma of fore wings brown, yellowish-brown in hind wings. M_2 arises between 3rd and 4th (nearest to 4th) postnodals in fore wings, and between 2nd and 3rd (nearest to 3rd) in hind wings; two postquadrangular cells. Cu_2 three cells long.

Abdomen: black on dorsum, pale as follows: sides, apical ring on segment 1, basal rings on 3-7; 8 mainly black, with a subapical blue spot on dorsum (Fig. 1); segment 9 blue, with a lateral black band which covers the basal half (Fig. 6); 10 black on dorsum, with a prominent bifid process, having a pale posterior border. Abdominal sterna pale with a dark longitudinal line which covers the basal half on segment 1, the basal 5/6 on 3-7, and basal 2/3 on 8; 9-10 entirely pale.

Appendages and genitalia: Superior appendage mainly pale, dorsum and tip dark, suboval, depressed, in apical view with a spine on the posterior dorsal surface. Inferior appendage with lateral, upturned, denticulated lobe. Penis 2nd segment with an erected spine on each side.

Variations among paratype males. — The differences noted were basically in the extent of the antehumeral stripe, in the development of blue spots on the dorsum of segments 8-10 and slight differences in overall size. All paratypes have the dorsal surface of abdominal segment 9 blue; seven specimens have a well developed blue spot on dorsum of 8; one individual has a very small blue dot on dorsum of 8 (Figs 2, 7); another has well developed spots on dorsum of 8-10, with that of 10 the smallest (Figs 3, 8).

FEMALE **(allotype).** — The color pattern is very similar to the male except that the pale color is pink-violet on head, thorax, segments 1-2 and 9-10. The antehumeral stripe is entire but constricted at posterior 4/5. The black line on the second lateral suture is very weak except at posterior end. The dorsal surfaces of abdominal segments 8 and 10 are entirely black, save for the posterior border of 8

which is almost white; dorsum of 9 black, with a rhomboidal pink-violet spot which extends medially the length of the segment; cerci black. Venation is more obscure than in the male and pterostigmata are yellowish-brown in all wings; M_2 arises at 4th and 3rd postnodals in fore and hind wing respectively. There is no ventral spine on segment 8; distal margin of 10 elevated on dorsum and fused medially. The mesostigmal laminae are identical to those of *I. p. acicularis*, with the lateral apices rounded and with the posterior border not elevated.

Variations among paratype females. — The pink-violet color of the thoracic pleura of young females changes to greenish-yellow with age; further the dorsal surfaces of the head, thorax and abdomen become pruinose, obscuring the pale spot on the dorsum of segment 9 which remains invisible even when brushed with alcohol. One female has vein M_2 arising between the 4th and 5th postnodals in the fore wing, and another between the 3rd and 4th postnodals in the hind wing.

Dimensions (mm). — Holotype male: hind wing 11.8; abdomen 18.7; — anterior part of antehumeral stripe (apas) 1.4; — space between this stripe and posterior spot (ssps) 0.3. — Paratype males: hind wing 10.5-12.6; — abdomen 17.4-20.5; — apas 1.1-1.4; — ssps 0.2-0.6. — Allotype female: hind wing 14.1; abdomen 19.7. — Paratype females: hind wing 14.5-15.5; — abdomen 19.9-21.2.

DISCUSSION

At first glance, the three subspecies of *Ischnura posita* are similar; nevertheless, at close examination, they are easily differentiable.

I. p. acicularis is rapidly separated by its more reduced size and, in the males, by the major extension of blue on abdominal segment 8 and the origin of M_2 at the 3rd or between the 2nd and 3rd postnodal veins in the fore wings (M_2 originates between 3rd and 4th postnodal veins, nearest to 4th, in the other two subspecies).

The other subspecies are distinguished exclusively by coloration. The males of *I. p. posita* never exhibit a pale blue spot on the dorsum of abdominal segment 8, a common feature in *atezca;* moreover the frequency of appearance of a pale spot on the dorsum of 9 is low in the nominate subspecies, while it is universal (100%) in *atezca.* Of the 14 males of *I. p. posita* analyzed, 13 exhibited pale coloration on the superior abdominal appendages, and only one had them slightly more obscure dorsally. In contrast, all the males of *atezca* had these appendages obscure on the dorsum, in a similar way to those of *acicularis.* On the other hand, the females of *atezca* always have the antehumeral stripe entire, whereas in *p. posita* this stripe is divided as in the males, save for a single individual from Oklahoma. In this feature the females of the nominate subspecies are quite similar to those of *acicularis.* Another difference is that females of *atezca* show the hind margin of abdominal segment 10 noticeably more elevated on the dorsum than *p. posita* females. Also it is important to mention that although other authors had described the pterostigmata of all wings as having the same color (Selys, 1876,

cited by DONNELLY, 1965; NEEDHAM & HEYWOOD, 1929; DONNELLY, 1965; JOHNSON & WESTFALL, 1970; JOHNSON, 1972), we found that they are dissimilar in color: those in fore wings being more obscure than the pterostigmata of hind wings, in all three subspecies.

This paper constitutes the second record in the literature (cf. NOVELO et al., 1988) of the occurrence of *I. posita* in Mexico and the first one for the Hidalgo State. The disjunct distribution of the three infraspecific taxa raises a very interesting question as to the speciation and dispersal of this group in Central and North America.

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