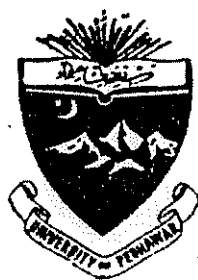


TAXONOMY OF PREDATORY MITES OF THE FAMILY PHYTOSEIIDAE (ACARI) OF PESHAWAR REGION.

Mohammad Shahid



*Department of Zoology,
University of Peshawar.*

April, 1984

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BY

Mohammad Shahid

A thesis submitted to the University of Peshawar in
partial fulfillment of the requirements for the

Degree of

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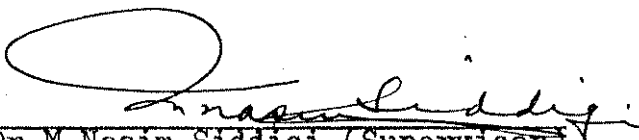
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Degree of

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Claim of originality and contribution to knowledge

This is the first comprehensive study of the phytoseiid mites of Peshawar Region. Out of 19 recorded species 18 are new to the Science. The relationship of various species of mites have been analysed and synthesized in the phenograms for each genus.

ABSTRACT

Mites of the Family Phytoseiidae (Acari) were collected from different host plants and localities in Peshawar, Mardan, Dargai, Mingora, Dir and Chitral. They were mounted on microscopic slides in Hoyer's medium. Identification was done with the help of keys of Chaudhri (1974 and 1979) and by comparison with descriptions and the type specimen. In all, 19 species belonging to 4 genera were recorded. The species were described, and drawings of the important diagnostic characters were made with ocular grid. Tables for comparison of characters of species in each genus were prepared and from these ph³ograms were constructed. The species recorded in this work are (1) Gnorimus tabolla Chaudhri (2) Phytoseius lynn, new species (3) Phytoseius flagrum, new species (4) Phytoseius hornus, new species (5) Amblydromella teramon, new species (6) Amblydromella zerena, new species (7) Amblydromella canaster, new species (8) Amblydromella chashmaensis, new species (9) Amblydromella kalashiensis, new species (10) Amblydromella mardaniensis, new species (11) Amblyseius takhti, new species (12) Amblyseius uvidus, new species (13) Amblyseius balios, new species (14) Amblyseius darghaiensis, new species (15) Amblyseius emotus, new species (16) Amblyseius inculatus, new species (17) Amblyseius latro, new species (18) Amblyseius nidus, new species (19) Amblyseius opimia, new species.

The type specimens (Holotypes) have been deposited in the Department of Zoology, University of Peshawar.

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Chapter I

INTRODUCTION

The mites are very minute creatures and are microscopic in size. They belong to the subclass Acari of the arthropodan Class Arachnida. Mites are widely distributed throughout the world and exceed insects in number and extent of their habitation. They live in salt and fresh water, in organic debris of all kinds, in pastures, in arable soils, on plants and animals. In Forests they greatly out-number all other arthropods. Their association with other animals include commensalism, predation and true parasitism. The parasitic mites are of great medical importance as they act as vector of pathogens or produce direct effect on the hosts. They cause serious damage to the livestock, agricultural crops, vegetables, fruit trees, ornamental and wild plants, stored grains and stored products, thus adversely affecting man and his possessions.

The phytophagous mites of the families Tetranychidae, Tenuipalpidae, Eriophyidae and Tarsonemidae feed on crops, vegetables, fruit plants, stored grains and food products. They cause heavy losses to the farmers and trade merchants. For example- Panonychus ulmi (Koch) is widely distributed throughout the world and attack plum, pears, prunes and apples whereas Tetranychus telarius (L.) is a major pest of cotton, and fruit trees in different countries,

and Bryobia praetiosa(Koch) is a serious mite pest of almond, peach,prunes,alfalfa,clovers and peas in many parts of the world(Baker and Wharton,1952). Oligonychus indicus(Hirst), Schizotetranychus mustafaii Mustafa and Chaudhri are serious mite pests of sugarcane while Tetranychus cucurbitae Rehman and Sapra and Larvacarus transitans(Ewing) attack vegetables and ber trees,respectively in Pakistan.

These harmful mites are being predated upon by the predatory mites of the families Anystidae,Bdellidae, Cunaxidae,Cheyletidae and Phytoseiidae.Out of these, mites of the family Phytoseiidae have been established as promising predators of harmful mites by Acarologists in different parts of the world.

Phytoseiulus sexpilis Muma feeds almost exclusively on acarids(Muma et al.,1961). Phytoseiulus macropilis(Banks) feeds on spider mites (Smith and Summers,1949), Orientiseius rickerti (Chant) helps to a great extent in the control of citrus rust mite(Muma and Denmark,1970).Typhlodromus (Amblyseius) cucumeris Oudemans feeds on Thrips tabaci (Evans,1952).Typhlodromus sudanicus ElBadry , Typhlodromus aleyrodii ElBadry have been found attacking the immature stages of white-flies of cotton(Bemisia tabaci)in Sudan. (ElBadry,1967a).McMurtry and Scriven(1966) reported Euseius habisci (Chant)feeding on Oligonychus punicae(Hirst) and found them capable of reducing the population of the mites to a great extent.T.pyri, a predatory mite controlled P.ulmi, a harmful plant mite on apple trees in the absence of insecticides and acaricides (Dosse, 1960).In addition

phytoseiid mites have also been recorded to prey on aphids, scale-insects, thrips and other small arthropods (MacGill 1939, Nesbitt 1951, Muma 1955 and McMurtry 1963).

A great deal of taxonomic work on the mites belonging to the family Phytoseiidae has been carried out in different parts of the world. In this family, more than 700 species have already been described and more are being described each year.

In Pakistan, some attention has been paid to explore the phytoseiid mite fauna of this region. Chaudhri (1965, 1967, 1968, 1973, 1974, 1975a, 1975b, 1975c, 1979) described 80 new species and redescribed 20 species with new distributional records and new host plants of phytoseiid mites from Pakistan.

N.W.F.P. is rich in different kinds of fruit plants like plum, pears, apricot, apple, loquat, citrus, mulberry and walnut, etc., and lot of areas are under crops, vegetables and forest plantations. These plants are attacked by different types of harmful mites and many predatory mites feed on them. No attempt, has, so far, been made to explore the mite fauna of the family Phytoseiidae from this part of the Province. Taking into consideration, the importance of predatory mites of the family Phytoseiidae in biological control of harmful plant mites, this study was taken up.

Chapter II

REVIEW OF LITERATURE

The family Phytoseiidae was erected by Berlese in 1913. Prior to 1961, this family contained two subfamilies--Phytoseiinae Berlese, 1916 and Macroseiinae Chant, Denmark and Baker, 1959. Muma (1961 a) erected two new subfamilies--Aceodrominae and Amblyseiinae in this family. Later, Lindquist and Chant (1964) placed the subfamily Aceodrominae in the family Blattisociidae and thus leaving three subfamilies. Chaudhri (1975 a) erected a new subfamily Gnoriminae in the family Phytoseiidae from Pakistan and it makes a total of four subfamilies in this family.

Banks (1915), Massee (1932), Gilliat (1935) and MacGill (1939) contributed new species to this family. Garman (1948) provided key to 5 genera viz., Amblyseius Berlese, Iphidulus Ribaga, Lasioseius Berlese, Seiulus Berlese and Typhlodromus Scheuten and 2 subgenera viz., Amblyseiopsis Garman and Seiopsis Berlese. Garman coined the nomenclature for body parts and setae of phytoseiid mites and established the identity of this category. Chant (1959) synonymised Amblyseiopsis and Seiopsis with the genus Typhlodromus. Nesbitt (1951) reviewed this family and less than 30 species of mites were known upto

that time. After establishing its predatory nature by some Acarologists, keen interest was taken by many Acarologists in different parts of the world. At present, more than 700 species are on published record. More than 50 well-known Acarologists are working on the mites of the family Phytoseiidae and they have contributed a lot to the taxonomic studies of the mites of this family. The following Acarologists are worth mentioning who contributed by adding new species to this family from their respective areas.

Athias-Henriot (1959, 1960), Chant (1955, 1956, 1957, 1958, 1959, 1960, 1965), Chant and Baker (1965), Chant and Hansell (1971), Chant, Hansell and Yoshida (1974), Chant and Lindquist (1965), Chant, Denmark and Baker (1959), Chaudhri (1965, 1967, 1968, 1973, 1974, 1975a, 1975b, 1975c, 1979), Collyer (1964), Corpuz and Rimando (1966), DeLeon (1957, 1958, 1959a, 1959b, 1959c, 1959d, 1960, 1961, 1965a, 1965b, 1966, 1967), Denmark (1965, 1966), Denmark and Muma (1967, 1970, 1972, 1973, 1975, 1978), Dosse (1958), Ehara (1958, 1959, 1962, 1964, 1966a, 1966b, 1967a, 1967b, 1970, 1972, 1975, 1978, 1982), Elbadry (1967a, 1967b, 1967c, 1968), Evans (1953, 1957), Evans and MacFarlane (1962), Garman (1948), Gonzalez and Schuster (1962), Gupta (1974, 1976a, 1976b, 1977a, 1977b, 1977c, 1978a, 1978b), Kennett (1958, 1963), Khan and Chaudhri (1969), Merwe (1965), Muma 1955,

1961a, 1961b, 1962, 1965, 1967), Muma and Denmark (1962, 1968, 1969a, 1969b, 1970), Narayanan, Kaur and Ghai (1960), Nesbitt (1951), Prasad (1968a, 1968b, 1968c), Pritchard and Baker (1962), Schicha (1977a, 1977b, 1977c, 1978, 1979a, 1979b, 1979c, 1980a, 1980b, 1981a, 1981b, 1981c, 1982), Schuster (1957, 1959), Schuster and Pritchard (1963), Schuster and Smith (1960), Shehata and Zaher (1970), Specht (1968), Specht and Rasmy (1970) Swirski and Amitai (1961), Swirski and Ragusa (1976), Swirski and Shechter (1961), Tuttle and Muma (1973), Wainstein (1958, 1959, 1960, 1961, 1962a, 1962b, 1970), Wainstein and Arutanjan (1967, 1968, 1970), Wei-Nan-Wu (1980, 1982), Womersley (1954) and Zack (1969).

Contributions made by Chant (1959), Pritchard and Baker (1962), Schuster and Pritchard (1963), Chant and Baker (1965), Denmark (1966), Muma and Denmark (1970), Chaudhri (1974 and 1979) are in the form of monographs.

Chant (1959) divided his monographic research work in two parts. In the first part, he studied the bionomics of seven species of phytoseiid mites which he collected from Southeastern England. These studies included habitats, host range, activities during autumn, overwintering sites, winter mortality, winter feeding, spring activity, predator-prey relationships, feeding habits and competition between phytoseiid species.

In the second part, he provided the taxonomic review of the family Phytoseiidae, gave key to the genera of this family, He included all the species described by

different workers up to 1958 in his work and described 38 new species collected from U.K. His work contained keys, descriptions and drawings for all the mite species belonging to the genera Typhlodromus, Phytoseius, Phytoseiulus, Iphiseius, Asperoseius, Seiulus, Typhloseiopsis and Macroseius.

Pritchard and Baker (1962) collected mites of the family Phytoseiidae from Central Africa and presented them in their monograph. They provided characteristic features of the family Phytoseiidae to identify the genera-- Seiulus, Neoseiulus, Typhlodromus, Metaseiulus and Typhloseiopsis with the help of drawings. They also provided a key to the genera and subgenera belonging to the family Phytoseiidae of the world. They described 31 new species of mites collected from Central Africa with drawings and comprehensive keys. These mites belong to the genera Typhlodromus, Phytoseius, Chantia, Amblyseius and Iphiseius.

Schuster and Pritchard in their attempt, published a monograph in 1963 describing mite species of the family Phytoseiidae which they collected from different localities of California (U.S.A.). They gave illustrated key for the identification of genera-- Seiulus, Neoseiulus, Typhlodromus, Metaseiulus, Typhloseiopsis, Amblyseius, Amblyseiella, Kampimodromus, Phytoseiulus, Asperoseius and Ptenoseius. They provided the characteristic features of the family Phytoseiidae. This research work contained key to tribes of the family Phytoseiidae of the world.

Included in this work are the key to the genera and descriptions, drawings and keys for species under each genus. They described 52 mites species of the family Phytoseiidae of the above mentioned genera and out of which 14 species were new to science.

Chant and Baker (1965) collected predatory mites of the family Phytoseiidae from Central America and provided keys to females of the genera Phytoseius, Typhlodromus, Iphiseius, Paraamblyseius, Phytoseiulus and Amblyseius. With detail descriptions and illustrations, they described 40 species in the above mentioned genera, out of which 19 species were new to science.

Denmark (1966) took into consideration only one genus (Phytoseius Ribaga) of the family Phytoseiidae and gave a comprehensive revision of the genus. He divided the genus into two subgenera Phytoseius and Dubininellus and gave their key. He divided subgenus Phytoseius into 6 groups (decoratus, finitimus, guyanensis, nahuatlensis, hongkongensis and mantecanus) and divided subgenus Dubininellus into 8 groups (macropilis, crinitus, intermedius, bakeri, ribagai, horridus, taiyushani and coheni) on the basis of certain body characters of females. He also provided keys for these groups. He described 19 species in the subgenus Phytoseius and out of these 2 were new to science. Whereas he included 21 species in the subgenus Dubininellus and out of these 5 were new species. He provided detail descriptions and drawings for all these

species.

Muma and Denmark (1970) made collection of mites of the family Phytoseiidae from different localities of Florida State of U.S.A. They provided terminology for different parts of mite species of the family Phytoseiidae alongwith the diagnostic characters and also variations of leg setal formulae in Phytoseiidae. They provided a key to 3 subfamilies and 28 genera of Phytoseiidae found in Florida. They also emphasised setal, scutal, peritremal and stigmatal, spermathecal and spermatodactyl, cheliceral and legs characters for the diagnosis of genera of Phytoseiidae found in Florida. They also gave keys, descriptions, drawings, distribution and host plants of all those mite species of the family Phytoseiidae found in Florida. They included 87 mite species in this Monographic work and new combinations in most of the species were formed. However, no new species was described.

Chant and Hansell (1971) described the mites belonging to the genus Amblyseius collected from Canada and Alaska. They gave key to the adult females and descriptions and drawings of 48 species of the genus Amblyseius, in this research work. Out of these, 31 species were new to the science.

Chaudhri (1974) made taxonomic studies of the mites belonging to the families Tenuipalpidae, Tetranychidae, Tuckerellidae, Caligonellidae, Stigmaeidae and Phytoseiidae from Pakistan. He described 100 species of mites (harmful

and predatory) in his monograph. Out of these 100 species, 87 are harmful mites (phytophagous) whereas 13 species are predatory mites of the family Phytoseiidae. These 13 species were all new and belonged to the genera Amblydromella, Parasciulus and Typhloctonus. Descriptions, keys and drawings of these species have been given in his monograph.

Chaudhri (1979) published another monograph "Studies on the predatory leaf inhabiting mites of Pakistan" in which he described 67 species of mites. He erected one new subfamily Gnoriminae in the family Phytoseiidae and gave key for all the 4 subfamiliesⁱⁿ this family. He erected 5 new genera (Gnorimus, Denmarkia, Amathia, Ansaria and Kashmerius) in the family Phytoseiidae and provided key to the genera of Phytoseiidae found in Pakistan. He described 36 species belonging to the genera Gnorimus, Phytoseius, Larophytoseius, Amblydromella, Orientiseius, Denmarkia, Amathia, Proprioseiopsis, Euseius, Ansaria, Amblyseius, Typhlodromips, Neoseiulus. Out of these, 21 species were new to science. Keys, descriptions and drawings of all the species have been given in his monograph.

Chapter III

MATERIALS AND METHODS

A large number of places in the plains and hills of the Northern Districts of the N.W.F.P. including Peshawar, Mardan, Dir, Swat and Chitral were surveyed for the collection of mites of the family Phytoseiidae. Samples were taken from organic matter, barks, leaves, plant debris, vegetables, fruit trees, ornamental and wild plants. The mites were collected by the following methods:

1. SIEVE METHOD:

The leaves, flowers and other plant parts were removed from different plants. These plant parts were beaten on a sieve over a piece of white paper. The material on the paper was examined with the help of hand lens and all the minute particles that were seen moving were picked up with the help of needle and preserved in vials in 50% alcohol along with a few drops of glycerine. The host plant, locality and date of collection was recorded for each collection.

2. BERLESE'S FUNNEL METHOD:

The plant material and samples suspected for mites were collected and stored in cellophane bags. They were brought to the laboratory for separation of mites with the help of Berlese's funnel.

The samples were processed through Berlese's funnel which proved to be the most effective apparatus for the separation of mites from the collected material. The mites came down into the beakers containing 50% alcohol up to 48 hours. The suspected phytoseiid mites were sorted out from the bulk collection with the help of a stereoscopic microscope. The collection was placed in small vials containing 50% alcohol with a few drops of glycerine for further taxonomic studies.

PREPARATION OF SLIDES:

The mites thus collected were mounted on the microscopic slides using Hoyer's solution. This medium was prepared at room temperature according to the following formula:

Distilled water	50 cc
Gum arabic	30 gms
Chloral hydrate	200 gms
Glycerine	20 cc
Glacial acetic acid	3 cc

The addition of glacial acetic acid proved very useful in clearing the mite specimens.

Permanent slides were prepared by placing half a drop of Hoyer's medium on a microscopic slide. A mite was picked up with the help of a fine needle from the vial and placed in Hoyer's medium on the slide in the desired position. A cover slip was gently placed on the medium and pressed a little with the help of needle for

distending different body parts of the mite. The freshly prepared slide was placed under a table lamp for slight heat treatment. This helped in quick clearing and fixing of the specimen. Each slide was labelled with exact locality, host plant, date of collection and name of collector.

EXAMINATION OF THE SLIDES OF MITES

All the slides were examined under a high power compound microscope, those containing the phytoseiid mites were separated. The phytoseiid mites were studied in greater detail for the purpose of identification and description.

Identification up to genera and species level was done with the help of keys of Chaudhri (1974) and Chaudhri (1979) and by comparison with original descriptions and type specimens. The determinations were confirmed through Dr. Wali Mohammad Chaudhri, Director, Acarology Research Laboratory, University of Agriculture, Faisalabad. New species were named according to the International System of Nomenclature. The names were selected from the Source Book of Scientific Names.

Drawings of the dorsal side, chelicerae, peritreme, periternal shield, sternal shield, genital shield, ventrianal shield, leg IV, and the spermatheca were made with the help of ocular grid for each species of the Phytoseiidae. Measurements of various body parts were recorded. The length of idiosoma was measured between the anterior

most limit of propodosoma and the hindermost limit of opisthosoma. Similarly width was measured at the broadest part of the body. Magnification is given along each drawing. The measurements are given in microns (μ).

All the species have been described in detail. The description of each species included almost all diagnostic morphological characters, measurements of various body parts, distribution of species in Pakistan and the points of separation of new species from the closely related species.

Tables I, III and V for comparison of characters of species within each genus were prepared. From these Tables, Similarity Matrices (Tables II, IV and VI) for the respective genera were prepared and from these Tables, the Phenograms (Figures B, C and D) were constructed after Sokal and Sneath (1963).

Chapter IV

MORPHOLOGY AND TERMINOLOGY

FAMILY PHYTOSEIIDAE BERLESE

SUBORDER MESOSTIGMATA

Phytoseiinae Berlese, 1913: 11; 1916: 19.

Phytoseiinae Vitzthum, 1941: 767; Garman, 1948: 10; Radford, 1950: 27; Nesbitt, 1951: 1; Womersley, 1954: 169.

Phytoseiidae Baker and Wharton, 1952: 87; Cunliffe and Baker, 1953: 1; Evans, 1957: 223; Athias-Henriot, 1957: 320; Chant, 1959: 45.

Macroseiinae Chant, Denmark, and Baker, 1959: 808.

Diagnosis: (Female) Dorsal shield entire or transversely divided with less than 24 pairs setae. Sublateral setae, 1 to 3 pairs. Peritreme extending anteriorly from mesosternal stigmata. Palpal apotele, two-tined. Chelicerae chelate with variable number of teeth on both digits. Epistome (Tectum) smooth or indistinctly serrate. Sternal shield with 2 to 3 pairs of sternal setae and 1 to 2 pairs of lyriform pores. Female genital pore protected by an anterior membrane of genital shield with 1 pair of lateral setae and more or less truncate posteriorly. Ventrianal shield having various shapes with 1 to 6 pairs of preanal setae in addition to para-anal and postanal setae. Ventrolateral setae, 1 to 5 pairs and a pair of caudal setae. A pair of spermathecae that open between coxae of legs III and IV. Cursorial type of legs provided with pretarsi and ambulacra.

The various biological terms used in the taxonomy of mites are defined for ease of understanding. The body is differentiated into gnathosoma and idiosoma.

1. Gnathosoma:

The gnathosoma bears the mouth parts, chelicerae and the palpi. The mouth is hidden by palpi and chelicerae. Dorsally, the gnathosoma is usually covered in part, by a thin shield of varying structures and is called as tectum or epistome.

(a) Chelicerae: Chelicerae 2 in number, chelate type. Each chelicera terminates in chela which is provided with 2 digits, dorsal is the fixed digit (Fd) and ventral is the movable digit (Md). Fixed and movable digits are provided with different number of teeth and a pilus dentilis (Pd) on the fixed digit (Fig.A3).

(b) Palpi: Palpi 2 in number. Coxae of palpi fuse together and form a basal shield known as basis capitulum. The segments of the palpus are named as those of legs, viz., coxa, trochanter, femur, genu, tibia and tarsus.

2. Idiosoma:

Idiosoma is provided with a dorsal shield. The shield may be entire or divided transversely. It is furnished with the following sets of setae (Fig.A1).

(a) Vertical setae (V): One pair of setae, anterior in position on the dorsal shield.

(b) Clunal setae (C1): One pair of setae, posterior in position on the dorsal shield.

(c) Dorsal setae (D): There is a central row of paired setae known as dorsal setae.

Generally 3 pairs are present, usually 4th pair is also present, 5th pair is rarely present.

(d) Median setae (M): First pair of median setae is always present and is at level midway between D2 and D3. Second pair of median setae is usually present, may be absent in most of the mites, when present, is on the proscutum of the shield. One pair of median setae is always present posteriorly.

(e) Lateral setae (L): The mites of the family Phytoseiidae contain variable number of lateral setae. Maximum number of setae is known to be 12 on one side. In some cases (Genus Platoseius) 4 and 2 lateral setae have been recorded in proscutal and postscutal parts, respectively.

(f) Sublateral setae (S): Generally there are 2 pairs of sublateral setae present on the membrane; some times a third pair may also be present.

3. Venter:

The ventral side of the mite is provided with the following shields and structures (Fig.A2):

- (a) Sternal shield(Sts) : Sternal shield is with 2 or 3 pairs of sternal setae. If 2 pairs, these setae are present on the shield proper, the 3rd pair is present on the membrane, otherwise all the 3 pairs of setae are on the sternal shield.
- (b) Metasternal platelets(Msp): One pair of small metasternal platelets are present. Each platelet is with a seta .
- (c) Genital shield (Gs) : Genital shield is provided with a pair of setae.
- (d) Ventrianal shield(Vs): Ventrianal shield is with different shapes and forms, with 1 to 6 pairs of setae known as preanal setae (Ps), a pair of preanal pores (Pp) may be present. Anal portion is surrounded by 3 setae.
- (e) Metapodal platelets(Mp): Generally 2 pairs of metapodal platelets are present, primary and secondary platelets. In some mites, only 1 pair of these

platelets is present while in others, they are wanting.

(f) Setae on membrane: Posteriorly, a variable number of setae and pores are present on the membrane surrounding ventrianal shield. One pair of caudal setae (VL1) is always present. In addition to seta VL1, 1 to 5 pairs of setae and a variable number of pores are present.

(g) Spermatheca:

A pair of spermathecae, one on each side, is always well developed in female members of the species of family Thytosciidae. Each spermatheca has its own external opening on the ventral side between coxae III and IV. The spermatophores are collected in a vesicle (Ve) which is usually membranous but with a sclerotized portion known as cervix (Cx). The cervix leads to a chamber known as atrium (At). A minor duct (Mid) arises from the atrium for the passage of the spermatozoa to the ova and a major duct (Ma) through

which the spermatophores are received. The external opening may be modified to form a receptacle (R). A labelled sketch is provided with the above details of spermatheca (Fig. A5).

(h) Peritreme (P):

Preitreme extending anteriorly from the mesolateral stigmata(St) which is enclosed in a stigmal shield (Ss) and is followed by peritremal shield (Pes). The peritremal shield encloses the peritreme (P), the length of which is variable in different species (Fig. A4).

4. Legs:

Legs, 4 pairs in adult. Leg IV is provided with 3 macrochaetae, 1 each on genu (Gpc), tibia(Sti) and basitarsus (Stu). This number is variable. When only 1 seta is present, then this is present on basitarsus (Fig. A6).

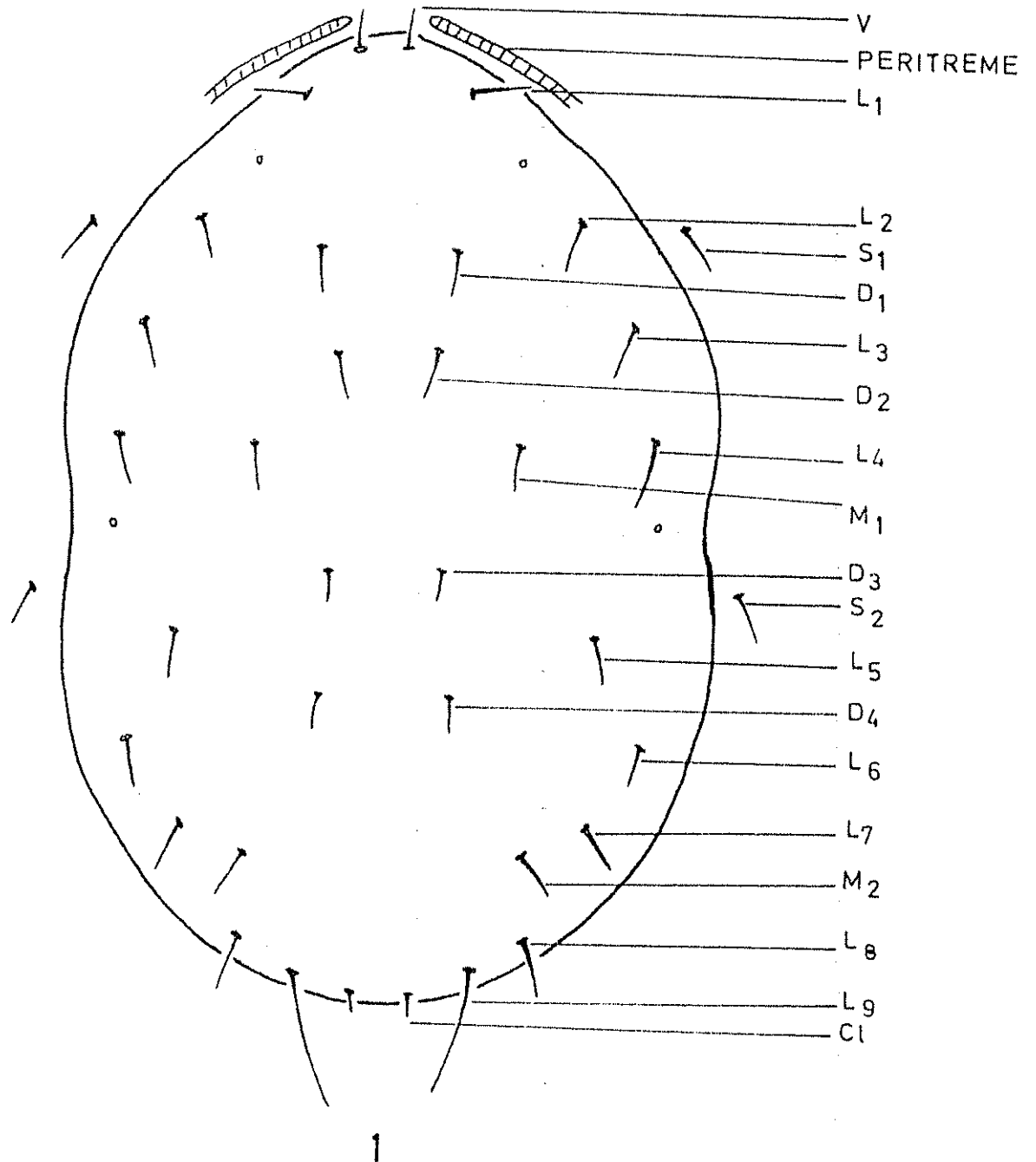
KEY TO ABBREVIATIONS

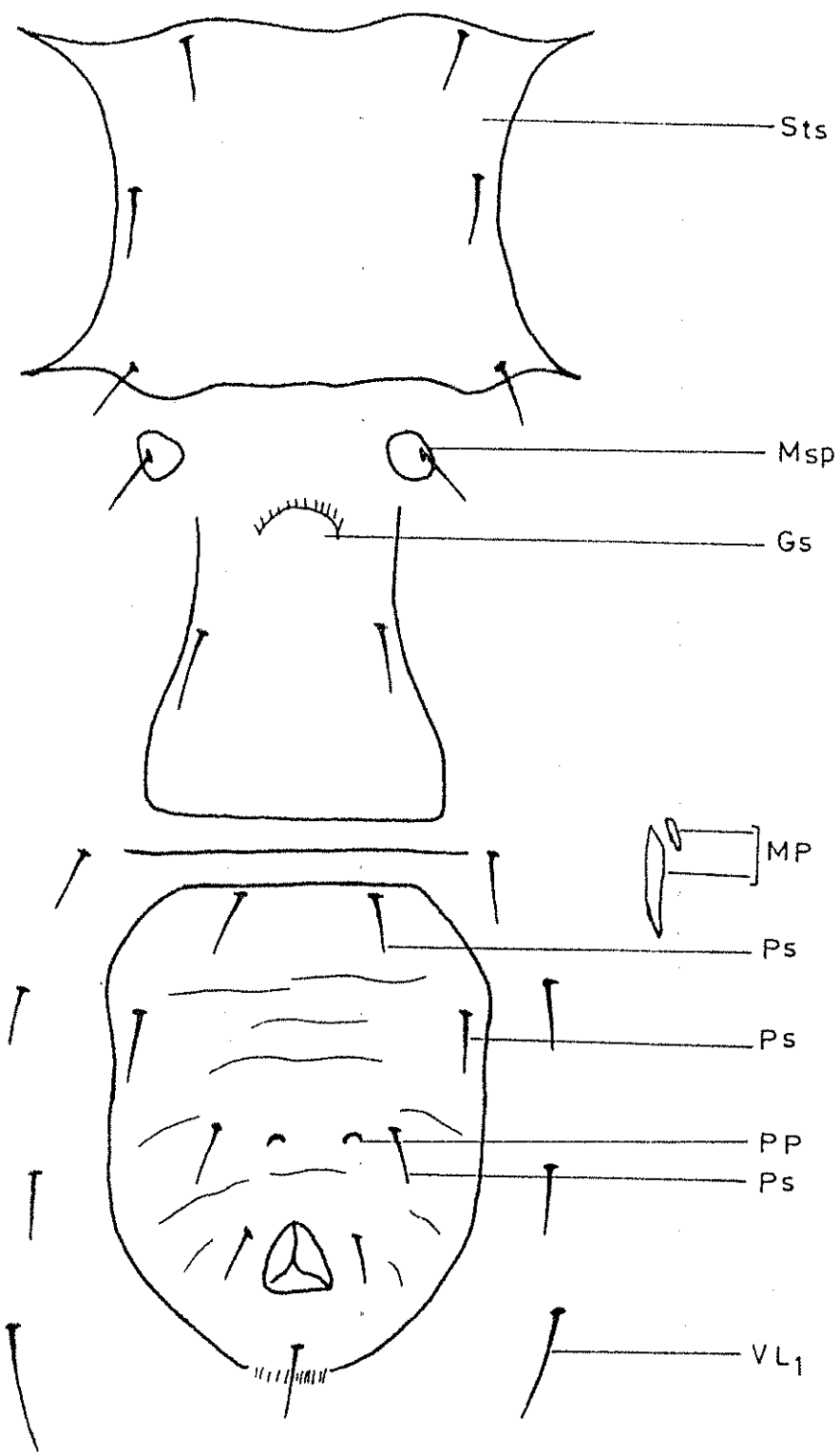
At	atrium
Cl	clunal setae
Cx	cervix
D	dorsal setae
Fd	fixed digit
Fig	figure
Gs	genital shield
L	lateral setae
M	median setae
Ma	major duct
Md	movable digit
Mid	minor duct
Mp	metapodal platelet
Map	metasternal platelet
P	peritreme
Pd	pilus dentilis
Pes	peritremal shield
Ip	preanal pore
Ps	preanal setae
R	receptacle
S	sublateral setae
St	stigmata
Sge	genu macroseta
Ss	stigmatal shield
Sta	tarsal macroseta
Sti	tibial macroseta
Sts	sternal shield
V	vertical setae
Ve	vesicle
Vla	ventrocaudal setae
Vs	ventrianal shield

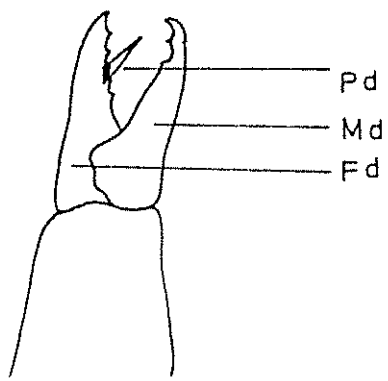
Fig. A. Generalised phytoseiid mite

1. Dorsal shield
2. Sternal, Genital and Ventrianal shields
3. Chelicera
4. Peritremal shield
5. Spermatheca
6. Leg IV

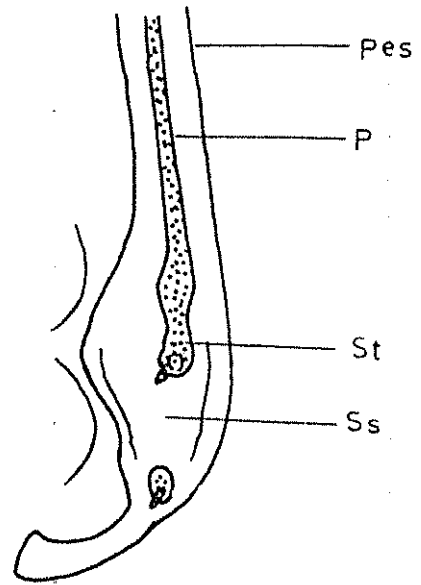
Fig. A



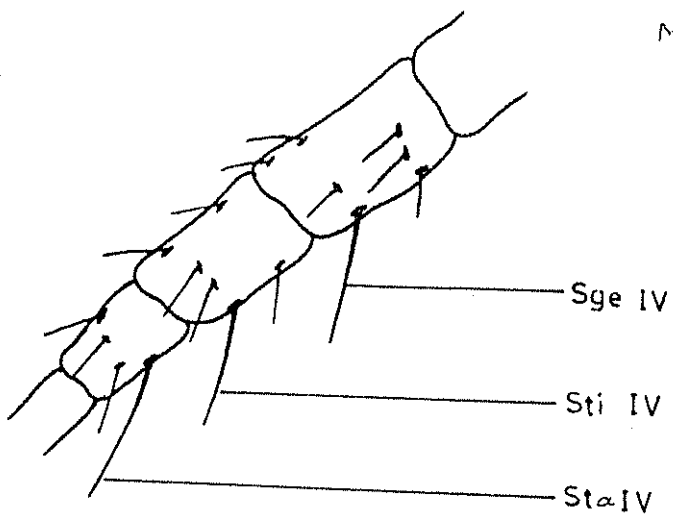




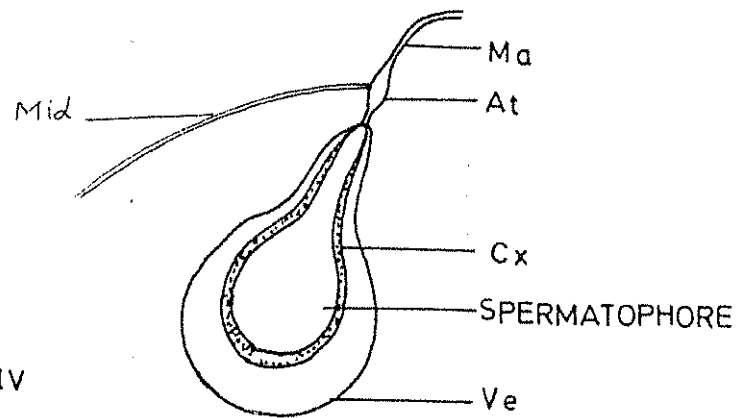
3



4



6



5

Chapter V

RESULTS

FAMILY PHYTOSEIIDAE BERLESE

KEY TO GENERA OF PHYTOSEIIDAE (N.W.F.P.)

1. Dorsal shield setae, 22 pairs; lateral setae, 12 pairs; preanal setae, 6 pairs..... Gnorimus Chaudhri
 Dorsal shield setae, less than 22 pairs; lateral setae less than 12 pairs; preanal setae less than 6 pairs 2
2. Dorsal shield setae, 15 or less than 15 pairs..... Phytoseius Ribaga
 Dorsal shield setae, more than 15 pairs. 3
3. lateral setae, 10 pairs..... Amblydromella Thuma
 lateral setae, 9 pairs Amblyseius Berlese

GENUS GNORIMUS CHAUDHRI

DIAGNOSIS: Genus Gnorimus was established by Chaudhri (1975a). This genus is distinguished on the basis of 12 pairs lateral setae, 3 pairs sublateral setae, 2 pairs of setae on membrane surrounding ventrianal shield (including VL1 seta), 6 pairs preanal setae, postanal seta serrate.

Type Species : Gnorimus tabella Chaudhri

1. Gnorimus tabella Chaudhri
(Fig.1)

Gnorimus tabella Chaudhri, 1975a:100; 1979:8.

FEMALE: Dorsal shield entire, partly reticulated anteriorly, completely reticulated posteriorly, 380 μ long, 224 μ wide with 25 pairs setae (including 3 pairs sublateral setae) and 8 pairs visible pores on it (Fig.1A). Chelicera 27 μ long, movable digit with 3 and fixed digit with 12 antapical teeth (Fig.1C). All dorsal shield setae serrate except dorsal setae, clunal setae, median seta I and sublateral setae (Fig.1A). Dorsal setae: V 34 μ ; D1 18 μ , D2 24 μ , D3 27 μ , D4, D5 20 μ ; G1 9 μ ; L1 44 μ , L2 40 μ , L3 36 μ , L4 17 μ , L5 14 μ , L6 43 μ , L7 58 μ , L8 54 μ , L9 46 μ , L10 53 μ , L11 62 μ , L12 68 μ ; M1 30 μ , M2 61 μ , M3 61 μ ; S1 = S2 = 20 μ ; S3 23 μ (Fig.1A). Peritremal shield as shown in figure 1E. Sternal shield with 3 pairs sternal setae (Fig.1B). Metasternal setae, 1 pair, each seta on a separate platelet. Ventrianal shield completely reticulated, measuring 164 μ long, 177 μ wide,

almost oval in shape with 6 pairs preanal setae. Genital and ventrianal shields 5 μ apart with a membranous fold inbetween. Two pairs setae on membrane surrounding ventrianal shield, seta VL1 smooth, pointed, 64 μ long. Postanal seta, serrate (Fig.1B). Metapodal platelets, 2 pairs, primary, 1 pair, 23 μ , secondary, 1 pair 15 μ (Fig. 1B). Spermatheca as shown in figure 1D. Macrosetae on leg IV genu 46 μ , basitarsus 63 μ , distitarsus 83 μ , macroseta absent on tibia (Fig. 1F).

KNOWN DISTRIBUTION: PAKISTAN-----Alipur, Behrain, Kabal, Mingora (Swat, 4000'), Hyderabad, Lahore (Burki Road, Ravi Bank), Okara, Rajana Forests, Samasatta and Sheikhupura.

KNOWN HOST PLANTS: Ageratum convzoides, Brassica oleracea, Cannabis sativa, Cichorium intybus, Citrus sp., Cordia obliqua, Cynodon dactylon, dry leaves, Gossypium hirsutum, Ipomea batatas, Malvastrum tricuspidatum, Malvastrum sp., Morus alba, Oryza sativa, Phoenix dactylifera, Raphanus sativa, Solanum melongena, Undet. No. 4/69, Undet. No.2/71, Undet. No.4/73.

NEW DISTRIBUTION: N.W.F.P. Dargai, Peshawar, Takhth Bhai (Map No.1).

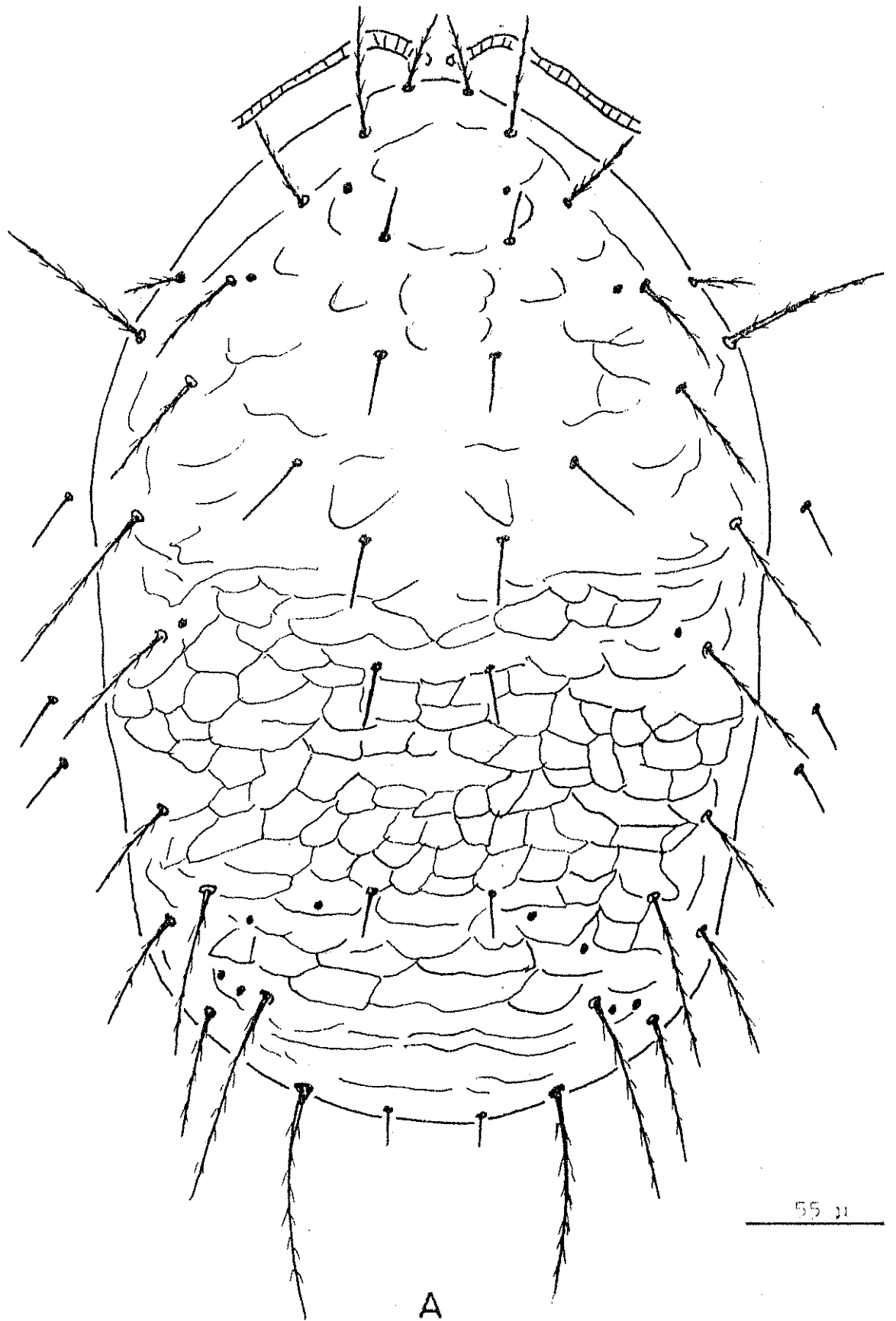
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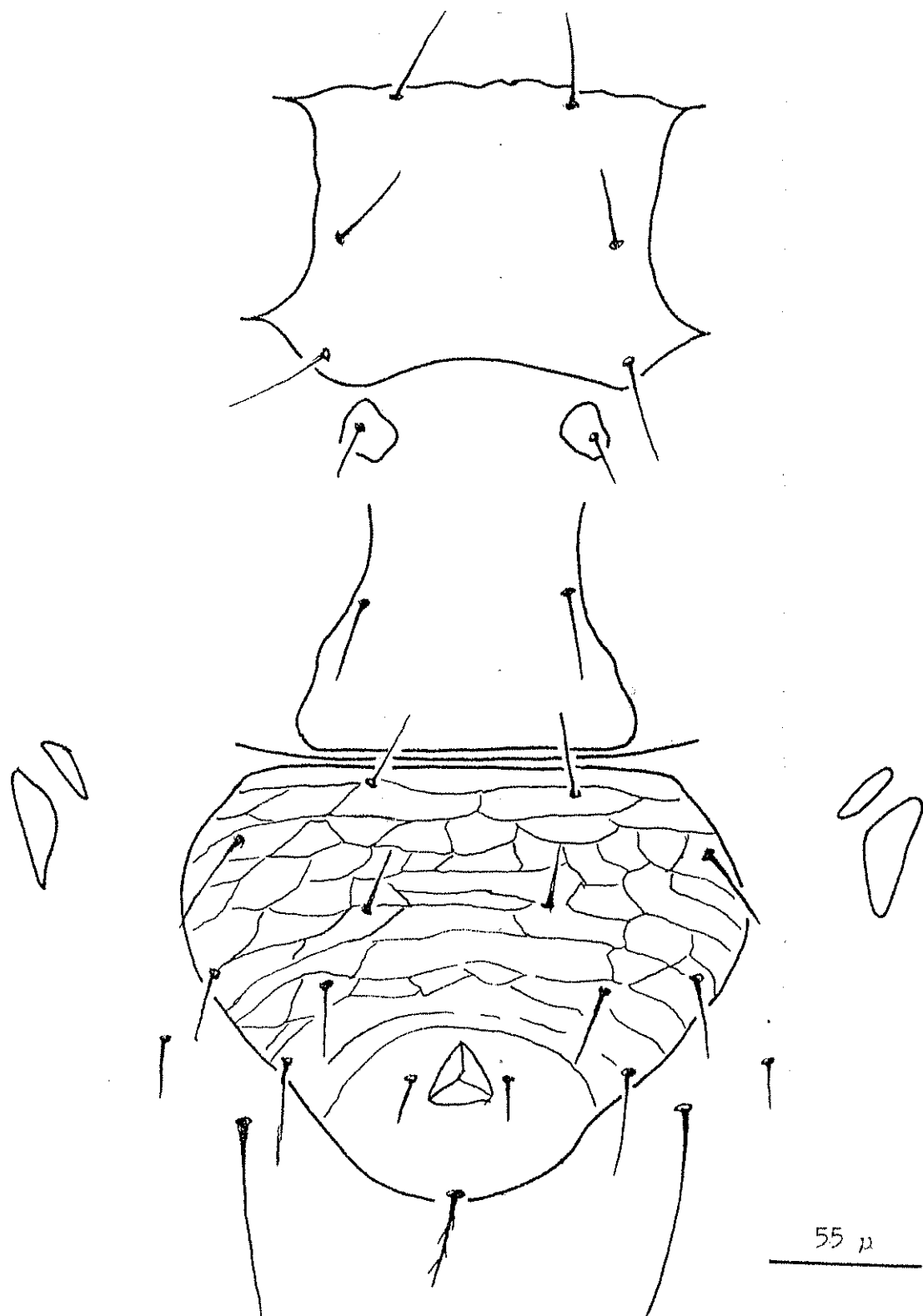
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Dargai	14.xi.1982	Grapes
Peshawar	11.viii.1981	Oat
		No.46/80
		No.155/81
Takhth Bhai	14.xi.1982	Flower

Fig. 1. Gnorimus tabella Chaudhri

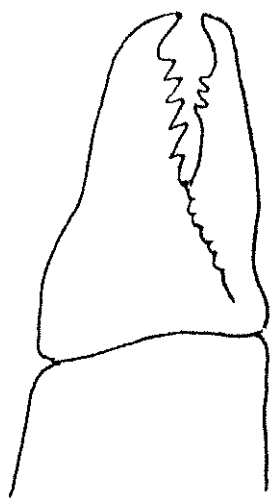
- A. Dorsal shield
- B. Sternal, Genital and Ventrianal shields
- C. Chelicera
- D. Spermatheca
- E. Peritremal shield
- F. Leg IV

Fig. 1

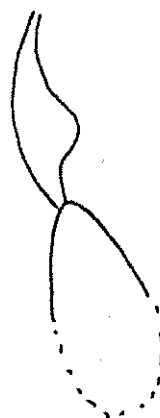




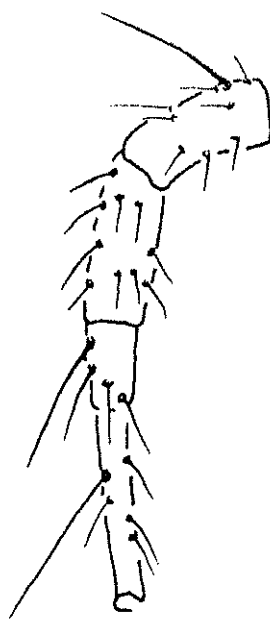
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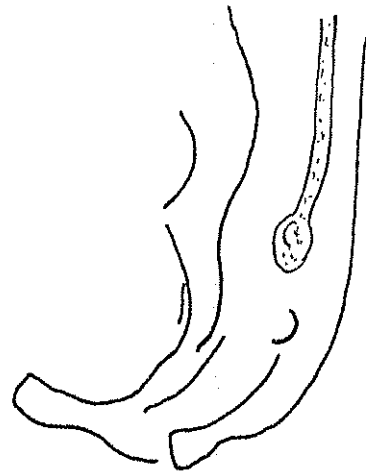
C



D



F



E

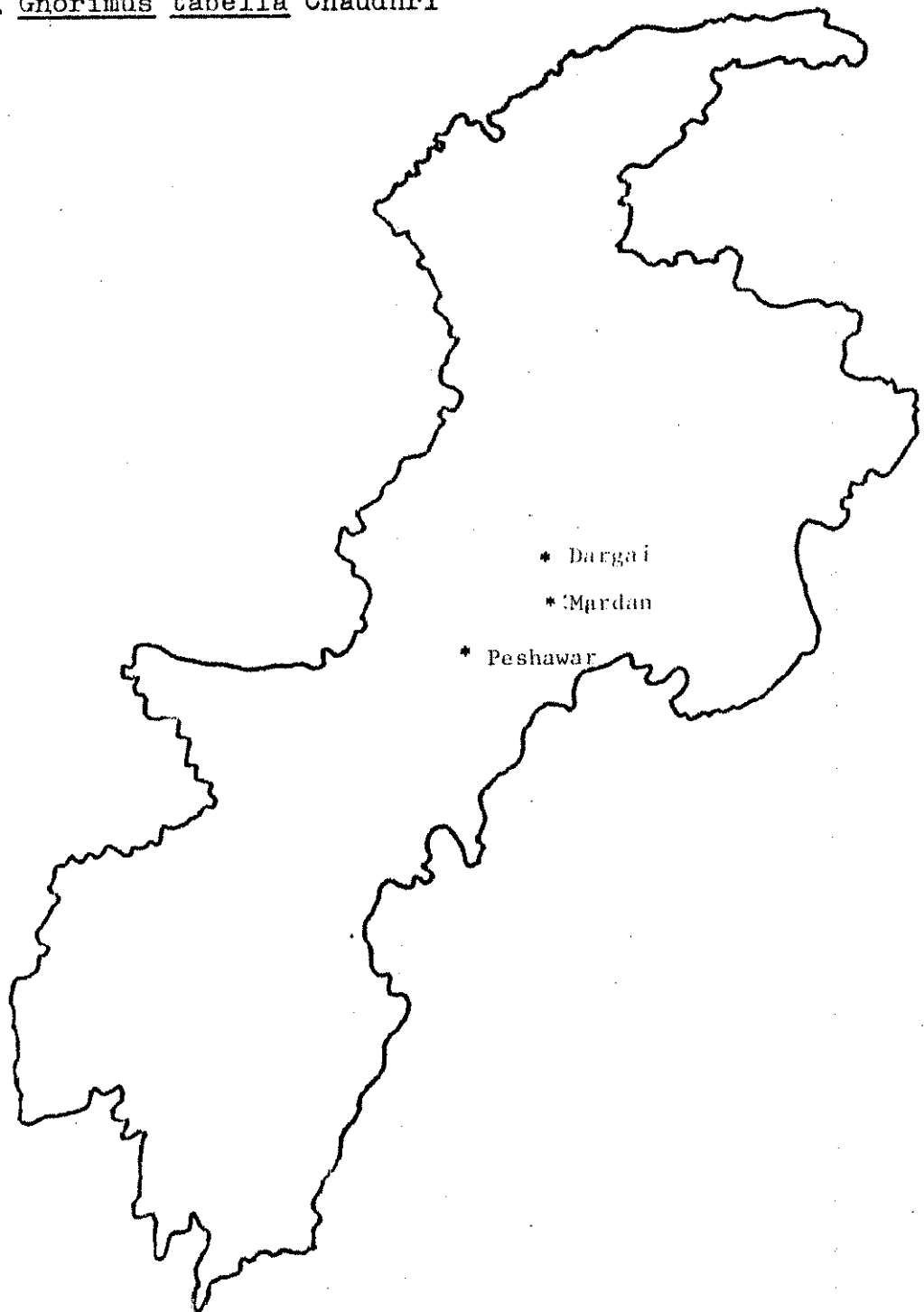
14 μ

N. W. F. P.

COLLECTION AREA

OF

1. Gnorimus tabella Chaudhri



Map No. 1

GENUS PHYTOSEIUS RIBAGA

Phytoseius Ribaga, 1904: 177; Dubininellus Wainstein, 1959: 1365; Phytoseius Ribaga, Chant and Athias-Henriot, 1960: 213; Pennaseius Pritchard and Baker, 1962: 223; Phytoseius Ribaga, Denmark, 1966: 11; Phytoseius Ribaga, Muma and Denmark, 1968: 229; Phytoseius Ribaga, Chaudhri, 1973: 79; Phytoseius Ribaga, Gupta, 1977a: 7; 1977b: 623.

The mites of the genus Phytoseius have been found to inhabit trees and low growing shrubs. In general, they predate upon mites of the families Tetranychidae, Eriophyidae, Tenuipalpidae, Tarsonemidae and small insects. Most of these mites are considered to be of great economic importance as they play a great role in the control of plant feeding mites.

DIAGNOSIS: Dorsal shield entire, smooth or rugose.

Setae: 3 or 4 pairs dorsal setae; 1 pair median setae; 8 pairs lateral setae, some serrate and thickened; 1 or 2 pairs sublateral setae, anterior pair on dorsal shield; 1 pair each of vertical and clunal setae. Ventrianal shield with 1 to 3 pairs preanal setae.

Type Species: Gamasus plumifer Canestrini and Fanzago

Key to PHYTOSEIUS in Pakistan (Females)

1. Sublateral seta, S2 present 2
- Sublateral seta, S2 absent 3

2. Cheliceral movable digit with 2 teeth,
fixed digit with 8 subapical teeth;
L3 14 μ , L6 8 μ P.lyma, new species

Cheliceral movable digit with 1 tooth,
fixed digit with 2 subapical teeth;
L3 42 μ , L6 88 μ P.curvatus Chaudhri
3. Seta L4 smooth; leg IV macrosetae
spatulate with hyaline membrane..... 4

Seta L4 serrate; leg IV macrosetae
knobbed or blunt..... 5
4. Macroseta on leg IV genu present;
seta C1 smooth..... P.spathulatus Chaudhri

Macroseta on leg IV genu absent;
seta C1 serrate..... P.rugulosus Chaudhri
5. Macroseta on leg IV distitarsus
present; macrosetae on leg IV
knobbed P.petentis Chaudhri

Macroseta on leg IV distitarsus
absent; macrosetae on leg IV
blunt..... 6
6. Peritreme up to seta L2; ventrianal
shield pores present..... P.mansehraensis Chaudhri

Peritreme up to seta V; ventrianal
shield pores absent..... 7
7. Seta L2 smooth..... P.flagrum, new species

Seta L2 serrate..... 8
8. Notocephalic pores near M1
present; 3 pairs visible pores on area
surrounding ventrianal shield..... P.mixtus Chaudhri

Notocephalic pores near M1 absent;
no visible pores on area surrounding
ventrianal shield..... P.hormus, new species

2. Phytoseius lyma, new species

(Fig. 2)

FEMALE: Dorsal shield 312μ long, 177μ wide, smooth with 16 pairs dorsal setae and 2 pairs visible pores. Chelicera 31μ long, movable digit with 2 and fixed digit with 8 subapical teeth (Fig.2B). Dorsal setae: 8 pairs lateral setae, 3 pairs dorsal setae, 1 pair each of median setae, vertical setae, clunal setae and 2 pairs sublateral setae. Setae V, L1, L5, L7, L8, S1 and S2 serrate, others smooth (Fig.2A). Dorsal shield setae: V 39μ ; D1-D3 minute; G1 5μ ; L1 89μ , L2 10μ , L3 14μ , L4 14μ , L5 135μ , L6 8μ , L7 81μ , L8 96μ ; M1 minute; S1 50μ , S2 26μ (Fig.2A). Peritremal shield as shown in figure 2C. Peritreme reaching seta V. Sternal shield setae 3 pairs. Metasternal seta 1 pair, each seta on a separate platelet. Genital shield, ventrianal shield, metapodal platelets not clear. Spermatheca as shown in figure 2D, knobbed atrium and bell shaped cervix. Leg IV macrosetae: genu 34μ , tibia 39μ , basitarsus 42μ , distitarsus 66μ , with droplet-like tips in all setae (Fig.2E).

MALE: Not known

TYPE: Holotype female, collected 10 mi.E.Peshawar (Tarnab Farm) 24.ix.1981 (M.Shahid) from brinjal, (Solanum melongena Linn.) and deposited in the Department of Zoology, University of Peshawar. (Map No.2).

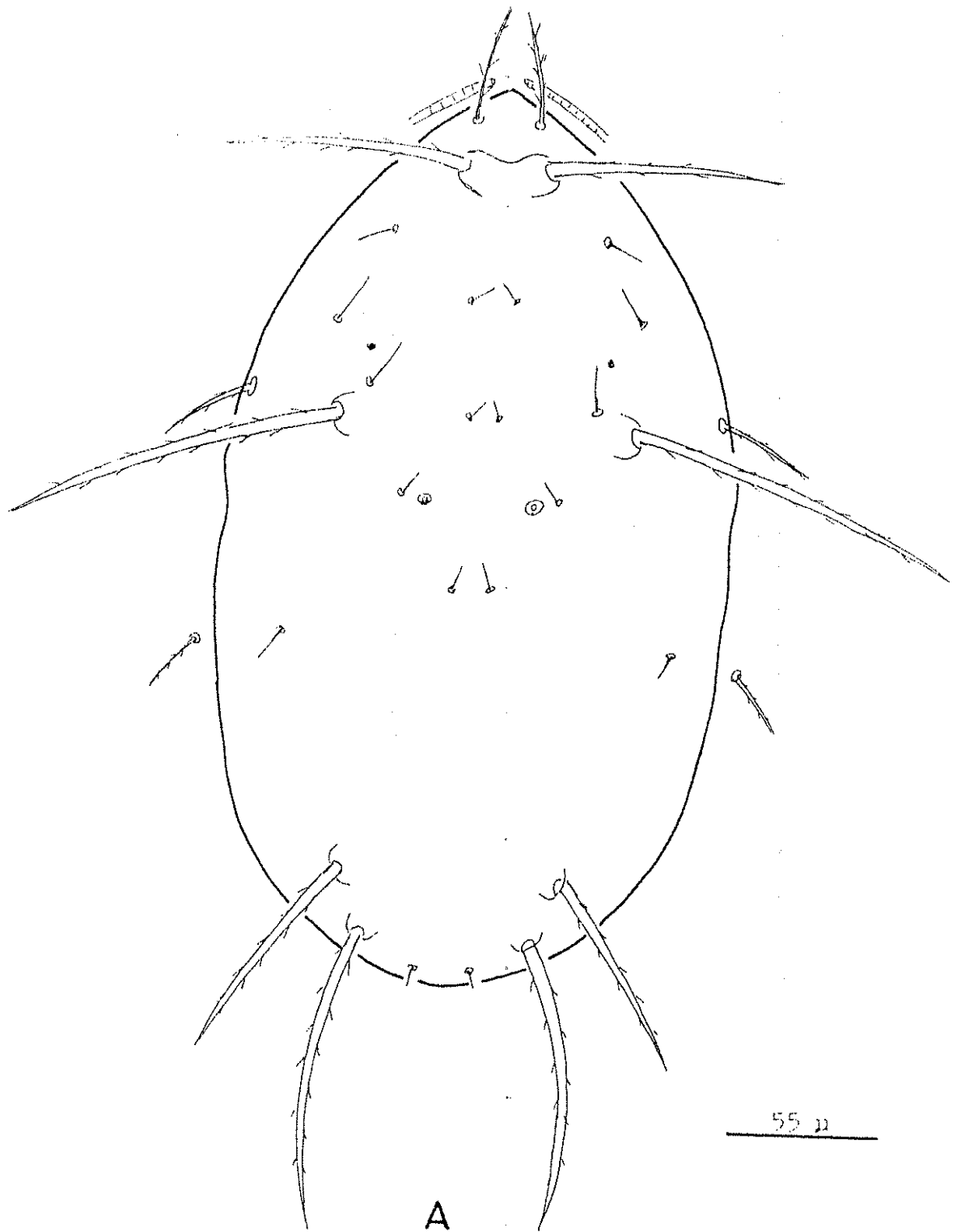
REMARKS:

This new species is closely related to Phytoseius (Phy.) purseglovei Deleon, P.(Phytoseius) orizaba Deleon and

Fig. 2. Phytoseius lyma, new species

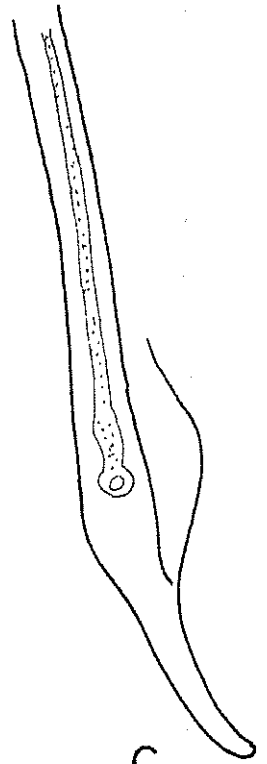
- A. Dorsal shield
- B. Chelicera
- C. Peritremal shield
- D. Spermatheca
- E. Leg IV

Fig. 2

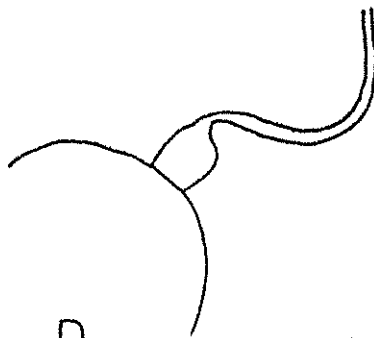




B

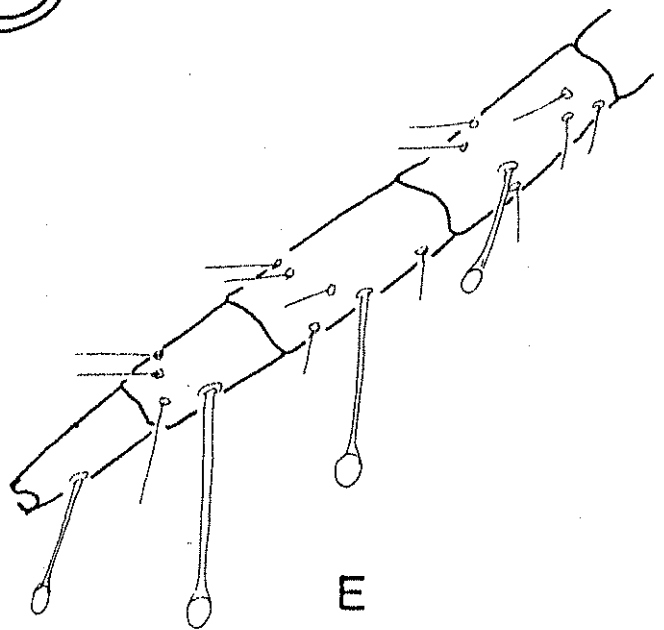


C



D

14 μ



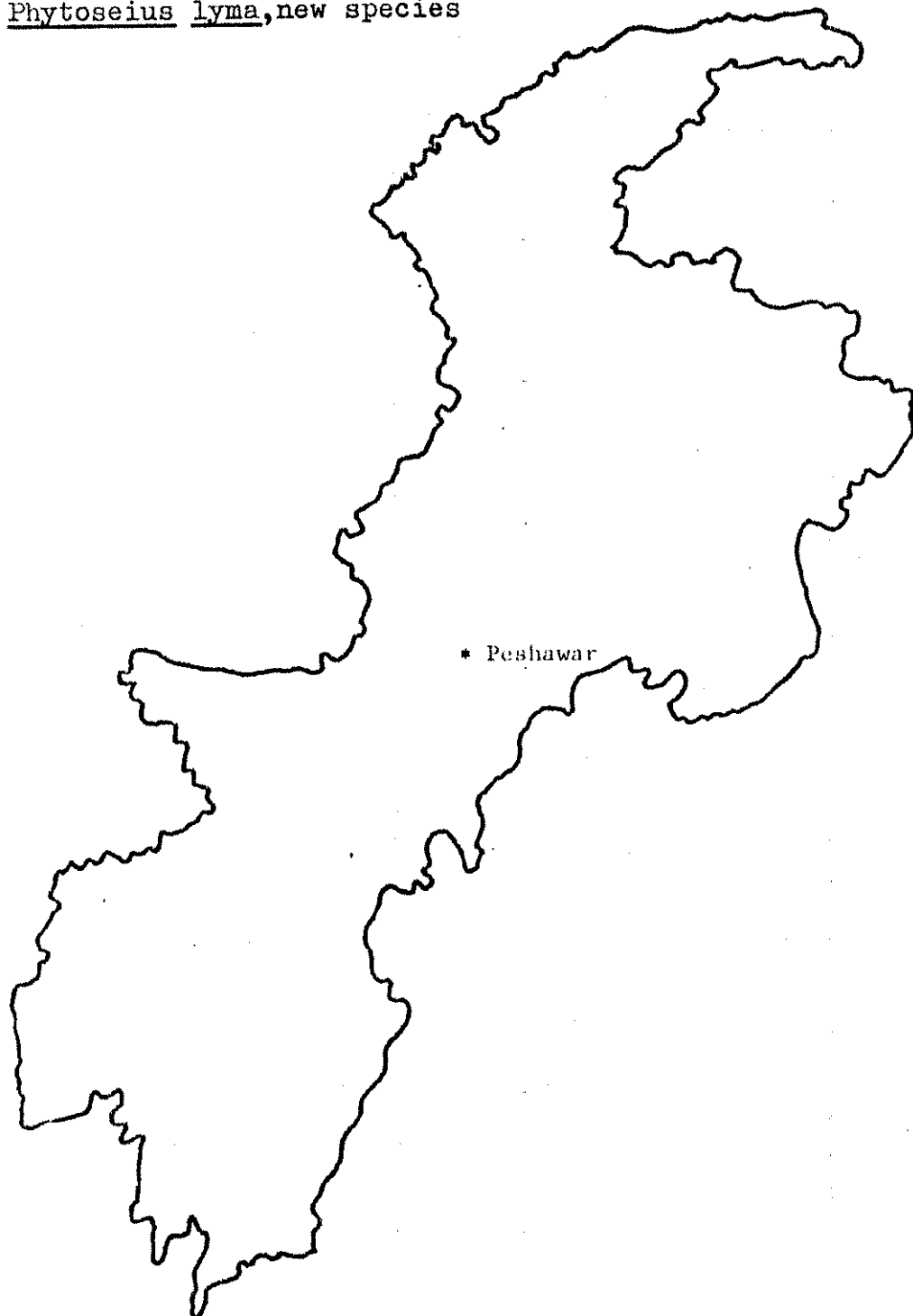
E

27

N. W. F. P.

COLLECTION AREA
OF

2. Phytoseius lyma, new species



Map No. 2

P. (Phytoseius) curvatus Chaudhri due to absence of seta D4. It can be separated from curvatus Chaudhri by the following differences:

1. Dorsal shield smooth in this new species but it is rugose posteriorly in curvatus.
2. Cheliceral movable and fixed digits with 1 and 4 subapical teeth in curvatus as against 2 and 8 subapical teeth, respectively in the new species.
3. Seta L3 and L6 42 μ and 88 μ long in curvatus but only 14 μ and 8 μ long, respectively in this new species.

This new species can also be separated from purseglovei and orizaba where seta V is simple in these species but serrate in the new species.

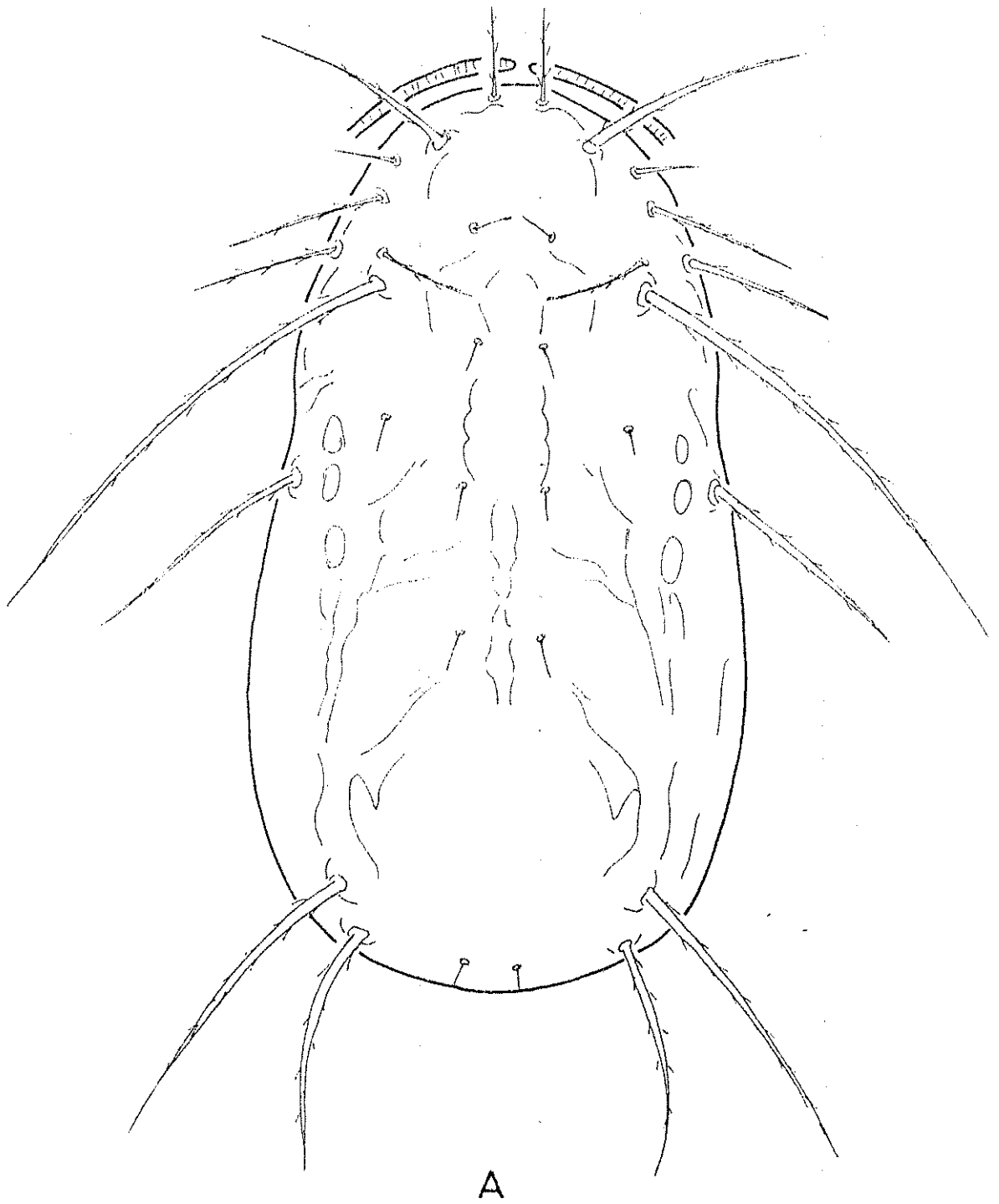
3. Phytoseius flagrum, new species (Fig. 3)

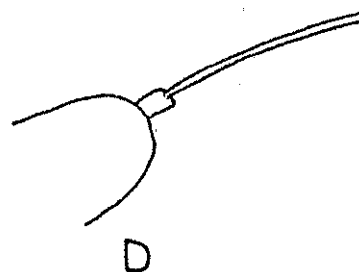
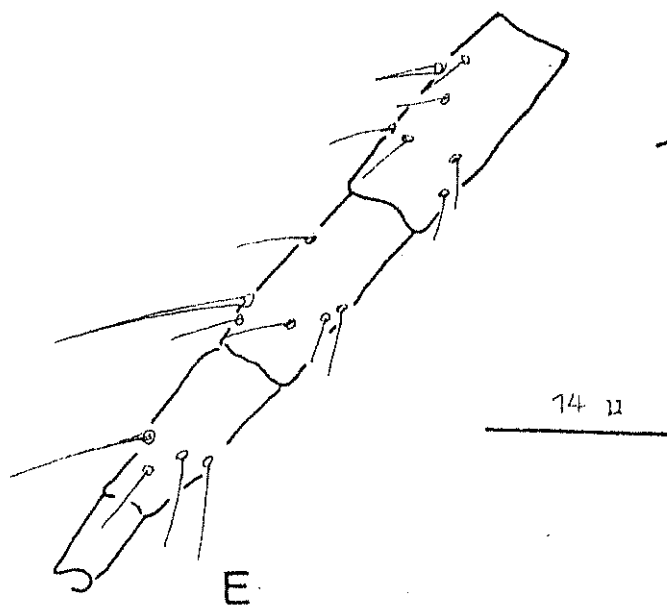
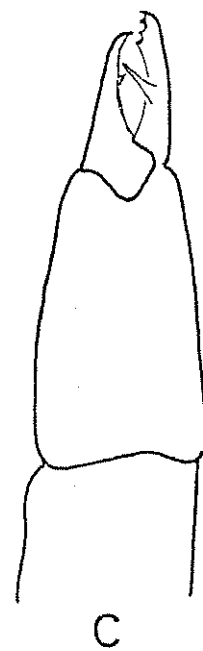
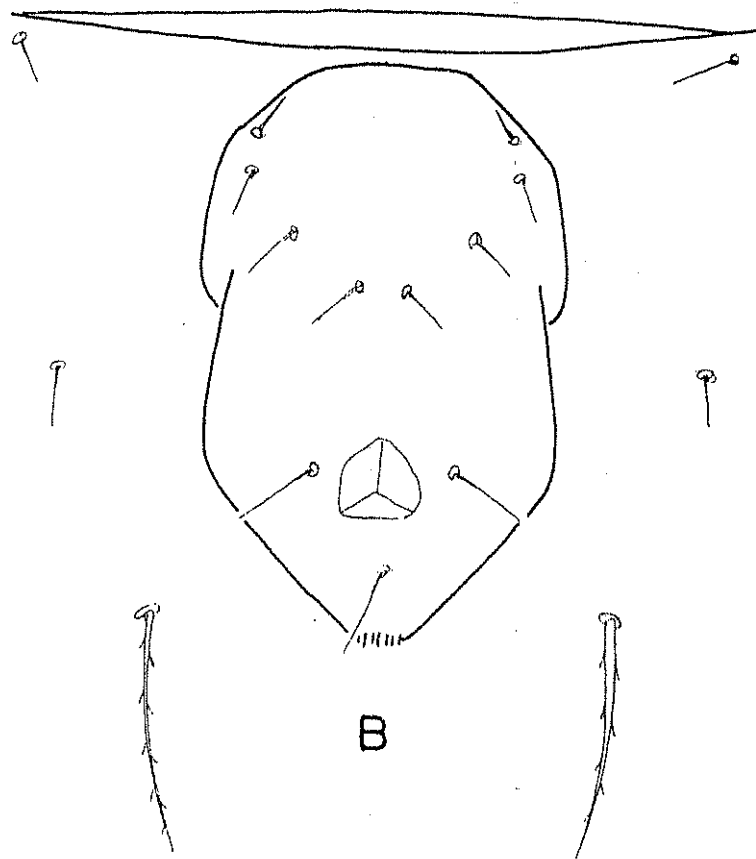
FEMALE: Dorsal shield 302 μ long, 156 μ wide, well sclerotized, rugose, with 16 pairs setae: 8 pairs lateral setae, 4 pairs dorsal setae, 1 pair each of median setae, anterior sublateral setae, vertical setae and clunal setae (Fig. 3A). Chelicera 24 μ long, movable digit with 1 and fixed digit with 3 subapical teeth (Fig. 3C). Dorsal setae, clunal and L2 smooth whereas vertical, L1, L3, L4, L5, L6, L7, L8, and S1 thick and serrate. Dorsal setae: V 34 μ ;

Fig. 3. Phytoseius flagrum, new species

- A. Dorsal shield
- B. Ventrianal shield
- C. Chelicera
- D. Spermatheca
- E. Leg IV

Fig. 3





D1-D4 = 5 μ ; C1 7 μ ; L1 73 μ , L2 18 μ , L3 44 μ , L4 31 μ , L5 133 μ , L6 81 μ , L7 83 μ , L8 73 μ ; M1 6 μ ; S1 52 μ (Fig.3A). Sternal shield with 3 pairs sternal setae. Metasternal setae 1 pair, each seta on a separate platelet. Genital shield 11 μ apart from ventrianal shield with a membranous fold inbetween. Ventrianal shield 91 μ long, 57 μ wide, with 4 pairs preanal setae, preanal pores absent (Fig.3B). Three pairs setae on membrane surrounding ventrianal shield, seta VI1 57 μ long, serrate. One pair elongated metapodal platelets, 21 μ long. Peritreme reaching base of seta V. Spermatheca with knotted atrium and bell-shaped cervix, atrium 3 μ long (Fig.3D). Leg IV macrosetae: genu 16 μ , tibia 57 μ , basitarsus 34 μ with blunt end (Fig.3E).

MALE: Not known.

TYPE: Holotype female, collected 2 mi. E. Mingora (Swat 4000'), 5.x 1981 (M. Shahid) from apple (Malus domestica) and deposited in the Department of Zoology, University of Peshawar (Map No.3).

REMARKS:

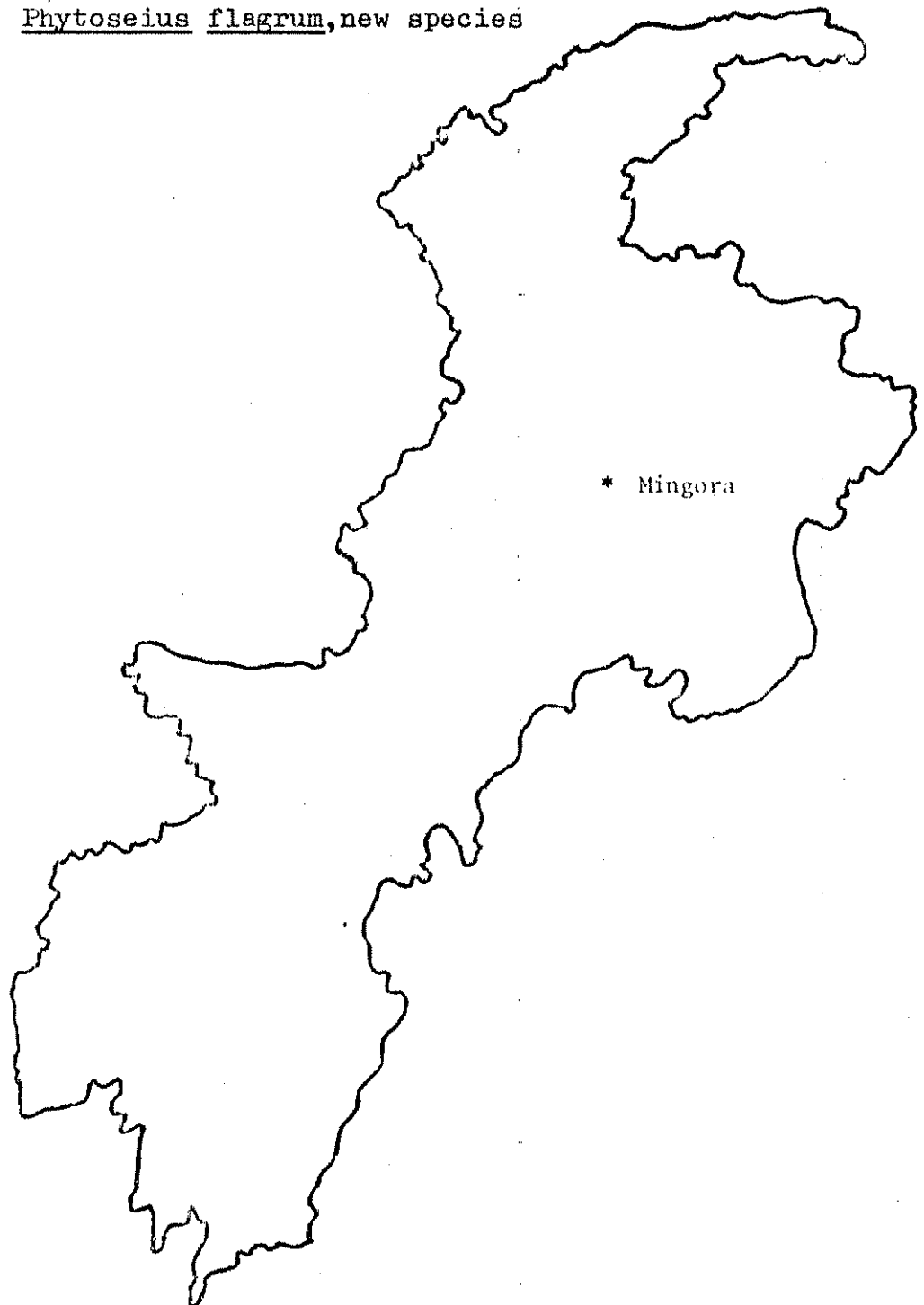
This new species is closely related to Phytocellus mixtus Chaudhri and hornus, new species on the basis of many body characters but the following characters separate them from one another.

1. Seta L2 serrate in mixtus and hornus, new species whereas it is smooth in this new species.
2. Shape of ventrianal shield differs in these three species.
3. Pattern of ornamentation on the dorsal shield differs in these species.

N. W. F. P.

COLLECTION AREA
OF

3. Phytoseius flagrum, new species



Map No. 3

4. Phytoseius hornus, new species
(Fig.4)

FEMALE: Dorsal shield 290 μ long, 188 μ wide, sclerotized, rugose, reticulated medially with 15 pairs setae: 8 pairs lateral setae, 3 pairs dorsal setae, 1 pair each of median setae, anterior sublateral setae, vertical and clunal setae. Dorsal and clunal setae smooth, all other setae thick and serrate (Fig.4A). Chelicera 21 μ long, movable digit with 1 and fixed digit with 3 subapical teeth (Fig. 4D). Dorsal setae: V 31 μ ; D1 = D2 = D3 = 5 μ ; C1 5 μ ; L1 63 μ , L2 17 μ , L3 34 μ , L4 23 μ , L5 130 μ , L6 81 μ , L7 91 μ , L8 70 μ ; M1 5 μ ; S1 50 μ , (Fig.4A). Peritremal shield as shown in figure 4E. Peritreme reaching seta V(Fig.4A). Sternal shield with 3 pairs sternal setae. Metasternal setae 1 pair, each seta on a separate platelet. Genital shield 26 μ apart from ventrianal shield with a membranous fold inbetween with 1 pair setae. Genital shield much wider than ventrianal shield. Ventrianal shield longer than wide with 3 pairs preanal setae, without pores, 68 μ long, 31 μ wide (Fig.4B). Three pairs setae on membrane surrounding ventrianal shield, seta VL1, serrate, 55 μ long (Fig.4B). One pair elongated metapodal platelets, 26 μ long. Spermatheca with knobbed artium 3 μ long and bell-shape cervix (Fig.4F). Leg IV macrosetae, pointed, tibia 52 μ , basitarsus 26 μ (Fig.4C).

MALE: Not known

TYPE: Holotype female, collected 3 mi.E.Peshawar

15.x.1981 (M.Shahid) from wheat straw (Triticum aestivum);
one female collected, 1 mi.S.Dargai, 14.xi.1982 from grapes
(Vitis vinifera), one female collected, Kalash valley (Chitral),
7.vii.1980 from walnut (Juglans regia) and deposited in the
Department of Zoology, University of Peshawar (Map No.4).

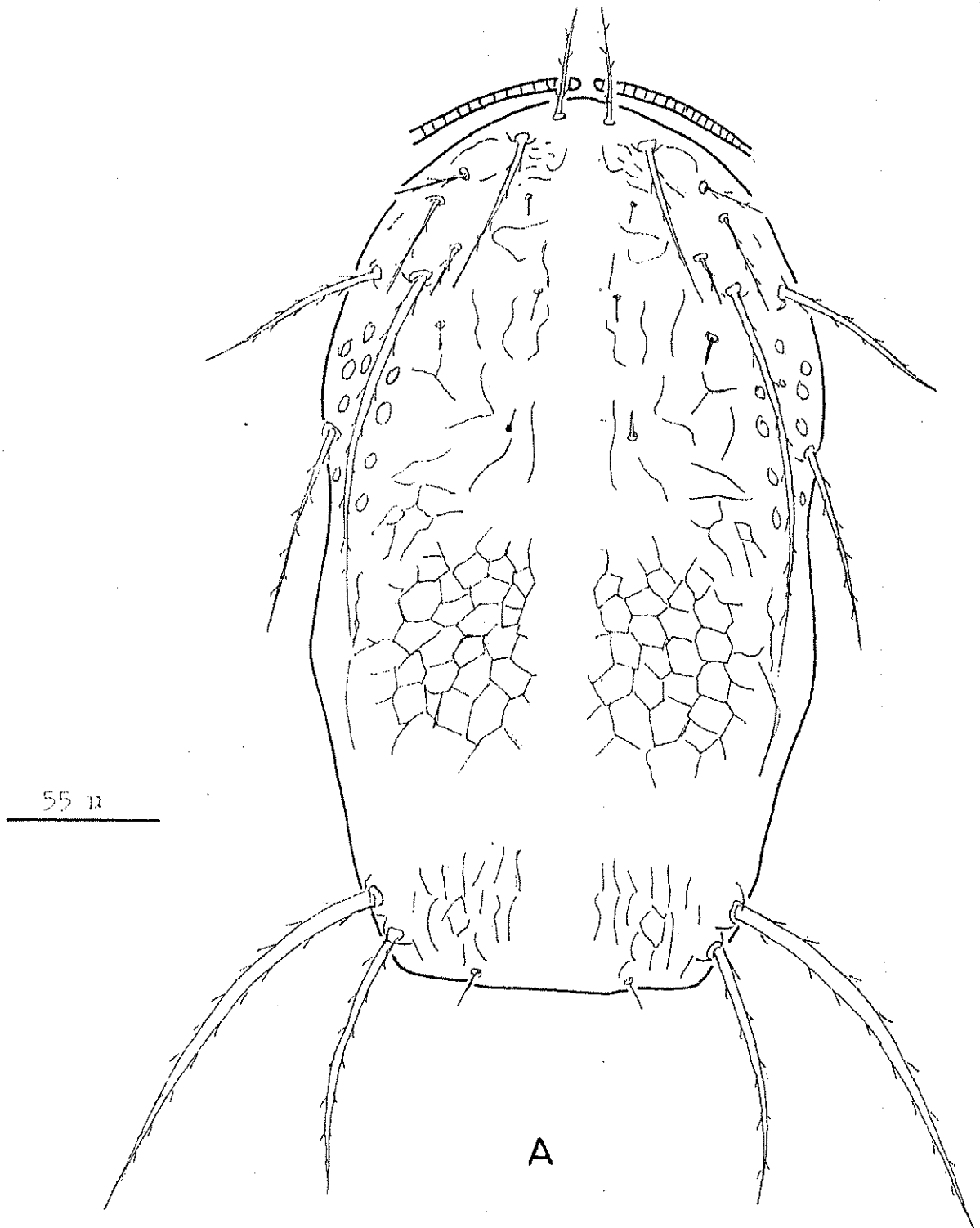
REMARKS:

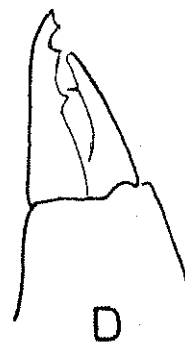
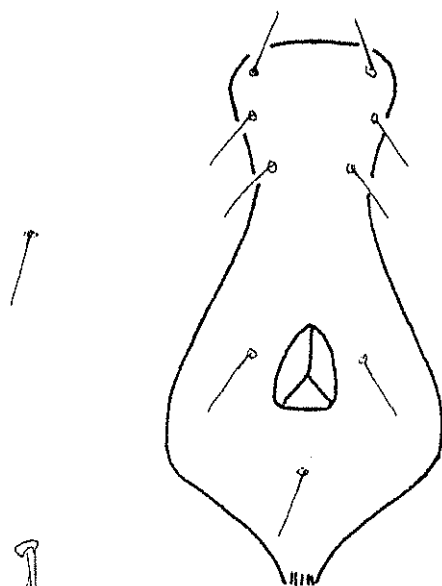
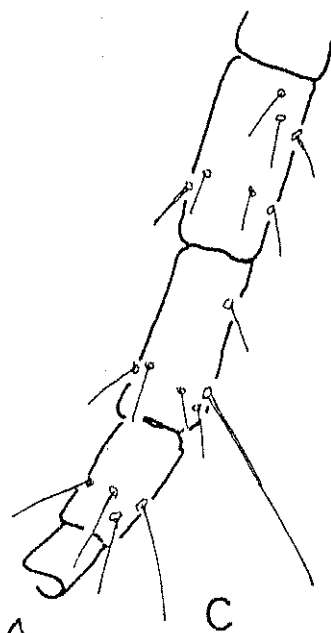
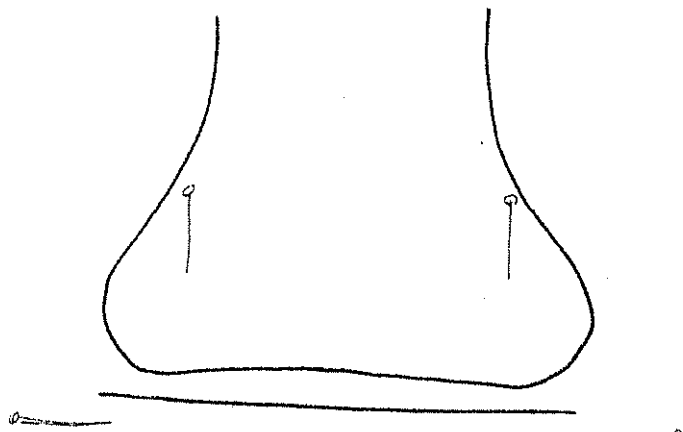
This new species is closely related to Phytoseius mixtus
Chaudhri due to similarity of most of the body characters
but shape of ventrianal shield, absence of notocephalic
pores near M1, absence of pores on area surrounding ventrianal
shield in this new species separate it from P. mixtus
Chaudhri.

Fig. 4. Phytoscius bernus, new species

- A. Dorsal shield
- B. Genital and Ventrianal shields
- C. Leg IV
- D. Chelicera
- E. Peritremal shield
- F. Spermatheca

Fig. 4

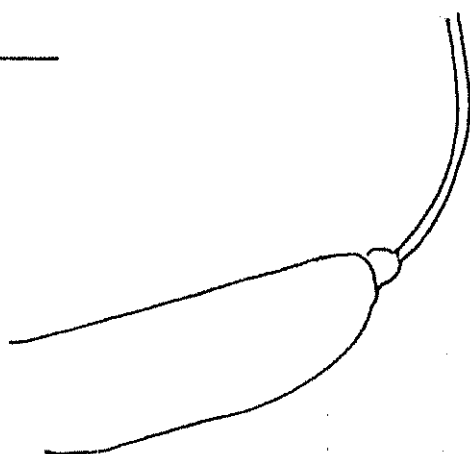




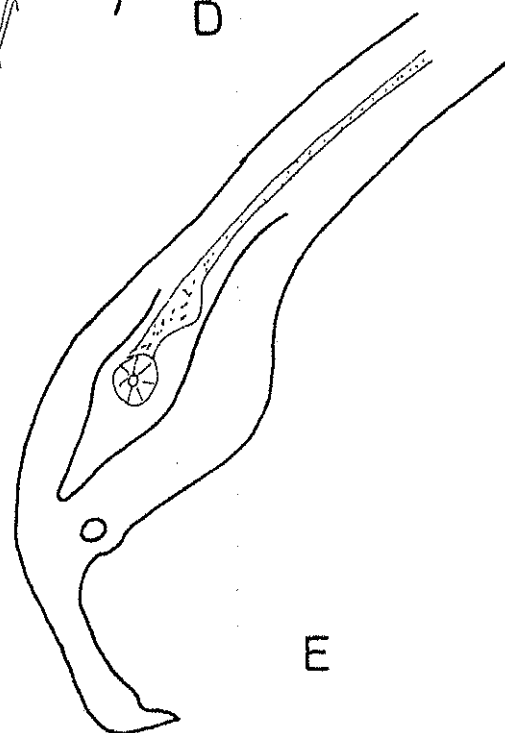
B

D

14 μ



F



E

47
N. W. F. P.

COLLECTION AREA
OF

4. Phytoseius hornus, new species



Map No. 4

GENUS AMBLYDROMELLA MUMA

Amblydromella Muma, 1961a: 294.

Typhlodromella Muma, 1961a: 299, synonymy after Muma 1967.

Amblydromella Muma, Chaudhri, 1975b:201, 1979:25.

Nesbitt (1951) described 19 species of the genera Typhlodromus and Phytoseius. Chant (1959) reviewed the family Phytoseiidae and divided it into 2 subfamilies viz., Macroseiinae and Phytoseiinae. He included 8 genera in the subfamily Phytoseiinae and genus Typhlodromus Scheuten was one of them. He further divided the genus Typhlodromus into 2 subgenera viz., Amblyseius and Typhlodromus. The subgenus Typhlodromus was characterized by having 8 to 12 pairs of lateral setae, 2 to 4 pairs of preanal setae and was again divided into 12 species groups on the basis of number of setae on dorsal shield and ventrianal shield. Chant (1959) included all the species having 10 pairs of lateral setae and 4 pairs of preanal setae in the rhenanus group. He also placed Typhlodromus (Typhlodromus) pyri Scheuten with 9 pairs of lateral setae in this group.

Muma (1961a) reclassified the family Phytoseiidae and added 29 new genera to it. He mentioned Neoseiulus Hughes, Amblydromella Muma, Clavidromus Muma, Anthoseius DeLeon, Typhlodromella Muma and Paraseiulus Muma as having 10 pairs of lateral setae. He used number of setae on sternal shield, ventrianal shield and macrosetae on leg IV as diagnostic characters for the separation of these genera. He placed

the species with 9 pairs of lateral setae, 4 pairs preanal setae and 1 macroseta on leg IV in the genus Typhlodromus Scheuten and transferred T.(T.)pyri Scheuten from the rhenanus group of Chant (1959) to the genus Typhlodromus as a type species. He separated these genera on basis of the following characters:

<u>GENUS NAME</u>	<u>STERNAL SETAE</u>	<u>PREANAL SETAE</u>	<u>LEG IV MACROSETAE</u>
<u>Neoseiulus</u> Hughes	3	3	0
<u>Amblydromella</u> Muma	3	3-4 *	3
<u>Clavidromus</u> Muma	2	3	3
<u>Anthoseius</u> DeLeon	2	3	0
<u>Typhlodromella</u> Muma	2	4	0-1
<u>Paraseiulus</u> Muma	2	2-4	0

* In one species, the author has noted 2 pairs preanal setae.

Later on, many Acarologists viz., Pritchard and Baker (1962), Schuster and Pritchard (1963), Ehara (1964, 1966b) retained Neoseiulus Hughes for those phytoseiid mites which had 10 pairs of lateral setae. Corpuz (1966), Prasad (1968a), Wainstein (1958), Wainstein and Arutunjan (1968) placed their specimens with 10 pairs lateral setae in the genus Typhlodromus. Muma and Denmark (1970) worked on the mite fauna of Florida and presented a new classification of mites.

Muma (1967) synonymized genus Typhlodromella with the genus Amblydromella because Amblydromella fleschneri (Chant)

and Typhlodromella rhenanus (Oudemans) the genotype of these genera are morphologically very closely related. He also described 2 new species, Amblydromella loraliana and Amblydromella ghanii from the collection which was sent to him Dr.M.A.Ghani, the then Entomologist Incharge, C.I.B.C. in Pakistan. This indicated the occurrence of genus Amblydromella in Pakistan.

Chaudhri (1975b, 1979) described 16 species belonging to the genus Amblydromella from Pakistan. He included these species in this genus instead of placing them in genus Anthoseius or Typhlodromus.

Moreover Muma and Denmark (1970) synonymized Amblydromella under Orientiseius. Chaudhri (1975b) did not agree to it and considered them two independent genera due to the following differences:

- and
1. Setae L2 L4 minute to short in Orientiseius but this condition does not prevail in the species of the genus Amblydromella where they are subequal.
2. Whip-like setae may be present in the species of Orientiseius whereas the case is not so in Amblydromella species.
3. Bulbous setae are present in most of the species of the genus Amblydromella while in the species of the genus Orientiseius, the setae are pointed.

I agree with Chaudhri (1975b and 1979) and place the following 6 species under the genus Amblydromella. This makes a total of 22 species collected from Pakistan.

DIAGNOSIS: Dorsal shield with 10 pairs lateral setae, L10, M2 may be knobbed; 1 pair vertical setae; 4 pairs dorsal setae; 1 pair clunal setae; 2 pairs median setae; 2 pairs sublateral setae; 2-3 pairs sternal setae; 2-4 pairs preanal setae; 4 pairs setae on membrane surrounding ventrianal shield including VL1. Chelicera normal in size, with different number of teeth on movable and fixed digits. Leg IV with 1-3 macrosetae, sometimes bulbous. Two pairs metapodal platelets.

TYPE SPECIES : Typhlodromus fleschneri Chant

Key to AMBLYDROMELLA in Pakistan
(Females)

1. Macrosetae on leg IV, pointed 2
Macrosetae on leg IV, bulbous 10
2. Dorsal shield smooth/partly
reticulated, slightly concave
near S2 3
Dorsal shield completely
reticulated, deeply concave
near S2 7
3. Macroseta on leg IV basitarsus
only; dorsal shield partly
reticulated 4
Macrosetae on leg IV genu,
tibia and basitarsus; dorsal
shield smooth 6
4. Seta M2 simple; 1 pair preanal
pores on ventrianal shield A. divergentis
Chaudhri
Seta M2 serrate; pores absent on
ventrianal shield 5

5. Dorsal shield with 1 pair visible pores; 2 pairs pores on membrane surrounding ventrianal shield A. balakotiensis Chaudhri
- Dorsal shield with 4 pairs visible pores; 1 pair pores and 1 pair minute platelets on membrane surrounding ventrianal shield A. sica Chaudhri
6. Dorsal shield with 2 pairs visible pores; 3 pairs preanal setae and a pair of pores on ventrianal shield; L10 and M2 serrate, pointed A. teramon, new species
- Dorsal shield without visible pores; 4 pairs preanal setae, pores absent; only L10 serrate, pointed and M2 simple A. zerena, new species
7. Seta M2 simple; preanal setae, 3 pairs A. canaster, new species
- Seta M2 serrate; preanal setae, 4 pairs 8
8. Dorsal shield with visible pores; ventrianal shield wider than width of genital shield 9
- Dorsal shield without visible pores; ventrianal shield not wider than width of genital shield A. ornatulus Chaudhri
9. Dorsal shield with 5 pairs visible pores; cheliceral fixed digit with 3 and movable digit with 4 subapical teeth A. libitus Chaudhri
- Dorsal shield with 3 pairs visible pores; cheliceral fixed digit with 2 and movable digit with 6 subapical teeth A. octavus Chaudhri

D 16675

10. Macrosetae present on genu,
tibia and basitarsus of
leg IV 11
- Macroseta present on leg
IV basitarsus only 18
11. Seta L10 serrate, pointed/
leaf-like 12
- Seta L10 serrate, bulbous 15
12. Seta M2 serrate A. eremitidis
Chaudhri
- Seta M2 smooth 13
13. Cheliceral movable digit with
3 teeth, fixed digit with 6
subapical teeth A. zafari (Chaudhri)
- Cheliceral movable and fixed
digits with less than 3 and 6
subapical teeth, respectively 14
14. Setae L8, L9 smooth; cheliceral
movable digit with 1 tooth,
fixed digit with 2 subapical
teeth A. chashmaensis,
new species
- Setae L8, L9 serrate; cheliceral
movable digit without teeth,
fixed digit with 3 subapical
teeth A. kalashiensis,
new species
15. Seta M2 smooth A. galumnatus Chaudhri
- Seta M2 serrate 16
16. Seta M2 serrate, pointed A. umbratus Chaudhri
- Seta M2 serrate, bulbous 17
17. Ventrianal shield preanal setae,
2 pairs; peritreme reaching
between setae L1- L2 A. mardaniensis, new

Ventrianal shield preanal
setae, 4 pairs; peritreme
reaching beyond seta V.....

A. limitatus
Chaudhri

18. All dorsal shield setae
serrate except D1- D3, M1
and C1 setae.....

A. serratus
Chaudhri

All dorsal shield setae
smooth except L10 and M2 19

19. All dorsal shield setae short
of distance to seta next in
line 20

All dorsal shield setae not
short of distance to seta
next in line 21

20. Dorsal shield with 5 pairs
visible pores; membrane
surrounding ventrianal
shield with 1 pair minute
platelets

A. plebius Chaudhri

Dorsal shield with 3 pairs
visible pores; membrane
surrounding ventrianal
shield with 2 pairs pores

A. incensus Chaudhri

21. Seta L1 longer than L1- L2;
L3 longer than L3- L4 ; dorsal
shield deeply reticulated

A. dactylifera
Chaudhri

Seta L1 smaller than L1- L2 ;
dorsal shield faintly reticulated.

A. maracus Chaudhri

5. Amblydromella teramon, new species
(Fig.5)

FEMALE: Dorsal shield smooth, 333 μ long, 192 μ wide with 18 pairs setae on dorsal shield and 2 pairs visible pores. Chelicera 26 μ long, movable digit smooth, fixed digit with 3 subapical teeth (Fig.5F). All setae, stout, smooth except M2 and L10, serrate. Dorsal setae L1- L6 longer than distance to seta next in line, L7 just reaching base seta L8, M2 longer than distance M2 - L10, bases of setae M2 and L8 at level with each other (Fig.5A). Dorsal setae: V 21 μ ; D1 23 μ , D2 26 μ , D3 36 μ , D4 44 μ ; C1 5 μ ; L1 34 μ , L2 23 μ , L3 34 μ , L4 42 μ , L5 43 μ , L6 57 μ , L7 57 μ , L8 53 μ , L9 10 μ , L10 52 μ ; M1 26 μ , M2 60 μ ; S1 26 μ , S2 29 μ (Fig.5A). Peritremal shield as shown in figure 5D. Peritreme reaching seta V. Sternal shield with 3 pairs sternal setae. Metasternal setae, 1 pair, each seta on a separate platelet. Genital shield 11 μ apart from ventrianal shield. Ventrianal shield 140 μ long, 105 μ wide with 3 pairs preanal setae and a pair of elliptical pores (Fig.5B). Three pairs setae on membrane surrounding ventrianal shield, seta VL1 42 μ long, smooth, Metapodal platelets, 2 pairs, primary, 1 pair, 26 μ long, secondary, 1 pair, 5 μ long. Spermatheca as shown in figure 5C. Leg IV macrosetae, simple, pointed, genu 18 μ , tibia 21 μ , basitarsus 31 μ long (Fig.5E).

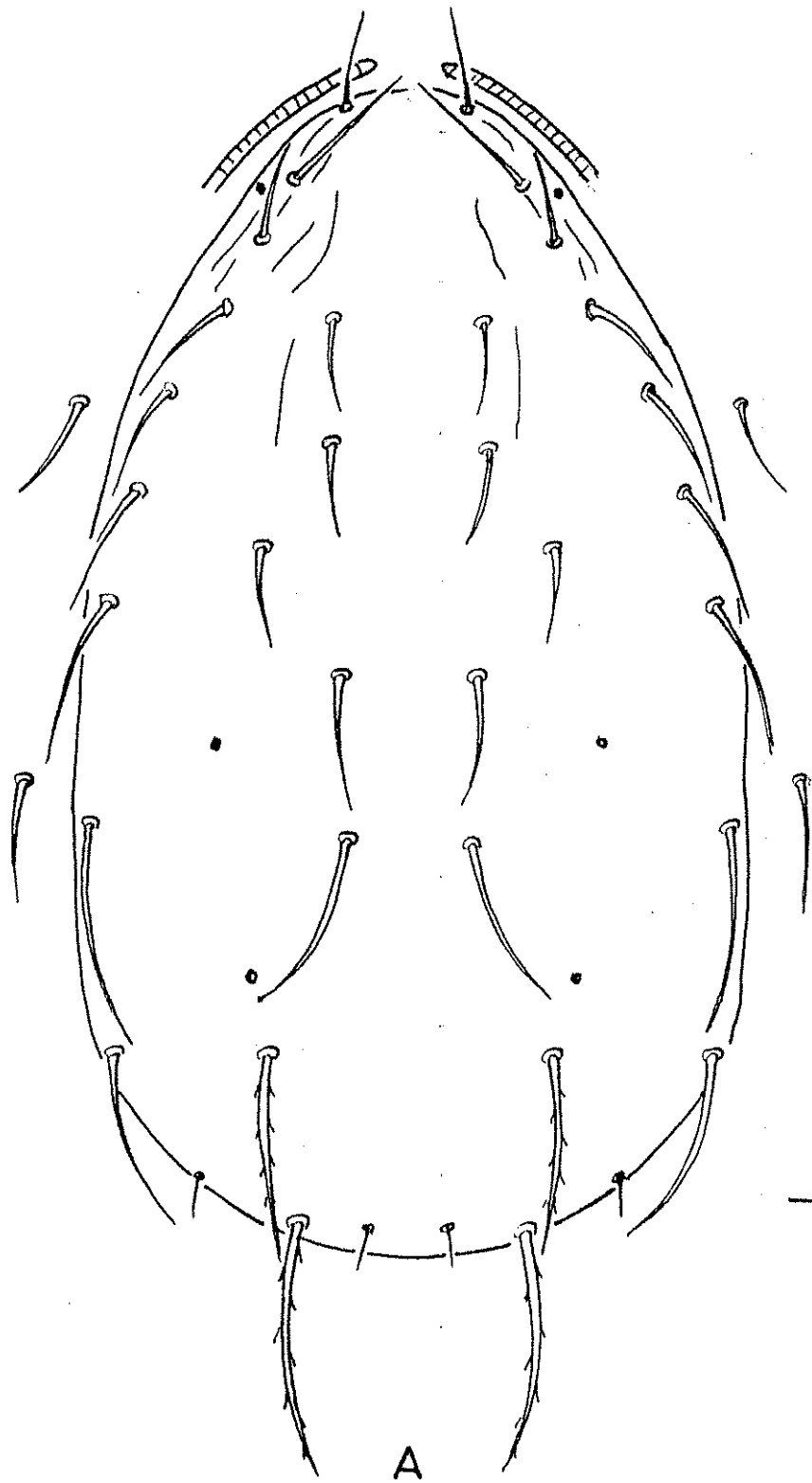
MALE: Not known.

TYPE: Holotype female, collected N.W.F.P. Agricultural University, Peshawar, 8.ix.1981 (M. Shahid) from Diospyros kaki and deposited in the Department of Zoology, University of Peshawar, Peshawar (Map No.5).

Fig. 5. Amblydromella terapon, new species

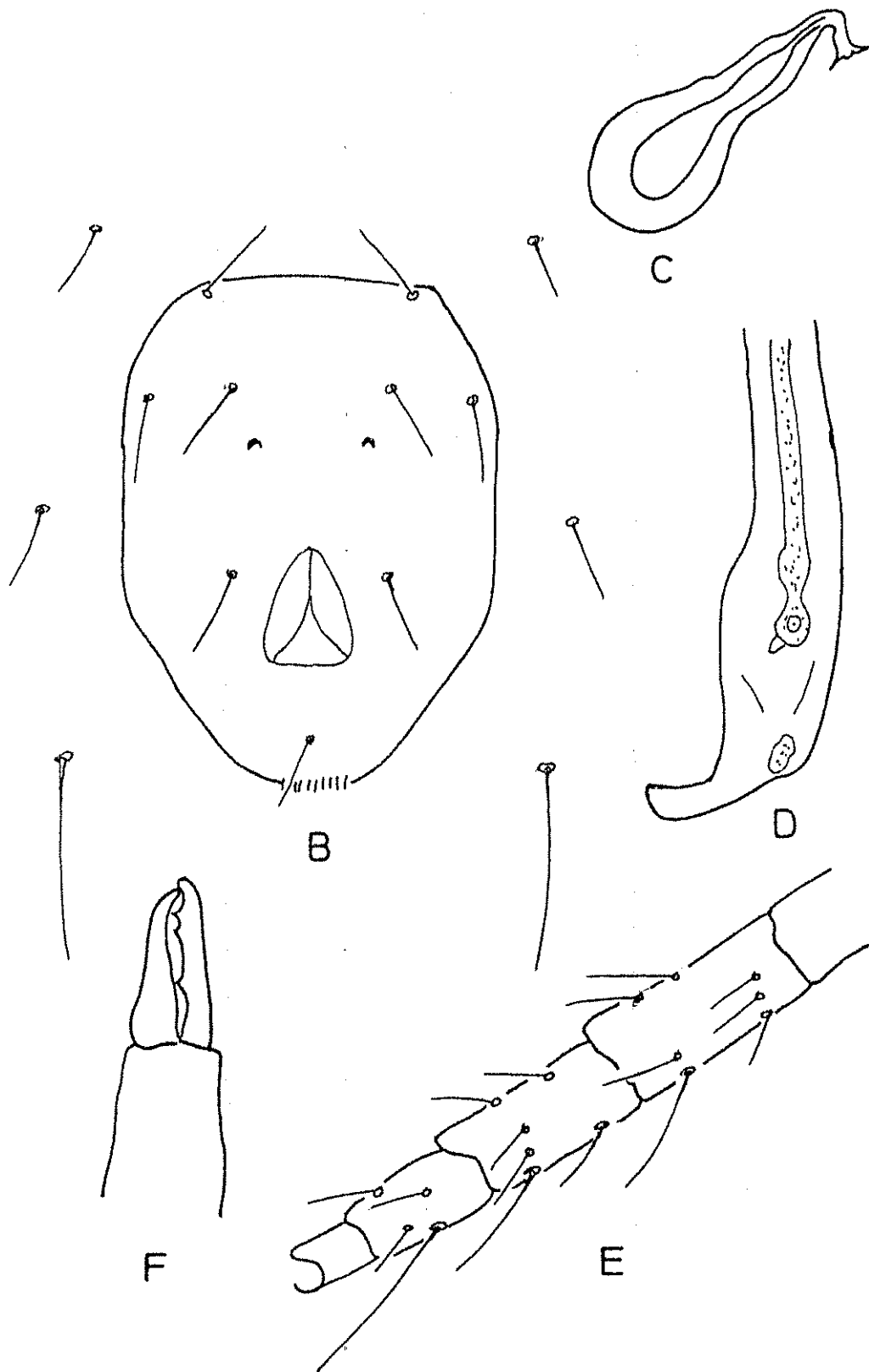
- A. Dorsal shield
- B. Ventrianal shield
- C. Spermatheca
- D. Peritremal shield
- E. Leg IV
- F. Chelicera

Fig.5



55 μ

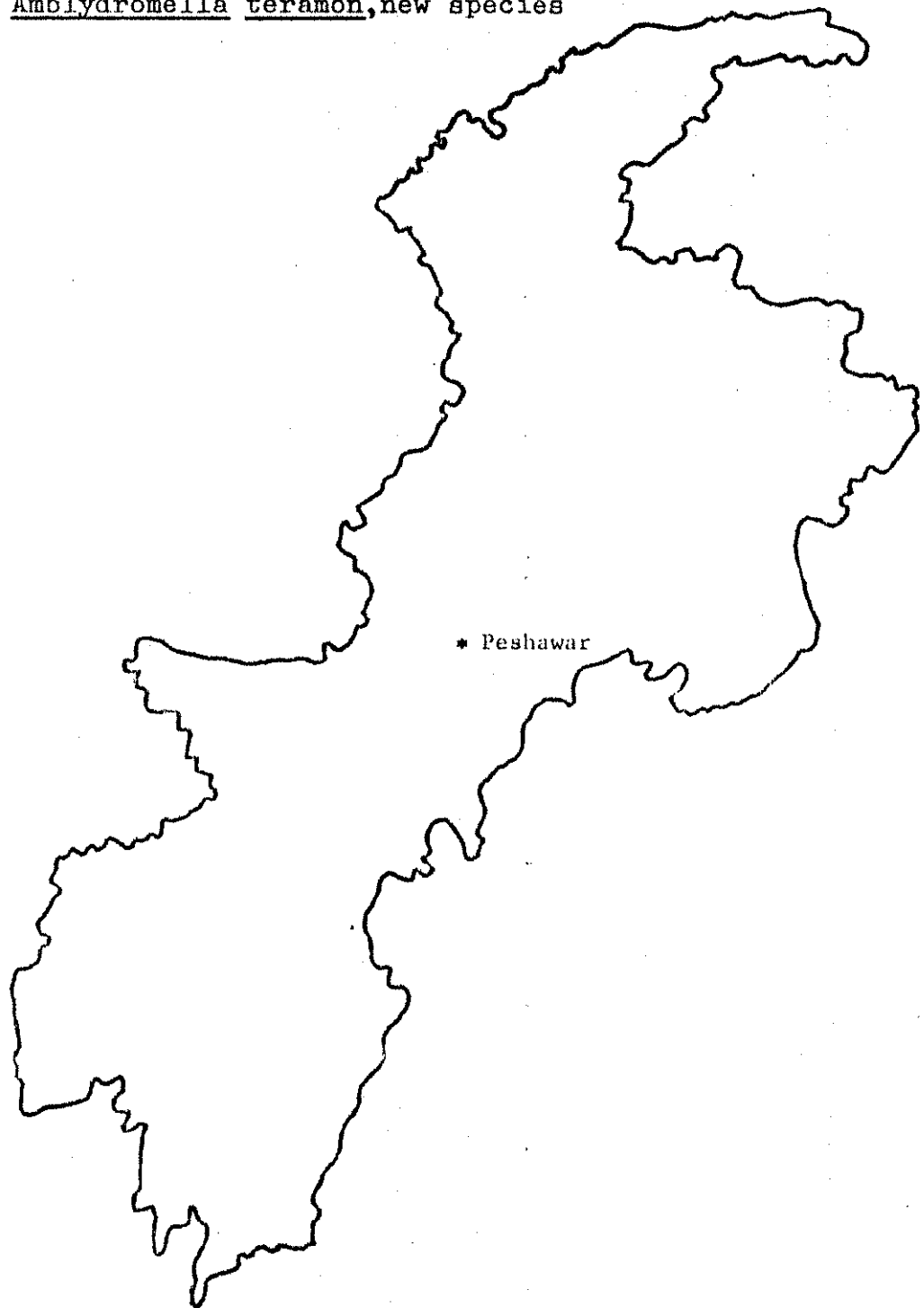
A



53
N. W. F. P.

COLLECTION AREA
OF

5. Amblydromella teramon, new species



Map No. 5

REMARKS: This new species is comparable with Amblydromella divergentis Chaudhri, Amblydromella balakotientis Chaudhri and Amblydromella sica Chaudhri due to some of the body characters but it can be separated from them on basis of the following differences.

1. Dorsal shield partly reticulated in divergentis, balakotensis and sica but it is smooth in this new species.
2. Leg IV with 1 macroseta in divergentis, balakotiensis and sica but 3 macrosetae on leg IV in this new species.
3. Ventrianal shield with 4 pairs preanal setae in divergentis, balakotiensis and sica but 3 pairs preanal setae in this new species.

This new species can also be separated from Amblydromella zerena, new species due to M2 serrate, without concave area near S2, 2 pairs visible pores on dorsal shield, 3 pairs preanal setae on ventrianal shield and shape of ventrianal shield.

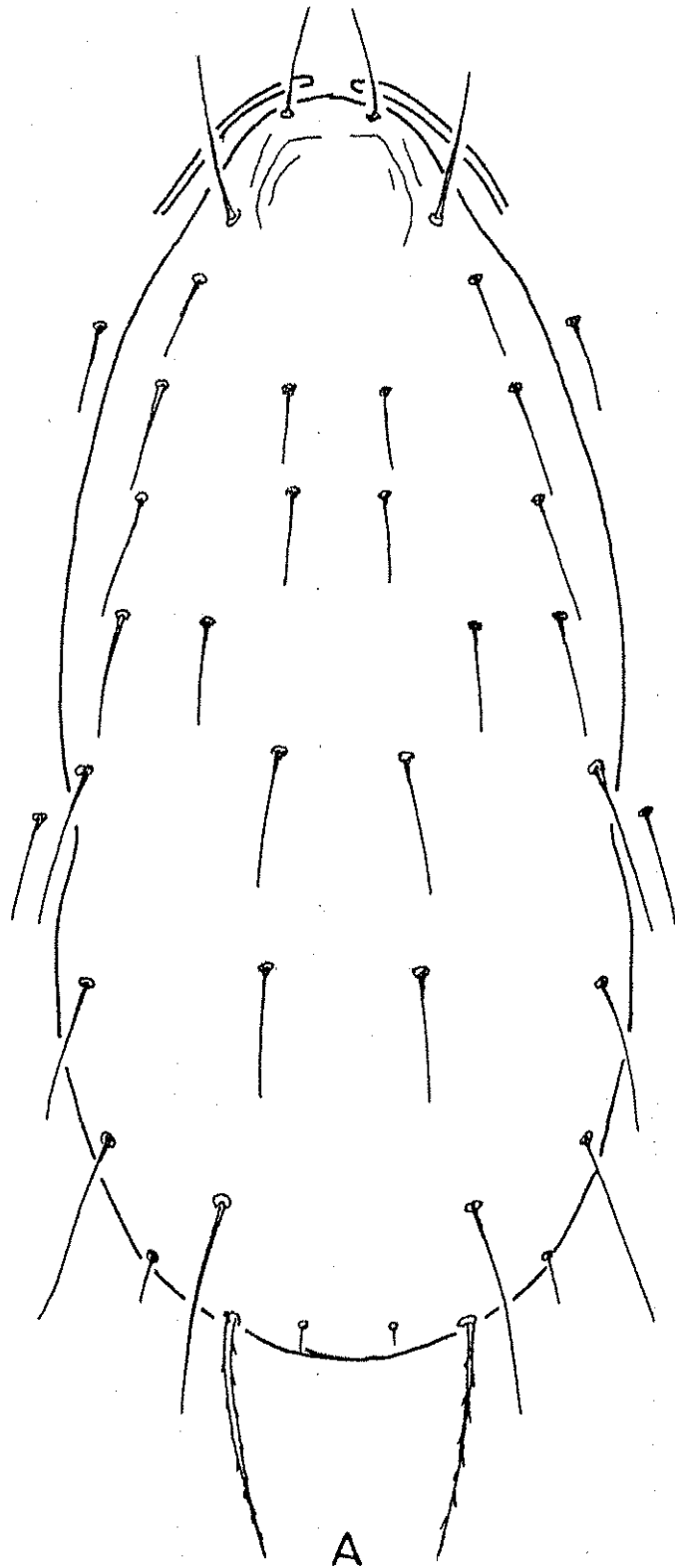
6. Amblydromella zerena, new species (Fig.6)

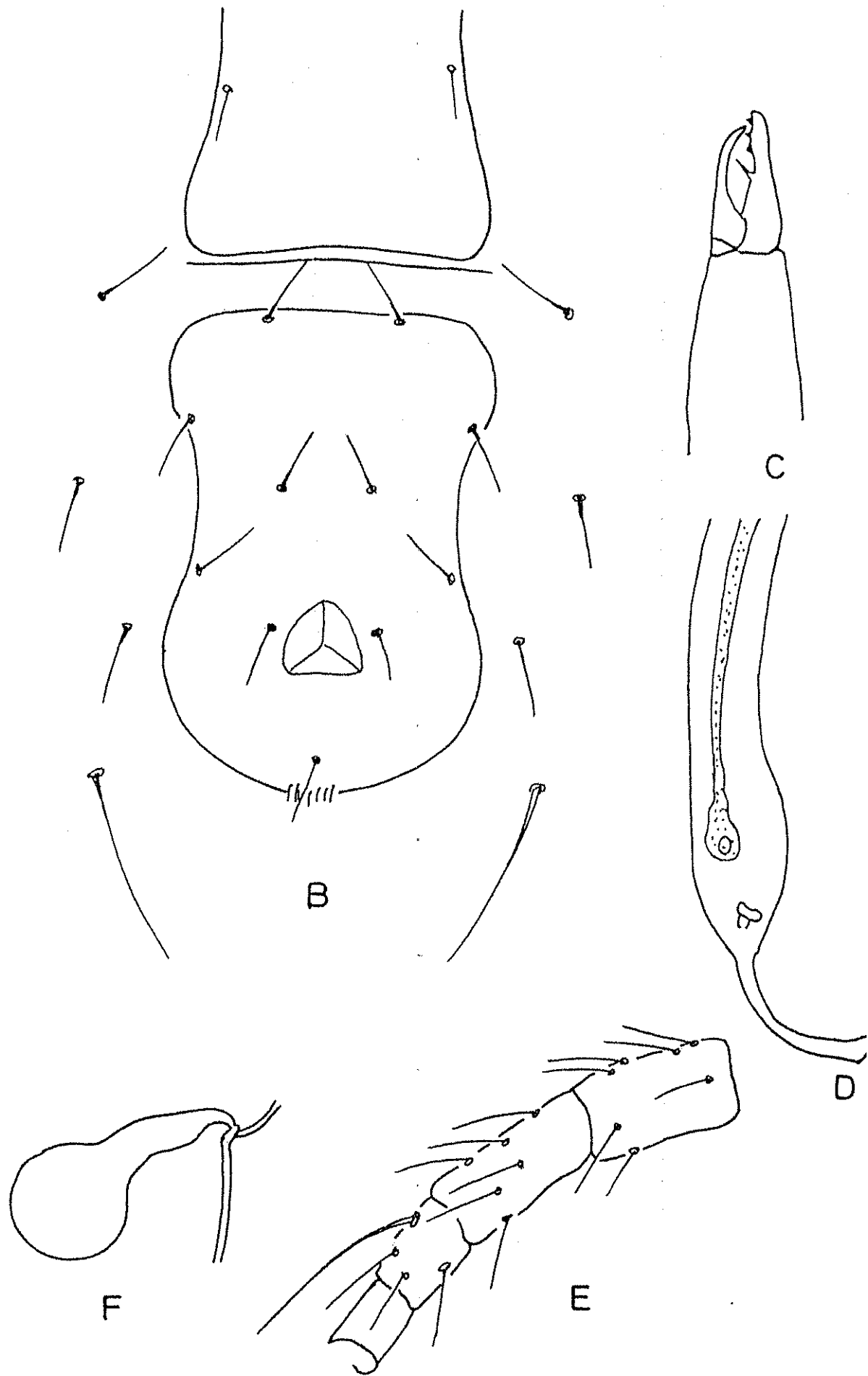
FEMALE: Dorsal shield elongated, smooth, 2 concave areas near L1 and S2, respectively, 436 μ long, 18 μ wide with 18 pairs setae on the shield (Fig.6A). Chelicera 22 μ long, movable digit smooth, fixed digit with 3 subapical teeth (Fig.6C). Setae L1, L3, L4 longer than their respective distances L1-L2, L3-L4, L4-L5; L5 smaller than distance L5-L6, L6 smaller than L6-L7,

Fig. 6. Amblydromella zerena, new species

- A. Dorsal shield
- B. Genital and Ventrianal shields
- C. Chelicera
- D. Peritremal shield
- E. Leg IV
- F. Spermatheca

Fig. 6





14 μ

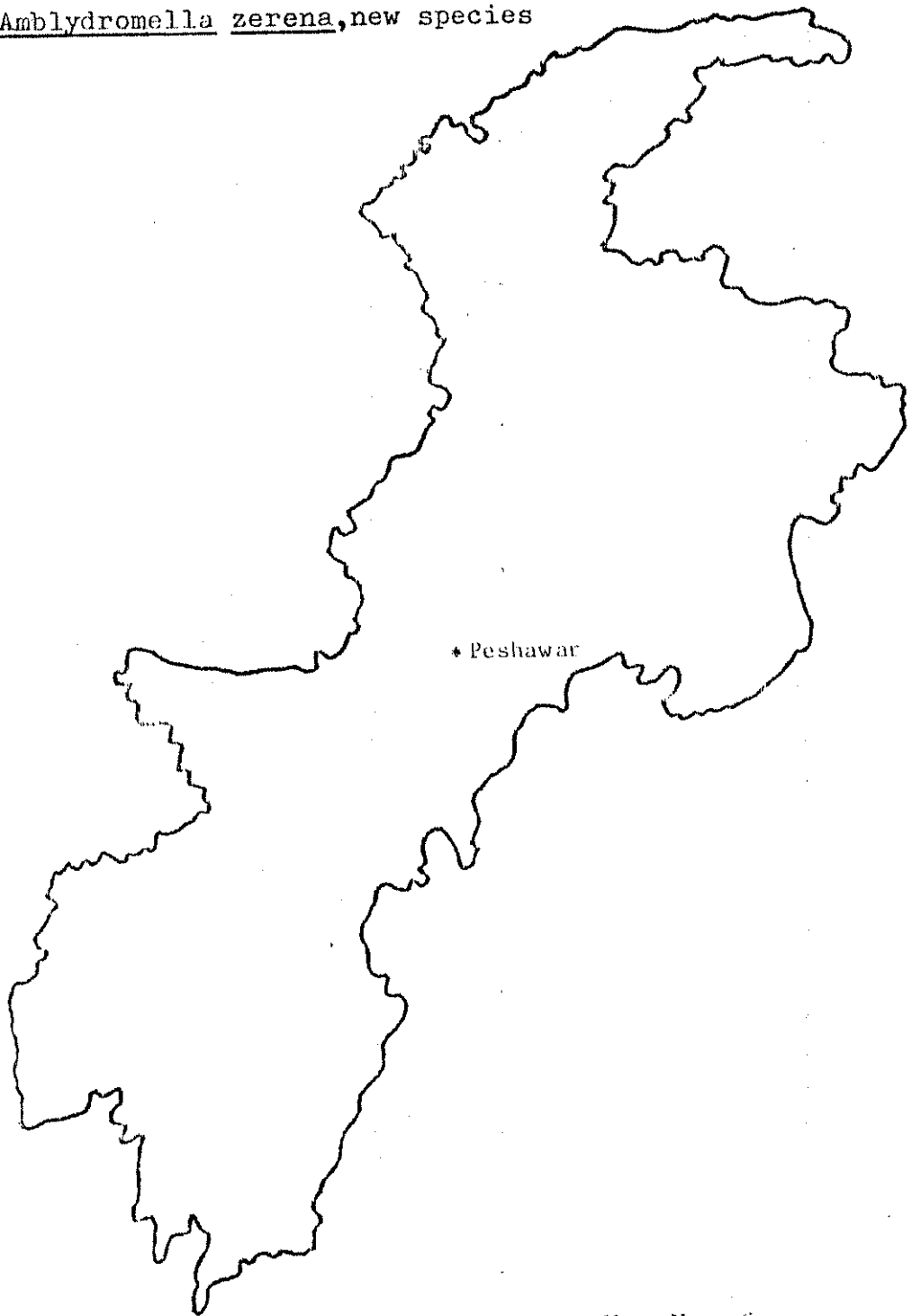
L7 just reaching base of seta L8, L8 at higher level as compared to base of M2 (Fig.6A). Dorsal setae: V 21 μ ; D1 18 μ , D2 22 μ , D3 33 μ , D4 39 μ ; C1 8 μ ; L1 31 μ , L2 21 μ , L3 29 μ , L4 30 μ , L5 44 μ , L6 47 μ , L7 49 μ , L8 47 μ , L9 8 μ , L10 47 μ ; M1 26 μ , M2 49 μ ; S1 22 μ , S2 26 μ (Fig.6A). Peritremal shield as shown in figure 6D. Peritreme reaching seta V (Fig.6A). Sternal shield with 3 pairs sternal setae. Metasternal setae, 1 pair, each seta on a separate platelet. Genital shield 18 μ apart from ventrianal shield with a membranous fold inbetween, genital setae, 1 pair. Genital shield width equals ventrianal shield width. Ventrianal shield 136 μ long, 97 μ wide with 4 pairs preanal setae, pores absent (Fig.6B). Four pairs setae on membrane surrounding ventrianal shield, seta VL1 simple, pointed, 34 μ long. Metapodal platelets, 2 pairs, primary 24 μ long, secondary 8 μ long. Spermatheca as shown in figure 6F. Leg IV macrosetae, smooth, pointed genu 16 μ , tibia 21 μ , basitarsus 32 μ long (Fig.6E).

MALE: Not known

TYPE: Holotype female, collected 6 mi.W.Peshawar, 22.ix.1981 (M.Shahid) from orange leaves, (Citrus sinensis Osbeck) and deposited in the Department of Zoology, University of Peshawar, Peshawar (Map.No.6).

REMARKS: This new species is comparable with Amblydromella teramon, new species due to smooth dorsal shield, cheliceral movable and fixed digits with 0 and 3 teeth, respectively; peritreme reaching up to seta V and leg IV with 3 macrosetae but these can be separated from each other on the basis of

N. W. F. P.

COLLECTION AREA
OF6. Amblydromella zerena, new species

Map No. 6

the following points.

1. No concave area on dorsal shield in teramon but 2 concave areas in this new species.
2. Seta L10 and M2 serrate in teramon, new species but M2 simple in this new species.
3. Two pairs visible pores on dorsal shield in teramon, new species but pores wanting in this new species.
4. Ventrianal shield with 3 pairs setae in teramon, new species but 4 pairs in this new species.
5. Shape of ventrianal shield differs in both the species.

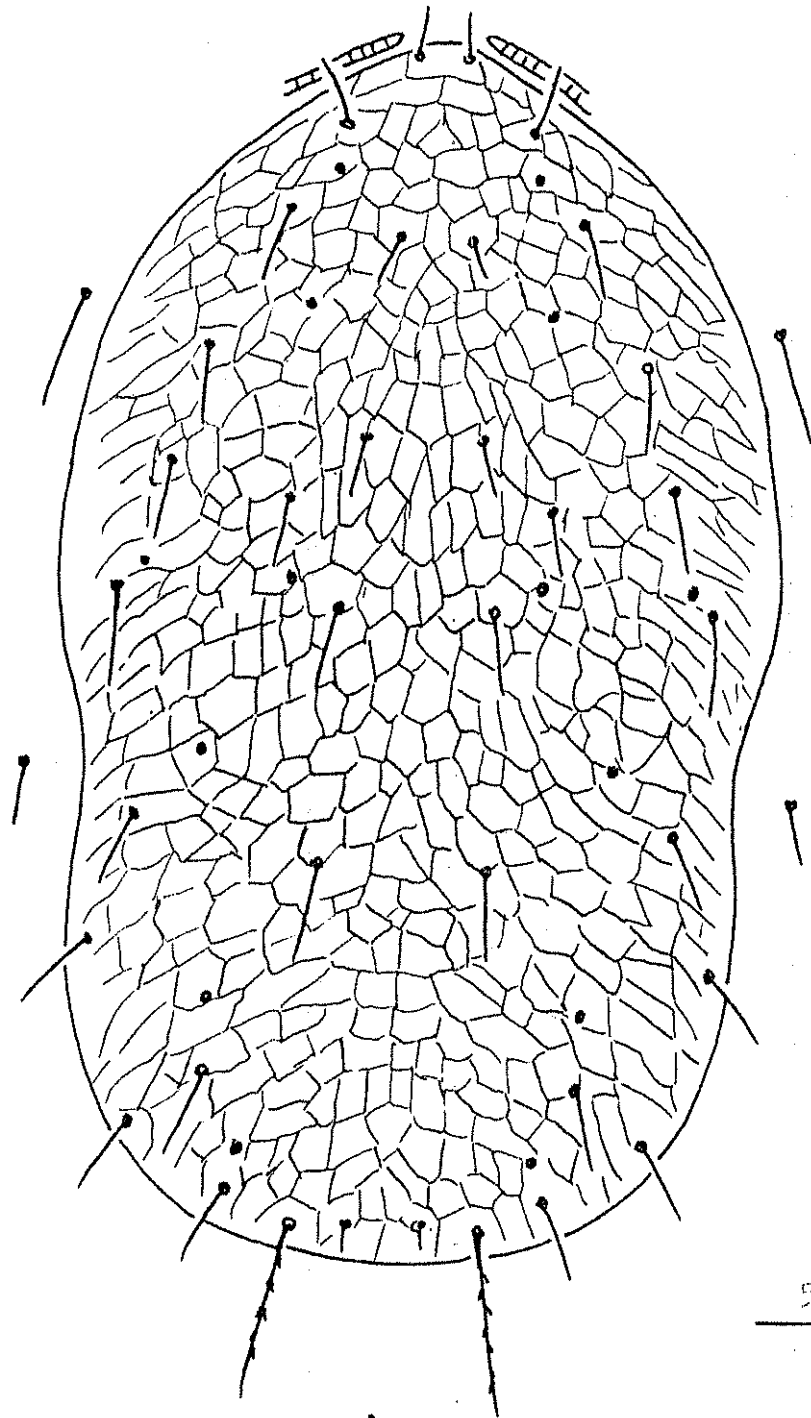
7. Amblydromella canaster, new species
(Fig.7)

FEMALE: Dorsal shield irregularly, completely reticulated, 432 μ long, 177 μ wide with 18 pairs setae and 7 pairs visible pores (Fig.7A). Chelicera 36 μ long, movable digit smooth, fixed digit with 4 subapical teeth (Fig.7D). All dorsal shield setae smooth except L10, serrate. All setae short of distance to seta next in line except M2 crosses distance M2 - L8 (Fig.7A). Dorsal shield setae: V 20 μ ; D1= D2= D3 = 16 μ , D4 21 μ ; C1 10 μ ; L1= L2= L3= L6 = 21 μ , L4= L5= 24 μ , L7= L8= 26 μ , L9 29 μ , L10 55 μ ; M1 16 μ , M2 32 μ ; S1 27 μ , S2 21 μ (Fig.7A). Peritremal shield as shown in figure 7E. Peritreme reaching seta V (Fig.7A). Sternal shield setae 3 pairs, smaller than distance to seta next in line (Fig.7B). Metasternal setae, 1 pair, each

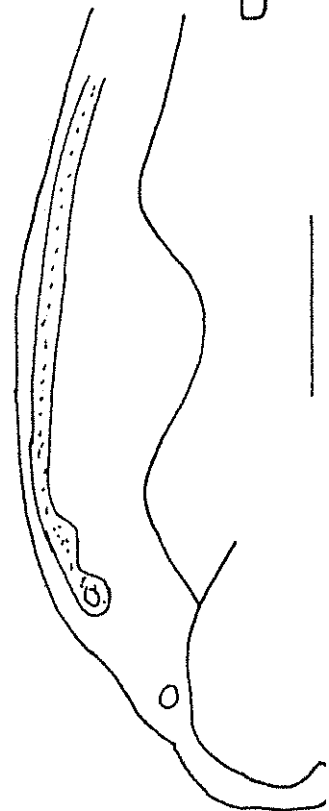
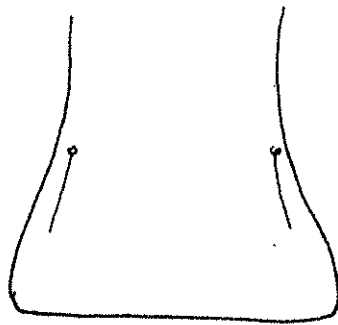
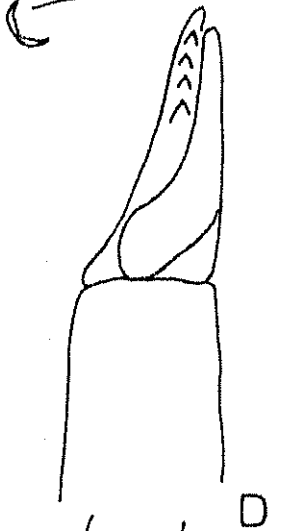
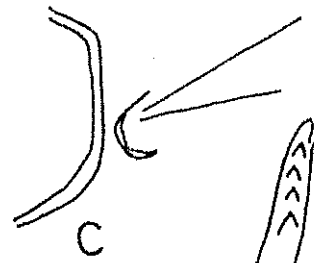
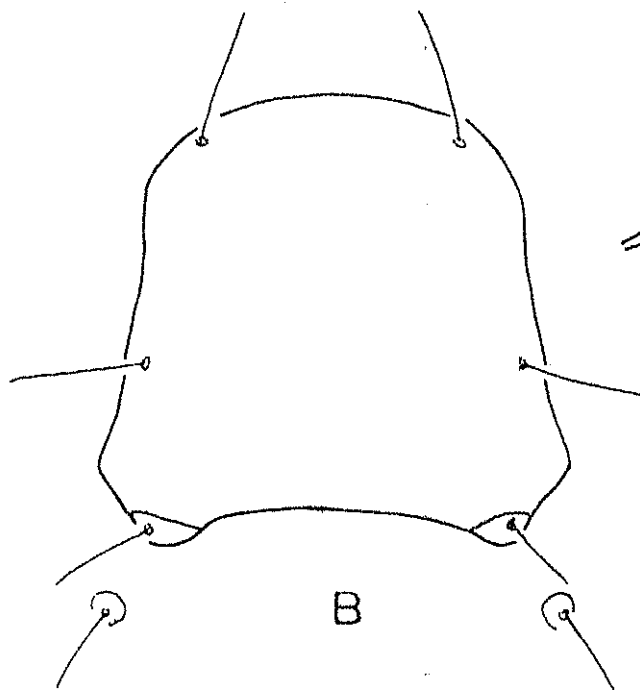
Fig. 7. Amblydromella canaster, new species

- A. Dorsal shield
- B. Sternal shield
- C. Spermatheca
- D. Chelicera
- E. Peritremal shield
- F. Genital and Ventrianal shield
- G. Leg IV

Fig. 7



A



1/4 μ

seta on a separate platelet(Fig.7B). Genital shield 20 μ apart from ventrianal shield with a membranous fold inbetween.Ventrianal shield striated,preanal area broadly subquadrate,130 μ long,104 μ wide with 3 pairs preanal setae and a pair of elliptical pores(Fig.7F). Four pairs setae and 3 pairs minute platelets on membrane surrounding ventrianal shield, seta VL1 smooth,34 μ long (Fig.7F). Metapodal platelets, 2 pairs,primary 26 μ long, secondary 10 μ long(Fig.7F). Spermatheca as shown in figure 7C.Leg IV macroseta on basitarsus, simple, pointed,53 μ long (Fig.7G).

MALE: Not known.

TYPE: Holotype female, collected 4 mi.E.Peshawar, 2.x.1980(M.Shahid) from Diospyros kaki and deposited in the Department of Zoology,University of Peshawar, Peshawar(Map No.7).

REMARKS: This new species is closely related to Amblydromella octavus Chaudhri,Amblydromella libitus and Amblydromella ornatulus Chaudhri due to the following characters.

1. Dorsal shield completely reticulated.
2. Peritreme reaching seta V.
3. Leg IV macroseta on basitarsus only.

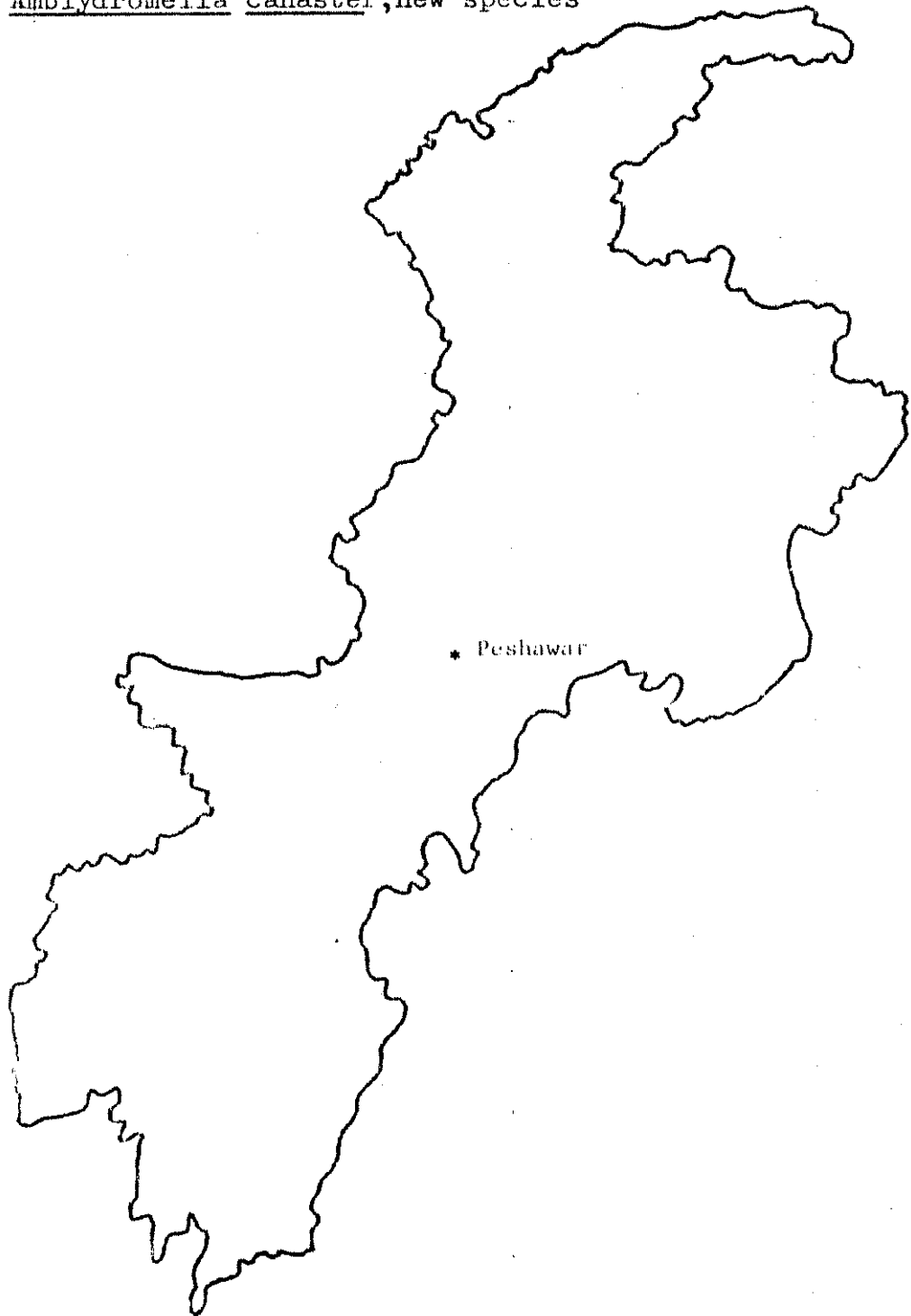
This new species can be separated from the above species on the basis of the following points.

1. Shape of ventrianal shield differs in both the species.

N. W. F. P.

COLLECTION AREA

OF

7. Amblydromella canaster, new species

Map No. 7

2. Seta M2 serrate in octavus, libitus and ornatulus but it is smooth in this new species.
3. Ventrianal shield preanal^{/setae} 4 pairs in octavus, libitus and ornatulus but 3 pairs in this new species.
4. Shape of spermatheca differs in all these species.

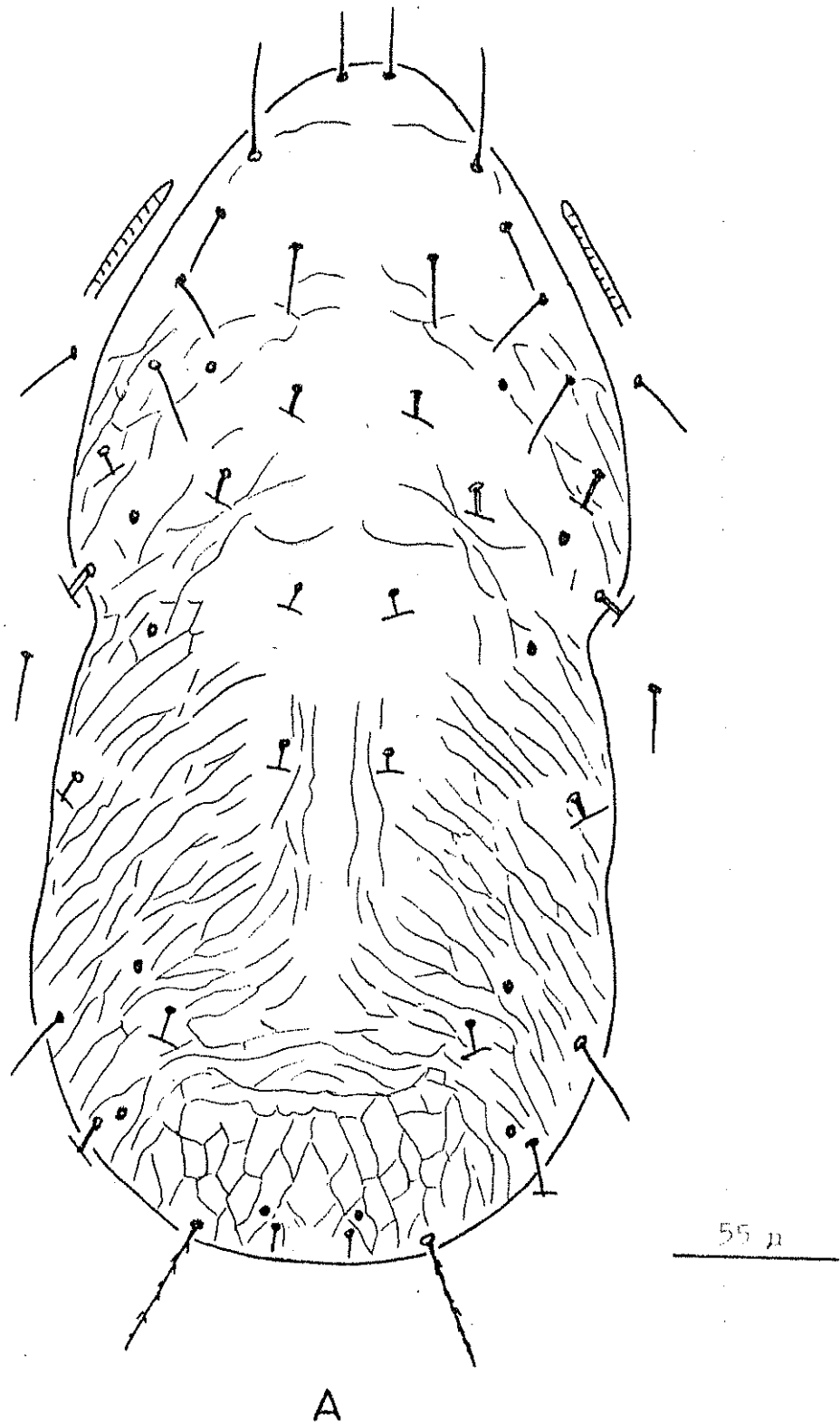
8. Amblydromella chashmaensis, new species
(Fig.8)

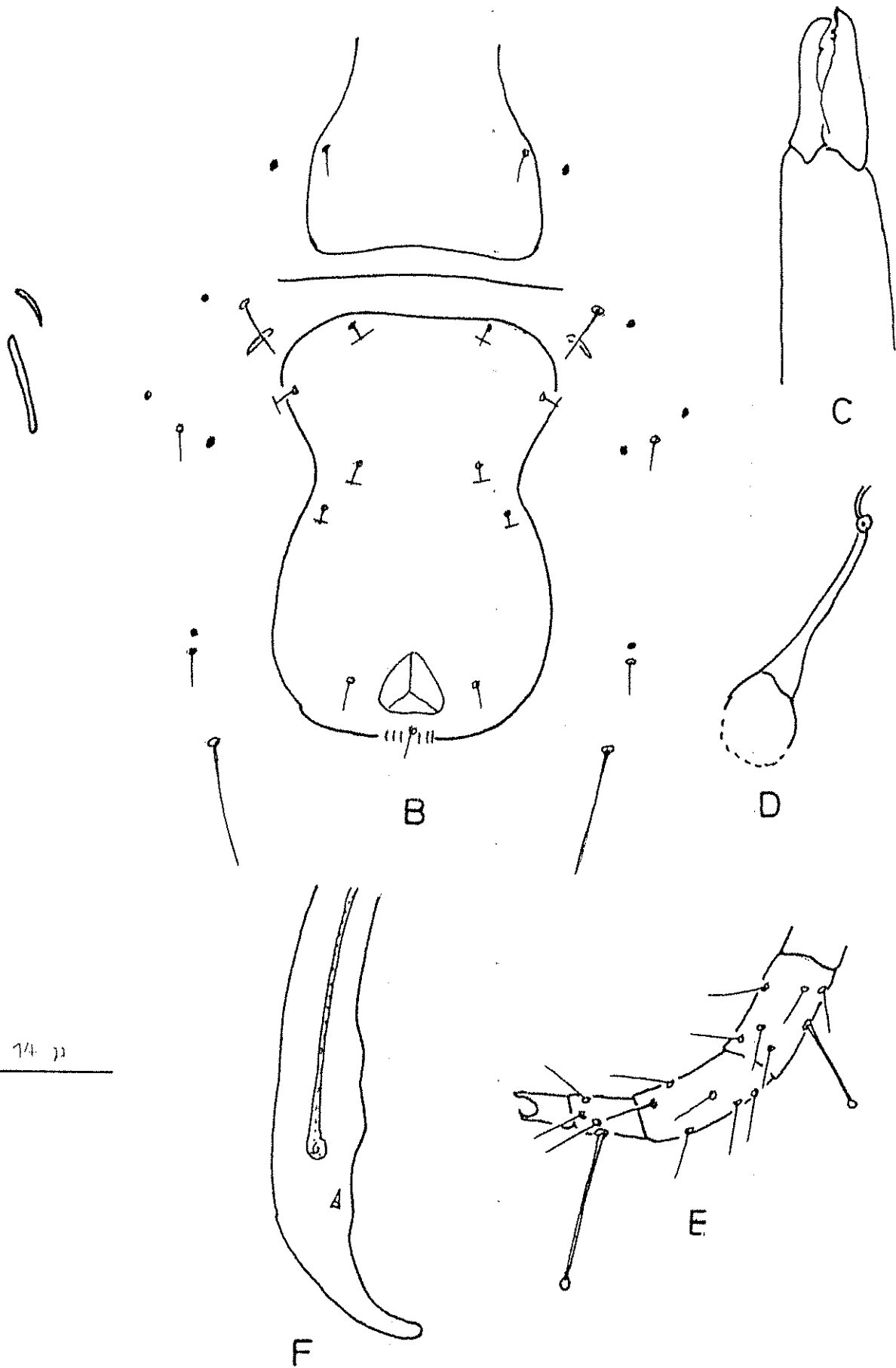
FEMALE: Dorsal shield irregularly striated, reticulated posteriorly, striations fade away anteriorly, 345 μ long, 177 μ wide (Fig.8A). Dorsal shield deeply recurved near S1, slightly recurved near and inbetween setae L7 and L8, with 18 pairs setae and 6 pairs visible pores (Fig.8A). Chelicera 34 μ long, movable digit with 1 tooth and fixed with 2 subapical teeth (Fig.8C). All dorsal setae smooth except L10, weakly serrate. Seta L1 longer than L1 - L2 whereas L2 and L3 smaller than respective distances L2 - L3 and L3 - L4; seta M2 29 μ and 44 μ apart from setae L8 and L9, respectively. Dorsal setae: V 26 μ ; D1 16 μ , D2 - D4 broken; C1 6 μ ; L1 34 μ , L2 18 μ , L3 23 μ , L4 26 μ , L5, L6, L7 broken, L8 34 μ , L9 38 μ , L10 57 μ ; M1 and M2 broken; S1 26 μ , S2 broken (Fig.8A). Peritremal shield as shown in figure 8F. Peritreme reaching up to seta L2 (Fig.8A). Sternal shield with 3 pairs sternal setae. Metasternal setae, 1 pair, each seta on a separate platelet.

Fig. 8. Amblydromella chashmaensis, new species

- A. Dorsal shield
- B. Genital and Ventrianal shields
- C. Chelicera
- D. Spermatheca
- E. Leg IV
- F. Peritremal shield

Fig. 8





Genital and ventrianal shields 24μ apart from each other with a membranous fold inbetween (Fig. 8B). Genital shield with 1 pair genital setae. Ventrianal shield slightly wider than genital shield with 4 pairs preanal setae, pores absent, shield with deep constriction near setae III and IV. Four pairs setae, 4 pairs pores and 1 pair visible minute platelets on membrane surrounding ventrianal shield, seta VL1 smooth, 52μ long (Fig. 8B). Metapodal platelets, 2 pairs, primary 26μ long, secondary 13μ long (Fig. 8B). Spermatheca with rounded atrium, elongated cervix (Fig. 8D). Macrosetae on leg IV simple, genu 29μ , knobbed, tibia 23μ , simple, basitarsus 52μ , knobbed (Fig. 8E).

MALE: Not known.

TYPE: Holotype female, collected 1 mi. E. Garam Chashma (Chitral Valley, 5000'), 7.vii.1980 (M. Shahid) from Undet. host plant No. 7/80; two females collected same locality, 8.vii.1980 from Undet. host plant No. 12/80. The specimens have been deposited in the Department of Zoology, University of Peshawar, Peshawar (Map No. 8).

REMARKS: This new species can be separated from Amblydromella kalashiensis, new species to which it closely resembles on the basis of the following characters.

1. Peritreme reaching seta V in kalashiensis, new species but reaching up to seta L2 in this new species.

N. W. F. P.

COLLECTION AREA

OF

8. Amblydromella chashmaensis, new species



Map No. 8

2. Dorsal shield ornamentation differs in both the species.
3. Seta VL1 serrate in kalashiensis, new species but it is smooth in this new species.
4. Shape of ventrianal shield differs in both the species.
5. Leg IV macrosetae serrate in kalashiensis, new species but smooth and knobbed in this new species.

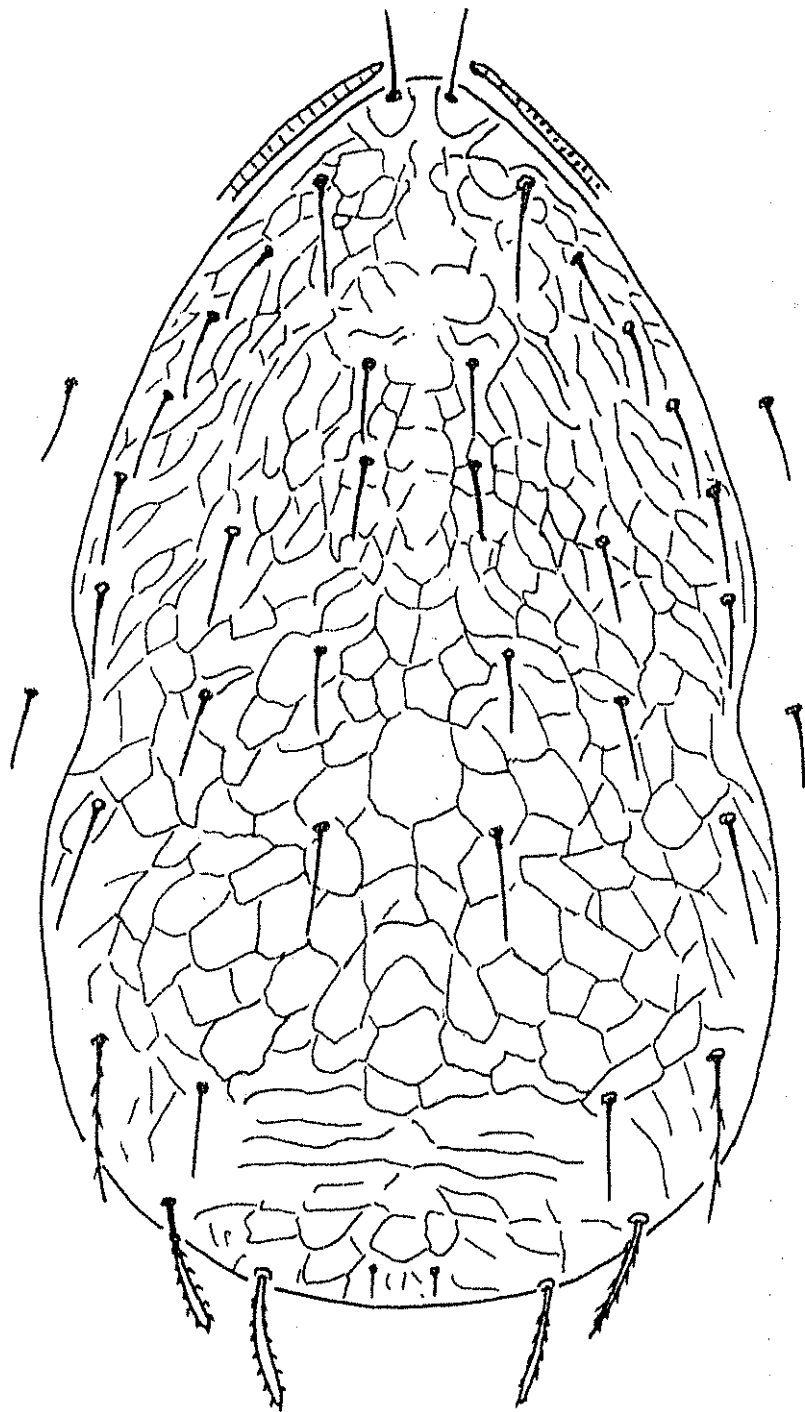
9. Amblydromella kalashiensis, new species
(Fig.9)

FEMALE: Dorsal shield irregularly and completely reticulated, concave near S2, 312 μ long, 239 μ wide, with 19 pairs setae (Fig.9A). Chelicera 24 μ long, movable digit smooth, fixed digit with 3 subapical teeth (Fig.9C). All dorsal setae stout, smooth except L8, L9 and L10, serrate. Seta L1 longer than distance L1-L2; setae L2, L3, L4 just reaching base of seta next in line, respectively; L5 smaller than distance L5-L6; seta M3 26 μ , 39 μ and 63 μ apart from L8, L9 and L10, respectively (Fig.9A). Dorsal setae: V 18 μ ; D1 13 μ , D2 16 μ , D3 21 μ , D4 31 μ ; C1 8 μ ; L1 23 μ , L2 21 μ , L3 21 μ , L4 26 μ , L5 31 μ , L6 31 μ , L7 34 μ , L8 41 μ , L9 34 μ , L10 40 μ ; M1 21 μ , M2 22 μ , M3 37 μ ; S1 = S2 = 24 μ (Fig.9A). Peritremal shield as shown in figure 9D. Peritreme reaching seta V (Fig.9A). Sternal shield setae, 3 pairs, setae much smaller than respective distance of setae next in line. Metasternal

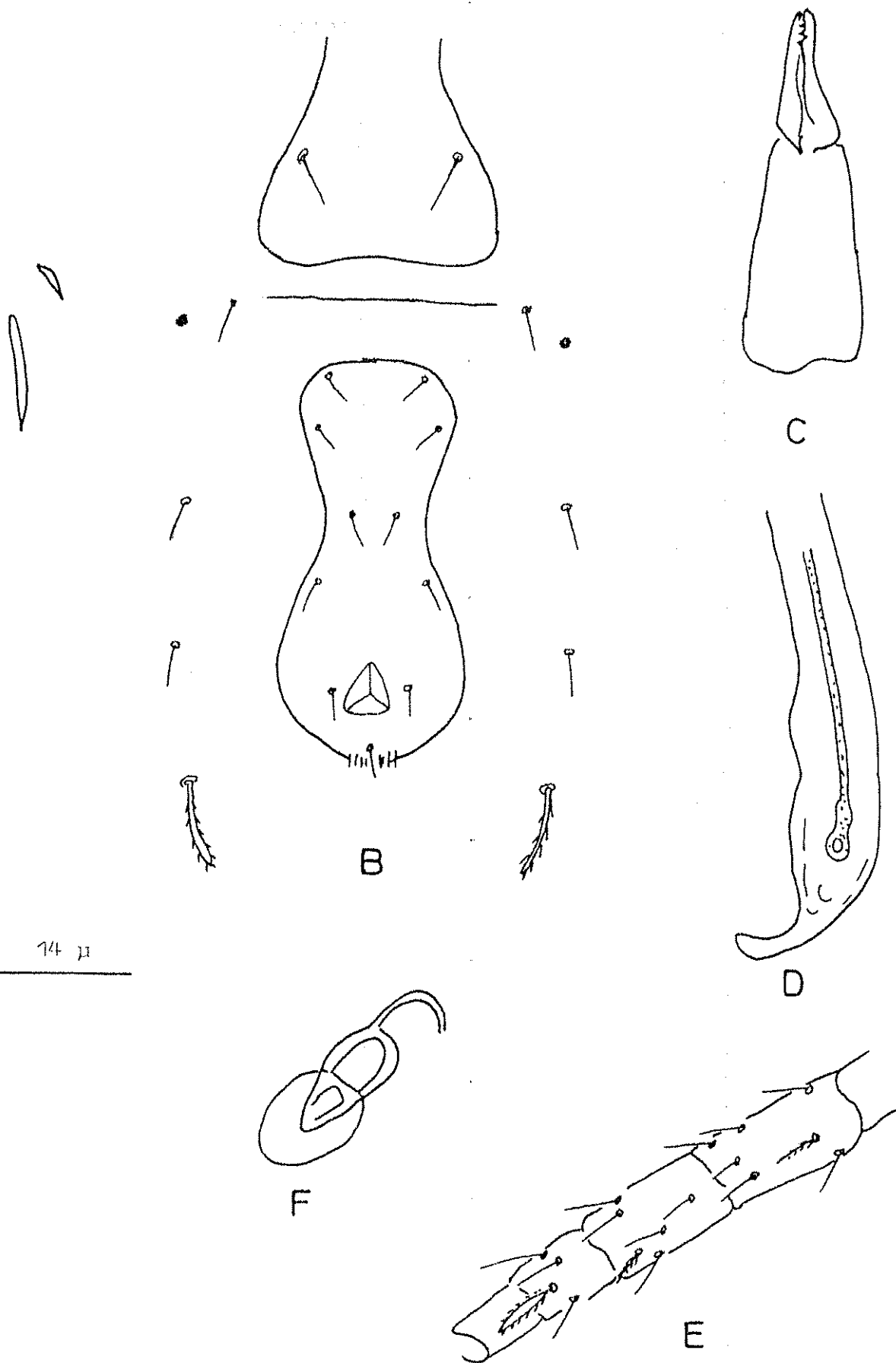
Fig. 9. Amblydromella kalashiensis, new species

- A. Dorsal shield
- B. Genital and Ventrianal shield
- C. Chelicera
- D. Peritremal shield
- E. Leg IV
- F. Spermatheca

Fig. 9



A



setae, 1 pair, each seta on a separate platelet. Genital shield wider than width of ventrianal shield, 39 μ apart from each other with a membranous fold inbetween. Genital shield with 1 pair of setae (Fig. 9B). Ventrianal shield vase-shaped with 4 pairs preanal setae, 139 μ long, 70 μ wide (Fig. 9B). Four pairs setae and a pair of pores on membrane surrounding ventrianal shield, seta VL1, serrate, 26 μ long (Fig. 9B). Metapodal platelets, 2 pairs, primary 31 μ long, secondary, 11 μ long (Fig. 9B). Spermatheca as shown in figure 9F. Macrosetae on leg IV serrate, genu 13 μ , tibia 11 μ , basitarsus 19 μ long (Fig. 9E).

MALE: Not known.

TYPE: Holotype female, collected Kalash Valley (Chitral, 5000'), 7.vii.1981 (M. Shahid) from walnut (Juglans regia) and deposited in the Department of Zoology, University of Peshawar (Map No. 9).

REMARKS: This new species can be separated from Amblydromella chashmaensis, new species on the basis of the following characters.

1. Peritreme reaching seta L2 in chashmaensis but up to seta V in this new species.
2. Dorsal shield ornamentation differs in both the species.
3. Seta VL1 smooth in chashmaensis but serrate in this new species.
4. Shape of ventrianal shield differs in both the species.

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COLLECTION AREA
OF

9. Amblydromella kalashiensis, new species



Map No. 9

5. Leg IV macrosetae smooth and knobbed in chashmaensis but serrate in this new species.

10. Amblydromella mardaniensis, new species

(Fig.10)

FEMALE: Dorsal shield smooth, 371 μ long, 115 μ wide with 18 pairs setae (Fig.10A). All dorsal setae smooth except M2 and L10 serrate with bulbous tip. Chelicera 31 μ long, movable digit with 1 tooth, fixed digit with 3 subapical teeth (Fig.10C). All setae smaller than distance to respective seta next in line except L8 longer than L8- L9. Dorsal setae: V 16 μ ; D1 10 μ , D2 13 μ , D3 18 μ , D4 18 μ ; C1 5 μ ; L1 = L2 = L3 = L6 = L9 = 13 μ , L4 = L5 = 16 μ , L8 26 μ , L10 36 μ ; M1 13 μ , M2 33 μ ; S1 18 μ , S2 13 μ (Fig.10A). Peritremal shield as shown in figure 10D. Peritreme extending up to and between setae L1 and L2 (Fig.10A). Ventrianal shield with 2 pairs preanal setae, pores absent, shape as shown in figure 10B. Four pairs setae on membrane surrounding ventrianal shield, seta VL1 smooth, 21 μ long (Fig.10B). Spermatheca with long atrium as shown in figure 10F. Macrosetae on leg IV genu 13 μ , tibia 13 μ , basitarsus 31 μ long, all with bulbous tip (Fig.10E).

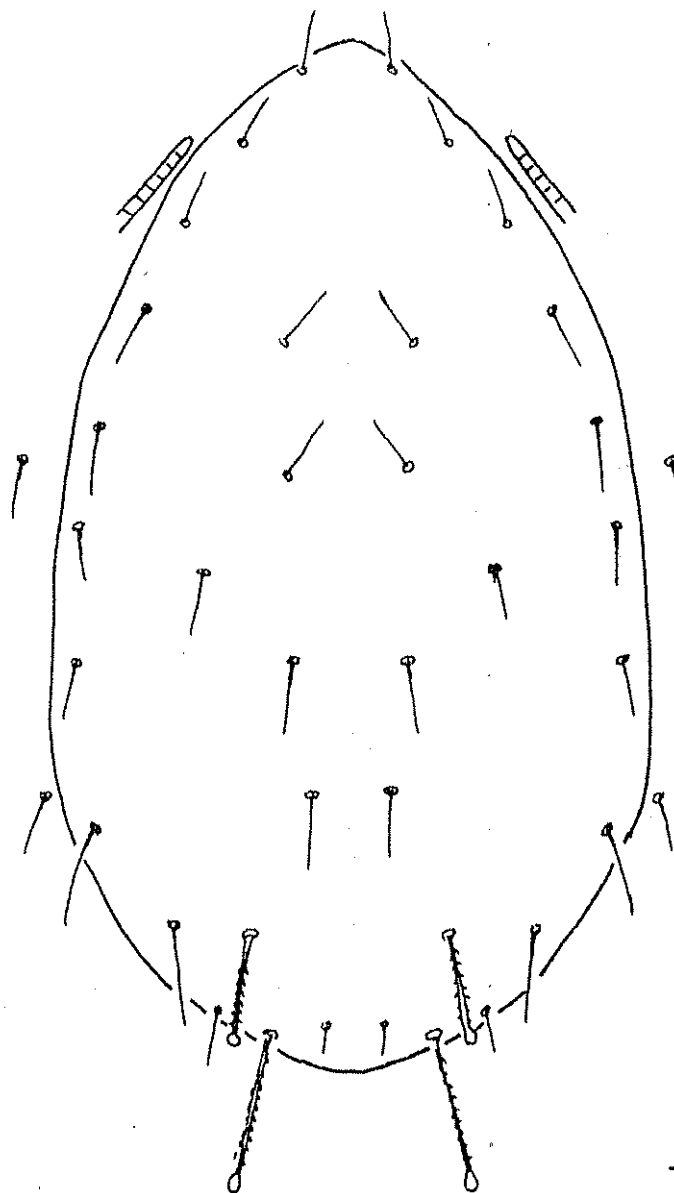
MALE: Not known.

TYPE: Holotype female, collected 2 mi. E. Mardan, 12.ix.1981 (M.Shahid) from guava (Psidium guajava) leaves and deposited in the Department of Zoology, University of Peshawar, Peshawar (Map.No.10.).

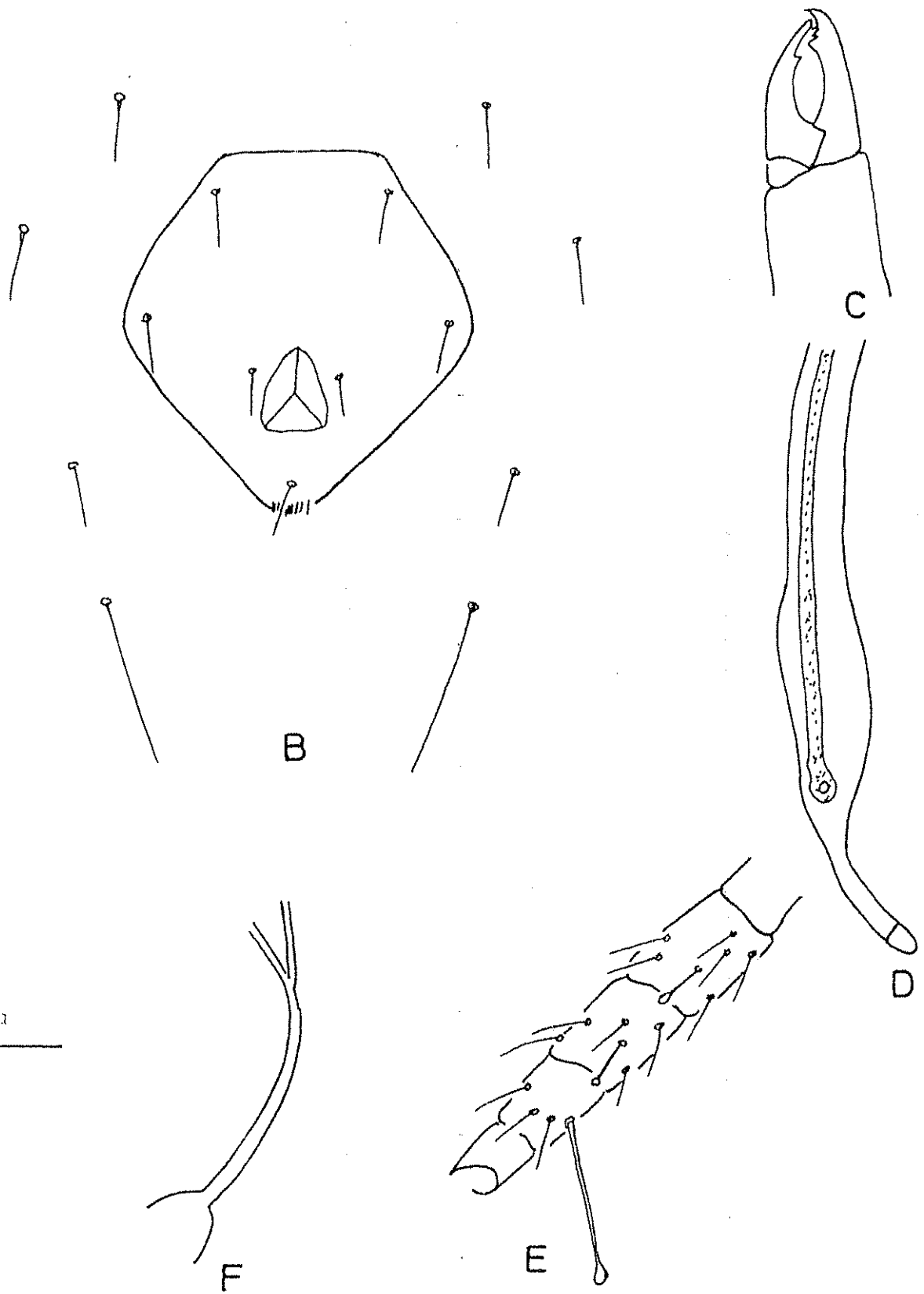
Fig. 10. Amblydromella mardaniensis; new species

- A. Dorsal shield
- B. Ventrianal shield
- C. Chelicera
- D. Peritremal shield
- E. Leg IV
- F. Spermatheca

Fig.10



A

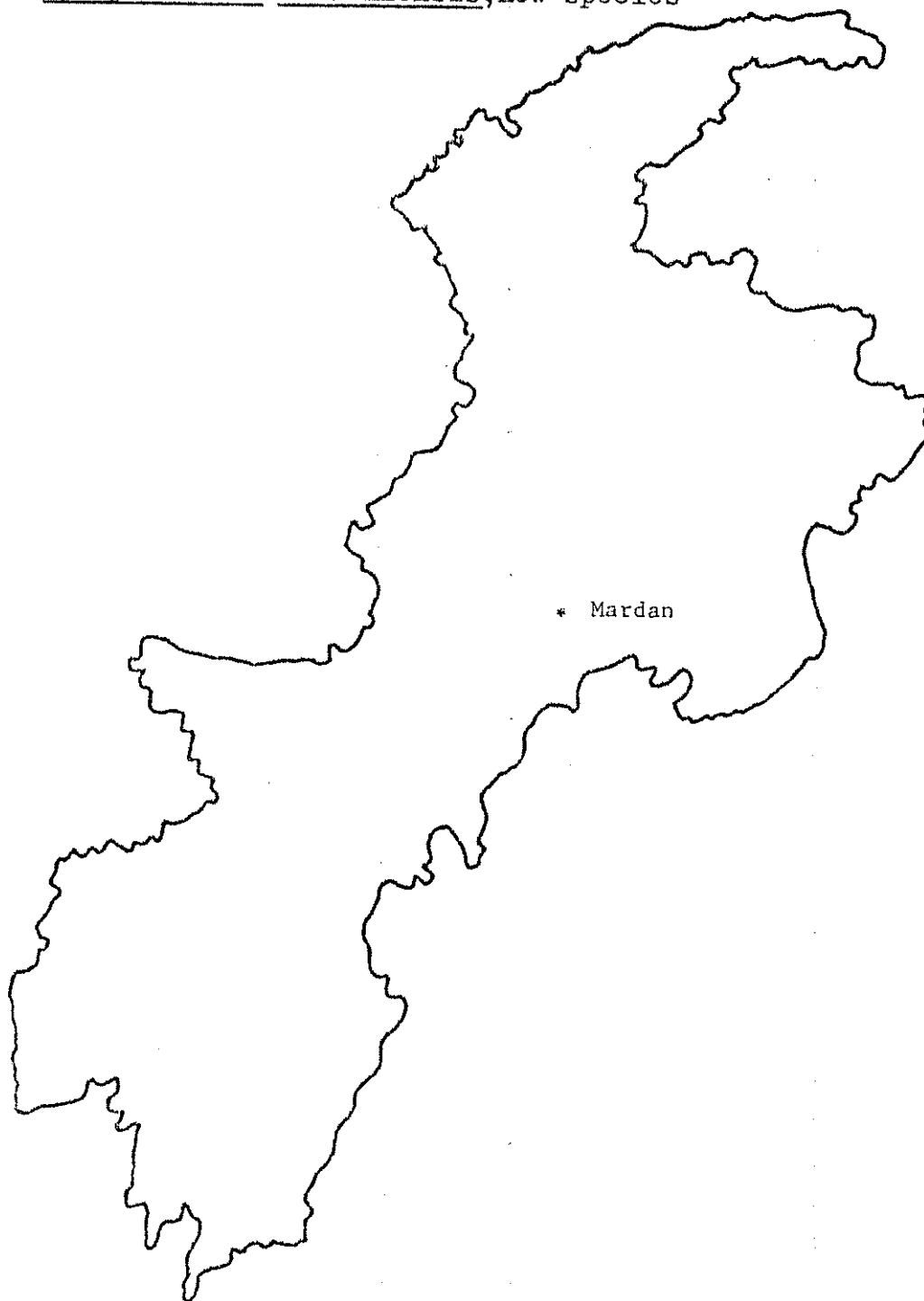


N. W. F. P.

COLLECTION AREA

OF

10. Amblydromella mardaniensis, new species



Map No. 10

REMARKS: This new species is comparable with Amblydromella limitatus Chaudhri due to smooth dorsal shield, setae L10, M2 serrate and bulbous; absence of pores on dorsal shield and leg IV with 3 knobbed macrosetae. The following characters separate them from each other.

1. Peritreme reaching up to seta V in limitatus but up to and between L1 and L2 in this new species.
2. Ventrianal shield with 4 pairs preanal setae in limitatus but 2 pairs setae in this new species.
3. Shape of ventrianal shield differs in both the species.

04

GENUS AMBLYSEIUS BERLESE

Amblyseius Berlese, 1914:143.

Amblyseius(Amblyseius) Berlese, Muma, 1961a:287.

Amblyseius(Amblyseiulus) Muma, 1961a:287.

Amblyseius Berlese, Muma and Denmark, 1962:62; 1970:62.

Amblyseius Berlese, DeLeon, 1966:88.

Amblyseius Berlese, Chaudhri, 1968:550; 1979:68.

Amblyseius Berlese, Khan and Chaudhri, 1969:52.

The genus Amblyseius was described by Berlese in 1914 and the type of the genus, by original designation is Zercon obtusus Koch 1839. Chant (1958) described 13 species of the mites under the genus Typhlodromus and subgenus Amblyseius. Later Chant(1959) divided the genus Typhlodromus into 2 subgenera, viz., Typhlodromus and Amblyseius. He further divided the subgenus Amblyseius into 9 groups(sextus, setosus, finlandicus, irregularis, obtusus, new-sami, aberrans, grandis and sandersi) and described 90 species in these groups. Pritchard and Baker(1962) recognized Amblyseius(sens.lit.) as genus but they divided the genus into 7 subgenera (Amblyseius, (sens.str.), Amblyseilla, Kampimodromus, Proprioseius, Phytoseiulus, Asperoseius and Ptenoseius). They described 22 species in the genus Amblyseius(subgenus Amblyseius). Ehara (1967a, 1967b, 1970), Ehara and Lee(1971), and Merwe(1965) followed this pattern for the description of Amblyseius species from their respective areas. Chant and Baker(1965), Chant and Hansell(1971) maintained the generic status of

Amblyseius. Athias-Henriot (1958,1960,1967), Corpuz and Rimando (1966), DeLeon(1961,1966), Denmark(1965), Ehara(1959, 1964,1966a,1966b), Gonzalez and Schuster(1962), Kennett(1958), Meyer and Rodrigues (1966), Muma (1961b,1967), Muma and Denmark(1970), Schuster and Fritchard(1963),Wainstein(1962b), Wainstein and Arutunjan(1970), Wainstein and Begliarov(1971) have assigned all the species of their respective areas to the genus Amblyseius.

Chaudhri(1968,1979) has collected 10 species of the genus Amblyseius from Pakistan. The present author has collected 9 new species of this genus from Peshawar area and this makes a total of 19 species from Pakistan and out of these only 1 species is redescribed whereas the other species are new to science and they have ^{been} described from Pakistan for the first time.

DIAGNOSIS: Dorsal shield lightly to well-sclerotized and smooth, shield undivided. Setae: vertical setae, 1 pair; dorsal setae, 3-4 pairs; clunal setae, 1 pair; median setae, 2 pairs; lateral setae, 9 pairs(4 pairs prolateral + 5 pairs postlateral setae); sublateral setae, 2 pairs(present on the membrane). Sternal shield with 3 pairs sternal setae. Ventrianal shield with 3 pairs preanal setae; 3-4 pairs setae on membrane surrounding ventrianal shield. Peritreme long, variable in length. Metapodal platelets, 1-2 pairs. Dentation of chelicerae variable. Legs normal, leg IV with 3 macrosetae,

1 each on genu, tibia and basitarsus(in some species, only 1 macroseta on basitarsus).

Type Species: Zercon obtusus Koch

Muma(1961a), Muma and Denmark(1970) considered seta L5 as M2 and described 3 median setae and 8 lateral setae (in pairs). Chaudhri(1968,1979) counted 2 median setae and 9 pairs lateral setae. Chaudhri has been followed in this research work.

The following key has ^{been} prepared for all the species collected and described from Pakistan. The new species collected from N.W.F.P. have been incorporated in this key.

Key to AMBLYSEIUS in Pakistan
(Females)

1. Dorsal shield setae, 17 pairs; seta D4 present..... 2
 Dorsal shield setae, 16 pairs; seta D4 absent A. beatus Chaudhri
2. Dorsal setae of normal size 3
 Some dorsal setae very long..... 16
3. Dorsal shield smooth 4
 Dorsal shield reticulated 11

4. Setae L9 and M2 both simple ... A.takhti, new species
 Setae L9 and M2 both serrate
 or L9 serrate, M2 smooth
 or serrate 5
5. Setae L9 and M2 both serrate .. 6
 Setae L9 serrate, M2
 serrate or simple 8
6. Ventrianal shield smooth;
 leg IV with 3 macrosetae A.perfectus Chaudhri
 Ventrianal shield striated;
 Leg IV with 1 macroseta 7
7. Cheliceral fixed digit with
 5 subapical teeth; shape of
 ventrianal shield different
 from that of venustus A.stolidus Chaudhri
 Cheliceral fixed digit with
 4 subapical teeth; shape of
 ventrianal shield different
 from that of stolidus A.venustus Chaudhri
8. Peritreme reaching up to
 seta V 9
 Peritreme reaching up to
 seta L2 10
9. Cheliceral movable digit with
 2 teeth; leg IV with macroseta
 on basitarsus only A.uvidus, new species
 Cheliceral movable digit with
 1 tooth; leg IV with 3
 macrosetae on genu, tibia and
 basitarsus A. balios, new species

10. Dorsal shield with 5
pairs visible pores;
seta L3 longer than
distance L3- L4

A. darghaiensis,
new species

Dorsal shield with 2 pairs
visible pores; seta L3 =
distance L3- L4

A. emotus, new species

11. Dorsal shield with
visible pores 12

Dorsal shield without
visible pores 15

12. Leg IV with 1 macroseta;
dorsal shield with 1 pair
pores

A. inculatus, new species

Leg IV with 3 macrosetae;
dorsal shield with more than
1 pair pores 13

13. Dorsal shield completely
reticulated; ventrianal
shield smooth without
preanal pores; peritreme
up to seta L1

A. latro, new species

Dorsal shield partly
reticulated; ventrianal
shield striated with 1 pair
preanal pores; peritreme
up to seta V..... 14

14. Dorsal shield with 3 pairs
visible pores; cheliceral
movable digit with 5
subapical teeth; 1 pair
platelets on membrane
surrounding ventrianal shield.

A. nidus, new species

Dorsal shield with 4 pairs
visible pores; cheliceral
movable digit with 8
subapical teeth; platelet
absent

A. opimia, new species

15. Metapodal platelets absent;
ventrianal shield squarish ... A. notatus Chaudhri
- Metapodal platelets 1 pair;
ventrianal shield much
longer than wide A. finlandicus
(Oudemans)
16. Dorsal shield sparsely
reticulated; pores present ... A. deductus Chaudhri
- Dorsal shield smooth;
pores absent 17
17. Setae L9, M2 smooth;
ventrianal shield smooth A. impactus Chaudhri
- Seta L9 simple/serrate;
M2 serrate; ventrianal
shield striated 18
18. Seta L9 simple; cheliceral
movable digit with 3 and
fixed digit with 11 subapical
teeth A. bajulus Chaudhri
- Seta L9 serrate; cheliceral
movable digit with 4 and fixed
digit with 6 subapical teeth.. A. excelsus Chaudhri

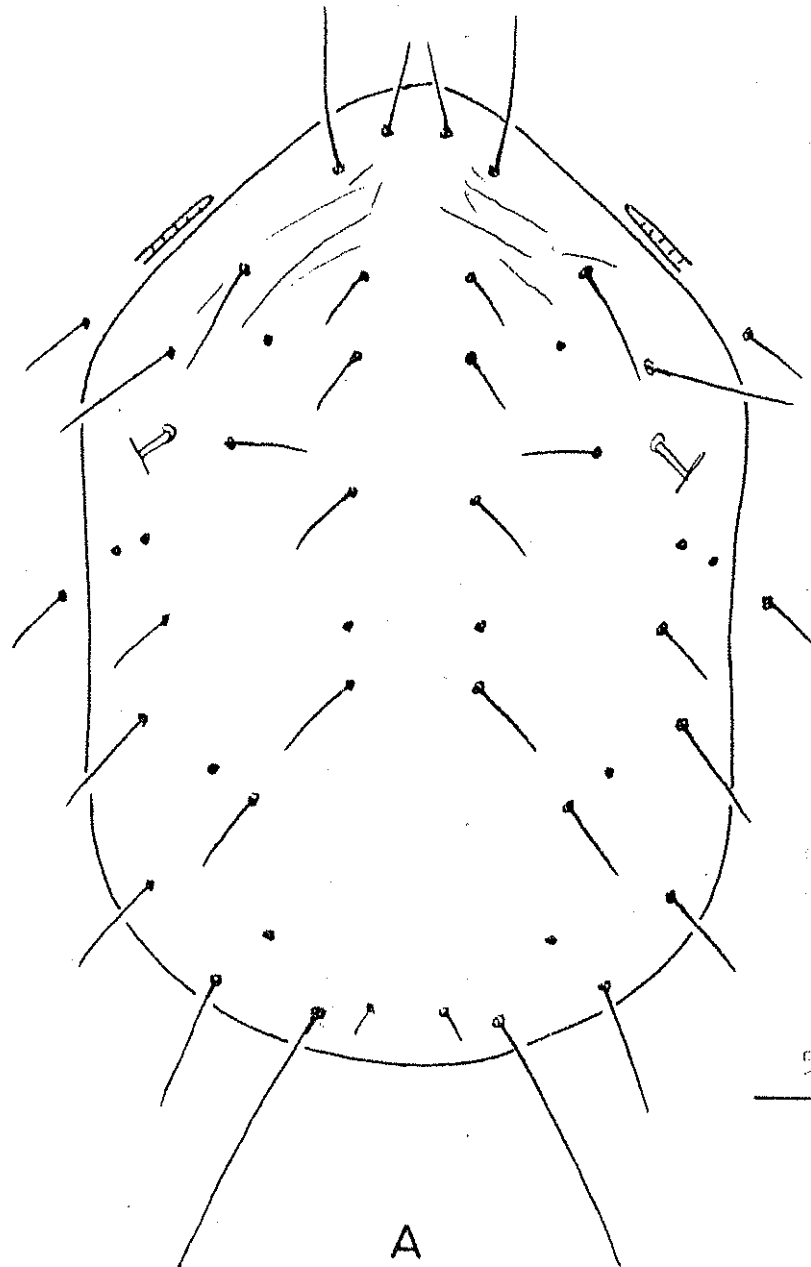
11. Amblyseius takhti, new species
(Fig.11)

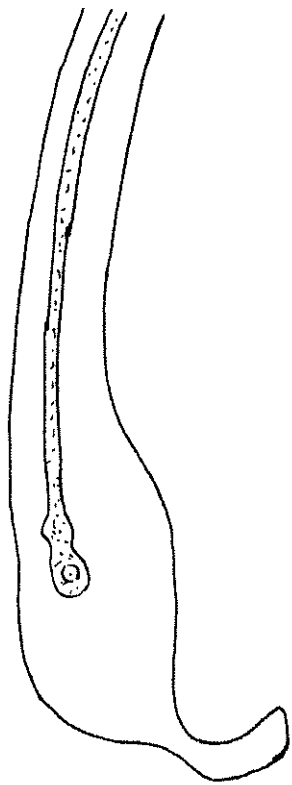
FEMALE: Dorsal shield smooth, slightly concave near
S2, 416 μ long, 291 μ wide, 17 pairs setae and 6 pairs visible
pores (Fig.11A). Chelicera 26 μ long, movable digit smooth,
fixed digit with 4 subapical teeth (Fig.11F). Dorsal setae
smooth; L1 longer than L1- L2; L2 just crosses base seta L3;
L3 longer than L3- L4; L5, L6 smaller than their respective
distances L4- L5 and L5- L6; L8 longer than L8- L9 (Fig.11A).

Fig. 11. Amblyseius takhti, new species

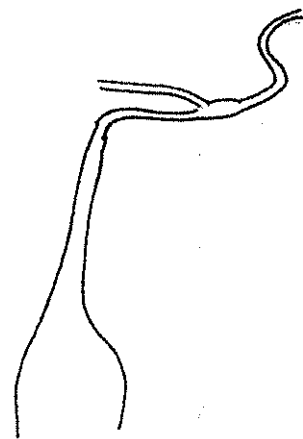
- A. Dorsal shield
- B. Peritremal shield
- C. Spermatheca
- D. Leg IV
- E. Genital and Ventrianal shields
- F. Chelicera

Fig. 11

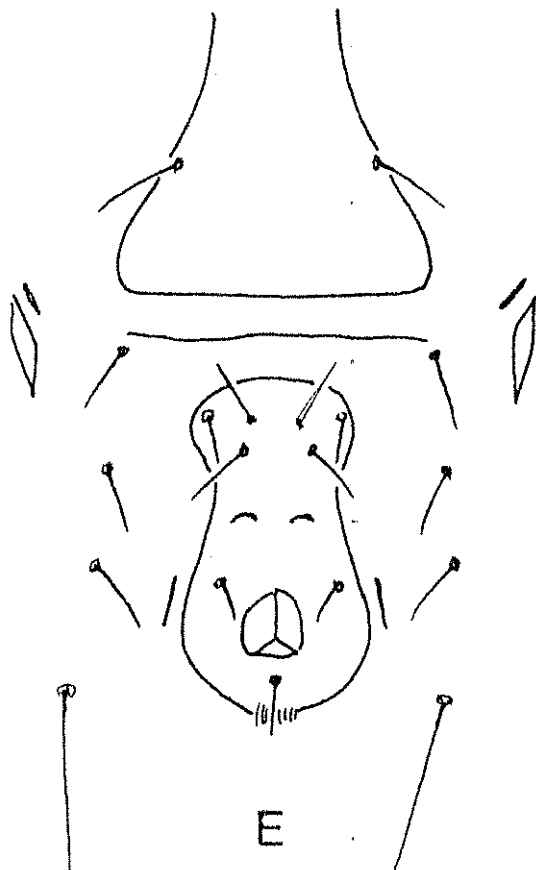




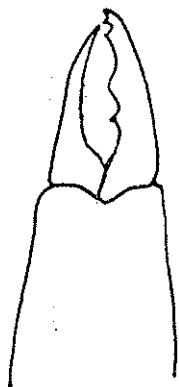
B



C

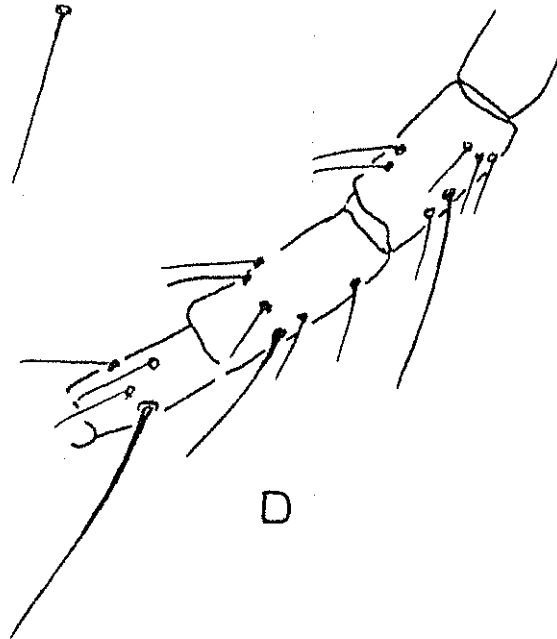


E



F

$\frac{1}{4} \mu$



D

26

Dorsal setae: V 36 μ ; D1 16 μ , D2 18 μ , D3 26 μ , D4 34 μ ; C1 5 μ ; L1 39 μ , L2 33 μ , L3 48 μ , L4 broken, L5 26 μ , L6 36 μ , L7 29 μ , L8 39 μ , L9 70 μ ; M1 16 μ , M2 31 μ ; S1 21 μ , S2 13 μ (Fig.11A). Peritremal shield as shown in figure 11B. Peritreme reaching beyond seta L2 (Fig.11A). Sternal shield with 3 pairs setae, I smaller than distance I- II, II just reaching base seta III. Metasternal setae, 1 pair, each seta on a separate platelet. Genital shield wider than width of ventrianal shield, 24 μ apart from each other, with a membranous fold inbetween (Fig.11E). Ventrianal shield smooth, vase-shaped, with 3 pairs preanal setae and 1 pair elliptical pores (Fig.11E). Four pairs setae and 1 pair minute platelets on membrane surrounding ventrianal shield, seta VL1 smooth, 44 μ long (Fig.11E). Metapodal platelets, 2 pairs, primary, 26 μ long, secondary, 5 μ long (Fig.11E). Leg IV macrosetae on genu, tibia, and basitarsus, simple measuring 57 μ , 42 μ and 73 μ in length, respectively (Fig.11D). Spermatheca as shown in figure 11C, major duct 16 μ , atrium 5 μ and cervix 31 μ long (Fig.11C).

MALE: Not known.

TYPE: Holotype female, collected 1 mi. E. Takht Bhai, 13.xi.1982 (M.Shahid) from Undet. host plant No.4/82 and deposited in the Department of Zoology, University of Peshawar, Peshawar (Map No.11).

REMARKS: This new species is closely related to Amblyseius perfectus Chaudhri, Amblyseius stolidus Chaudhri

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COLLECTION AREA

OF

11. Amblyseius takhti, new species



Map No. 11

and Amblyseius venustus Chaudhri due to smooth dorsal shield and other body characters but the following characters separate it from these three species.

1. Cheliceral movable digit with 1 tooth in perfectus, stolidus and venustus whereas it is smooth in this new species.
2. Setae L9 and M2 serrate in perfectus, stolidus and venustus but smooth in this new species.
3. Ventrianal shield striated in perfectus, stolidus and venustus but smooth in this new species.
4. Peritreme reaching up to seta V in perfectus, stolidus and venustus whereas it reaches only up to seta L2 in this new species.

12. Amblyseius uvidus, new species

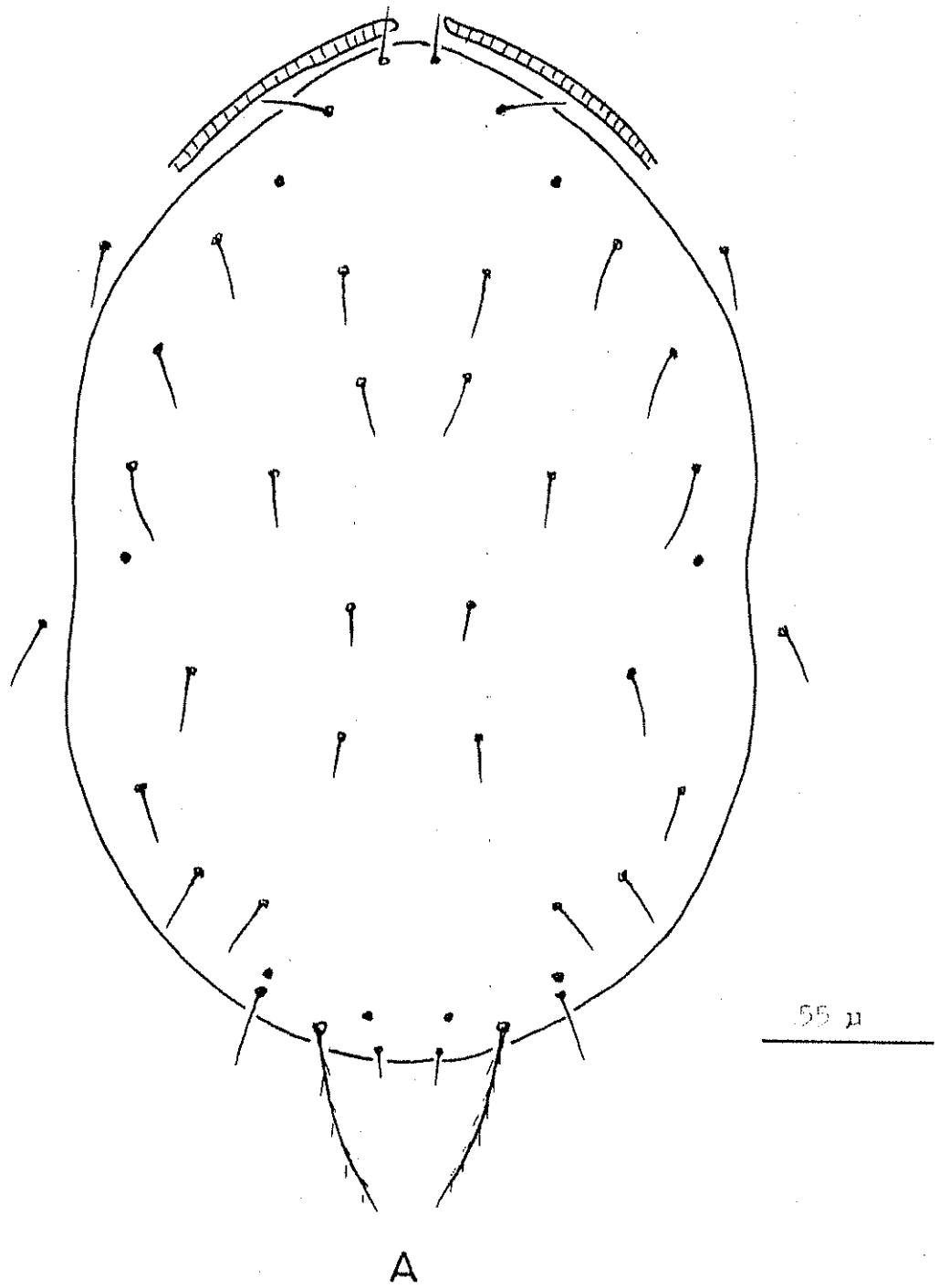
(Fig.12)

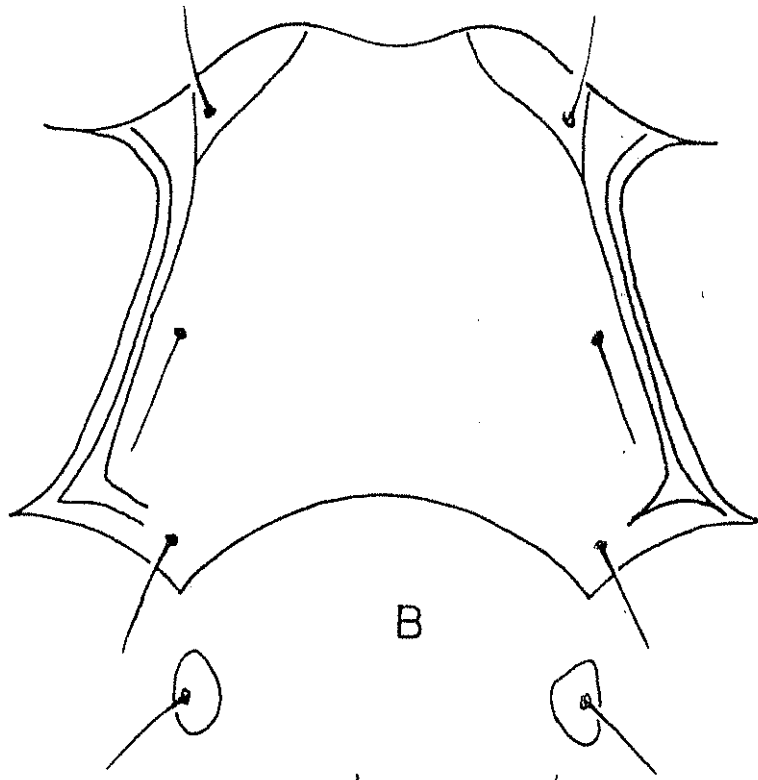
FEMALE: Dorsal shield smooth, concave near S2, 335 μ long, 243 μ wide with 17 pairs setae and 4 pairs visible pores (Fig.12A). Chelicera 34 μ long, movable digit with 2 teeth and fixed digit with 3 subapical teeth (Fig.12E). Dorsal setae smooth except L9, weakly serrate. All dorsal setae smaller than distance to respective seta next in line. Dorsal setae: V 13 μ ; D1 16 μ , D2 13 μ , D3 11 μ , D4 10 μ ; C1 10 μ ;

Fig. 12. Amblyseius uvidus, new species

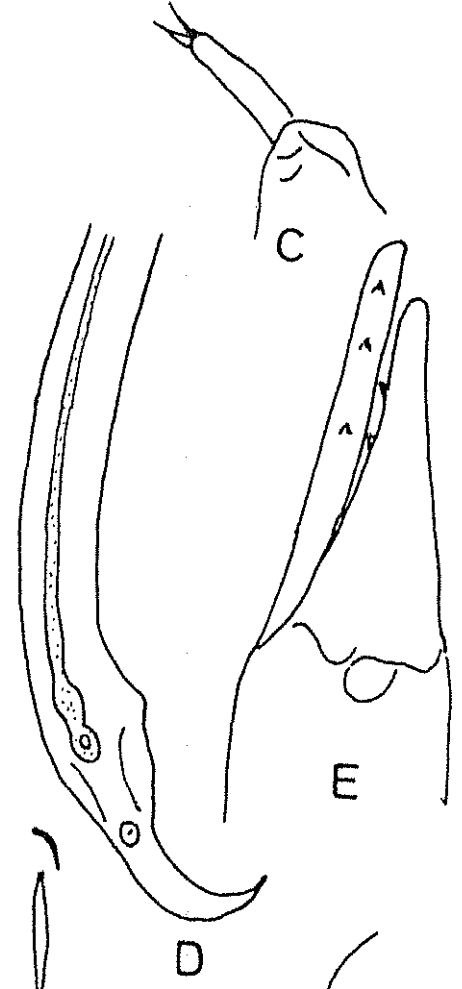
- A. Dorsal shield
- B. Sternal shield
- C. Spermatheca
- D. Peritremal shield
- E. Chelicera
- F. Leg IV
- G. Genital and Ventrianal shields

Fig. 12





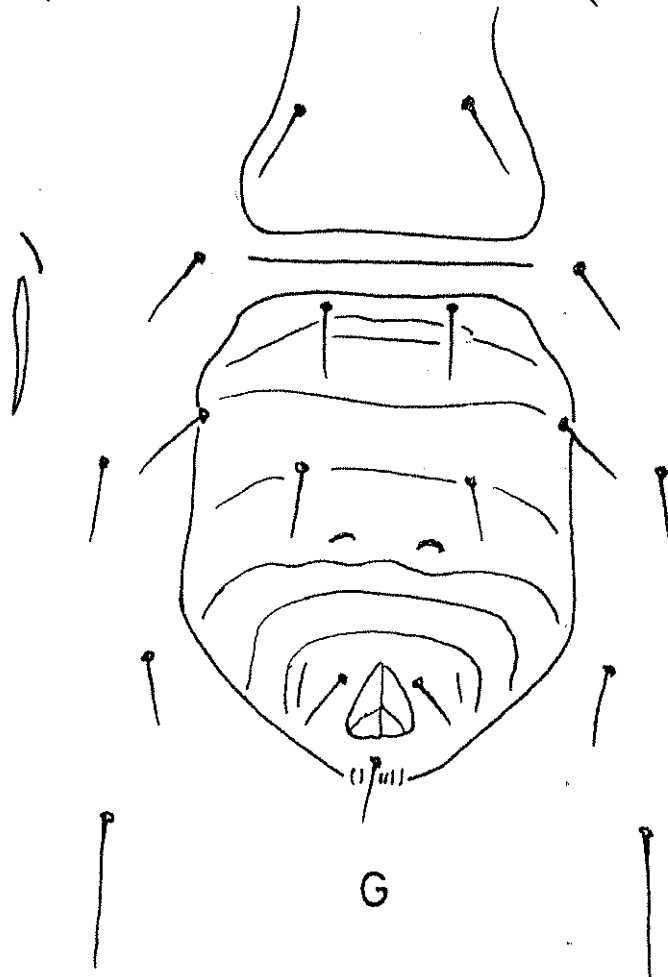
B



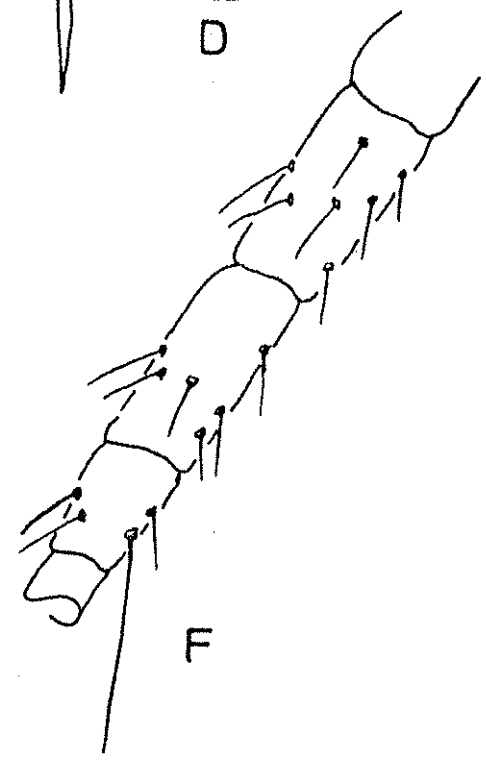
C

E

D



G



F

14 μ

L1 18 μ , L2 16 μ , L3 13 μ , L4 16 μ , L5= L6= 13 μ , L7 10 μ , L8 18 μ , L9 50 μ ; M1 13 μ , M2 18 μ ; S1 13 μ , S2 16 μ (Fig.12A). Peritremal shield as shown in figure 12D. Peritreme reaching up to seta V. Sternal shield as shown in figure 12B, 3 pairs sternal setae, all short of distance to seta next in line. Metasternal setae, 1 pair, each seta on a separate platelet (Fig.12B). Genital shield 20 μ apart from ventrianal shield, as wide as width of ventrianal shield, 1 pair genital setae. A membranous fold in between genital and ventrianal shields (Fig.12G). Ventrianal shield striated, lateral sides almost straight, 3 pairs preanal setae and a pair of elliptical pores (Fig.12G). Four pairs setae on membrane surrounding ventrianal shield, seta VL1 smooth, 47 μ long (Fig.12G). Metapodal platelets, 2 pairs, primary, 1 pair, 26 μ long, secondary, 1 pair, 8 μ long (Fig.12G). Leg IV macroseta on basitarsus, simple, 57 μ long (Fig.12F). Spermatheca as shown in figure 12C, atrium 4 μ , cervix, 18 μ .

MALE: Not known.

TYPE: Holotype female, collected 1 mi. E. Takht Bhai, 13.xi.1982 (M. Shahid) from Undet. host plant No. 1/82; one female, same collection data from maize (Zea mays) and deposited in the Department of Zoology, University of Peshawar, Peshawar (Map No. 12).

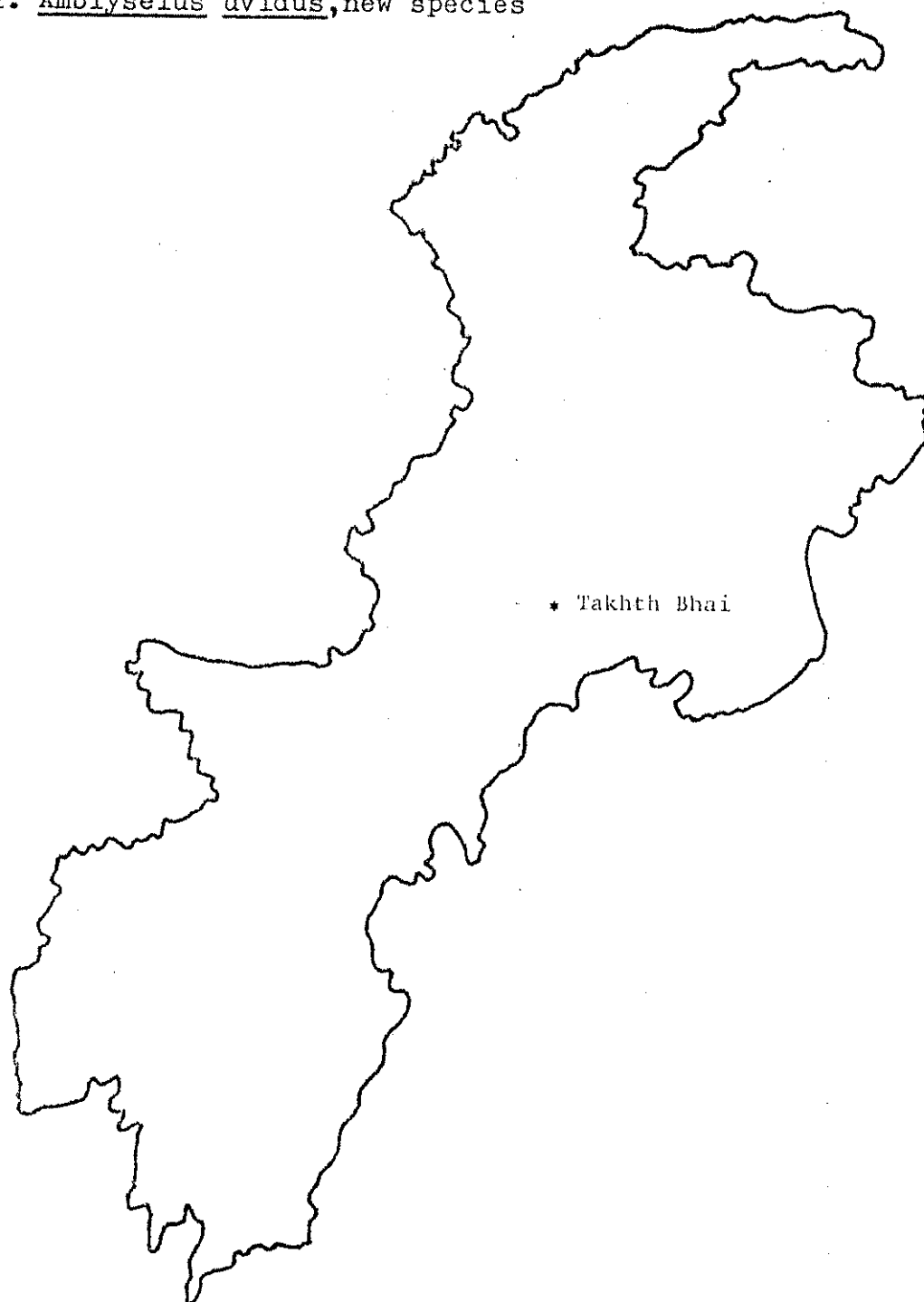
REMARKS: This new species is closely related to Amblyseius balios, new species due to smooth dorsal shield, seta L9 serrate, M2 smooth, peritreme reaching seta V. The following characters separate the two species from each other.

1. Dorsal shield with 2 pairs visible pores in balios

N. W. F. R.

COLLECTION AREA
OF

12. Amblyseius uvidus, new species



Map No. 12

whereas 4 pairs pores in this new species.

2. Cheliceral movable digit with 1 tooth in balios but 2 subapical teeth in this new species.
3. Leg IV with 3 macrosetae in balios whereas only 1 macroseta on leg IV in this new species.

13. Amblyseius balios, new species

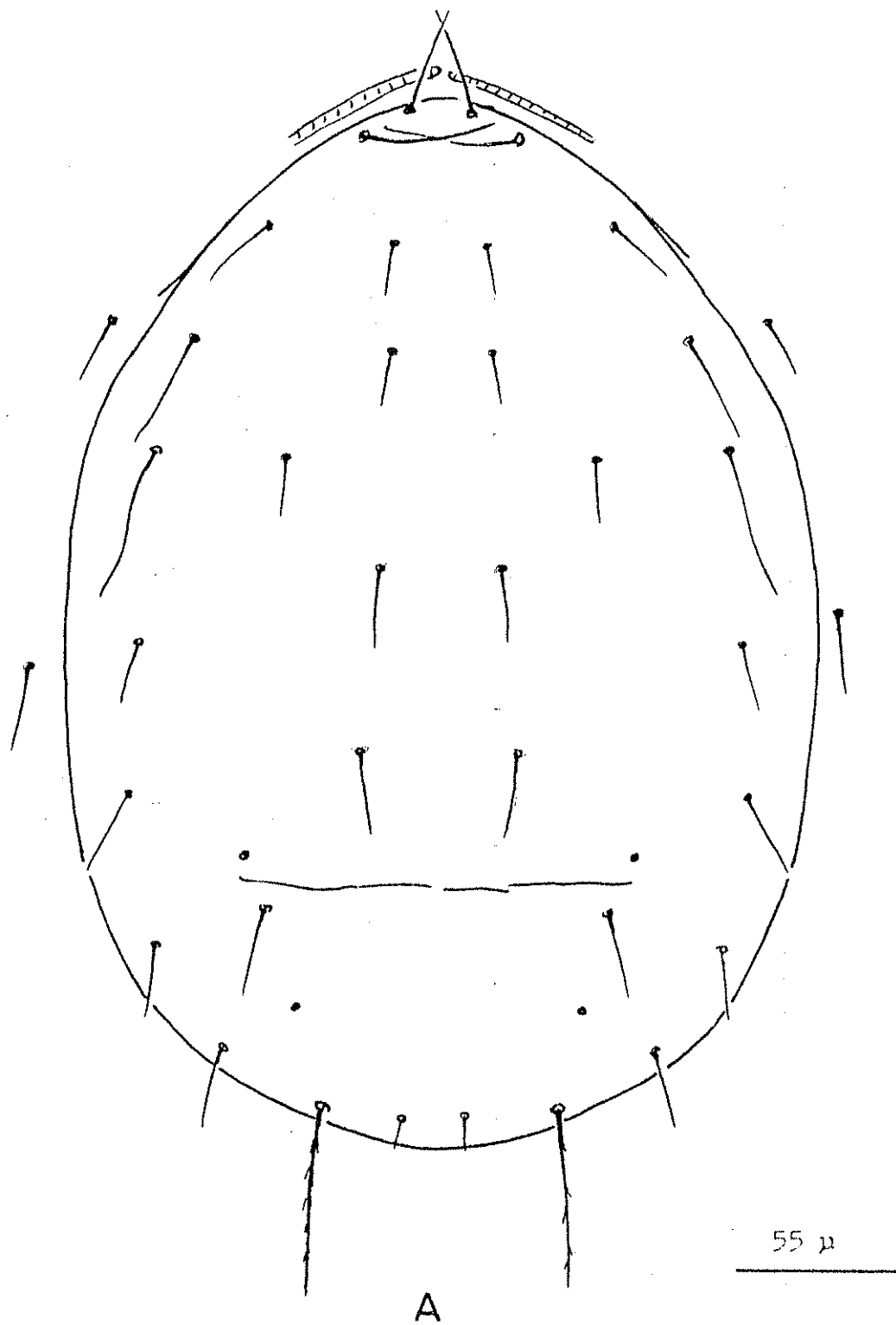
(Fig.13)

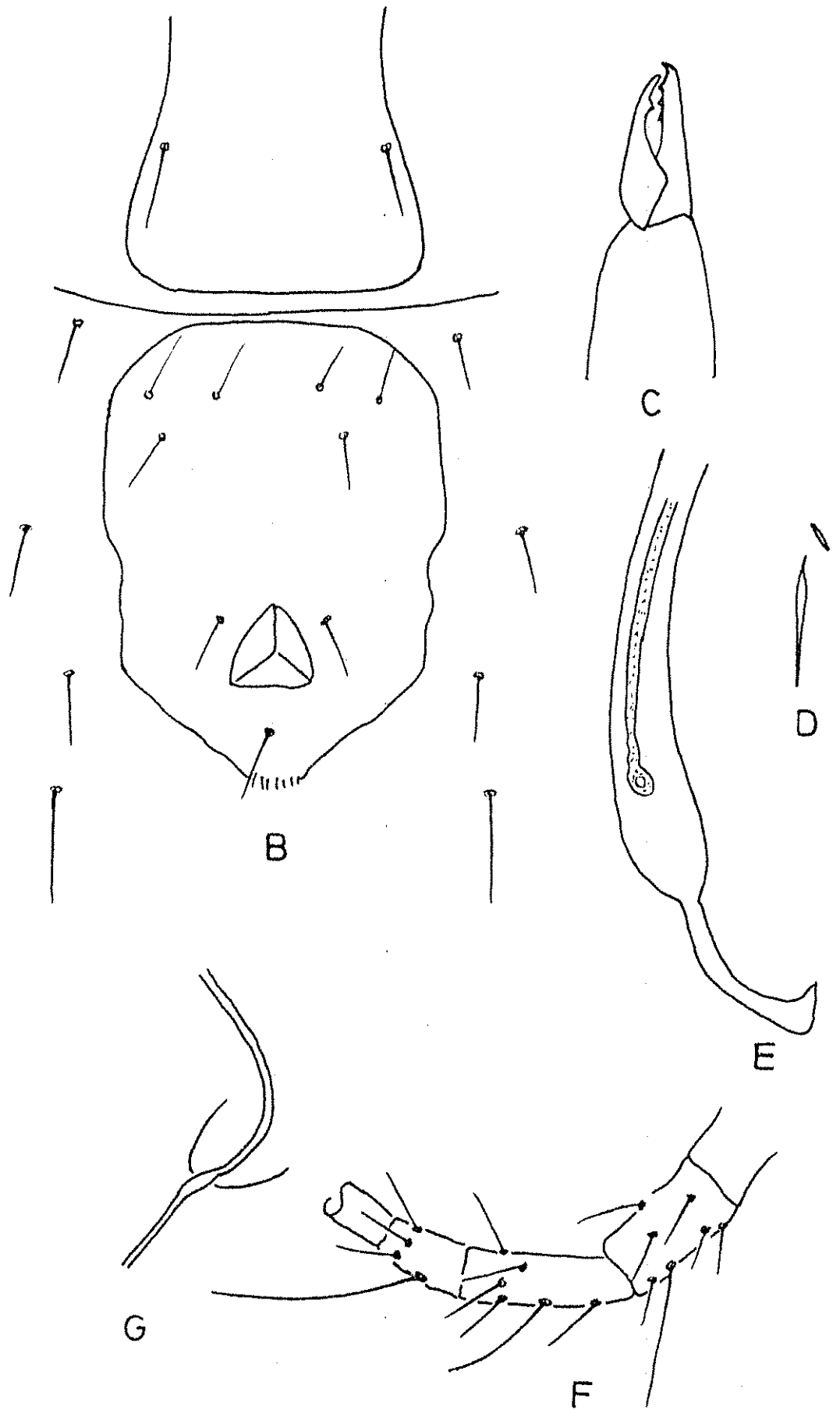
FEMALE: Dorsal shield smooth, oval, 322 μ long, 250 μ wide with 17 pairs setae and 2 pairs visible pores (Fig.13A). Chelicera 26 μ long, movable digit with 1 tooth and fixed digit with 3 subapical teeth (Fig.13C). All setae smooth except L9, weakly serrate. Seta L1 longer than distance L1- L2, L2 smaller than distance L2- L3, L3 longer than distance L3- L4, L5, L6, L7, L8 and L9 smaller than respective distance to seta next in line. Dorsal setae : V 31 μ ; D1 = D2 = 11 μ , D3 = D4 = 16 μ ; C1 5 μ ; L1 31 μ , L2 26 μ , L3 31 μ , L4 49 μ , L5 13 μ , L6 21 μ , L7 18 μ , L8 23 μ , L9 55 μ ; M1 11 μ , M2 18 μ ; S1 11 μ , S2 13 μ (Fig.13A). Peritremal shield as shown in figure 13E. Peritreme reaching up to seta V. Sternal shield with 3 pairs sternal setae. Metasternal setae, 1 pair, each seta on a separate platelet. Genital shield 11 μ apart from ventrianal shield, 1 pair genital setae, simple. A membranous fold in between genital and ventrianal shields

Fig. 13. Amblyscius balios, new species

- A. Dorsal shield
- B. Genital and Ventrianal shields
- C. Chelicera
- D. Metapodal platelets
- E. Peritremal shield
- F. Leg IV
- G. Spermatheca

Fig. 13





14 μ

(Fig.13B). Ventrianal shield with 3 pairs preanal setae, pores absent, first two pairs setae forming a straight line (Fig.13B). Four pairs setae on membrane surrounding ventrianal shield, seta VL1 simple, 31μ long. Metapodal platelets, 2 pairs, primary, 1 pair, 26μ long, secondary, 1 pair, 5μ long (Fig.13D). Spermatheca as shown in figure 13G. Leg IV with 3 macrosetae, simple, genu 49μ , tibia 21μ , basitarsus 68μ long (Fig.13F).

MALE: Not known.

TYPE: Holotype female, collected 6 mi.E. Peshawar, 2.ix.1981 (M.Shahid) from wheat straw, Triticum aestivum and deposited in the Department of Zoology, University of Peshawar, Peshawar (Map No.13).

REMARKS: This new species is separated from Amblyseius uvidus, new species due to difference in the shape of ventrianal shield, difference in number of subapical teeth on movable digit of chelicera, number of leg IV setae and pores on dorsal shield.

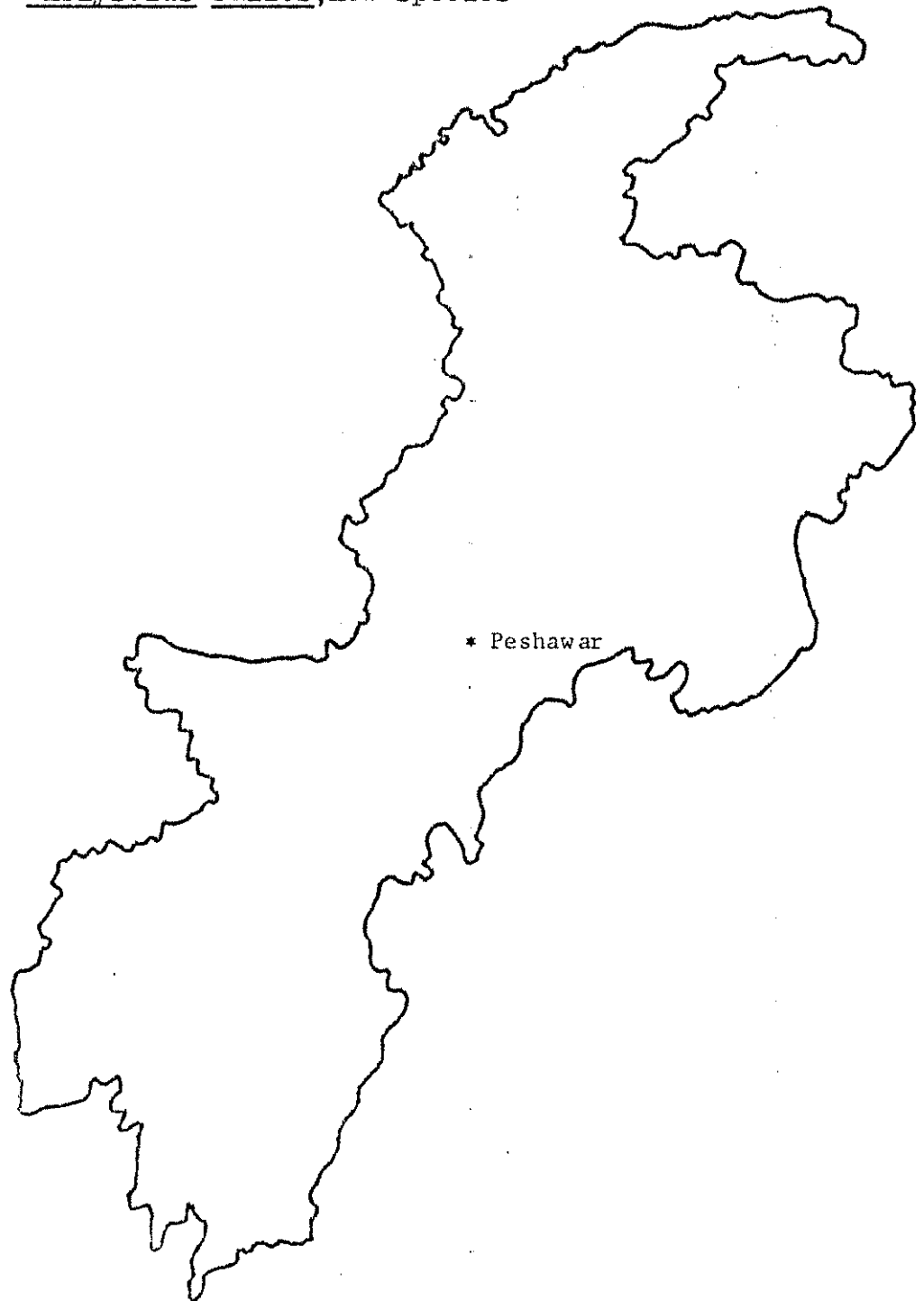
14. Amblyseius darghaiensis, new species
(Fig.14)

FEMALE: Dorsal shield smooth, sole-shaped, 343μ long, 219μ wide with 17 pairs setae and 5 pairs visible pores (2 pairs pores ^l elliptical and 3 pairs rounded) (Fig.14A).

N. W. F. P.

COLLECTION AREA

OF

13. Amblyseius balios, new species

Map No. 13

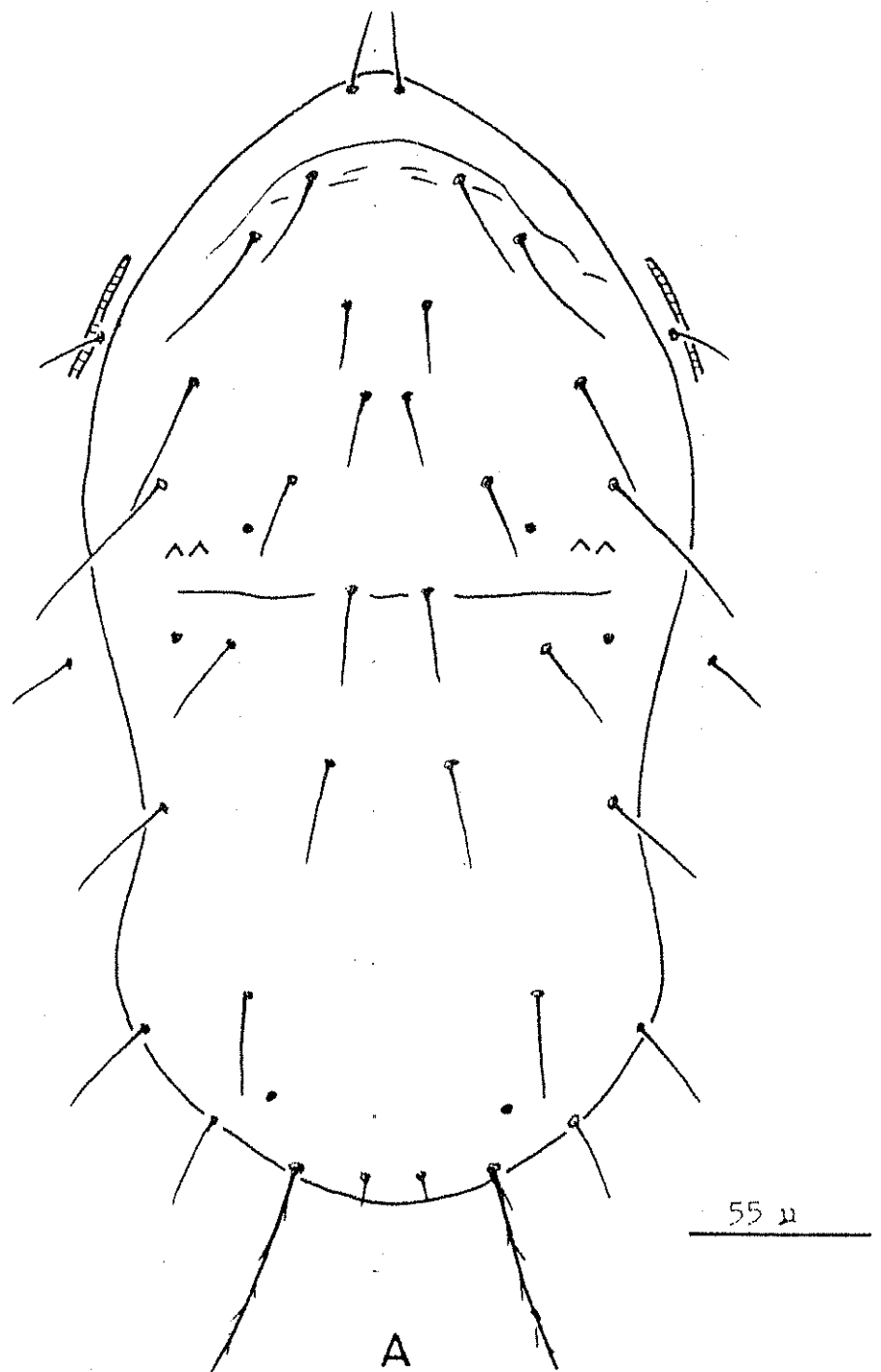
Chelicera 28 μ long, movable digit with 1 tooth and fixed digit with 2 subapical teeth (Fig.14B). Dorsal setae smooth except L9, serrate. Seta L1 longer than distance L1- L2, L2 smaller than distance L2- L3, L3 longer than distance L3- L4, other setae smaller than distance to respective seta next in line, seta M2 39 μ and 47 μ apart from setae L7 and L8, respectively. Dorsal setae: V 34 μ ; D1 23 μ , D2 26 μ , D3 34 μ , D4 39 μ ; C1 5 μ ; L1 41 μ , L2 44 μ , L3 52 μ , L4 68 μ , L5 36 μ , L6 42 μ , L7 31 μ , L8 36 μ , L9 68 μ ; M1 23 μ , M2 34 μ ; S1 13 μ , S2 15 μ (Fig.14A). Peritremal shield as shown in figure 14E. Peritreme reaching up to seta L2 (Fig.14A). Sternal shield with 3 pairs sternal setae, seta I reaching base of seta II, seta II longer than distance II-III. Metasternal setae, 1 pair, each seta on a separate platelet. Genital shield 8 μ apart from ventrianal shield with a membranous fold inbetween, genital setae, 1 pair (Fig.14F). Ventrianal shield concave anteriorly, rounded posteriorly and deeply concave laterally with 3 pairs preanal setae and a pair of elliptical preanal pores (Fig.14F). Four pairs setae on membrane surrounding ventrianal shield, seta VL1 smooth, 39 μ long. Metapodal platelets, 2 pairs. Spermatheca as shown in figure 14D, atrium 3 μ long, cervix elongated tube. Leg IV macrosetae on genu, tibia and basitarsus measuring 57 μ , 39 μ and 65 μ , in length, respectively (Fig.14C).

MALE: Not known.

Fig. 14. Amblyscius danghaiensis, new species

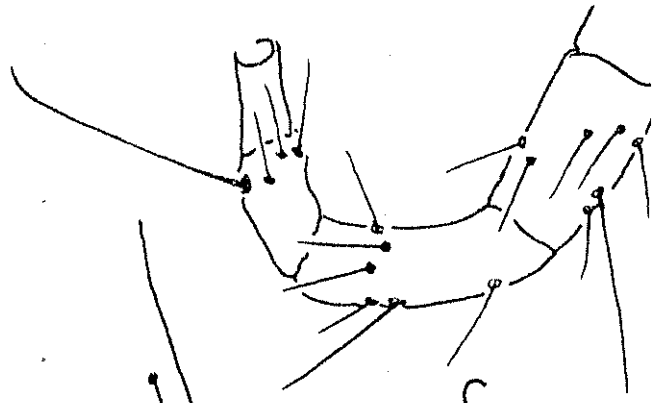
- A. Dorsal shield
- B. Chelicera
- C. Leg IV
- D. Spermatheca
- E. Peritremal shield
- F. Genital and Ventrianal shields

Fig. 14

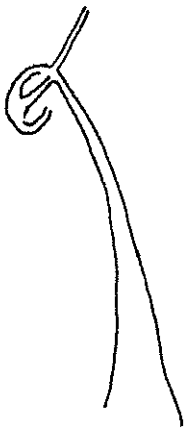




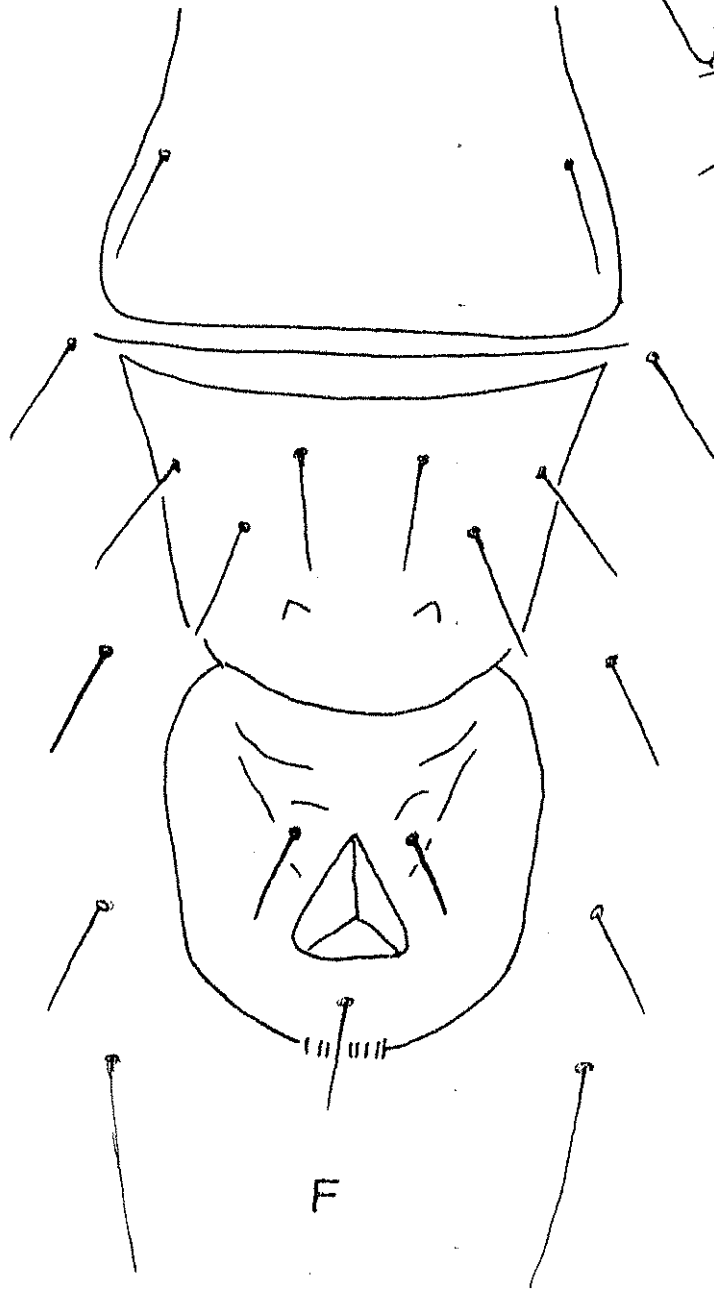
B



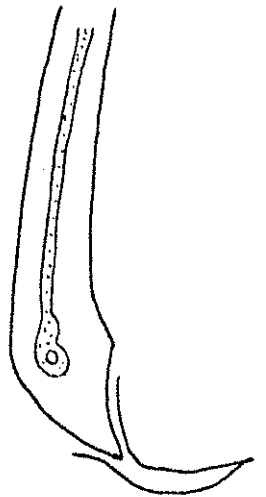
C



D



F



E

14 μ

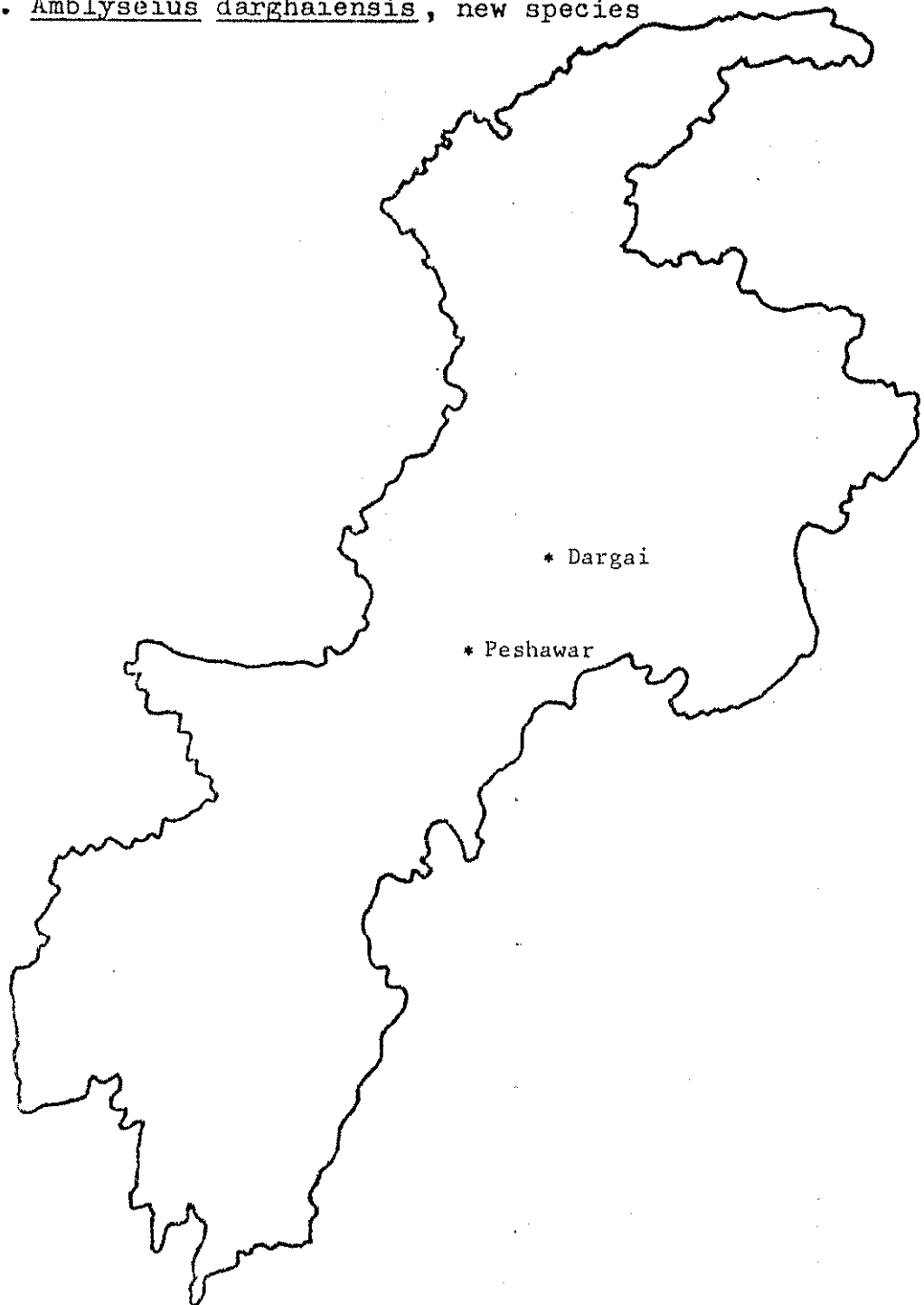
107

TYPE: Holotype female, collected 1 mi. N. Dargai ,
14.xi.1982 (M. Shahid) from 'Bhang' (Cannabis sativa); two
females collected, 2 mi. N. Peshawar, 8.x.1980 from Undet.
host plant No. 18/80; one female, 4 mi. E. Peshawar, 13.x.1980
from maize, (Zea mays); six females, 1 mi. S. Peshawar,
18.x.1980 from mulberry, (Morus alba); Undet. host plant
No. 70/80, lady's finger, (Hibiscus esculentus); three
females collected 1 mi. E. Dargai , 14.xi.1982 from 'wild
podeena, (Mentha sylvestris). The specimens have been
deposited in the Department of Zoology, University of
Peshawar, Peshawar (Map No. 14).

REMARKS: This new species is comparable with Amblyseius
emotus, new species but the following characters separate
the two species from each other.

1. Shape of dorsal shield differs in both the species.
2. Cheliceral fixed digit with 3 teeth in emotus but 2
teeth in this new species.
3. Ventrianal shield preanal pores absent in emotus but
present in this new species.
4. Shape of ventrianal shield differs in both the species.

N. W. F. P.

COLLECTION AREA
OF14. Amblyseius darghaiensis, new species

Map No. 14

15. Amblyseius emotus, new species

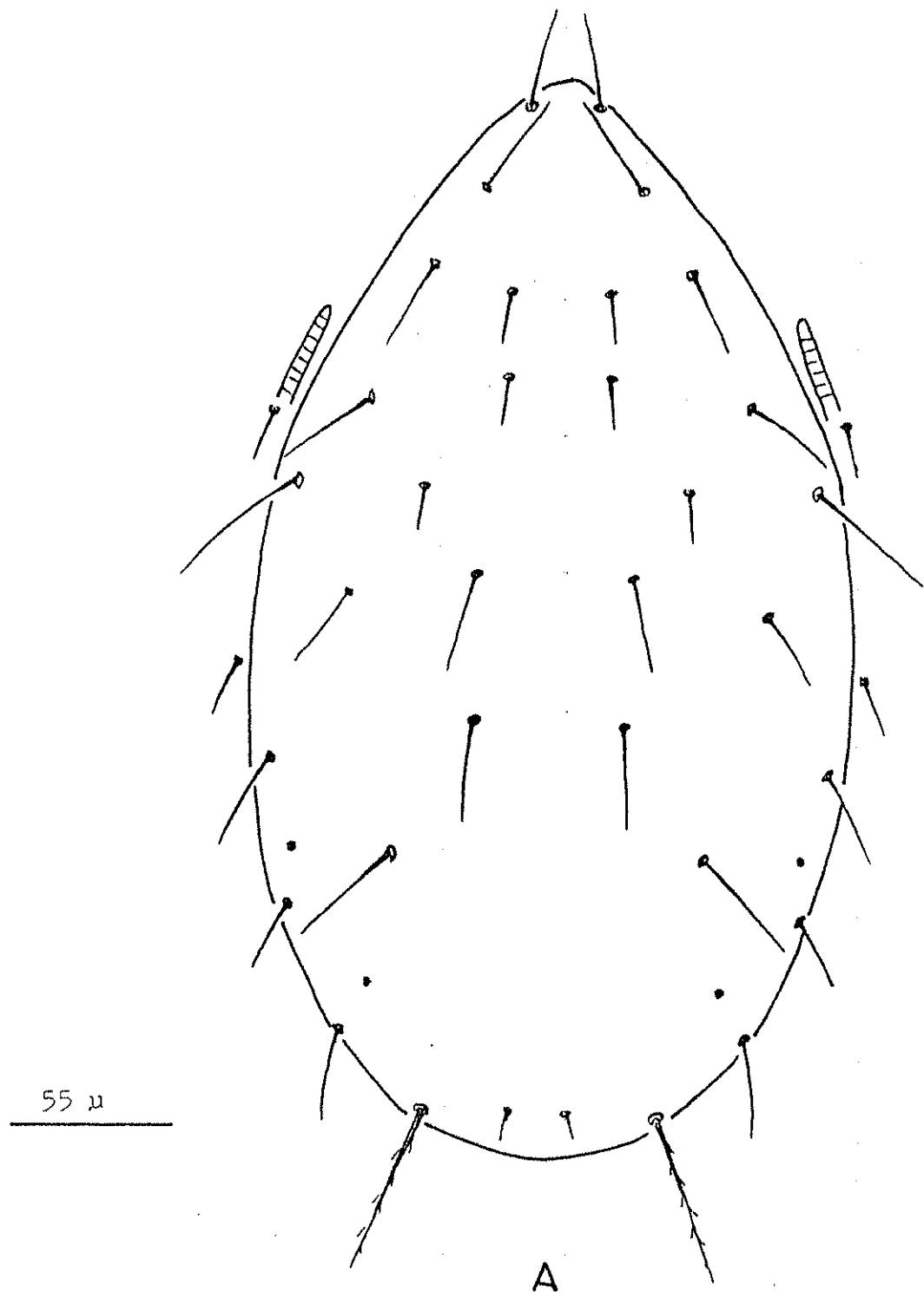
(Fig.15)

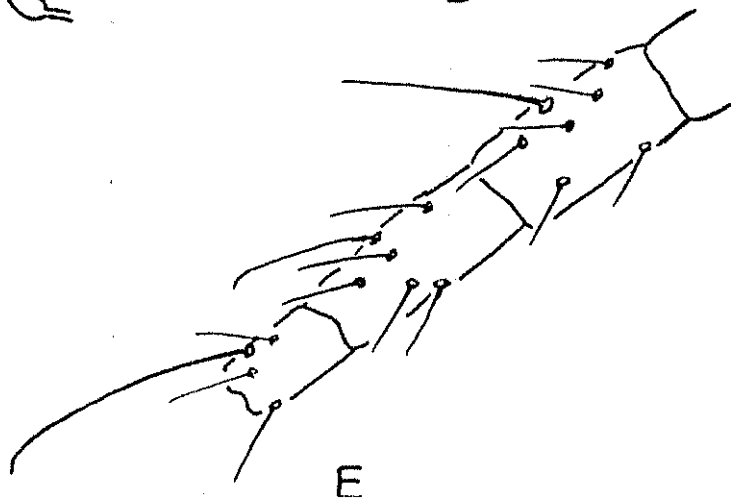
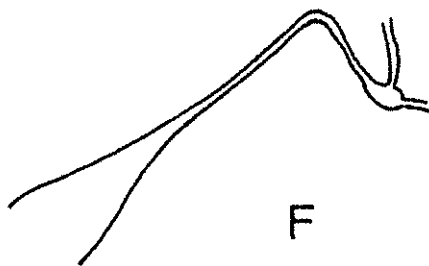
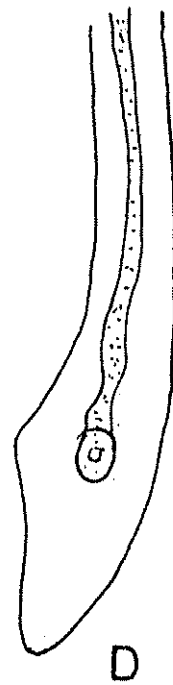
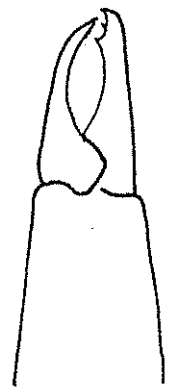
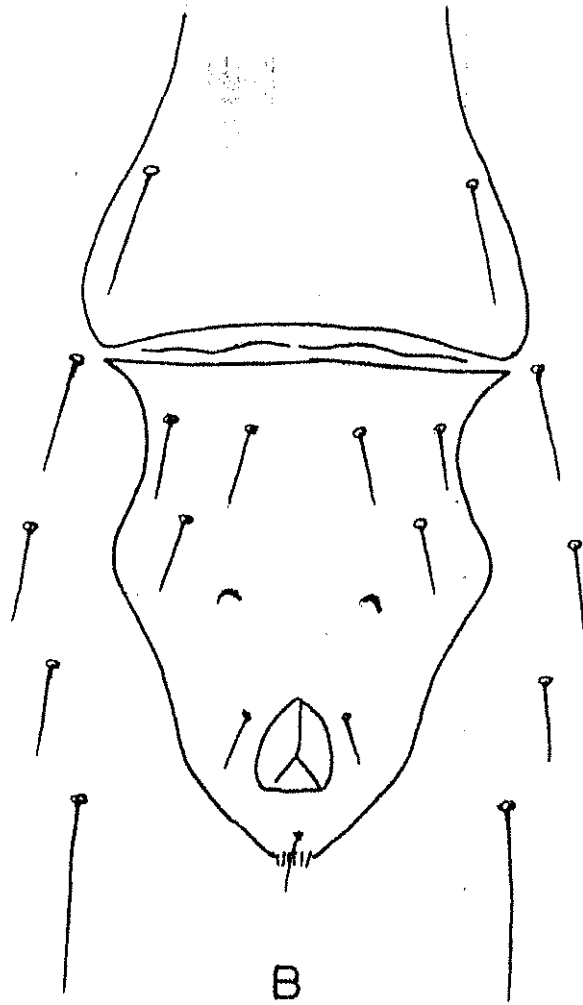
FEMALE: Dorsal shield smooth, pear-shaped, 338 μ long, 193 μ wide with 17 pairs setae and 2 pairs visible pores (Fig.15A). Chelicera 26 μ long, movable digit smooth, fixed digit with 2 subapical teeth (Fig.15C). Dorsal setae smooth except L9, serrate. Seta L1 longer than distance L1- L2, L2 smaller than distance L2- L3, L3 reaching base of seta L4, seta M2 24 μ and 42 μ apart from L7 and L8, respectively (Fig.15A). Dorsal setae: V 29 μ ; D1 13 μ , D2 16 μ , D3 26 μ , D4 26 μ ; C1 6 μ ; L1 36 μ , L2 27 μ , L3 42 μ , L4 55 μ , L5 21 μ , L6 26 μ , L7 18 μ , L8 25 μ , L9 57 μ ; M1 13 μ , M2 26 μ ; S1= S2= 14 μ (Fig.15A). Peritremal shield as shown in figure 15D. Peritreme reaching middle of setae L2- L3 (Fig.15A). Sternal shield with 3 pairs sternal setae, I smaller than distance to seta next in line, II reaching beyond distance II-III. Metasternal setae, 1 pair, each seta on a separate platelet. Genital shield 10 μ apart from ventrianal shield, with a membranous fold inbetween, a pair of genital setae. Ventrianal shield straight anteriorly, with 2 deep concave areas laterally, 3 pairs preanal setae and a pair of preanal pores (Fig.15B). Four pairs setae on membrane surrounding ventrianal shield, seta VL1, simple, 31 μ long (Fig.15B). Metapodal platelets, 2 pairs, primary, 1 pair, 26 μ long, secondary, 1 pair, 7 μ long. Spermatheca as shown in figure

Fig. 15. Amblyseius emotus, new species

- A. Dorsal shield
- B. Genital and Ventrianal shields
- C. Chelicera
- D. Peritremal shield
- E. Leg IV
- F. Spermatheca

Fig.15





14 μ

15F, atrium 7 μ long, cervix, a long tube, 42 μ long. Leg IV macrosetae smooth, genu 55 μ , tibia 34 μ , basitarsus 70 μ long, tip minutely recurved (Fig. 15E).

MALE: Not known.

TYPE: Holotype female, collected N.W.F.P. Agricultural University area, Peshawar, 27.viii.1980 (M. Shahid) from plum, (Prunus domestica); one female collected, 3 mi. E. Peshawar, 22.ix.1982 from 'ber', (Zizyphus jujuba); two females collected, 1 mi. S. Peshawar, 15.x.1982 from citrus, (Citrus sinensis). The specimens were deposited in the Department of Zoology, University of Peshawar, Peshawar (Map No. 15).

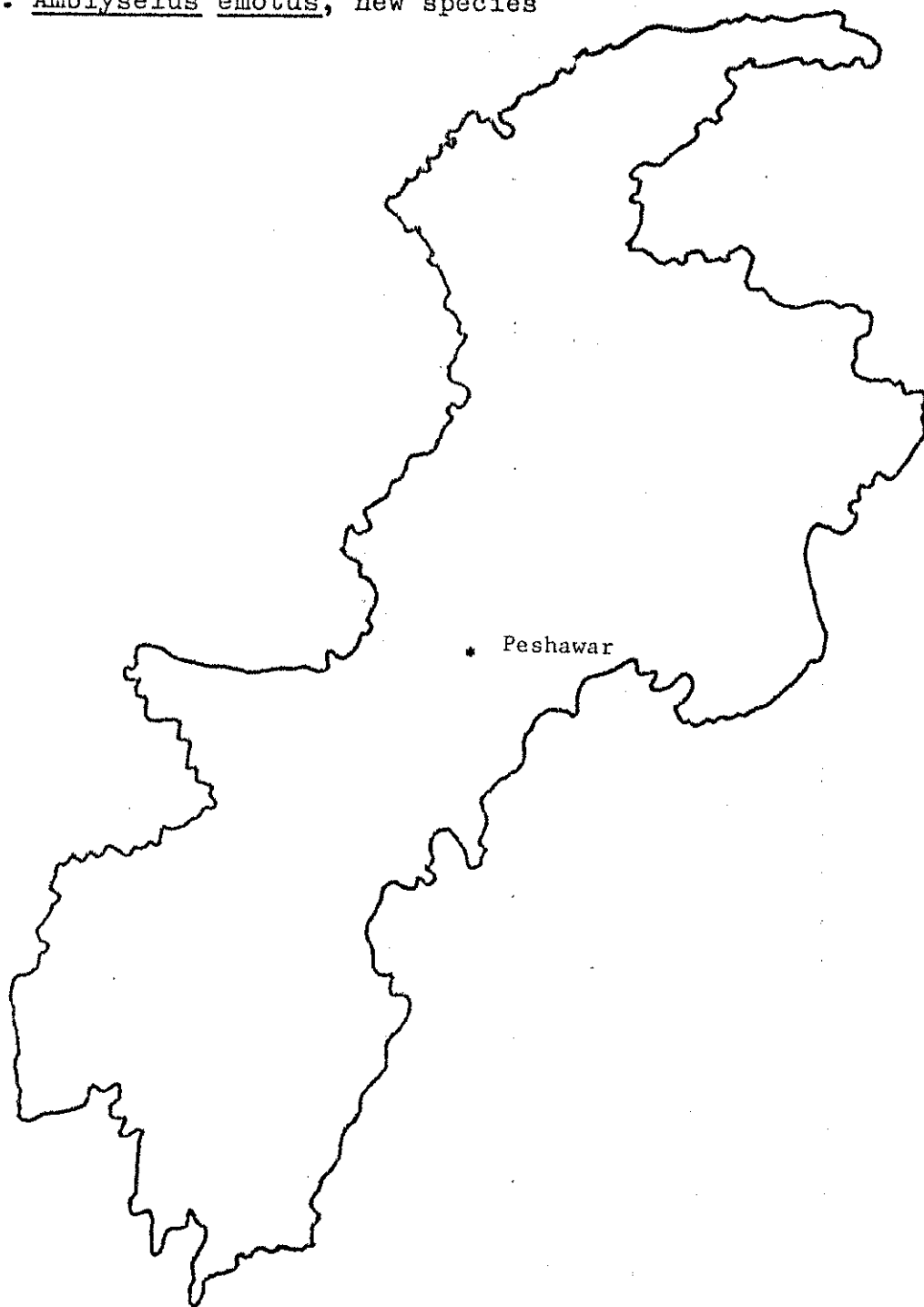
REMARKS: This new species is separable from Amblyseius darghaiensis, new species on the basis of the following characters.

1. Shape of dorsal shield differs in both the species.
2. Cheliceral fixed digit with 2 subapical teeth in darghaiensis but 3 subapical teeth in this new species.
3. Shape of ventrianal shield differs in both the species.
4. Dorsal shield with 5 pairs visible pores in darghaiensis but 2 pairs visible pores in this new species.

N. W. F. P.

COLLECTION AREA
OF

15. Amblyseius emotus, new species



Map No. 15

16. Amblyseius inculatus, new species

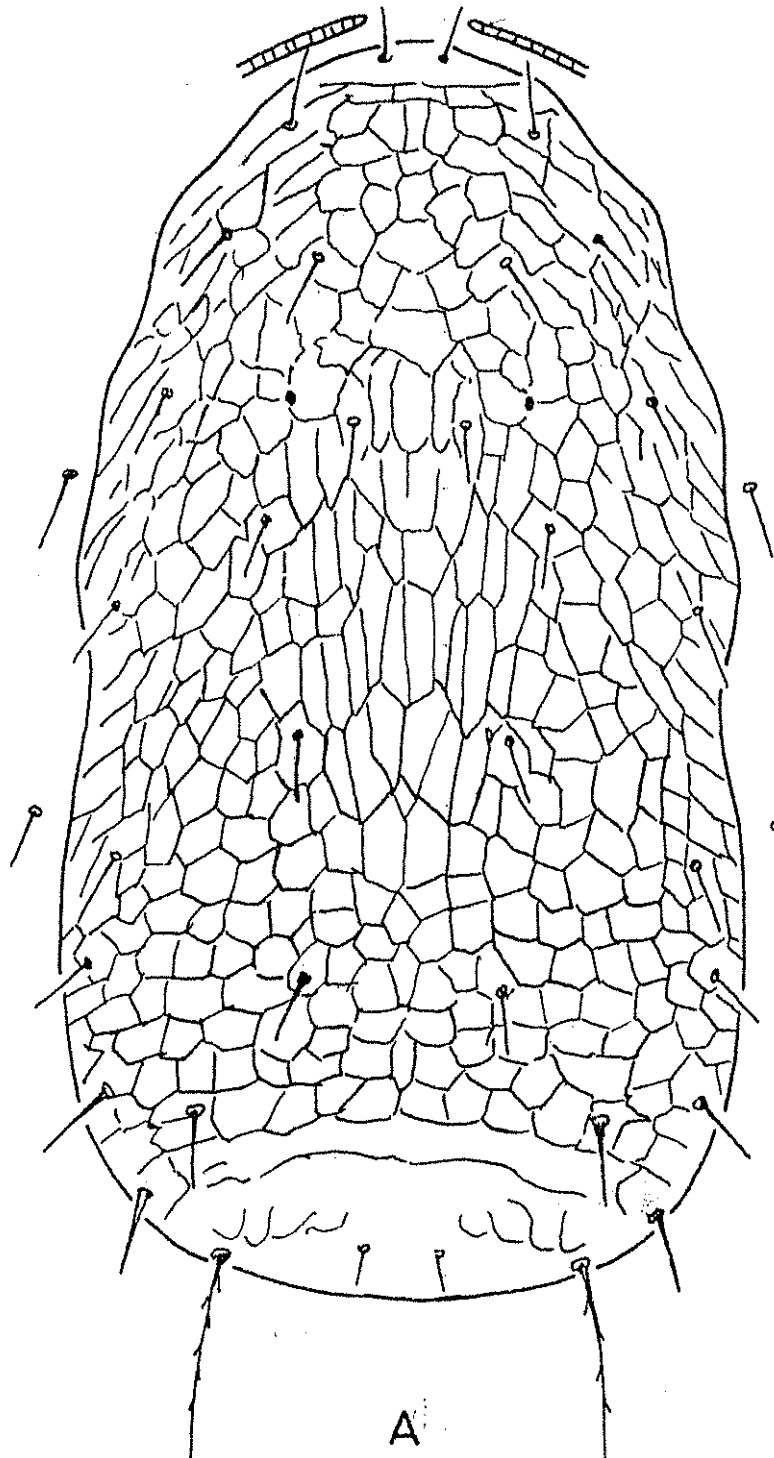
(Fig.16)

FEMALE: Dorsal shield completely reticulated, 3 concave areas on each side of dorsal shield, 406 μ long, 208 μ wide with 17 pairs setae and 1 pair visible pores (Fig.16A). Chelicera 31 μ long, movable digit with 3 and fixed digit with 7 subapical teeth (Fig.16C). Dorsal setae smooth except L9, serrate, setae L7, L8, L9 and M2 stout as compared to other setae on the shield. All dorsal setae shorter than respective distance to seta next in line. Dorsal setae: V 13 μ ; D1 13 μ , D2= D3= D4= 16 μ ; C1 16 μ ; L1 17 μ , L2 13 μ , L3= L4= L5= L6= 18 μ , L7 31 μ , L8 24 μ , L9 70 μ ; M1 11 μ , M2 23 μ ; S1 16 μ , S2 18 μ (Fig.16A). Peritreme reaching up to seta V. Sternal shield with 3 pairs sternal setae, seta I smaller than distance I-II, II smaller than distance II-III (Fig.16B). Metasternal setae, 1 pair, each seta on a separate platelet (Fig.16B). Genital shield 5 μ apart from ventrianal shield with a thick membranous area inbetween the two shields, genital setae, 1 pair. Ventrianal shield oblong, weakly striated, 109 μ long, 104 μ wide, 3 pairs preanal setae and a pair of pores (Fig.16F). Four pairs setae on membrane surrounding ventrianal shield, seta VL1 simple, 34 μ long. Metapodal platelets, 2 pairs, primary 1 pair, 29 μ long, secondary, 1 pair, 8 μ long (Fig.16F). Spermatheca as shown in figure 16D, atrium 5 μ long, cervix broadly rounded. Leg IV macroseta on basitarsus only, smooth, 44 μ long (Fig.16E).

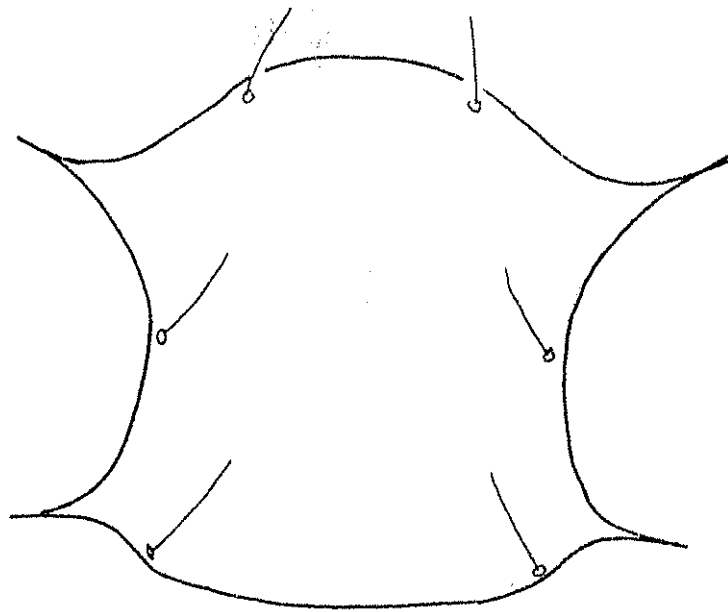
Fig. 16. Amblyseius inculatus, new species

- A. Dorsal shield
- B. Sternal shield
- C. Chelicera
- D. Spermatheca
- E. Leg IV
- F. Genital and Ventrianal shields

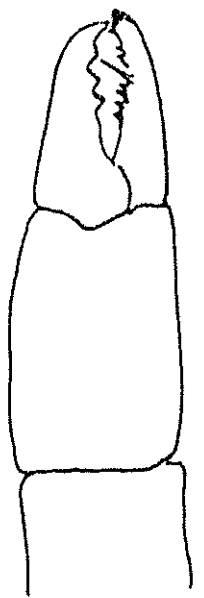
Fig. 16



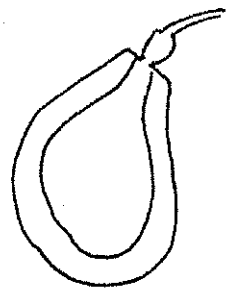
55 μ



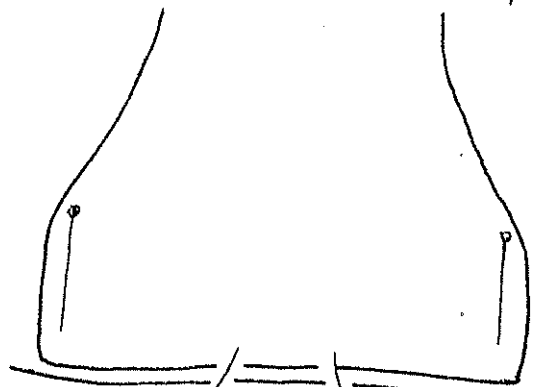
B



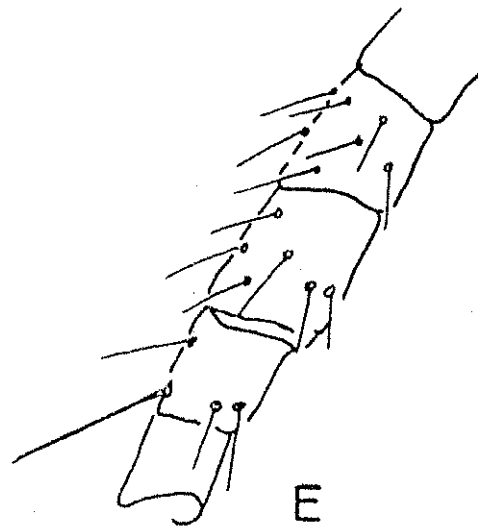
C



D



F



E

14 μ



MALE: Not known.

TYPE: Holotype female, collected 1 mi.E.
N.W.F.P. Agricultural University Campus, Peshawar, 6.x.1980
(M.Shahid) from Undet.host plant No.32/80 and deposited in
the Department of Zoology, University of Peshawar, Peshawar
(Map No.16).

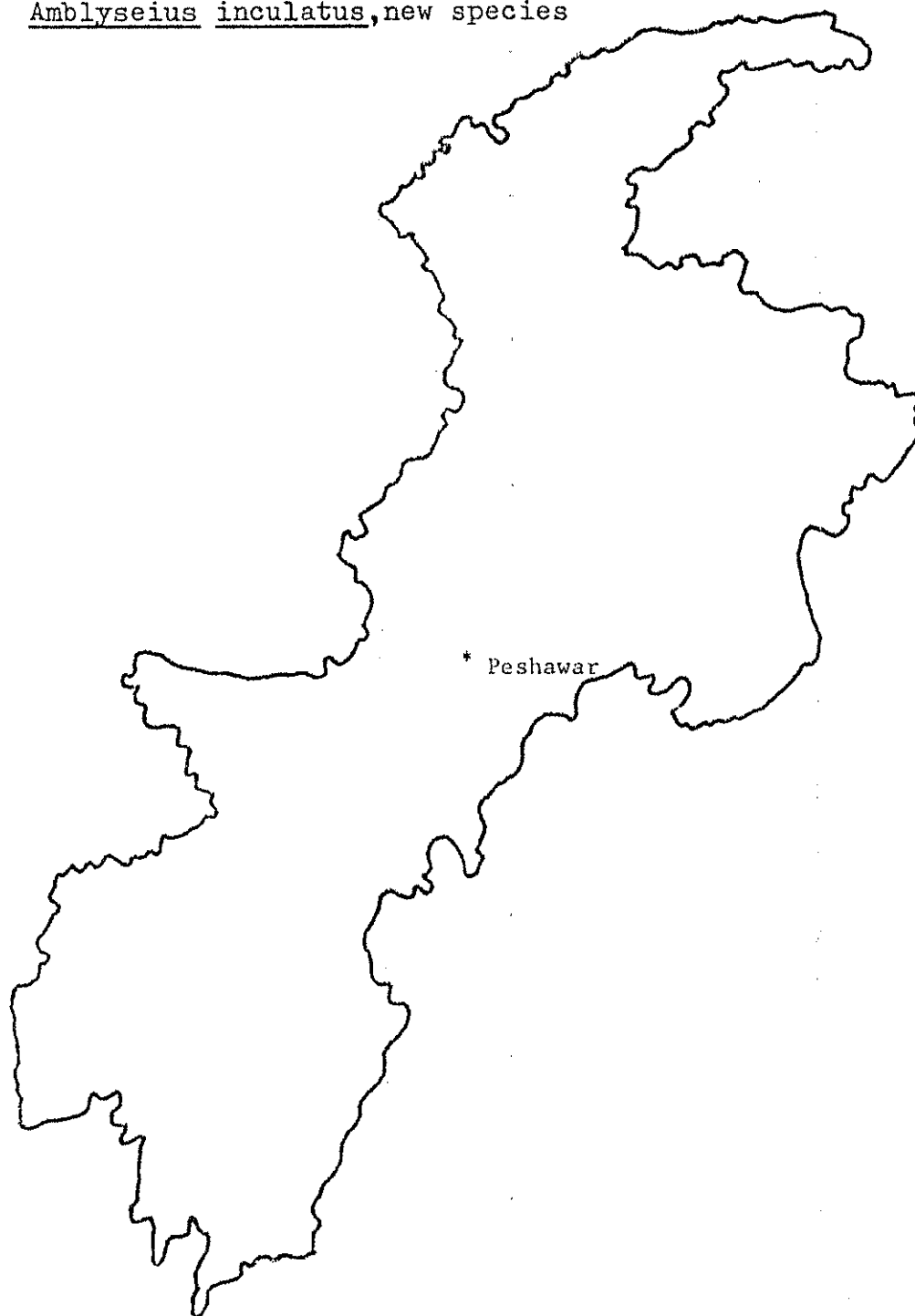
REMARKS: This new species is comparable with Amblyseius
latro, new species due to completely reticulated dorsal shield;
L9 serrate; M2 simple; all dorsal shield setae smaller than
distance to seta next in line but the following characters
separate both the species from each other.

1. Dorsal shield with 3 pairs visible pores in latro but
only 1 pair visible pores in this new species.
2. Peritreme reaching up to seta L1 in latro but it reaches
up to seta V in this new species.
3. Shape of ventrianal shield differs in both the species.
4. Ventrianal shield preanal pores absent in latro but
present in this new species.
5. Leg IV with 3 macrosetae in latro but only 1 macroseta
on leg IV in this new species.

N. W. F. P.

COLLECTION AREA
OF

16. Amblyseius inculatus, new species



Map No. 16

17. Amblyseius latro, new species

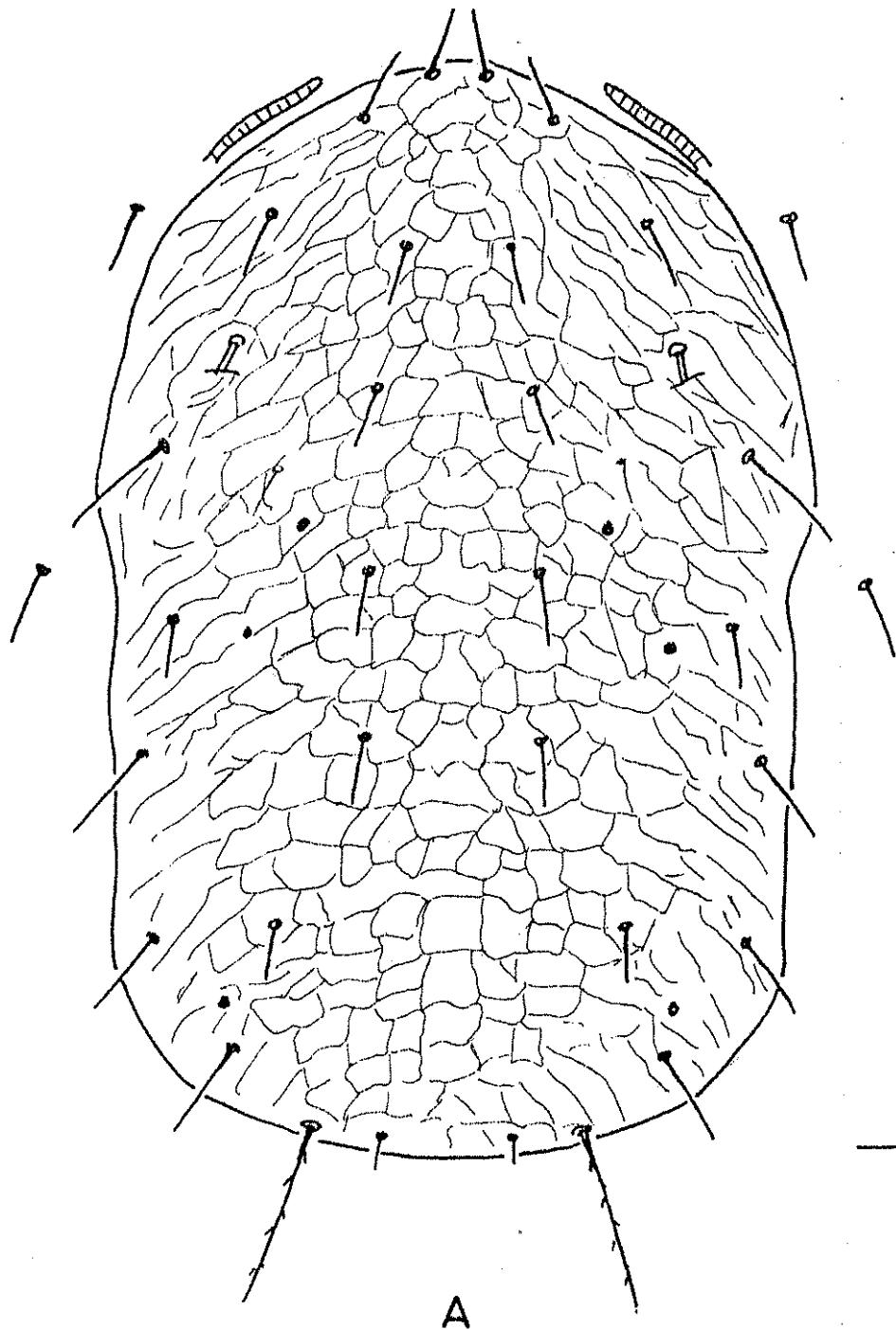
(Fig.17)

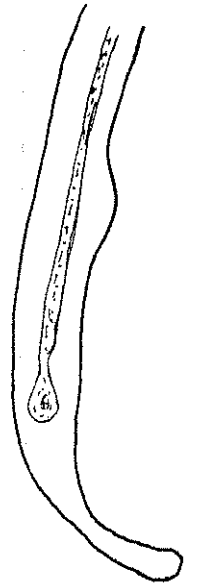
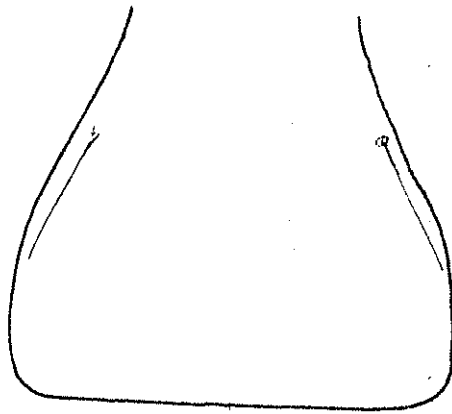
FEMALE: Dorsal shield completely reticulated, 365 μ long, 302 μ wide with 17 pairs setae and 3 pairs visible pores (Fig.17A). Chelicera 31 μ long, teeth not clear due to the position of the specimen. Dorsal setae smooth except L9, serrate. All setae smaller than distance to seta next in line. Dorsal setae: V 34 μ ; D1 13 μ , D2 15 μ , D3 18 μ , D4 24 μ ; C1 5 μ ; L1 31 μ , L2 29 μ , L3 broken, L4 39 μ , L5 18 μ , L6 26 μ , L7 21 μ , L8 29 μ , L9 52 μ ; M1 19 μ , M2 24 μ ; S1 18 μ , S2 16 μ (Fig.17A). Peritremal shield as shown in figure 17C. Peritreme reaching up to seta L1 (Fig.17A). Sternal shield with 3 pairs sternal setae, I reaches base of seta II, II crosses base of seta III. Metasternal setae, 1 pair, each seta on a separate platelet. Genital shield 13 μ apart from ventrianal shield, 1 pair genital setae. Ventrianal shield almost squarish with 3 pairs preanal setae, preanal pores absent (Fig.17B). Four pairs setae on membrane surrounding ventrianal shield, seta VL1 smooth, 45 μ long (Fig.17B). Metapodal platelets, 2 pairs, primary, 1 pair, 26 μ long, secondary, 1 pair, 8 μ long (Fig.17F). Spermatheca as shown in figure 17D, atrium 8 μ and cervix 11 μ long. Leg IV macrosetae on genu, tibia and basitarsus, simple, measuring 44 μ , 36 μ and 63 μ in length, respectively (Fig.17E).

Fig. 17. Amblyseius latro, new species

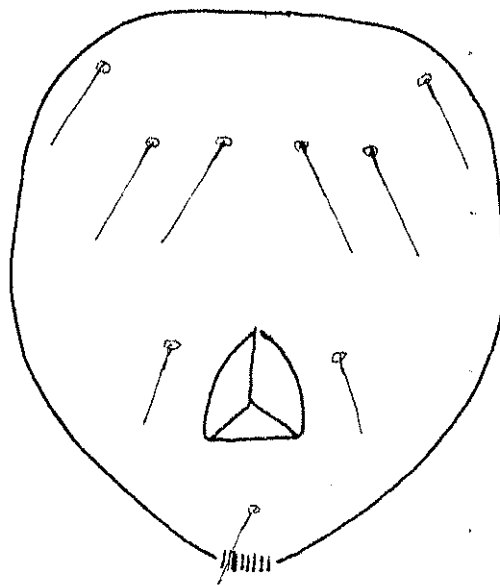
- A. Dorsal shield
- B. Genital and Ventrianal shields
- C. Peritremal shield
- D. Spermatheca
- E. Leg IV
- F. Metapodal platelets

Fig.17

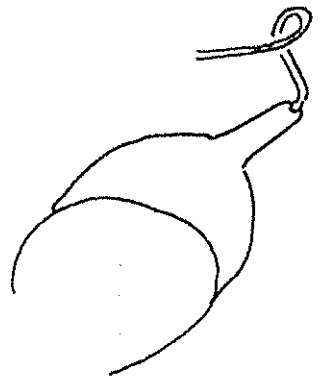




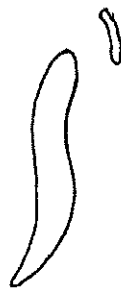
C



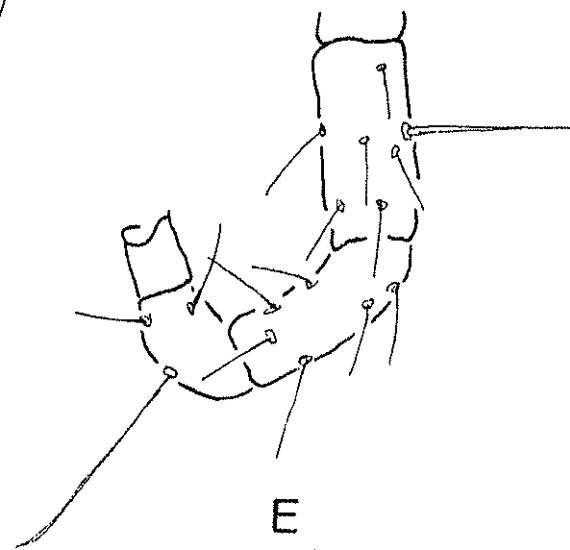
B



D



F



E

14 μ

MALE: Not known.

TYPE: Holotype female, collected 2 mi. N. Chitral (Chitral Valley, 5000'), 10.vii.1980 (M. Shahid) from apple, (Malus domestica) and deposited in the Department of Zoology, University of Peshawar, Peshawar (Map No. 17).

REMARKS: This new species is separated from its closely related species Amblyseius inculatus, new species on the basis of the following characters.

1. Dorsal shield with 1 pair visible pores in inculatus but 3 pairs visible pores in this new species.
2. Peritreme reaching up to seta V in inculatus but reaching up to seta L1 in this new species.
3. Shape of ventrianal shield differs in both the species.
4. Ventrianal shield pores present in inculatus but wanting in this new species.
5. Leg IV with 1 macroseta in inculatus but 3 macrosetae on leg IV in this new species.
6. Ventrianal shield weakly striated in inculatus but smooth in this new species.

18. Amblyseius nidus, new species
(Fig. 18)

FEMALE: Dorsal shield partly reticulated, concave near

N. W. F. P.

COLLECTION AREA
OF

17. Amblyseius latro, new species



Map No. 17

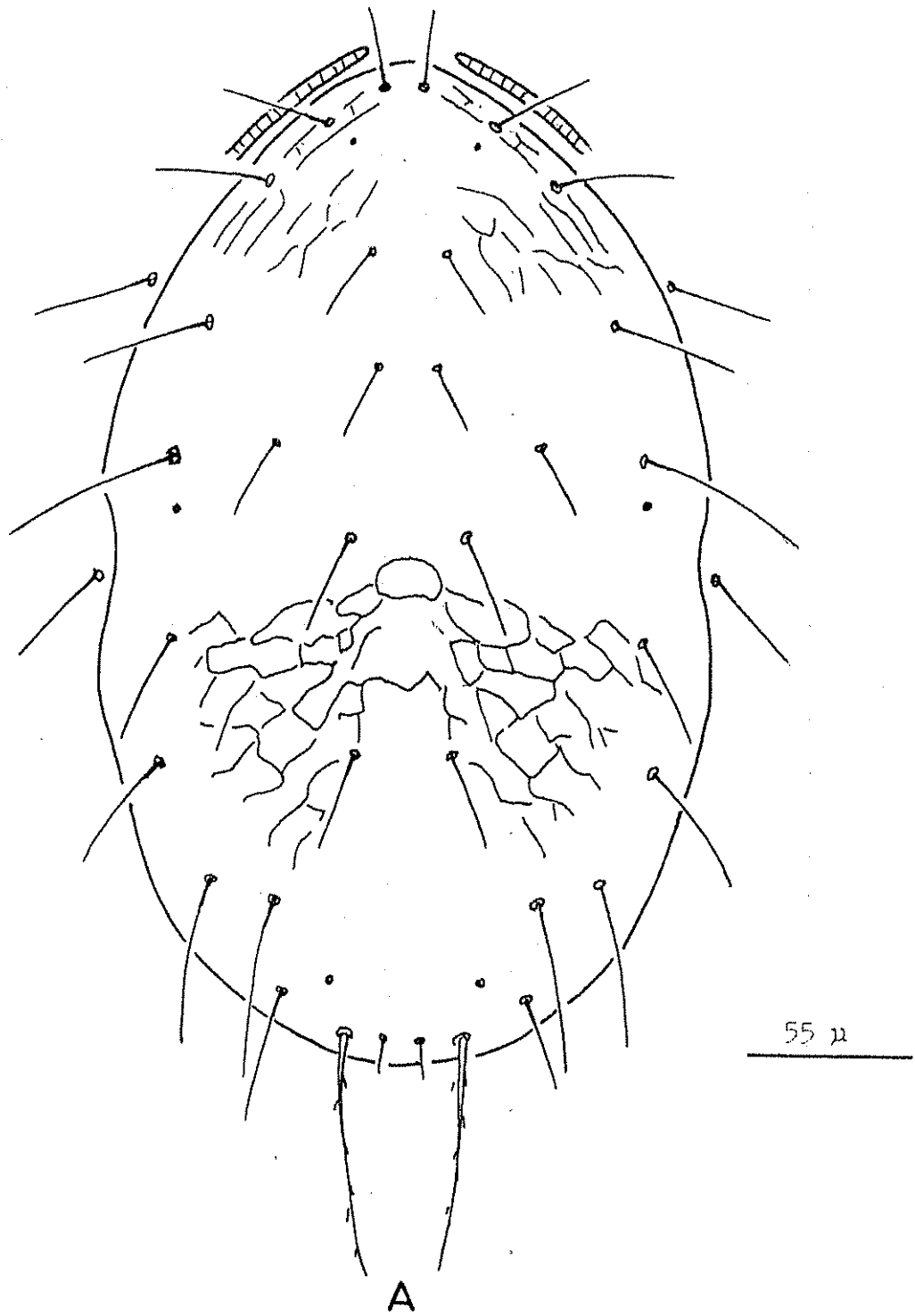
S2, 437 μ long, 250 μ wide with 17 pairs setae and 3 pairs visible pores (Fig.18A). Chelicera 30 μ long, movable digit with 5 and fixed digit with 3 subapical teeth (Fig.18C). Dorsal setae smooth, simple except L9 serrate, L1 longer than distance L1- L2, L2 = distance L2- L3, L3 smaller than distance L3- L4, L5 just reaching base L6, L6 just reaching base L7, M2 longer than distance M2- L8 and M2- L9 (Fig.18A). Dorsal setae: V 31 μ ; D1 = D2 = 26 μ , D3 39 μ , D4 44 μ ; C1 7 μ ; L1 = L2 = 47 μ , L3 44 μ , L4 57 μ , L5 52 μ , L6 60 μ , L7 60 μ , L8 42 μ , L9 76 μ ; M1 26 μ , M2 65 μ ; S1 = S2 = 52 μ (Fig.18A). Peritremal shield as shown in figure 18D. Peritreme reaching up to seta V (Fig.18A). Sternal shield with 3 pairs sternal setae. Metasternal setae, 1 pair, each seta on a separate platelet (Fig.18B). Genital shield 21 μ apart from ventrianal shield with a membranous fold in between these two shields, 1 pair genital setae. Ventrianal shield with broken striations, 136 μ long, 109 μ wide with 3 pairs preanal setae and a pair of elliptical pores (Fig.18F). Four pairs setae and a pair of minute platelets on membrane surrounding ventrianal shield, seta VL1 smooth, 60 μ long (Fig.18G). Metapodal platelets, 2 pairs, primary, 1 pair, 31 μ long, secondary, 1 pair, 13 μ long (Fig.18F). Leg IV macrosetae on genu, tibia and basitarsus, smooth, simple, measuring 39 μ , 42 μ and 78 μ in length, respectively (Fig.18E).

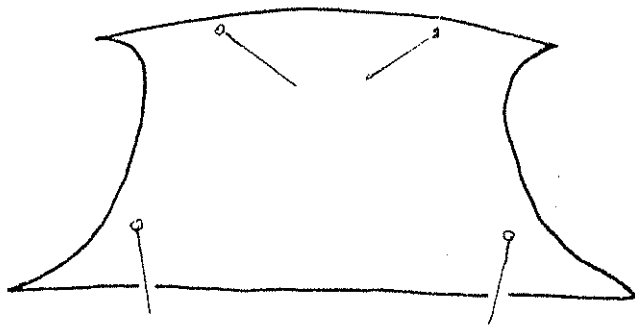
MALE: Not known.

Fig. 18. Amblyseius nidus, new species

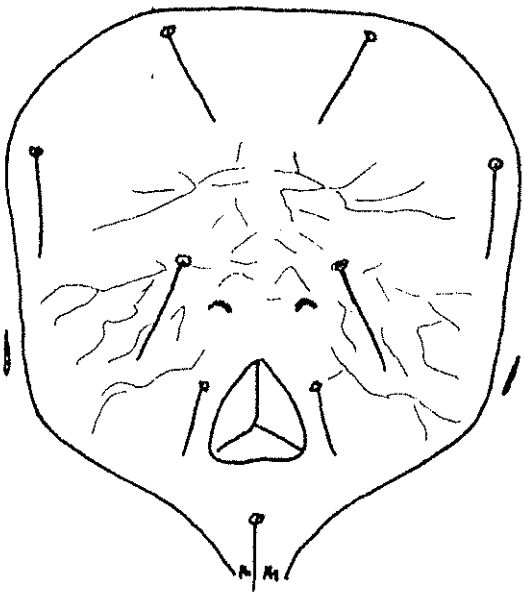
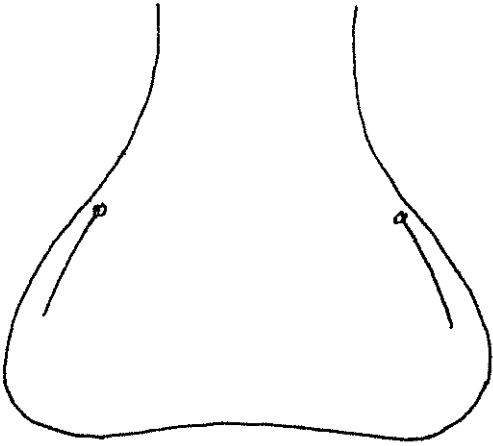
- A. Dorsal shield
- B. Sternal shield
- C. Chelicera
- D. Peritremal shield
- E. Leg IV
- F. Metapodal platelets
- G. Genital and Ventrianal shields

Fig.18





B



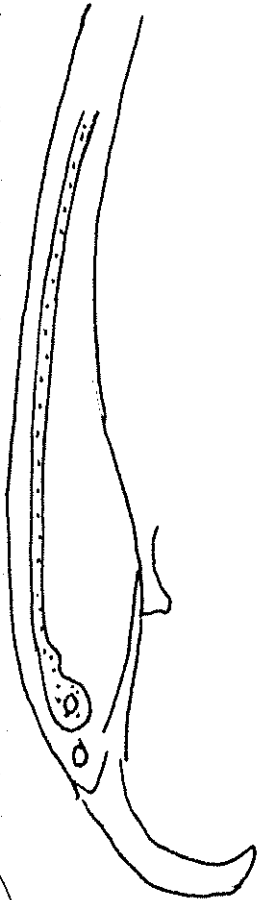
G



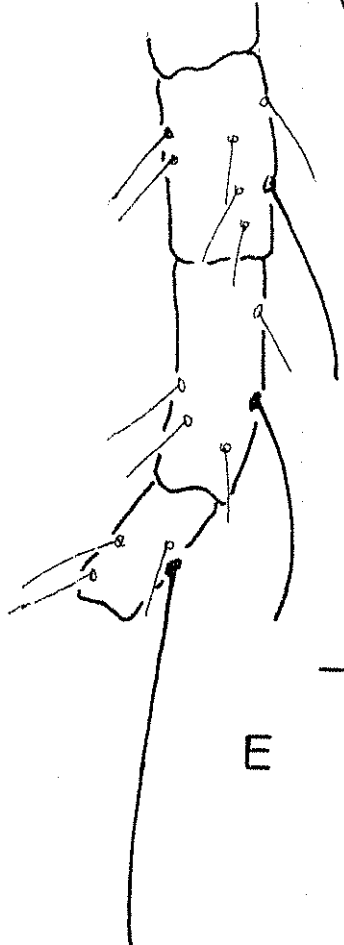
C



F



D



E

14 μ



TYPE: Holotype female, collected 3 mi.E. Mingora (Swat, 4000'), 8.ix.1981 (M. Shahid) from groundnut leaves, (Arachis hypogaea) and deposited in the Department of Zoology, University of Peshawar, Peshawar (Map No. 18).

REMARKS: This new species can be separated from Amblyseius emotus, new species on the basis of the following characters.

1. Shape of ventrianal shield differs in both the species.
2. Dorsal shield with 4 pairs visible pores in emotus but 3 pairs visible pores in this new species.
3. Cheliceral movable and fixed digits with 2 and 8 teeth in emotus as against 5 and 3 subapical teeth in this new species.
4. Minute platelets absent on membrane surrounding ventrianal shield in emotus but 1 pair platelets present in this new species.

19. Amblyseius opimia, new species

(Fig. 19)

FEMALE: Dorsal shield partly reticulated, margins concave near L2 and S2, 406 μ long, 260 μ wide with 17 pairs setae and 4 pairs visible pores (Fig. 19A). Chelicera 36 μ long, movable digit with 2 and fixed digit with 8 strong subapical teeth (Fig. 19C). Dorsal setae smooth except L9, weakly serrate.

N. W. F. P.

COLLECTION AREA

OF

18. Amblyseius nidus, new species



Map No. 18

Seta L1 longer than distance L1- L2, L2 and L3 smaller than respective distance to seta next in line, L6 longer than L6- L7, seta M2 31 μ , 29 μ and 55 μ apart from L6, L8 and L9, respectively (Fig.19A). Dorsal setae: V 33 μ ; D1 26 μ , D2 29 μ , D3 39 μ , D4 44 μ ; C1 13 μ ; L1 47 μ , L2 42 μ , L3 47 μ , L4 60 μ , L5 49 μ , L6 57 μ , L7 57 μ , L8 49 μ , L9 75 μ ; M1 26 μ , M2 57 μ ; S1 47 μ , S2 49 μ (Fig.19A). Peritremal shield as shown in figure 19E. Peritreme reaching up to seta V(Fig.19A). Sternal shield with 3 pairs sternal setae, seta I smaller than distance I- II, II smaller than distance II-III. Metasternal setae, 1 pair, each seta on a separate platelet (Fig.19B). Genital shield 11 μ apart from ventrianal shield with a membranous fold inbetween these shields, genital setae 1 pair. Ventrianal shield longer than wide, subquadrate, 130 μ long, 91 μ wide, 3 pairs preanal setae and a pair of preanal elliptical pores having a few striations near and above the anal shield (Fig.19G). Four pair setae on membrane surrounding ventrianal shield, seta VL1 smooth, 60 μ long(Fig.19G). Metapodal platelets, 2 pairs, primary, 1 pair, triangular in shape, 24 μ long, secondary, 1 pair, 10 μ long(Fig.19H). Spermatheca as shown in figure 19D, atrium rounded, 3 μ , cervix broadly rounded at base. Leg IV macrosetae simple, genu 36 μ , tibia 29 μ and basitarsus 78 μ long (Fig.19F).

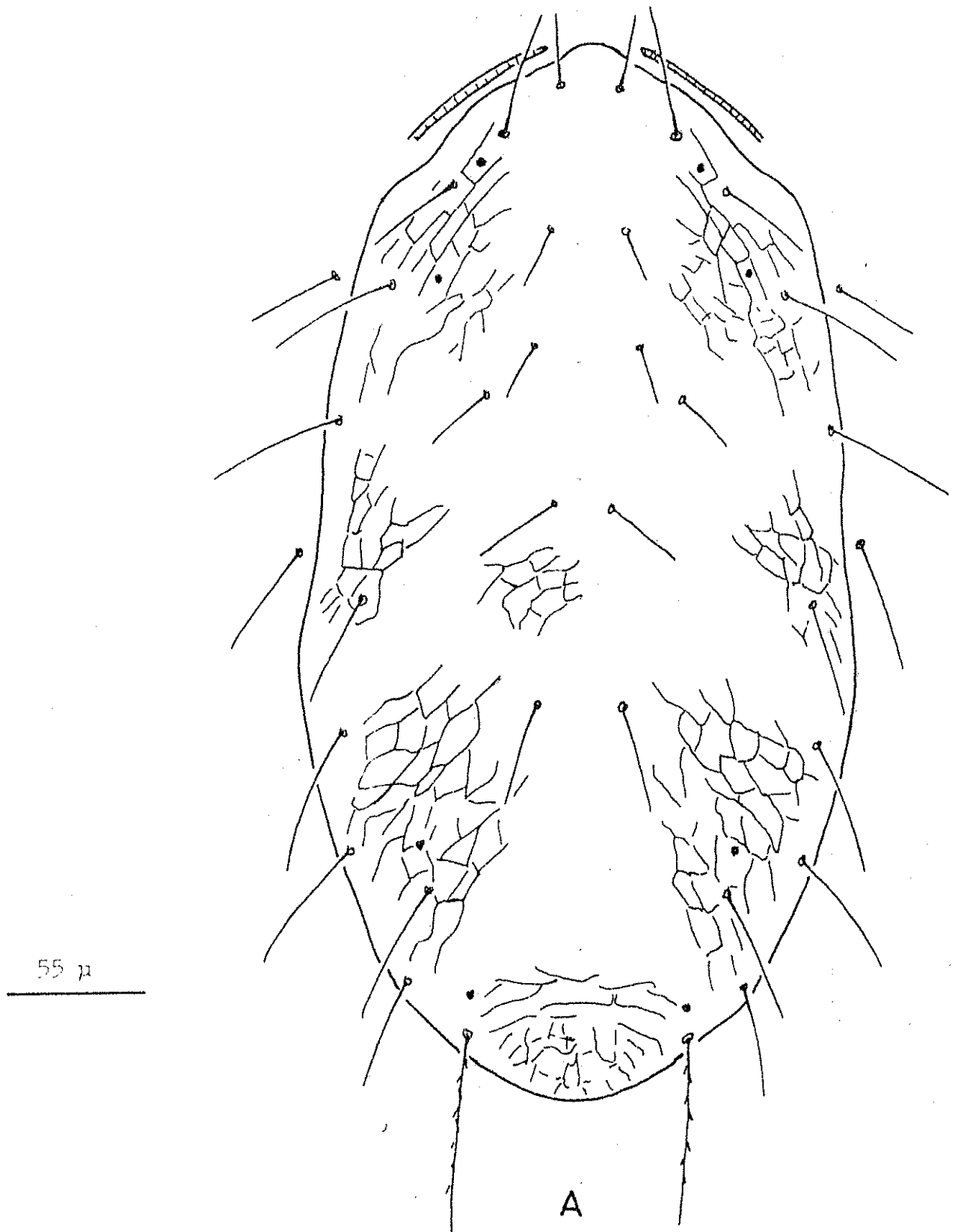
MALE: Not known.

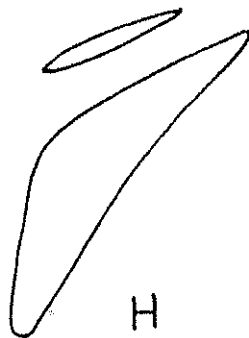
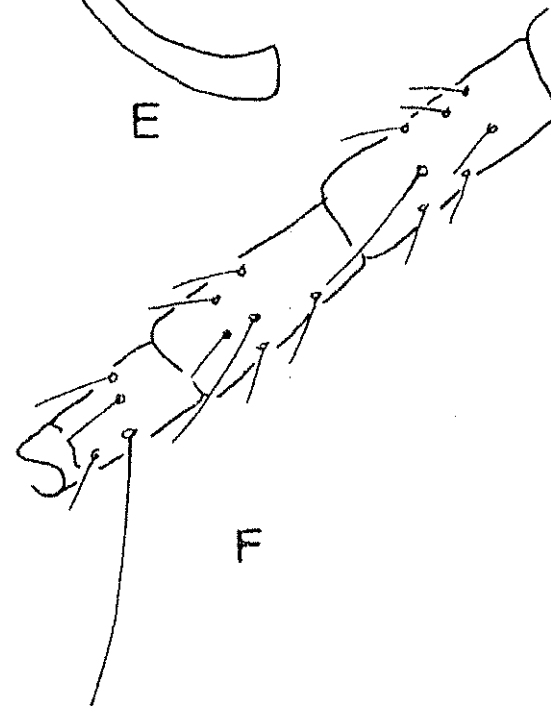
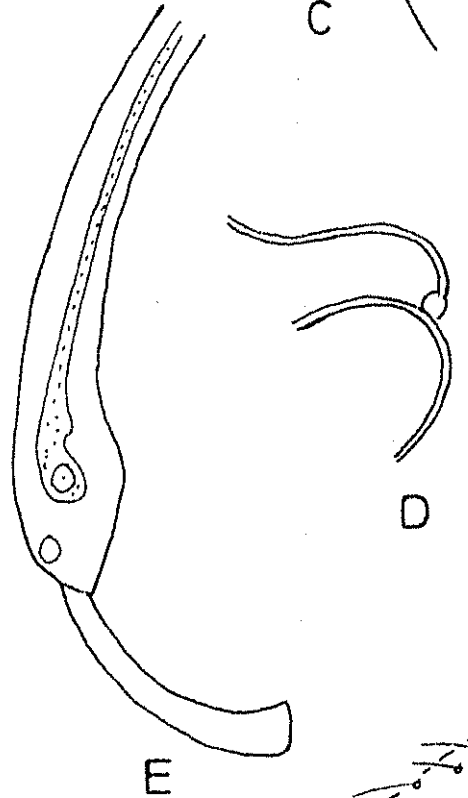
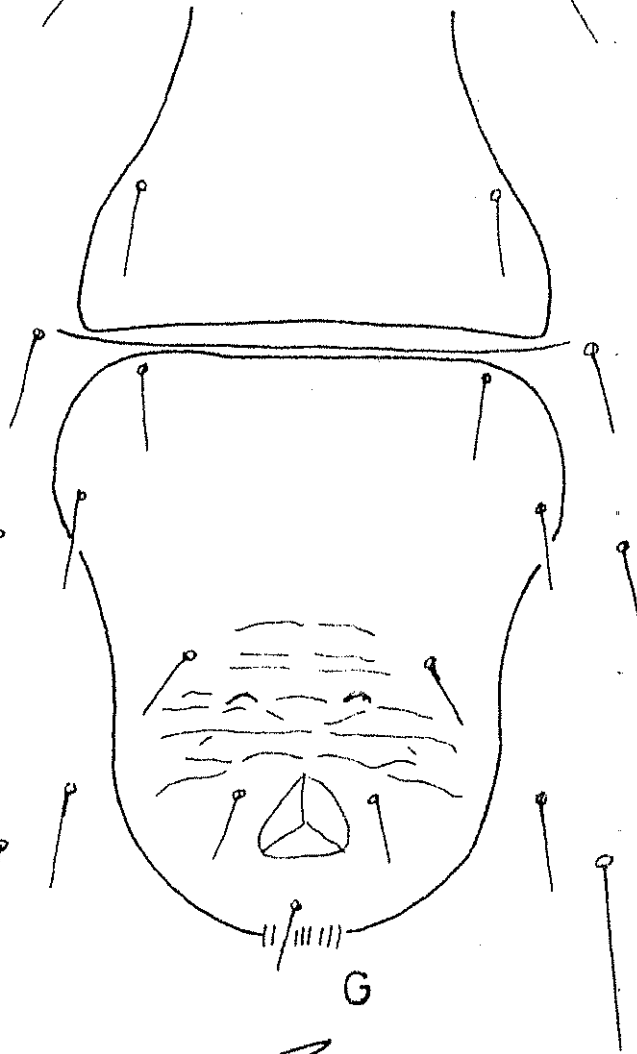
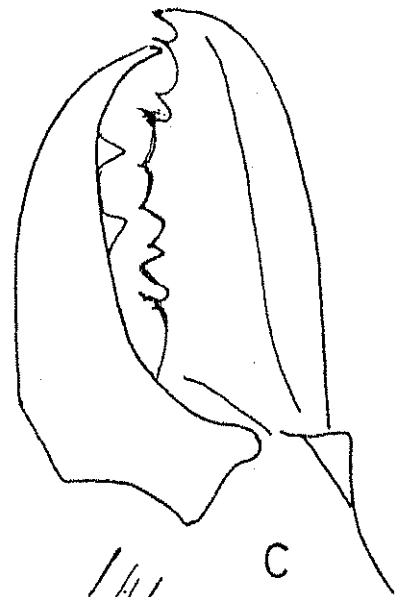
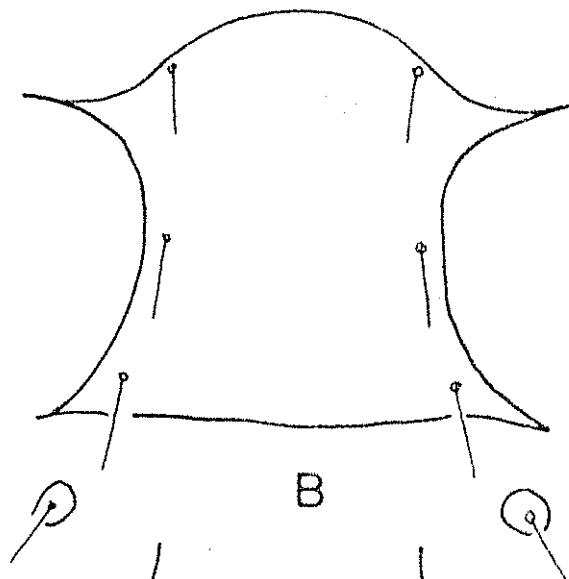
TYPE: Holotype female, collected 1 mi.W. Mingora (Swat, 4000'), 4.x.1981 (M.Shahid) from rice (Oryza sativa); 1 female collected, 1 mi.E. Mingora (Swat, 4000'), 5.x.1981

Fig. 19. Amblyseius opimia, new species

- A. Dorsal shield
- B. Sternal shield
- C. Chelicera
- D. Spermatheca
- E. Peritremal shield
- F. Leg IV
- G. Genital and Ventrianal shields
- H. Metapodal platelets

Fig. 19





14. 11

from same host plant. The specimens were deposited in the Department of Zoology, University of Peshawar, Peshawar (Map.No.19).

REMARKS: This new species is comparable with Amblyseius nidus, new species due to partly reticulated dorsal shield; seta L9 serrate; M2 simple; peritreme reaching seta V and leg IV with 3 macrosetae but the following characters separate these two species from each other.

1. Shape of ventrianal shield differs in both the species.
2. Dorsal shield with 3 pairs visible pores in nidus as against 4 pairs pores in this new species.
3. Cheliceral movable and fixed digits with 5 and 3 teeth in nidus and 2 and 8 subapical teeth in this new species, respectively.
4. Membrane surrounding ventrianal shield having 1 pair minute platelets in nidus but absent in this new species.

N. W. F. P.

COLLECTION AREA

OF

19. Amblyseius opimia, new species



Map No. 19

Chapter VI

DISCUSSION

The present study relates to the taxonomy of mites of the family Phytoseiidae. The collection was made from different areas of the N.W.F.P. In all 19 species (18 new to science and 1 already known species) have been described in this research work. The description of the already known species has been improved with new distributional records and new host plants. These mite species were collected from 9 different localities and 30 host plants. These mites have been assigned to four genera, i.e., Gnorimus Chaudhri, Phytoseius Ribaga, Amblydromella Muma and Amblyseius Berlese of the family Phytoseiidae. The results regarding the phenetic similarities of various species taxa included in each of the above mentioned genera are discussed as under.

GENUS GNORIMUS CHAUDHRI

Only one species, Gnorimus tabella Chaudhri, is known, so far, in this genus from Pakistan. The author has found out new localities and new host plants of this species in N.W.F.P. which have been incorporated in this research work.

GENUS PHYTOSEIUS RIBAGA

The genus Phytoseius has a wide range of distribution in the world and also in Pakistan. The author has collected 3 new species, thus raising the number of species in this genus to 9 from Pakistan. The phenogram(Fig.B) based on comparison of characters (Table I) and similarity matrix(Table II) pertaining to these species indicates two species groups in this genus. One group comprising of the species mixtus Chaudhri and hornus, new species sharing 80% characters with each other. The highest percentage of similarity of these two species is because of similar habitat they occupy, since both have been collected from the sub-mountainous areas. The third species, flagrum, new species shares 74% characters with the above mentioned two species. This slightly low similarity percentage is due to a little difference in the climatic conditions of the areas of these species, since flagrum, new species has been collected from high altitude.

The second group comprising of species rugulosus Chaudhri, petentis Chaudhri sharing 80% characters with each other and spathulatus Chaudhri sharing 77% characters with these two species. The close relationship of these three species is due to the same type of climatic conditions as all these three species have been collected from the plains.

These two groups show a linkage of 67% among themselves. The species mansehraensis Chaudhri and lyma, new species share

Table I. Comparison of characters in species of genus Phytoseius Ribaga

S.No	C H A R A C T E R S	<u>lyma</u>	<u>curvatus</u>	<u>scutellatus</u>	<u>maculosus</u>	<u>setosus</u>	<u>mansuetor</u>	<u>flavus</u>	<u>mixtus</u>	<u>horridus</u>
1	Dorsal shield rugose	+	+	+	+	+	+	+	+	+
2	Notocapalic pore near M ₁ present	+	+	+	+	+	+	+	+	+
3	Seta L ₂ smooth	+	+	+	+	+	+	+	+	+
4	Sublateral setae 2 pairs	+	+	+	+	+	+	+	+	+
5	Seta L ₄ serrate	+	+	+	+	+	+	+	+	+
6	Seta L ₂ = L ₅ (equal in length)	+	+	+	+	+	+	+	+	+
7	Pore near L ₅ present	+	+	+	+	+	+	+	+	+
8	Peritreme reaching upto seta V	+	+	+	+	+	+	+	+	+
9	Ventrianal shield more than 20 u apart from genital shield	+	+	+	+	+	+	+	+	+
10	Preanal pores present	+	+	+	+	+	+	+	+	+
11	Leg IV with 3 macrosetae	+	+	+	+	+	+	+	+	+
12	Leg IV macroseta on distitarsus present	+	+	+	+	+	+	+	+	+
13	Leg IV macrosetae spatulate	+	+	+	+	+	+	+	+	+
14	Pores on membrane surrounding ventrianal shield present	+	+	+	+	+	+	+	+	+
15	Collection from hilly area	+	+	+	+	+	+	+	+	+

Table II. Matrix showing percentage of similarity in
species of Genus Myrozetus Ribaga

	<u>lyma</u>	<u>curvatus</u>	<u>spatulatus</u>	<u>ruulosus</u>	<u>petentis</u>	<u>munsehraensis</u>	<u>flatus</u>	<u>mixtus</u>	<u>hornus</u>
<u>lyma</u>									
<u>curvatus</u>	40								
<u>spatulatus</u>	67	33							
<u>ruulosus</u>	60	27	80						
<u>petentis</u>	67	20	74	80					
<u>munsehraensis</u>	20	47	53	60	53				
<u>flatus</u>	53	33	74	67	74	60			
<u>mixtus</u>	33	27	67	60	67	74	74		
<u>cornus</u>	40	20	60	67	74	53	74	80	

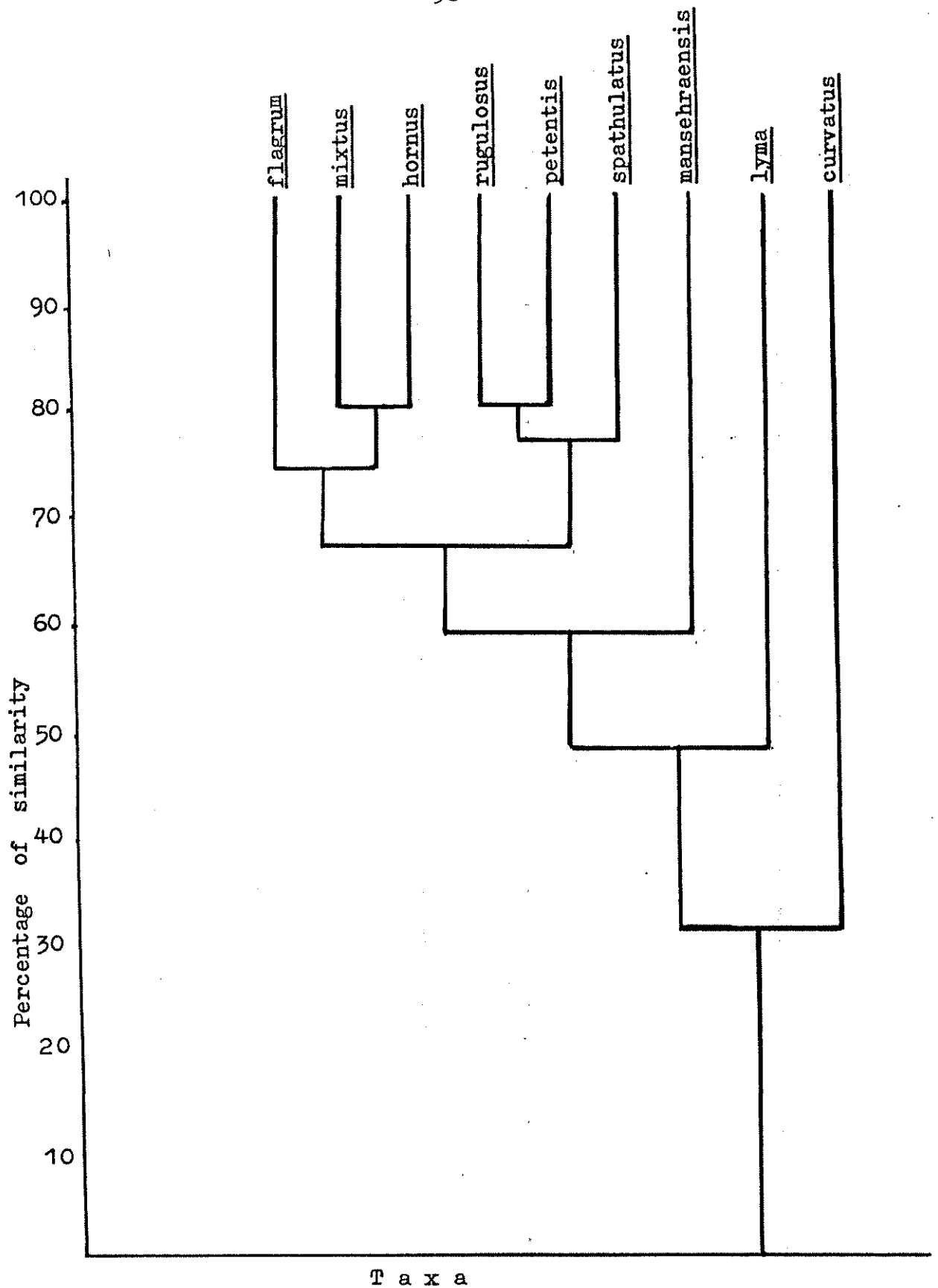


Fig. B. Phenogram of species of genus Phytoseius Ribaga

58.8%, and 48.5% characters, respectively with the two groups combined. The lowest (30.8%) similarity of curvatus Chaudhri with rest of the species combined is due to the difference in climatic conditions of the habitats of curvatus Chaudhri and other species.

GENUS AMBLYDROMELLA MUMA

Phenogram (Fig.C) based on comparison of characters (Table III) and similarity matrix (Table IV) of species of the genus Amblydromella, so far, collected from Pakistan (including 6 new species) has been prepared. The phenogram indicates many small groups linked to one another at different level of similarity thus forming five major groups which are again linked to each other at different levels.

The first group comprises of teramon, new species and zerena, new species linked to each other at 72.7% level. The linkage is probably due to the fact that both the species have the same habitat and locality. The third species, kalashiensis, new species linked to these two species at quite a low level although belongs to a totally different climatic conditions and region but it is understood that the linkage could be due to the serrate setae VL1, M2 and L10 alongwith numerous other characters.

The next group comprises of three small groups linked to one another at different levels of similarities. The

highest linkage (86.3%) exists between plebius Chaudhri and incasus Chaudhri whereas serratus Chaudhri is linked to these two species at 79.5% level. The linkage is established due to the fact that all these species are plain dwellers and possess bulbous VL1 seta. The next linkage of 77.2% is between umbratus Chaudhri and galummatus Chaudhri and again this linkage is the attribute of the presence of VL1 knobbed seta along with other characters. The next linkage (72.7%) is between maracus Chaudhri and dactylifera Chaudhri. It is a bit strange linkage since VL1 seta is not knobbed in dactylifera Chaudhri but this has been supported by the presence of knobbed macroseta on basitarsus of leg IV. If one puts a general look on all these species forming small groups which ultimately establish one major group, the reason of this clustering becomes obvious that all the seven species forming the large group under discussion, have been collected from plains and further this linkage is supported by the presence of bulbous VL1 seta in all the species except dactylifera Chaudhri where this has been supported by bulbous seta on leg IV basitarsus.

The third group comprises of octavus Chaudhri, sica Chaudhri, balakotiensis Chaudhri and canaster, new species. Species octavus Chaudhri and sica Chaudhri share 81.8% characters with each other. Both the species are high altitude species. Species balakotiensis shares 74.9% characters with

Table III. Comparison of characters in species of genus *Amblydromella* Numa

[illegible]

Table IV. Matrix showing percentage of similarity in species of genus Amblydromella Mma

	<u>plebeius</u>	<u>dactylifera</u>	<u>eremitidis</u>	<u>umbriatus</u>	<u>salumnatus</u>	<u>divergentis</u>	<u>octavus</u>	<u>sica</u>	<u>balakotiensis</u>	<u>serratus</u>	<u>incasus</u>	<u>maracus</u>	<u>zafari</u>	<u>ornatus</u>	<u>libitus</u>	<u>limitatus</u>	<u>teramon</u>	<u>zerena</u>	<u>canaster</u>	<u>chashmaensis</u>	<u>kalashensis</u>	<u>urdanensis</u>
<u>plebeius</u>	100																					
<u>dactylifera</u>	81.8	100																				
<u>eremitidis</u>	50	50	100																			
<u>umbriatus</u>	68.1	59	72.7	100																		
<u>salumnatus</u>	72.7	54.5	50	77.2	100																	
<u>divergentis</u>	50	59	45.4	54.5	59	100																
<u>octavus</u>	63.6	63.6	59	68.1	54.5	68.1	100															
<u>sica</u>	63.6	63.6	68.1	68.1	54.5	77.2	81.8	100														
<u>balakotiensis</u>	59	54.5	68.1	68.1	63.6	68.1	72.7	81.8	100													
<u>serratus</u>	77.2	59	63.6	72.7	68.1	54.5	68.1	68.1	77.2	100												
<u>incasus</u>	86.3	68.1	54.5	72.7	77.2	54.5	68.1	59	77.2	81.8	100											
<u>maracus</u>	81.8	72.7	31.8	50	63.6	40.9	45.4	45.4	54.5	59	77.2	100										
<u>zafari</u>	59	59	72.7	72.7	68.1	72.7	59	68.1	68.1	63.6	59	50	100									
<u>ornatus</u>	54.5	72.7	40.9	40.9	36.3	68.1	63.6	63.6	63.6	50	59	72.7	59	100								
<u>libitus</u>	59	68.1	54.5	54.5	40.9	72.7	68.1	68.1	68.1	54.5	63.6	59	72.7	77.2	100							
<u>limitatus</u>	63.6	63.6	68.1	68.1	72.7	50	54.5	54.5	54.5	59	59	54.5	68.1	45.4	40.9	100						
<u>teramon</u>	45.4	63.6	50	40.9	45.4	68.1	45.4	54.5	54.5	40.9	40.9	54.5	59	72.7	68.1	54.5	100					
<u>zerena</u>	45.4	54.5	50	31.8	45.4	59	45.4	54.5	54.5	31.8	40.9	54.5	59	72.7	50	63.6	72.7	100				
<u>canaster</u>	63.6	63.6	59	59	54.5	59	81.8	63.6	63.6	59	59	45.4	68.1	54.5	63.1	63.6	45.4	54.5	100			
<u>chashmaensis</u>	54.5	54.5	77.2	68.1	54.5	59	63.6	72.7	54.5	50	50	36.3	72.7	45.4	59	54.5	36.3	54.5	63.6	100		
<u>kalashensis</u>	45.4	36.3	40.9	40.9	54.5	59	54.5	63.6	54.5	50	50	54.5	59	63.6	50	45.4	45.4	72.7	45.4	63.6	45.4	100
<u>urdanensis</u>	45.4	45.4	77.2	59	63.6	40.9	36.3	45.4	54.5	40.9	50	45.4	63.1	36.3	40.9	81.8	45.4	63.6	54.5	63.6	45.4	45.4

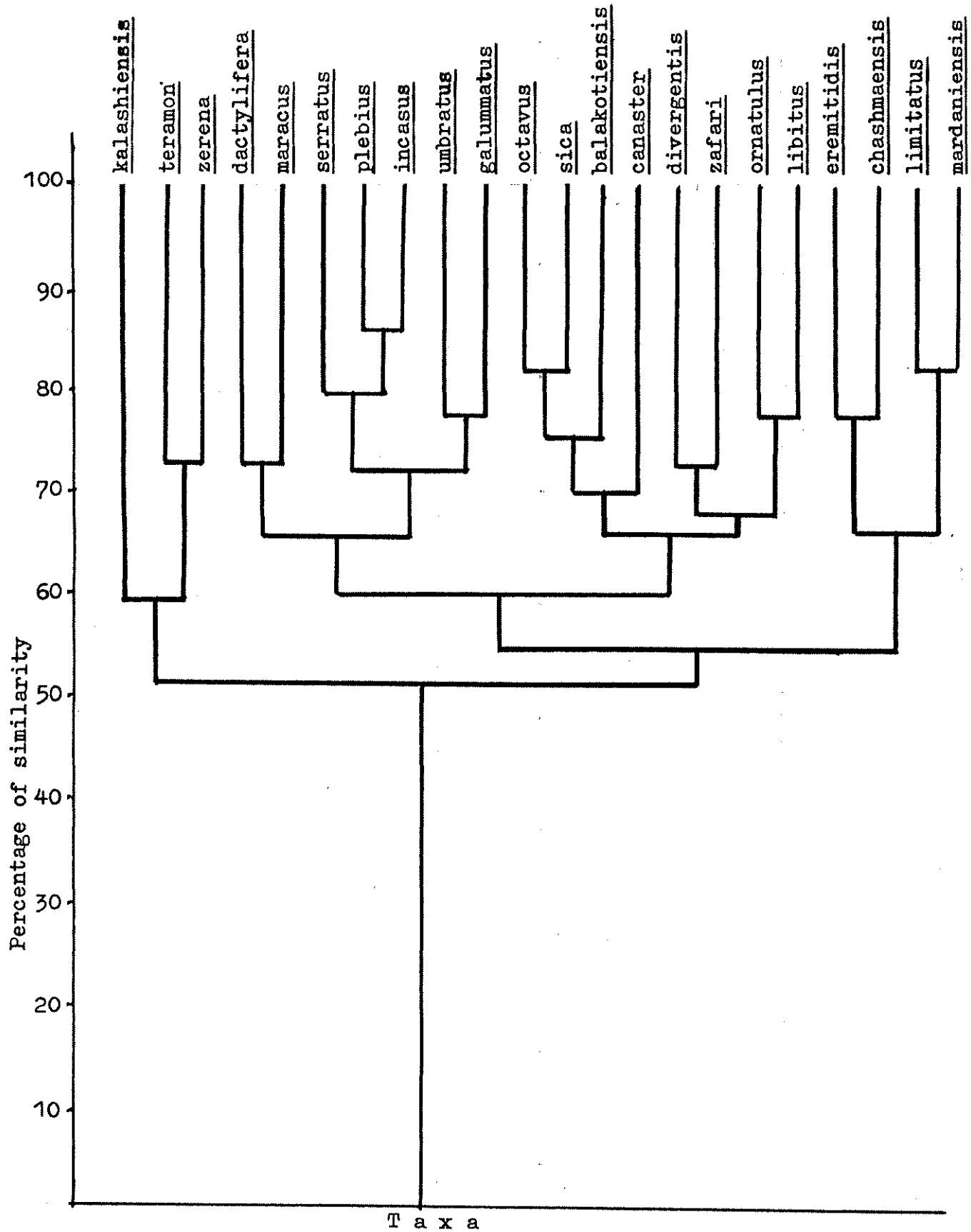


Fig. C. Phenogram of species of genus *Amblydromella* Muma

these two species as it has also been collected from hilly areas. The linkage of canaster, new species with the above mentioned three species is understood to be due to combination of other characters with remarkable reticulated dorsal shield and serrate M2 and L10 setae.

The fourth group comprises of divergentis Chaudhri and zafari Chaudhri linked at 72.7% level shares 68.12% characters with ornatulus Chaudhri and libitus Chaudhri (these two being linked at 77.2% level). The close linkage (except divergentis Chaudhri) is probably due to the fact that all the species have reticulated dorsal shield alongwith serrate M2 and L10 setae. From the above discussion it is obvious that in spite of the fact that all the species in the large group belong to different climatic zones yet they are grouped in one major group probably due to combination of characters with remarkable characters of reticulate dorsal shield, serrate M2, L10 setae and pointed macrosetae on leg IV.

The fifth group comprises of two sub-groups: in one group eremitidis Chaudhri shares 77.2% characters with chashmaensis, new species whereas the other group limitatus Chaudhri is linked to mardaniensis, new species at 81% level. The clustering of these species in one group is due to the presence of smooth VL1 seta, bulbous macrosetae on leg IV and bulbous M2, L10 setae in combination with other characters.

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GENUS AMBLYSEIUS BERLESE

Phenogram of species of the genus Amblyseius (Fig.D) based on comparison of characters (Table V) and similarity matrix (Table VI) reveals that the range of variation among the species is enough for their classification. The percentage of sharing of characters is mainly due to the climatic conditions of the areas of collection of these species. The species collected from the same type of climate share maximum characters with one another.

The species opimia, new species and nidus, new species share 83.8% characters with each other as both belong to the hilly areas of Mingora (Swat, 4000'). The same is the case with inculatus, new species and uvidus, new species sharing 83.8% characters since both have been collected from the plains (Peshawar areas). Species perfectus Chaudhri shares 83.8% characters with the highest linked species venustus Chaudhri and stolidus Chaudhri. The species excelsus Chaudhri shares 77.7% characters with these three species combined. All these species have been collected from the similar climatic conditions (Tropical climate of the Punjab plains) and same habitat (Sheikhupura). The same facts are true in case of balios, new species and beatus Chaudhri sharing 77.7% characters; finlandicus Oudemans and notatus Chaudhri sharing 77.7% characters; latro, new species and darghaiensis, new species sharing 83.8% characters; emotus, new species and takhti,

Table V. Comparison of characters in species of genus Amblyseius Berlese

S.No.	C H A R A C T E R S	beatus	takhti	perfectus	stolidus	venustus	uvulus	ballos	dargahensis	emotus	inculatus	latro	indus	optimis	notatus	finlandicus	deductus	impactus	bafulus	excellus
1	Dorsal shield reticulated	+	-	+	-	-	-	-	-	-	+	+	+	+	+	+	+	+	+	+
2	Dorsal shield concave near S2	-	+	+	+	+	+	-	+	-	+	+	+	+	-	-	-	+	+	+
3	Dorsal setae 17 pairs	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
4	Pores on dorsal shield present	+	+	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
5	Seta L9 serrate	+	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
6	Seta M2 serrate	+	-	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-	-	-
7	Seta M2 more than 100 u in length	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	Peritreme reaching upto seta V	+	-	+	+	+	+	+	-	-	+	-	+	+	-	-	+	+	+	+
9	Peritremal shield reticulated or striated	+	-	+	+	+	+	-	-	-	+	-	+	+	-	-	+	+	+	+
10	Ventrifanal shield pores present	+	+	+	+	+	+	-	+	+	+	-	+	+	+	+	+	+	+	+
11	Pores on membrane surrounding ventrifanal shield	-	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
12	Metapodal platelets present	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
13	Leg IV with 3 macrosetae	+	+	+	-	-	-	+	+	+	-	+	+	+	+	+	+	+	+	+
14	Chelical movable digit with 1 tooth	+	-	+	+	+	-	+	+	-	-	-	-	-	-	-	-	-	-	-
15	Chelical fixed digit with 5 teeth	+	-	-	+	-	+	+	-	-	-	-	+	-	-	-	-	-	-	-
16	Genital shield wider than ventrifanal shield	+	+	+	+	+	+	+	+	+	-	+	+	+	-	+	+	+	+	+
17	Platelets on membrane surrounding ventrifanal shield present	-	-	-	-	-	-	-	-	-	-	-	+	-	-	-	+	-	-	+
18	Collection from plains	-	+	+	+	+	+	+	-	+	+	-	+	-	-	+	+	+	-	+

Table VI. Matrix showing percentage of similarity in species of Genus Amblyseius Berlese

	<u>beatus</u>	<u>takhti</u>	<u>perfectus</u>	<u>stolidus</u>	<u>venustus</u>	<u>avidus</u>	<u>balios</u>	<u>darghaiensis</u>	<u>emotus</u>	<u>inculatus</u>	<u>latro</u>	<u>nidus</u>	<u>opimia</u>	<u>notatus</u>	<u>finlandicus</u>	<u>deductus</u>	<u>impuctus</u>	<u>baiulus</u>	<u>excellens</u>
<u>beatus</u>	100	72.2	72.2	77.7	77.7	72.2	77.7	72.2	77.7	72.2	77.7	72.2	77.7	77.7	77.7	77.7	77.7	77.7	77.7
<u>takhti</u>	50	100	55.6	50	55.6	50	55.6	50	55.6	50	55.6	50	55.6	50	55.6	50	55.6	50	55.6
<u>perfectus</u>	72.2	55.6	100	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3
<u>stolidus</u>	77.7	50	83.3	100	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3
<u>venustus</u>	77.7	55.6	83.3	83.3	100	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3
<u>avidus</u>	72.2	56.6	66.6	83.3	83.3	100	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3
<u>balios</u>	77.7	61.1	61.1	66.6	66.6	72.2	100	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3
<u>darghaiensis</u>	61.1	77.7	66.6	61.1	72.2	66.6	72.2	100	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3
<u>emotus</u>	66.6	83.3	61.1	55.6	66.1	72.2	77.7	83.3	100	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3
<u>inculatus</u>	55.6	72.2	61.1	66.6	77.7	83.3	55.6	61.1	66.6	100	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3
<u>latro</u>	45.4	77.2	50	44.4	55.6	61.1	66.6	83.3	72.2	66.6	100	83.3	83.3	83.3	83.3	83.3	83.3	83.3	83.3
<u>nidus</u>	66.6	61.1	61.1	66.6	66.6	83.3	61.1	61.1	66.6	77.7	66.6	100	83.3	83.3	83.3	83.3	83.3	83.3	83.3
<u>opimia</u>	61.1	66.6	66.6	61.1	72.2	77.7	61.1	77.7	72.2	83.3	83.3	83.3	100	83.3	83.3	83.3	83.3	83.3	83.3
<u>notatus</u>	55.8	66.6	44.4	38.8	55.8	44.4	50	66.6	72.2	61.1	72.2	50	66.6	77.7	50	50	50	50	50
<u>finlandicus</u>	61.1	66.6	66.6	61.1	61.1	55.6	72.2	77.7	83.3	61.1	72.2	61.1	66.6	77.7	50	50	50	50	50
<u>deductus</u>	44.4	50	50	33.3	44.4	50	44.4	50	55.6	55.6	55.6	66.6	72.2	50	50	50	50	50	50
<u>impuctus</u>	44.4	72.2	66.6	55.6	55.6	61.1	55.6	61.1	66.6	55.6	55.6	55.6	61.1	50	61.1	56.6	66.6	66.6	66.6
<u>baiulus</u>	61.1	61.1	61.1	55.6	66.6	61.1	55.6	61.1	66.6	55.6	55.6	55.6	72.2	50	50	77.7	66.6	66.6	66.6
<u>excellens</u>	66.6	61.1	72.2	66.6	77.7	72.2	55.6	72.2	66.6	66.6	66.6	77.7	83.3	50	50	66.6	55.6	77.7	77.7

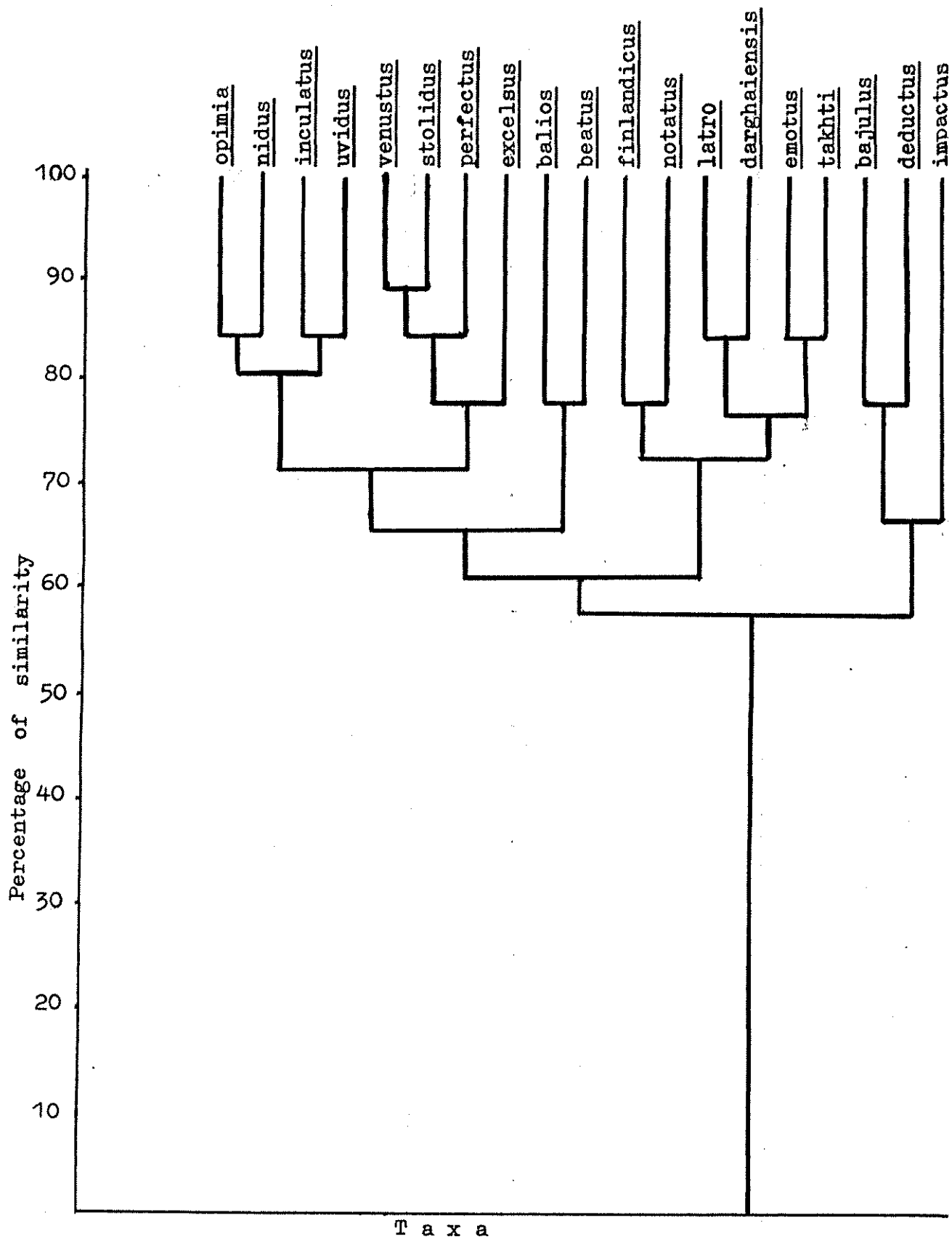


Fig. D. Phenogram of species of genus Amblyseius Berlese.

new species sharing 83.8% characters and bajulus Chaudhri and deductus Chaudhri sharing 77.7% characters because all of these groups of species have been collected from similar climatic zones and similar habitats.

The species collected from one kind of habitat and climatic area show minimum affinity and share minimum characters with other species or group of species collected from different climatic conditions. In such cases, the relationship of species with other species or groups is the attribute of combination of certain characters like smooth dorsal shield, serrate M₂ and L₉ setae and simple macrosetae on leg IV segments. The species impactus Chaudhri collected from Sheikhpurashows such nature of linkage(66.6%) with bajulus Chaudhri and deductus Chaudhri group, both collected from hilly areas of Kalam and Murree, respectively. This reveals that climatic conditions and nature of habitat paly an important role in morphological character building of species and such species maintain a clear linkage or sharing of characters with one another.

Chapter VII

SUMMARY

Mites of the Family Phytoseiidae (Acari) being useful for predating on plant feeding mites and small insects, were collected with Berlese's funnel and the sieve method of collection from as many different plants and localities as possible in the Northern Districts of the N.W.F.P. specially Peshawar, Mardan, Swat, Dir and Chitral. The mites were preserved in 50% alcohol. Later on the mites were mounted on microscopic slides in Hoyer's medium.

Identification was done with the help of keys of Chaudhri (1974 and 1979) and by comparison with the original descriptions and type specimens. Appropriate names for the new species were selected from the Source Book of Biological Names. All the slides with phytoseiid mites were labelled with field and identification labels.

In all 19 species belonging to four genera namely Gnorimus Chaudhri, Phytoseius Ribaga, Amblydromella Fuma and Amblyseius Berlese of the Family Phytoseiidae were recorded. In these only one species i.e. Gnorimus tabella Chaudhri was described previously whereas all the rest of 18 species are new to science.

Keys for the separation of species in each genus were prepared by incorporating the already recorded and described species of Pakistan. All the species have been

described. The description included important diagnostic characters and measurements of various setae on the body.

Drawings were made with help of ocular grid on the microscope. The following species have been recorded from the locality(ies) given against each.

S.No.	Name of species	Locality
1.	<u>Gnorimus tabella</u> Chaudhri	Peshawar, Dargai, Takht Bhai
2.	<u>Phytoseius lyma</u> , new species	Peshawar.
3.	<u>Phytoseius flagrum</u> , new species	Mingora
4.	<u>Phytoseius hornus</u> , new species	Peshawar, Kalash (Chitral)
5.	<u>Amblydromella teramon</u> , new species	Peshawar.
6.	<u>Amblydromella zerena</u> , new species	Peshawar.
7.	<u>Amblydromella canaster</u> , new species	Peshawar.
8.	<u>Amblydromella chashmaensis</u> new species	Garam Chashma (Chitral)
9.	<u>Amblydromella kalashiensis</u> , new species	Kalash (Chitral)
10.	<u>Amblydromella mardaniensis</u> , new species	Mardan.
11.	<u>Amblyseius takhti</u> , new species	Takht Bhai.
12.	<u>Amblyseius uvidus</u> , new species	Takht Bhai Peshawar.
13.	<u>Amblyseius balios</u> , new species	Peshawar.
14.	<u>Amblyseius darghaiensis</u> , new species	Dargai.
15.	<u>Amblyseius emotus</u> , new species	Peshawar.
16.	<u>Amblyseius inculatus</u> , new species	Peshawar.
17.	<u>Amblyseius latro</u> , new species	Chitral
18.	<u>Amblyseius nidus</u> , new species	Mingora
19.	<u>Amblyseius opimia</u> , new species	Mingora

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