

**ISCHNURA INTERMEDIA SPEC. NOV. FROM TURKEY, AND ITS
RELATIONS TO *I. FORCIPATA* MORTON, 1907 AND *I. PUMILIO*
(CHARPENTIER, 1825) (ANISOPTERA: COENAGRIONIDAE)**

Results of the Ghent University Expedition to Turkey, July-August 1973, No. 2

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I. intermedia sp. n. from Halber Çay, a tributary of the Euphrates R., Turkey, is described. The holotype ♂ is in the collection of the Institut des Sciences naturelles de Belgique, Brussels; the ♀ allotype and ♂ paratypes are in the author's collection. The new species is transitory between *I. pumilio* and *I. forcipata*, although more closely related to the latter. Considerations on morphology and ecology of the three taxa are presented. It is concluded that *I. intermedia* is probably a relic species; it is more primitive than *I. forcipata*, but more specialized than *I. pumilio*.

INTRODUCTION

During the biological expedition of the University of Ghent to Turkey, July-August 1973, dragonflies were collected in more than 70 localities. The primary aim was to gain an insight into the dragonfly fauna of that country and its geographical distribution. Although numerous papers deal with the dragonflies of Turkey, this country is so vast that large areas are still completely unexplored. Therefore, the discovery of a new species of *Ischnura* is not surprising.

ISCHNURA INTERMEDIA SP. N.

MATERIAL EXAMINED

3 ♂♂, 1 ♀. Holotype: a male, deposited at the Institut des Sciences naturelles de Belgique. Female allotype and male paratypes: Author's collection.

DIAGNOSIS

A small species. Male with app. sup. slightly longer than app. inf., the former with small apical hook. Hind border of pronotum slightly elevated in the middle. Median teeth on lam. mes. small. Pt. in forewing bicoloured. Pt. in hindwing less than half the size of that in forewing, unicoloured. Female with hind border of pronotum broadly and steeply raised, hollowed out posteriorly. Lam. mes. without median teeth. Pt. an unicoloured parallelogram in both pairs of wings, smaller in hindwing than in forewing.

DESCRIPTION

Male. — Holotype: abdomen 19 mm, hindwing 11.5 mm.

Paratypes: abdomen 20 mm, hindwing 11.5 and 12 mm.

Head: Face green. Postclypeus bronze-black. Space between postclypeus and level of insertion of antennae green. Rest of head black except small, green postocular spots and a green transverse occipital stripe.

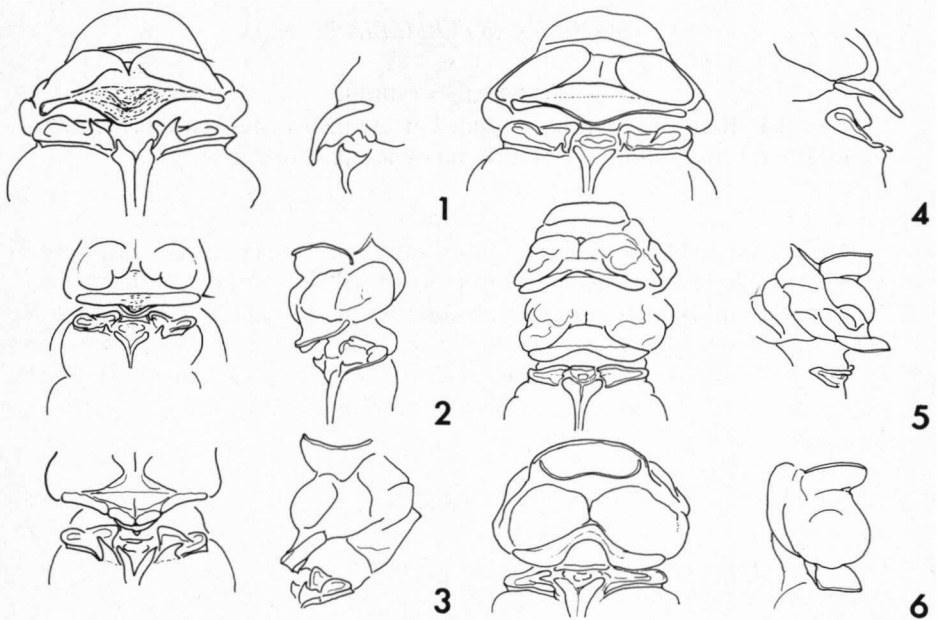
Pronotum: largely black, green on sides. Hind border green, median lobe slightly produced (Fig. 2).

Synthorax: lam. mes. triangular, medio-anterior corners connected by a bridge. Medio-posterior corners with small upright hook (Fig. 2). Carinal and humeral black bands wide. Antehumerals green, narrower than humeral stripe. Sides green. Legs green yellow, exterior surface of femora with black stripe; spines black.

Wings: venation brown. Pt: bicoloured in forewing, black part largest, strongly asymmetrical (Fig. 9): coastal border much shorter than radial border, apical border much shorter than nodal border. The Pt. is therefore a trapezium with nodal side longest. The distance between the basal nodal angle of the Pt. and the first postnodal transverse vein is slightly shorter than the length of the base of the Pt. Pt. in hindwing pale yellow, with central reticulum, parallelogram-shaped, its surface less than half that of the Pt. in the forewing (Fig. 9).

Abdomen: S1-S8 bronze black dorsally; S8-S9 blue; S10 black. Sides: S1-apical half of S3 green: basal half of S3-apical half of S7 yellow; basal half of S7-S10 blue.

Appendages: App. sup. in lateral view, slightly longer than app. inf. (Fig. 26, Fig. 30), shorter than S10, forcipate, ending in a small apical hook (Fig. 32). Its inner surface concave dorsally (Fig. 29, 32), sending a strong tooth ventrad



Figs. 1-6. Pronotum and lamina mesostigmalis of three *Ischnura* species in dorsal and lateral view: (1) *pumilio* ♂, Les Eyziès, France; - (2) *intermedia* sp. n. ♂, Halber Çay, Turkey; - (3) *forcipata* ♂, Godavari, Nepal; - (4) *pumilio* ♀; - (5) *intermedia* sp. n. ♀; - (6) *forcipata* ♀.

between the hooks of the app.inf. (Fig. 20, 29). The latter of comparatively simple structure: a basal plate, slightly expanded medio-exteriorly, bearing an inwardly bent upright hook (Fig. 20, 29).

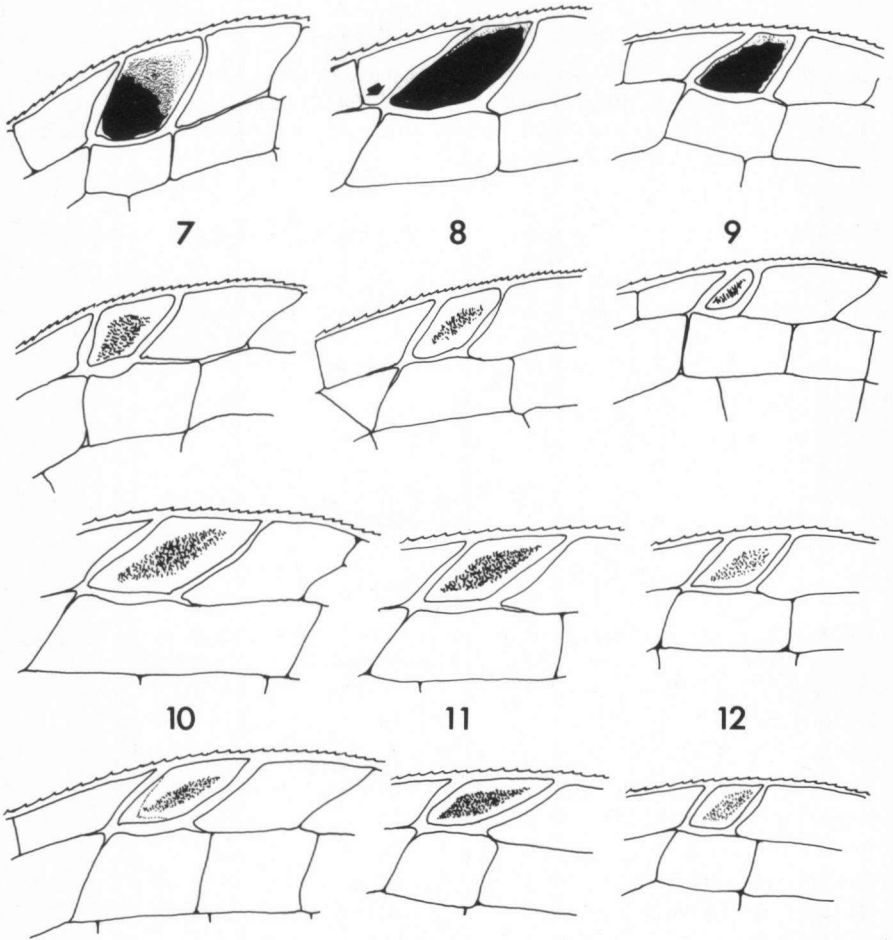
Female. - Allotype: abdomen 19 mm, hindwing 12 mm.

Head: face yellowish, dorsum of head greenish-brown; postocular spots turquoise, large, confluent across occiput. A black transverse band between postocular spots and insertion of the antennae. A small yellow spot in front and behind the anterior ocellus.

Pronotum: brownish-yellow, a black marking in front of the hind ridge. Hind ridge simple, broadly but not sinuously raised, steeply upright in lateral view (Fig. 5), hollowed-out posteriorly.

Synthorax: lam.mes. a hollow triangle, medio-posterior angle confluent with mid-dorsal carina, no teeth. Carina light brown, with a rather narrow black stripe on both sides of it. No humeral stripe. Humeral suture brown, a small black spot at its posterior end. Dorsum and sides of synthorax green-brown.

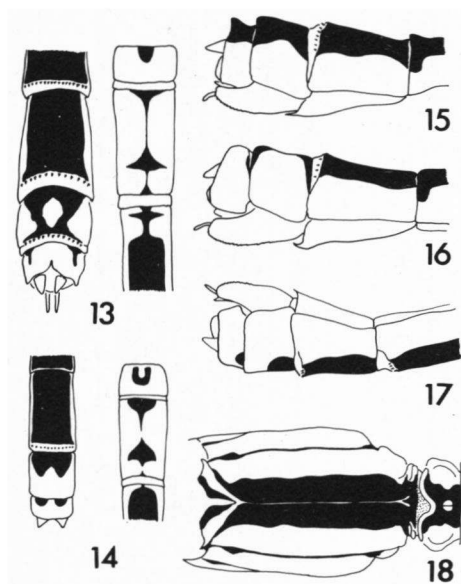
Wings: venation brown. Pt. yellow with central reticulum, unicoloured and symmetrical in both pairs of wings. Pt. in forewing larger than in hindwing (Fig. 12).



Figs. 7-12. Pterostigma in forewing and hindwing of three *Ischnura* species: (7) *pumilio* ♂; - (8) *forcipata* ♂; - (9) *intermedia* sp. n. ♂; - (10) *pumilio* ♀; - (11) *forcipata* ♀; - (12) *intermedia* sp. n. ♀. (Localities cf. Figs. 1-6).

Legs yellow, spines black. A diffuse black spot at the articulation of femora and tibiae.

Abdomen: S1 light brownish with small U-shaped dark spot; S2 brownish, marked as in Fig. 14. S3-S8 with broad black dorsal markings; S9-S10 brownish with basal black spot (Fig. 14). Styli short, triangular, robust. Vulvar spine sharp and short, at an oblique angle with the axis of the abdomen (Fig. 17).



Figs. 13-18. (13, 14) Terminal and proximal abdominal segments, (13) *Ischnura forcipata* ♀, (14) *I. intermedia* sp. n. ♀. (15-17) Vulvar spine, (15) *I. pumilio* ♀, (16) *I. forcipata* ♀, (17) *I. intermedia* sp. n. ♀. (18) Pronotum and synthoracic colour pattern in *I. forcipata* ♀. (Localities cf. Figs. 1-6).

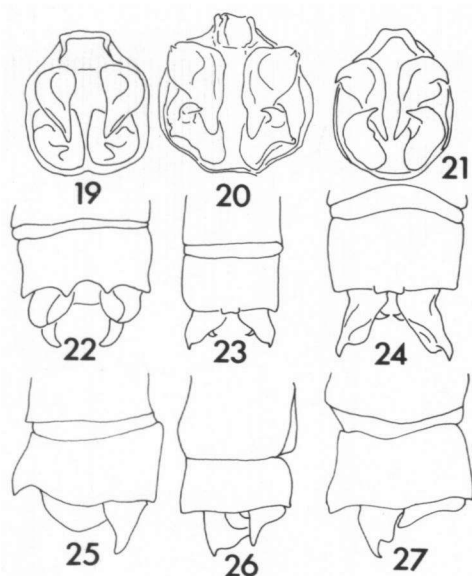
TYPE LOCALITY

Halber Çay, a probably second-order tributary of the River Euphrates (Firat Nehri). The exact location is along the road from Adiyaman to Samsat, at about 20 km from Adiyaman. Here the road (a rather uncomfortable track) crosses the Halber Çay, which, during periods of floods, probably reaches a width of well over 100 m. At the time of our visit (August 2, 1973), the major part of its bed was dry. A gentle waterflow persisted in two narrow, shallow canals, along which some swampy patches grown with grasses and *Carex* sp. were observed. It is in one of these spots, among low herbage, that *I. intermedia* was collected. It co-exists here with *I. elegans ebneri* Schmidt, *I. pumilio* (Charpentier) and *Platycnemis dealbata* Sélys.

DISCUSSION

STATUS WITHIN THE FRAMEWORK OF THE WEST-PALEARCTIC SPECIES

It is important to discuss the status of *I. intermedia* within the framework of the West-Palaeartic species of *Ischnura* already known. Using SCHMIDT's



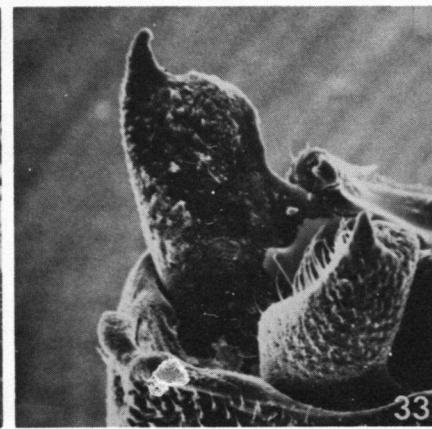
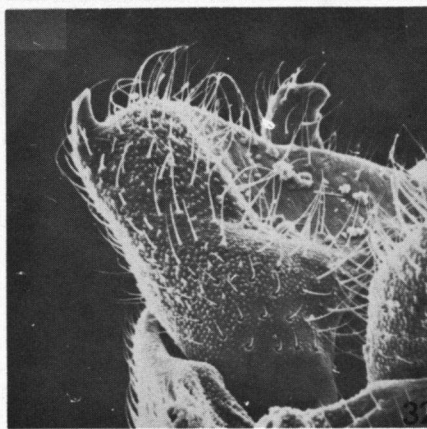
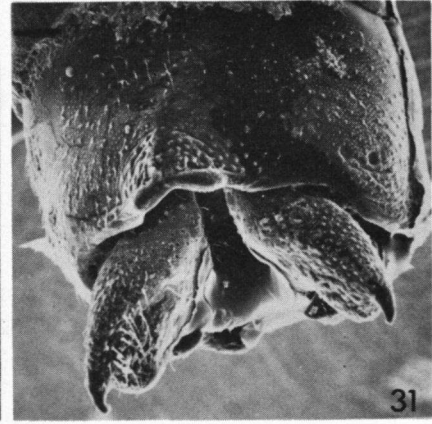
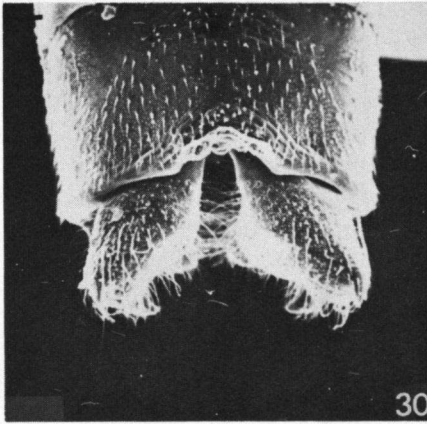
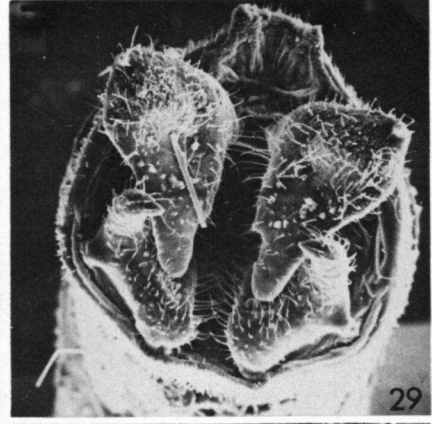
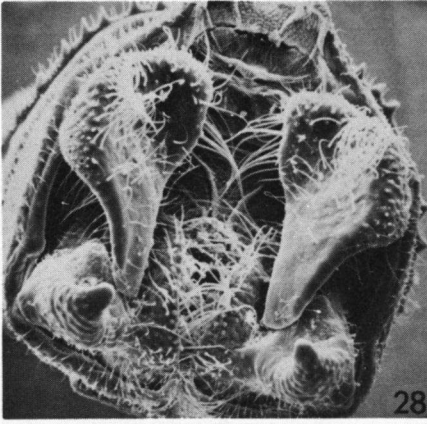
Figs. 19-27. Terminalia in posterior, dorsal and lateral view of three *Ischnura* species: (19, 22, 25) *pumilio* ♂; – (20, 23, 26) *intermedia* sp. n. ♂; – (21, 24, 27) *forcipata* ♂. (Localities cf. Figs. 1-6).

(1954) key, it naturally falls into the *pumilio-forcipata* group, which also embraces the East Asiatic *I. asiatica* Brauer. The latter will not be further considered here.

The natural grouping within *pumilio-intermedia-forcipata* is most obvious in the male appendages and the hind ridge of the female pronotum, and it could hardly be a coincidence that precisely those characters play an important role in the mechanical reproductive isolation within the genus *Ischnura*.

The male appendages, viewed posteriorly, are strikingly analogous. In all three species, they are, roughly, elongate triangles, with a dorso-medial concavity. The dorso-lateral side bears no tooth in *I. pumilio*, a small tooth in *I. intermedia* and a strongly developed tooth in *I. forcipata* (Fig. 19-21; Fig. 28-33). In lateral and dorsal view, the development of an apical tooth is accompanied by a lengthening of the app. sup. and a shortening of the app. inf. (Fig. 22-27): in *I. pumilio* the app. inf. is distinctly longer than the app. sup.; in *I. intermedia*, the app. inf. is slightly shorter than the app. sup. and in *I. forcipata*, the app. inf. is much

Figs. 28-33. Terminalia (28-31) and appendix superior (32-33) of three (two) *Ischnura* species: (28) *pumilio* ♂, posterior view; – (29) *intermedia* sp. n., paratype: – (30) *intermedia* sp. n. ♂, paratype, dorsal view; – (31) *forcipata* ♂, dorso-lateral view; – (32) *intermedia* sp. n. ♂; – (33) *forcipata* ♂. (Localities cf. Figs. 1-6).



shorter than the app. sup. When studying more closely the structure of the app. inf., especially in posterior view, one realises that its fundamental structure differs little in all three species (Fig. 19-21; Fig. 28-29). The app. inf. really is a basal plate, on which stands a strong tooth. In *I. pumilio* it inserts ventrally, stands upright and is weakly curved, almost in the axis of the abdomen; in *I. intermedia*, it has migrated along the ventro-lateral margin of the appendix and is strongly curved over the "tail" of the app. sup., thus appearing shorter. In *I. forcipata*, this process has gone even further: the tooth has moved further dorsad and is very strongly bent over the app. sup.

A similar, almost continuous structural series is found in the pronotum and lam. mes. of the females: a triangular plate, strongly bent posteriorly in *I. pumilio* (Fig. 4); a triangular, though strongly and broadly raised plate, gently hollowed out in the middle, in *I. intermedia* (Fig. 5). The hind lobe in *I. forcipata* is easily derived from this by depressing the edges of the plate, producing the very characteristic median hollow dome (Fig. 6). The latter is, of course, much better visualized by the stereo-scan pictures of Fig. 34, 35. Further note that the lamina in *I. pumilio* ♀ still has a small median tooth, an andromorphic character. This tooth has disappeared in both *intermedia* and *forcipata*. The male pronotum is shown in Figures 1 and 36 for *I. pumilio*. It is very similar to that in the female, except for the medio-posterior spines on the lamina which are much stronger. Sexual dimorphism is much more pronounced in *I. intermedia* and *I. forcipata*. In *I. intermedia* the hind ridge is rectangular with a small medial tubercle. The medio-posterior spines on the lamina are remarkably small (Fig. 2). In *I. forcipata* the middle lobe of the hind ridge is distinctly produced backwards (Fig. 3; Fig. 37); the medio-posterior spines on the lamina are as strongly developed as in *I. pumilio* (Figs. 38, 39).

Another interesting character is given by the pterostigma. In the males, differences in shape, size and colour exist between both pairs of wings. In the females, differences in shape and size occur. They are summarized in Table I. Again, the intermediate position of *I. intermedia* appears. A unique character in this species, however, is in the angles between the longitudinal and cross marginal veins of the Pt. in both sexes. These angles are much steeper than in *I. pumilio* and in *I. forcipata*. A second non-transitional character of *I. intermedia* is found in the female ovipositor. In *I. pumilio*, the vulvar spine is relatively long, almost in the axis of the abdomen (Fig. 15). In *I. forcipata*, it is rather distinctly curved dorsad (Fig. 16). In *I. intermedia*, it is very short and sharp standing at an

Figs. 34-39. Dorsal structures of two *Ischnura* species: (34, 35) *I. forcipata* ♀, pronotum, dorso-posterior view; – (36) *I. pumilio* ♂, pronotum and lamina mesostigmatis; – (37-39) *I. forcipata* ♂, (37) pronotum and lamina mesostigmatis, dorsal view; – (38) median lobe of hind ridge pronotum and lamina mesostigmatis enlarged; – (39) lamina mesostigmatis, lateral view (localities cf. Figs. 1-6).

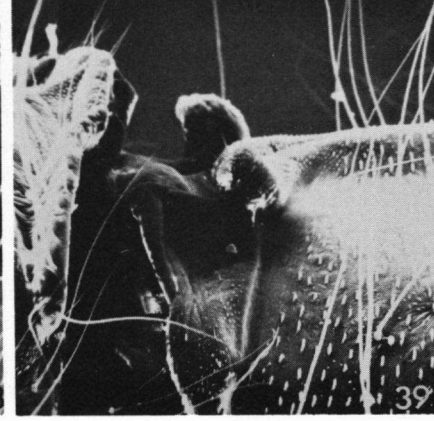
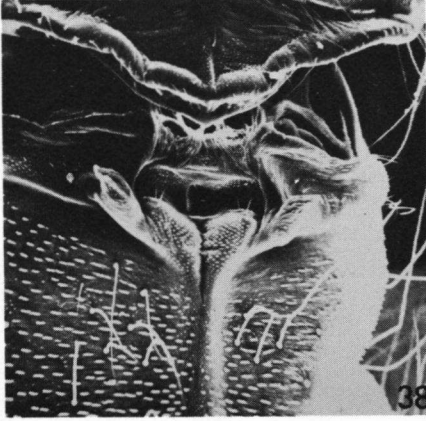
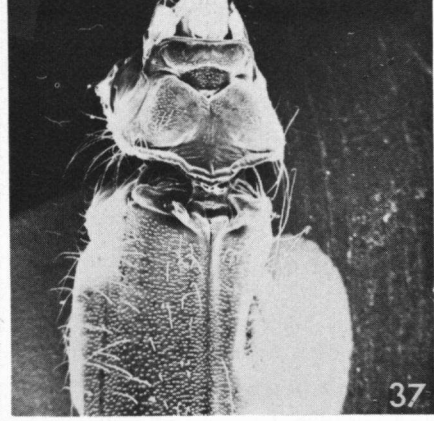
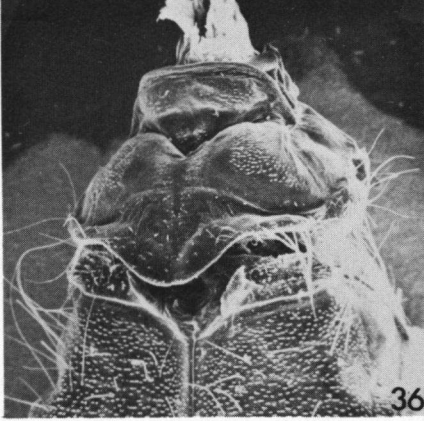
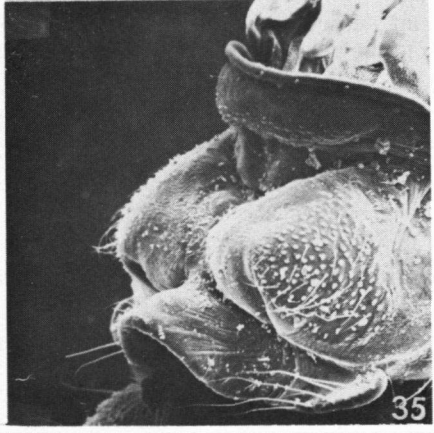
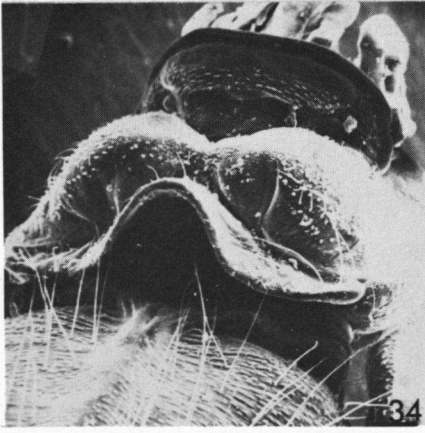


Table I
Structure of pterostigma in three *Ischnura* species

Characters	<i>pumilio</i>				<i>intermedia</i>				<i>forcipata</i>			
	male		female		male		female		male		female	
	<i>Fw</i>	<i>Hw</i>	<i>Fw</i>	<i>Hw</i>	<i>Fw</i>	<i>Hw</i>	<i>Fw</i>	<i>Hw</i>	<i>Fw</i>	<i>Hw</i>	<i>Fw</i>	<i>Hw</i>
Shape	par.	trap.	par.	par.	trap.	par.	par.	par.	par.	trap.	par.	trap.
Shape of postnodal cell adjacent to pterostigma	trap.	-	-	-	trap.	-	-	-	-	triangle	-	-
Size	fw > hw		fw > hw		fw > hw		fw > hw		fw > hw		fw > hw	
Colour	½ black yellow ½ yellow		yellow yellow		largely yellow black		yellow yellow		largely yellow black		yellow yellow	

par. = parallelogram; trap. = trapezium

oblique angle with the body axis (Fig. 17).

Establishing relationships based on body colours is hindered by the limited material of *I. intermedia* available. In the male, good agreement between *I. intermedia* and *I. forcipata* is however obvious, especially in the extent of blue colours on S8-S10. It is well-known that in *I. pumilio*, S8 is, at least, partly black. This agreement might still hold in the females: in *intermedia* and *forcipata* the black markings on S1-S2 and S8-S10 are not identical, but probably fall within each other's range of variability (Figs. 13, 14). But this still applies to the *aurantiaca* forms of *I. pumilio*, and especially the green individuals of that form, which are probably no more than different stages in the development of body colours. The synthoracic colour pattern in *I. intermedia* also agrees well with that of *I. forcipata*, and with that of *I. pumilio*, form *aurantiaca*.

As the synthorax in *I. intermedia*, allotype, is somewhat damaged, I prefer not to give a figure of it. Instead, the synthorax of *I. forcipata*, ♀, is figured in Figure 18. *I. intermedia* (allotype) only differs from it in having a narrower black carinal band, the anterior black spot on the humeral suture reduced, and the posterior spot on that suture smaller. As far as we know, there exists no female form in *I. forcipata* (and in *I. intermedia*?) that develops humeral black stripes (FRASER, 1933). In this respect, *I. pumilio* differs from both, but it should be stressed that the development of black humerals in *I. pumilio* is a slow process, that begins as a diffuse pigmentation in the area of the humeral suture and is only complete in fully mature individuals.

GEOGRAPHIC DISTRIBUTION AND HABITAT SELECTION

Ischnura pumilio has a wide distribution, including West North Africa, the whole North Mediterranean basin, Western Europe, parts of South Central Europe and Eastern Europe, Asia Minor and South Central Asia. In Iran, Afghanistan, North Pakistan and Kashmir, it overlaps with *I. forcipata*, which lives at moderate altitudes in mountainous areas, roughly the Southern flanks of the

Himalaya and adjacent western mountain chains (cf. Fig. 40).

Ischnura forcipata is a rather poorly known species. The male was described from Quetta, Pakistan (MORTON, 1907). Shortly thereafter, a male was reported and described as a new species (*Ischnura musa*) by BARTENEV (1913) from Derbent, "Turkestan", in the present Sourkhan-Darya Oblast of the Altai range, Russian Central Asia. Females were first seen by LIEFTINCK (1927), who studied material from several localities in Himachal Pradesh, Northern India. FRASER (1933) gives a complete synonymy and all locality data known at that time. Later, the species was found more to the West, near Teheran, Iran (SCHMIDT, 1954) and in many localities in Afghanistan, Northern India and Kashmir (SCHMIDT, 1961). All these specimens have abd. 22-25 mm., but SCHMIDT (loc. cit.) had also specimens from "Bagir, Transkaspien" which were smaller (abd. 20.7 and 20.8 mm). The latter locality I am unable to place with certainty, and the specimens approach *I. intermedia* in size (perhaps that species?).

Recently, *I. forcipata* was reported from Nepal (ST. QUENTIN, 1970), where it is common in the Kathmandu valley. I observed specimens at Kathmandu-Chauni during the second half of April, 1973 and at Godavari, Kathmandu valley, on May 1, 1973. Their habitat is very characteristic: small rivulets, and particularly spots where the current is held up on plateaus, eventually with small springs, so that marshy edges or small swamps develop, grown with low herbage.

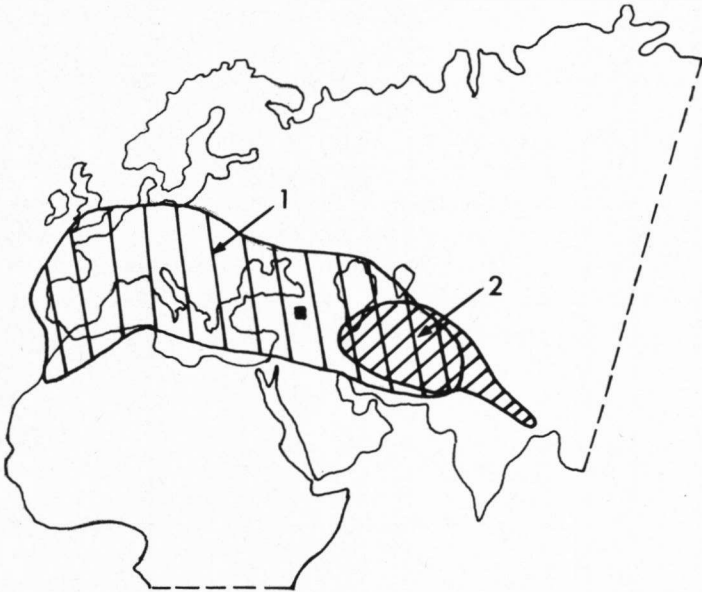


Fig. 40. Geographical distribution of 1. *Ischnura pumilio* (Charpentier) and 2. *I. forcipata* Morton. Black dot: type locality of *I. intermedia* sp. n.

The species lives among grasses, settling most commonly at only a few centimeters above water. *I. forcipata* is not a very active flyer, and therefore is a rather inconspicuous insect. In places where the water current increases, it is no longer found. It is here replaced by representatives of the *I. aurora*-group (most frequently *I. rufostigma annandalei*). It is quite striking that the type locality of *I. intermedia* shows a physical relationship with the habitats of *I. forcipata*, although the former is situated in a semi-desert environment. But here again it should be recalled that *I. pumilio*, although less exclusively, shows a clear preference for similar biotopes too.

POSSIBLE PHYLOGENETIC RELATIONSHIP

It is evident from the above that the three species of *Ischnura* dealt with form a cluster of common origin. In this, *I. intermedia* is a transitory species, though more closely allied to *I. forcipata*. The question which species is more primitive than the others is more difficult to answer and certainly involves a great deal of speculation. If one assumes, however, that the species in which the accessory genitalia are simplest and in which more elements of gynandromorphism are present, is also the most primitive one, then, evidently, *I. pumilio* should be considered the most primitive of the three, and *I. forcipata* the most specialized one.

In earlier times, in the eastern area of the range of a pre-*pumilio* animal, part of the gene pool may have split off to form the *intermedia-forcipata* complex. The latter, afterwards, once again gave rise to speciation and finally *I. pumilio*, coming from the West, extended over part of their area.

The primitiveness of *I. pumilio* is supported by the relatively wide ecological spectrum of habitats it tends to colonise (with, however, the restricted preference given above). The specialisation of *I. forcipata* appears from its restriction to mountain environments. *I. intermedia* seems to live under much less favourable and unstable ecological conditions. This might suggest a species under severe competitive pressure and therefore of very restricted occurrence. The latter statement is almost synonymous to considering it a relict species.

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