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NEW SPECIES OF THE GENUS CENOPALPUS
(ACARINA : TENUIPALPIDAE) FROM PAKISTAN
AND THEIR PHENETIC AFFINITIES

BY S. AKBAR* and W. M. CHAUDHRI*

ABSTRACT: The genus Cenopalpus includes 5 species already described from Pakistan. Now the authors have added 8 new species, viz., Cenopalpus saryabiensis, C. haqii, C. virgulatus, C. chitraliensis, C. dignus, C. limbatus, C. homalos and C. orakiensis to the existing list, thus making a total of 13 species in this genus collected and described from Pakistan. Studies of the phenetic affinities (following Sokal and Sneath, 1963 and Jardine and Sibson, 1971) among species taxa of the genus Cenopalpus collected so far from Pakistan has been made. A key to Pakistan species has been given.


INTRODUCTION

The genus Cenopalpus was erected by Pritchard and Baker in 1958, and Brevipalpus spinosus Donnadieu was designated as type species. The research work done on the mite species of this genus by Pritchard and Baker (1958), Manson (1963), Zaher and Yousef (1968), Chaudhri (1971, 1974), Mitrofanov (1973) and Meyer (1979) should be mentioned.

Based on the fact that Brevipalpus recki Livshitz and Mitrofanov, and Brevipalpus ericae (Meyer) have most of the characters of the genus Cenopalpus but lack sublateral setae, Meyer (1979) placed all the previously described species of Cenopalpus under Brevipalpus. She felt that presence or absence of body setae in this instance was not enough criterion for creating a new genus. The present writers prefer to consider Cenopalpus a separate genus.

It is further noteworthy that Mitrofanov (1973) divided Cenopalpus into 2 subgenera, namely Cenopalpoides and Cenopalpus s. str. The writers adhere to Meyer's (1979) views

* Department of Entomology, University of Agriculture, Faisalabad (Pakistan).

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and believe that generic division at this stage is not desirable.

*Cenopalpus* Pritchard and Baker, 1958

**DIAGNOSIS**: Body elliptical. Idiosoma dorsally reticulated or striated. Palpus 4 segmented. Rostral shield present. Propodosomatic setae 3 pairs, humeral setae 1 pair, dorsocentral hysterosomatic setae 3 pairs, dorsosublateral hysterosomatic setae 1 pair, dorsolateral hysterosomatic setae 5-6 pairs. Sensory organ on tarsi I and II slender and tapering rather than rod like.

A key to the 13 species thus far reported from Pakistan is given below.

**KEY TO PAKISTAN SPECIES OF THE GENUS Cenopalpus (FEMALES)**

1. Body reticulated ........................................ 2
   Body striated ........................................... 3
2. Dorsal body setae lanceolate .......................... 4
   Dorsal body setae setiform ......................... 9
3. Rostral shield with 2 median lobes; genital shield setae simple; anal shield unstriated .......... C. aratus Chaudhri
   Rostral shield with 1 median lobe (fig. 1 C); genital shield setae serrate; anal shield striated (fig. 1 B) ... C. saryabiensis spec. nov.
4. Central setae III simple; propodosoma reticulated mediolaterally; hysterosoma reticulated anteromedially and caudally; complete striated area between metapodosoma and opisthosoma ........ C. ramus Manson
   Central setae III serrate; propodosoma reticulated throughout; hysterosoma reticulated entirely; no striated area between metapodosoma and opisthosoma ........................................ 5
5. Rostrum reaching end of femur I; ventral shield striated ........................................ 6
   Rostrum reaching beyond femur I; ventral shield reticulated ....................................... 7
6. Rostral shield with 1 median and 3 lateral lobes on each side (fig. 2 C); coxae I-IV with 2-2-0-0 setae; trochanters I-IV with 1-1-1-1 setae (fig. 2 A) .... C. haqii spec. nov.
   Rostral shield with 1 median and 2 lateral lobes on each side; coxae I-IV with 2-2-1-1 setae; trochanters I-IV with 1-1-2-1 setae .. C. capacis Chaudhri
7. Terminal segment of palpus with 1 rod; rostrum reaching tibia 1. . . . . . . . . . . . . . . . . . . . . . . . . . C. picitilis Chaudhri
   Terminal segment of palpus with 1 rod and 2 setae; rostrum reaching distal end of genu I. 8
8. Rostral shield striated, 1 median and 4 lateral lobes on each side (fig. 3 C); trochanters I-IV with 1-1-1-1 setae; femora I-IV with 4-4-2-0 setae; tibiae I-IV with 5-5-3-3 setae (fig. 3 A) .................. C. virgulatus spec. nov.
   Rostral shield reticulated, 1 median and 1 lateral lobes on each side (fig. 4 C); trochanters I-IV with 1-1-2-1 setae; femora I-IV with 4-3-2-0 setae; tibiae I-IV with 4-4-3-3 setae (fig. 4 A) ........... C. chitraliensis spec. nov.
9. All dorsal setae serrate; trochanters I-IV with 1-1-2-1 setae .............................................. 10
   All dorsal setae simple; trochanters I-IV with 1-1-1-1 setae (fig. 5 A) ...................... C. dignus spec. nov.
10. Rostral shield with 1 median and 2 lateral lobes on each side (fig. 6 C); ventral, genital and anal shields striated (fig. 6 B) . . . C. limbatis spec. nov.
   Rostral shield with 1 median and 1 lateral lobe on each side; ventral, genital and anal shields reticulated ........................................ 11
11. Rostrum reaching distal end of femur I (fig. 7 A); palpus terminal segment with 1 rod and 1 seta (fig. 7 D); coxae I-IV with 3-2-1-1 setae (fig. 7 A) .. C. homalos spec. nov.
   Rostrum reaching genu I; palpus terminal segment with 1 rod and 2 setae; coxae I-IV with 2-2-1-1 setae ........................................... 12
12. Area anterior to ventral shield reticulated medially; genua I-IV with 3-3-1-0 setae; genital and anal shield setae simple ............. C. favosus Chaudhri
   Area anterior to ventral shield not reticulated medially (fig. 8 B); genua I-IV with 3-3-1-1 setae (fig. 8 A); genital and anal shield setae serrate (fig. 8 B) ........ C. orakiensis spec. nov.

1. *Cenopalpus saryabiensis* spec. nov. (Fig. 1)

**FEMALE**: Body 281 µm long (without rostrum), 177 µm wide. Rostrum narrow, greatly elongate with almost parallel sides reaching middle of genu I (Fig. 1 A). Palpus terminal segment with a long sensory rod and 2 setae, segment III with 1 seta, barbed (Fig. 1 D). Rostral shield with broad, median notch, with only 1 broad, round lobe on each side (Fig. 1 C). Propodosoma with
FIG. 1: *Cenopalpus saryabiensis* spec. nov.
A. — Dorsal side; B. — Ventral side; C. — Rostral shield; D. — Palpus.
irregular, broken striations. Propodosomatic setae strongly barbed, I 21 μm, II 16 μm, III 18 μm long. Hysterosoma striated, striations irregular, broken, transverse on opisthosoma. A band of prominent transverse lines separate opisthosoma from metapodosoma. Metapodosoma with irregular, broken striations, medially longitudinal, laterally striations directed caudally and marginally (Fig. 1A). Humeral setae strongly barbed, 18 μm long. Dorsocentral hysterosomatic setae setiform, serrate, measuring I 13 μm, II 10 μm, III 8 μm in length. Dorsosublateral hysterosomatic setae setiform serrate, 16 μm long with 6 pairs dorsolateral hysterosomatic setae, strongly barbed, I and II 13 μm, III 16 μm, IV 13 μm, V 16 μm and VI 10 μm long; all are shorter than distances between their bases (Fig. 1A).

Venter nude. Medioventral propodosomatic setae 34 μm long, simple. Anterior and posterior medioventral metapodosomatic setae 8 μm and 34 μm long, respectively, posterior setae longer than distance to base of anterior setae (Fig. 1B). Ventral shield with transverse striations, setae 16 μm long, simple. Genital shield with transverse striations with 2 pairs of setae, outer 19 μm, inner 13 μm long, both serrate. Anal shield with longitudinal striations, with 2 pairs of setae, each 13 μm long. Area lateral to ventral shield near lateral margins striated.

Setae on leg segments: coxae 2-2-1-1, trochanters 1-1-2-1, femora 4-4-2-1, genua 3-3-1-0, tibiae 5-5-3-3. Setae on tarsi not clear. Femora I, II, III each with 1 seta strongly barbed (Fig. 1A).

- MALE : Not known.

TYPE : Holotype female, collected at Saryab 5500' (Quetta Valley) on 20.vi.1981 (AKBAR and CHAUDHRI) from pinus sp. and deposited in Acarology Research Laboratory, Department of Entomology, U.A.F.

- REMARKS : This new species may be separated from its closest relative, Cenopalpus aratus Chaudhri, on the basis of the following points:

1. Rostral shield with 1 median and 1 lateral lobe on each side in C. aratus, as against only 1 median lobe on each side in C. saryabiensis.
2. All dorsal body setae are setiform, serrate in C. aratus but only the dorsocentral and dorsosublateral hysterosomatic setae are setiform, serrate in C. saryabiensis.
5. One pair of anal shield setae serrate in C. aratus but both the pairs serrate in C. saryabiensis.

Cenopalpus saryabiensis may also be separated from C. lineola Canestrini and Fanzago on the basis of shape of rostral shield and size of dorsocentral hysterosomatic setae I and II.

It may also be separated from an Egyptian species (Cenopalpus jewstrii Zaher and Yousef) on the basis of the following points:

1. Dorsal setae lanceolate, serrate in C. jewstrii but setiform and strongly barbed in C. saryabiensis.
2. Dorsum with incomplete longitudinal and transverse striations mediolaterally, no striations medially in C. jewstrii whereas entire dorsum is striated with longitudinal and transverse striations and a band of transverse striations present in C. saryabiensis.
3. There is only 1 pair of anal setae in C. jewstrii, as against 2 pairs in C. saryabiensis.

Absence of striations medially on the metapodosoma, shape of dorsal body setae, and number of setae on the anal shield separate this new species from Cenopalpus wainsteini Livshitz and Mitrofanov, a similar species found in U.S.S.R.

2. Cenopalpus haqii spec. novo.

(Fig. 2)

- FEMALE : Body 281 μm long (without rostrum), 177 μm wide. Rostrum reaching distal end
FIG. 2: Cenopalpus haqii spec. nov.
A. — Dorsal side; B. — Ventral side; C. — Rostral shield; D. — Palpus.
of femur I. Palpus terminal segment with 1 rod and 2 setae, segment III with 2 setae, barbed (Fig. 2C). Rostral shield deeply notched with 1 median and 3 lateral lobes on each side, entirely reticulated, reticulations continuous with those of propodosoma (Fig. 2D). Propodosoma entirely reticulated, reticulations much elongate near lateral margins (Fig. 2A). Propodosomatic setae I minute, II, III 21 μm and 26 μm long, respectively. With 1 pair of eyes on each side. Hysterosoma reticulated, reticulations broken, much elongate on lateral margins and medially near central setae III (Fig. 2A). Humeral setae 8 μm long. Dorsocentral hysterosomatic setae each 13 μm long. Dorsosublateral hysterosomatic setae 21 μm long, with 6 pairs dorsolateral hysterosomatic setae, I 13 μm, II and III = 16 μm, IV and V = 13 μm and VI 8 μm long. All the dorsal setae lanceolate, serrate. One pair of pores present (Fig. 2A).

Venter with a few markings on bases of coxae I and II. Medioventral propodosomatic setae 27 μm long. Anterior and posterior medioventral metapodosomatic setae 8 μm and 36 μm long, respectively, posterior setae surpass anterior setae (Fig. 2B). Ventral shield striated with 1 pair of setae 26 μm long, serrate. Genital shield striated, setae (2 pairs) each 10 μm long, simple. Anal shield reticulated, with 2 pairs of setae, anterior pair 5 μm, simple, posterior 8 μm, serrate. Marginal area lateral to ventral shield with reticulations (Fig. 2B).

Setae on leg segments: coxae 2-2-0-0, trochanters 1-1-1-1, femora 4-4-2-1, genua 3-3-1-0, tibiae 5-5-3-3. Setae on tarsi not clear. Femora I, II, III each with 2 long setae (Fig. 2A).

■ MALE: Not known.

TYPE: Holotype female, collected at Mastung 5000' (Quetta Valley) on 23.vi.1981 (AKBAR and CHAUDHR) from Apple (Pyrus malus), 1 female paratype with same collection data, 1 female collected Quetta on 24.vi.1984 from prunus amygdalus, all deposited in Acarology Research Laboratory, Department of Entomology, U.A.F.

■ REMARKS: This new species of Cenopalpus resembles Cenopalpus lanceolatisetae (Attiah) but may be separated from it on the basis of the following points:

1. Rostral shield with 1 median and 2 lateral lobes on each side in C. lanceolatisetae as against 1 median and 3 lateral lobes on each side in C. haqii.
2. Coxae I-IV with 2-2-1-1 setae in C. lanceolatisetae, as against 2-2-0-0 setae in C. haqii.
3. Ventral and genital shields reticulated in C. lanceolatisetae, but striated in C. haqii.
4. Area anterior to ventral shield under apodemes of coxae IV reticulated in C. lanceolatisetae whereas this region is striated in C. haqii.

3. Cenopalpus virgulatus spec. nov.

(Fig. 3)

■ FEMALE: Body 291 μm long (without rostrum), 166 μm wide. Rostrum reaching distal end of genu I. Palpus terminal segment with 1 rod and 2 setae, segment III with 2 setae (Fig. 3 C). Rostral shield notched, striated, 1 median, 4 lateral lobes on each side (Fig. 3 D). Propodosoma reticulated, reticulations fade away medially and towards lateral margins. Propodosomatic setae I broken, II 34 μm, III 29 μm long. Hysterosoma with reticulations mediolaterally and medially between central setae I and II; reticulations beyond central setae II up to caudal end, broader than long giving appearance of striations. Lateral reticulations broken, directed marginally (Fig. 3 A). Humeral setae 21 μm long. Dorsocentral hysterosomatic setae, measuring I 32 μm, II 25 μm and III 23 μm in length. Dorsosublateral hysterosomatic setae, I and II 26 μm, III 18 μm, IV 23 μm and V 21 μm long. Seta VI much smaller, 5 μm in length. All the dorsal setae broadly lanceolate, barbed (Fig. 3 A).

Venter with a few reticulate elements posterior to apodemes of coxae IV. Median area anterior to ventral shield without reticulations, with marginal reticulations lateral to ventral shield (Fig. 3 B). Medioventral propodosomatic setae 44 μm long. Anterior and posterior medioventral metapodosomatic setae 18 μm and 42 μm long, respec-
Fig. 3: *Cenopalpus virgulatus* spec. nov.
A. — Dorsal side; B. — Ventral side; C. — Rostral shield; D. — Palpus.
tively, posterior surpass bases of anterior setae. Ventral shield reticulated in its lower half, setae serrate, 16 \( \mu \text{m} \). Genital shield reticulated, with 2 pairs setiform, serrate setae, each 8 \( \mu \text{m} \) long. Anal shield reticulated with 2 pairs simple setae, the more anterior 8 \( \mu \text{m} \), the posterior pair 13 \( \mu \text{m} \) long (Fig. 3 B).

Setae on leg segments: coxae 2-2-1-1, trochanters 1-1-1-1, femora 4-4-2-0, genua 3-3-1-0, tibiae 5-5-3-3. Setae on tarsi not clear. Femora I, II, III each with 1 lanceolate, barbed seta.

**MALE**: Not known.

**TYPE**: Holotype female, collected at Čarm Chashmâ 6100' (Chitral Valley) on 8.viii.1980 (AKBAR and CHAUDHRI) from undet. host plant No. 5/80 and deposited in Acarology Research Laboratory, Department of Entomology, U.A.F.

**REMARKS**: Cenopalpus virgulatus spec. novo resembles *Cenopalpus picitilis* Chaudhri but the following are points of differences between the two species:

1. Rostral shield reticulated in *C. picitilis* as against striated in *C. virgulatus*.
2. Terminal segment of palpus with only 1 rod in *C. picitilis* as against 1 rod and 2 setae in *C. virgulatus*.
3. Dorsal body setae in *C. picitilis* slightly lanceolate, serrate as against broadly lanceolate, barbed in *C. virgulatus*.
4. Area lateral to ventral shield without reticulations in *C. picitilis* whereas reticulations present in *C. virgulatus*.

*Cenopalpus virgulatus* may also be separated from *C. lanceolatisetae* (Attiah) on the basis of ornamentation of the rostral shield, dorsal body reticulation, shape of dorsal setae, and number of setae on coxae and femora I-IV.

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4. *Cenopalpus chitraliensis* spec. nov.

(Fig. 4)

**FEMALE**: Body 260 \( \mu \text{m} \) long (without rostrum), 146 \( \mu \text{m} \) wide. Rostrum reaching distal end of genu I. Palpus terminal segment with 1 sensory rod and 2 setae, segment III with 2 barbed setae (Fig. 4 D). Rostral shield deeply notched, reticulated, 1 median and 1 lateral lobe on each side (Fig. 4 C). Propodosoma reticulated entirely, reticulate elements well defined, hexagonal, longer than broad near central suture. Propodosomatic setae I 18 \( \mu \text{m} \), II and III each 16 \( \mu \text{m} \) long. Hysterosoma reticulated entirely, reticulations broader than long between central setae II and III. Humeral setae 18 \( \mu \text{m} \) long. Dorso-central hysterosomatic setae I 13 \( \mu \text{m} \), II and III 8 \( \mu \text{m} \) long. Dorso-sublateral hysterosomatic setae 10 \( \mu \text{m} \) long. Dorso-lateral hysterosomatic setae 6 pairs, I-IV 16 \( \mu \text{m} \), V 10 \( \mu \text{m} \) and VI 5 \( \mu \text{m} \) long; all setae shorter than distances between their bases. All dorsal setae lanceolate, serrate (Fig. 4 A).

Venter with few reticulations posterior to apodemes of coxae IV. Median area anterior to ventral shield without reticulations. Marginal reticulations present lateral to ventral shield (Fig. 4 B). Medioventral propodosomatic setae 36 \( \mu \text{m} \) long. Anterior and posterior medioventral setae measuring 10 \( \mu \text{m} \) and 31 \( \mu \text{m} \) long, respectively. Ventral shield with weak reticulations, setae 1 pair, lanceolate, serrate, 10 \( \mu \text{m} \) long. Genital shield with broken striations, setae lanceolate, serrate, inner pair 10 \( \mu \text{m} \), outer pair 8 \( \mu \text{m} \) long. Anal shield with weak striations, setae 2 pairs, lanceolate, serrate, each 10 \( \mu \text{m} \) long (Fig. 4 B).

Setae on leg segments: coxae 2-2-1-1, trochanters 1-1-2-1, femora 4-3-2-0, genua 3-3-1-0, tibiae 4-4-3-3. Setae on tarsi not clear.

**MALE**: Not known.

**TYPE**: Holotype female, collected at Chitral 4980' on 10.viii.1981 (AKBAR and CHAUDHRI) from apple (*Pyrus malus*), paratypes 2 females,
Fig. 4: Cenopalpus chitraliensis spec. nov.

A. — Dorsal side; B. — Ventral side; C. — Rostral shield; D. — Palpus.
same collection data. All deposited in Acarology Research Laboratory, Department of Entomology, U.A.F.

REMARKS: In many body characters, Cenopalpus chitraliensis resembles Cenopalpus picitilis Chaudhri and Cenopalpus virgulatus spec. nov. but may be separated from them on the basis of the following points:

1. Rostral shield with 1 median and 2 lateral lobes in C. picitilis, and 1 median and 4 lateral lobes in C. virgulatus, as against 1 median and 1 lateral lobe on each side in C. chitraliensis.

2. The chaetotaxy of leg trochanters, femora, genua and tibiae in C. virgulatus and C. picitilis differs from that in C. chitraliensis.


Shape of the rostral shield, number of setae on femora I-IV, and tibiae I-IV, lanceolate, serrate setae on anal shield separate C. chitraliensis from C. lanceolatisetae.

5. Cenopalpus dignus spec. nov.
(Fig. 5)

FEMALE: Body 270 μm long (without rostrum), 156 μm wide. Rostrum reaching distal end of femur I. Palpus terminal segment with 1 sensory rod and 2 setae, segment III with 2 setae (Fig. 5 D). Rostral shield with a broad notch, raised areolae under median lobe, rest of the area with longitudinal striations, 1 median and 3 lateral lobes on each side (Fig. 5 C). Propodosoma reticulated medially and mediolaterally, reticulations fade away towards lateral margins, reticulations almost hexagonal. Propodosomal setae setiform, serrate, I and II 16 μm, III 13 μm long. Hysterosoma reticulated medially between central setae I and II mediolaterally, reticulations fade away towards lateral margins. Reticulate elements broader than long between central setae II and III (Fig. 5 A). Humeral setae 8 μm long. Dorsocentral hysterosomatic setae I 10 μm, II 5 μm and III 8 μm long. Dorsosublateral hysterosomatic setae 8 μm long. Dorsolateral hysterosomatic setae 6 pairs, I 7 μm, II, III and IV each 8 μm, V 5 μm and VI 3 μm long. All the dorsal hysterosomatic setae setiform, simple (Fig. 5 A).

Venter with a few cells caudad to apodemes of coxae I and II, striations posterior to apodemes of coxae IV giving appearance of reticulations, fading away medially anterior to ventral shield. Reticulations lateral to ventral shield on lateral margins present (Fig. 5 B). Medioventral propodosomatic setae 52 μm long. Anterior and posterior medioventral metapodosomatic setae 13 μm and 73 μm long, respectively, posterior setae surpass anterior setae. Ventral shield with a few reticulations in the middle, setae 1 pair, 13 μm long, simple. Genital shield with irregular striations, with 2 pairs setae, inner setae 16 μm, outer setae 13 μm, simple. Anal shield reticulated on lower half, upper half with longitudinal striations, setae 2 pairs, upper setae 8 μm, lower setae 10 μm long, simple (Fig. 5 B).

Setae on leg segments: coxae 2-2-1-1, trochanters 1-1-1-1, femora 4-4-2-1, genua 3-3-1-1, tibiae 5-5-3-3. Setae on tarsi not clear.

MALE: Not known.

TYPE: Holotype female, collected at Charrapani, 3500' (Murree Hills) on 23.x.1976 (AKBAR and CHAUDHRI) from Banana (Musa paradisica) and deposited in Acarology Research Laboratory, Department of Entomology, U.A.F.

REMARKS: Cenopalpus dignus spec. nov. is separated from all the species described so far from Pakistan in that all the dorsal setae are simple and chaetotaxy of trochanters I-IV (1-1-1-1) is unique.

Cenopalpus dignus may also be separated from Cenopalpus piger Wainstein, a species from apple in U.S.S.R., on the basis of the following points:

1. Rostral shield with few striations and 2 lateral lobes in C. piger whereas it is with areolae and 3 lateral lobes on each side in C. dignus.

2. Dorsal setae serrate in C. piger as against simple in C. dignus.

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Fig 5: *Cenopalpus dignus* spec. nov.
A. — Dorsal side; B. — Ventral side; C. — Rostral shield; D. — Palpus.
(Fig. 6)

**FEMALE** : Body 250 μm long (without rostrum), 156 μm wide. Rostrum reaching proximal end of femur I. Palpus terminal segment with 1 sensory rod and 2 setae, segment III with 2 setae (Fig. 6 D). Rostral shield notched with wavy striations, 1 median and 2 lateral lobes on each side, median and lateral lobes of similar height (Fig. 6 C). Propodosoma entirely reticulated, reticulations well defined, hexagonal (Fig. 6 A). Propodosomatic setae I 23 μm, II 21 μm and III 20 μm long. Hysterosoma entirely reticulated, reticulate elements mostly hexagonal, broken reticulations medially from posterior to central setae II up to posterior to central setae III, caudally reticulations longer than wide (Fig. 6 A). Humeral setae 13 μm long. Dorsocentral hysterosomatic setae simple, I 10 μm, II 8 μm and III 5 μm long. Dorsosublateral hysterosomatic setae 13 μm long. Dorsolateral hysterosomatic setae 6 pairs I 16 μm, II 13 μm, III 12 μm, IV 10 μm, V and VI each 5 μm long, all shorter than distances between their bases. All dorsal setae, except dorsocentral hysterosomatic setae, setiforme, serrate (Fig. 6 A).

Venter with striations caudad to apodemes of coxae II. Reticulations caudad to apodemes of coxae IV, fading away medially anterior to ventral shield. Marginal area lateral to ventral shield reticulated (Fig. 6 B). Medioventral propodosomatic setae 36 μm long. Anterior and posterior medioventral metapodosomatic setae 8 μm and 39 μm long, respectively, posterior setae surpass bases of the anterior setae. Ventral shield with broken striations, setae 13 μm long, simple. Genital shield with broken striations, setae 2 pairs each 13 μm long, simple. Anal shield with weak reticulations, setae 2 pairs, inner setae 8 μm and outer setae 10 μm long, both serrate (Fig. 6 B).

Setae on leg segments : coxae 2-2-1-1, trochanters 1-1-2-1, femur 4-4-2-1, genu 3-3-1-0, tibiae 5-5-3-3. Setae on tarsi not clear.

**MALE** : Not known.

**TYPE** : Holotype female, collected at Garm Chashma 6100' (Chitral Valley) on 8.viii.1980 (AKBAR and CHAUDHRI) from undet. host plant no. 10/80 and deposited in Acarology Research Laboratory, Department of Entomology, U.A.F.

**REMARKS** : Cenopalpus limbatus spec. novo. may be separated from Cenopalpus favosus Chaudhri on the basis of the following points :

1. Rostral shield reticulated with 1 lateral lobe on each side in *C. favosus* as against it is striated with 2 lateral lobes on each side in *C. limbatus*.

2. Ventral, genital and anal shields reticulated in *C. favosus* but striated in *C. limbatus*.

3. Area anterior to ventral shield reticulated medially in *C. favosus* whereas not so in *C. limbatus*.

4. Anal shield setae simple in *C. favosus* but serrate in *C. limbatus*.

7. Cenopalpus homalos spec. novo.
(Fig. 7)

**FEMALE** : Body 291 μm long (without rostrum), 187 μm wide. Rostrum reaching distal end of femur I. Terminal segment of palpus with 1 sensory rod and 1 seta, segment III with 2 setae (Fig. 7 D). Rostral shield deeply notched, reticulated, 1 median and 1 lateral lobe on each side (Fig. 7 C). Propodosoma reticulated medially and mediolaterally, reticulations fade away towards lateral margins, reticulate elements hexagonal. Propodosomatic setae measuring I 5 μm, II 23 μm, III 18 μm, in length. Hysterosoma reticulated entirely, elements well defined, mostly hexagonal. Reticulations broader than long from posterior of central setae II to posterior to central setae III, elongated, fade away laterally (Fig. 7 A). Humeral setae, 10 μm long. Dorsocentral hysterosomatic setae I and II 8 μm, III 5 μm long. Dorsosublateral hysterosomatic setae 13 μm long. Dorsolateral hysterosomatic setae 6 pairs, I
Fig. 6: *Cenopalpus limbatus* spec. nov.

A. — Dorsal side; B. — Ventral side; C. — Rostral shield; D. — Palpus.
Fig. 7: *Cenopalpus homalos* spec. nov.
A. — Dorsal side; B. — Ventral side; C. — Rostral shield; D. — Palpus.
Venter with a few markings at bases of coxae I and II. Area anterior to ventral shield between coxae IV reticulated. Margins lateral to ventral shield with reticulations (Fig. 7 B). Medioventral propodosomatic setae simple, 34 μm long. Anterior and posterior medioventral metapodosomatic setae, 8 μm and 23 μm long, respectively. Ventral shield reticulated, with 1 pair setae 13 μm, simple. Genital shield striated, with 2 pairs setae, each 13 μm long, serrate. Anal shield reticulated, setae 2 pairs, serrate, each 8 μm long (Fig. 7 B).

Setae on leg segments: coxae 3-2-1-1, trochanters 1-1-2-1, femora 4-4-2-1, genua 3-3-1-0, tibiae 5-5-3-3. Setae on tarsi not clear.

**MALE :** Not known.

**TYPE :** Holotype female, collected at Orak Valley 5500’ (Quetta) on 19.vi.1981 (AKBAR and CHAUDHRI) from almond (Prunus amygdalus). Paratypes, 2 females with same collection data. All specimens deposited in Acarology Research Laboratory, Department of Entomology, U.A.F.

**REMARKS :** Cenopalpus homalos spec. nov. may be separated from Cenopalpus limbatus spec. nov. on the basis of the following points:

1. Terminal segment of palpus with 1 sensory rod and 2 setae in C. limbatus as against 1 sensory rod and 1 seta in C. homalos.
2. Rostral shield striated with 2 lateral lobes on each side in C. limbatus whereas it is reticulated with 1 lateral lobe in C. homalos.
3. Ventral and anal shields striated in C. limbatus but reticulated in C. homalos.
4. Coxae I-IV with 2-2-1-1 setae in C. limbatus as against 3-2-1-1 in C. homalos.

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8. **Cenopalpus orakiensis** spec. nov.

(Fig. 8)

**FEMALE :** Body 270 μm long (without rostrum), 187 μm wide. Rostrum reaching base of genu I. Palpus terminal segment with 1 sensory rod and 2 setae, segment III with 2 setae (Fig. 8 D). Rostral shield reticulated with broad deep notch, 1 median and 1 lateral lobe on each side (Fig. 8 C). Propodosoma reticulated entirely, elements hexagonal, fade away laterally. Propodosomatic setae measuring I 23 μm, II 18 μm, III 21 μm long. Hysterosoma reticulated entirely, elements hexagonal, fade away laterally. Reticulations, medially broken, from central setae III upto caudal end broader than long (Fig. 8 A). Humeral setae 18 μm long. Dorso-central hysterosomatic setae I 13 μm, II and III 8 μm long. Dorosublateral hysterosomatic setae 13 μm long. Dorosolateral hysterosomatic setae 6 pairs, I 13 μm, II, III and IV each 16 μm, V 8 μm, VI 5 μm long, all shorter than distances between their bases. All the dorsal setae setiform, serrate (Fig. 8 A).

Venter with a few reticulations anterior to ventral shield between coxae IV, fading away medially. Marginal area lateral to ventral shield with reticulations (Fig. 8 B). Medioventral propodosomatic setae 1 pair, 42 μm. Anterior and posterior medioventral metapodosomatic setae each 1 pair, 8 μm and 42 μm long, respectively. Ventral shield reticulated, setae serrate, 16 μm long. Genital shield reticulated, with 2 pairs setae, serrate, each 13 μm long. Anal shield reticulated, setae 2 pairs, serrate, anterior pair 16 μm, posterior pair 13 μm long (Fig. 8 B).

Setae on leg segments: coxae 2-2-1-1, trochanters 1-1-2-1, femora 4-4-2-1, genua 3-3-1-0, tibiae 5-5-3-3. Setae on tarsi not clear. Femora I, II and III each with 1 seta very long, serrate (Fig. 8 A).

**MALE :** Not known.

**TYPE :** Holotype female, collected at Orak Valley 5500’ (Quetta) on 28.vi.1981 (AKBAR and CHAUDHRI) from apple (Pyrus malus) and deposit-
Fig. 8: Cenopalpus orakiensis spec. nov.
A. — Dorsal side; B. — Ventral side; C. — Rostral shield; D. — Palpus.
ed in Acarology Research Laboratory, Department of Entomology, U.A.F.

**Remarks:** *Cenopalpus orakiensis* spec. nov. closely resembles *Cenopalpus favosus* Chaudhri in most of the body characters but may be separated from *C. favosus* on the basis of the following points:

1. Area anterior to ventral shield between leg coxae IV reticulated medially in *C. favosus* but not so in *C. orakiensis*.
2. Genua I-IV with 3-3-1-0 setae in *C. favosus* as against 3-3-1-1 setae in *C. orakiensis*.
3. Genital and anal shield setae simple in *C. favosus* but serrate in *C. orakiensis*.

*C. orakiensis* may also be separated from *C. piger* Wainstein on the basis of shape of rostral shield, number of setae on leg genua I-IV and presence of reticulations medially anterior to ventral shield.

**Discussion**

A numerical taxonomy technique for assessing the similarity of various taxa of the genus *Ceno-

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**Table I: Comparison of characters in Pakistan species of genus Cenopalpus Pritchard and Baker**

<table>
<thead>
<tr>
<th>Characters</th>
<th>aratus</th>
<th>ramus</th>
<th>orakiensis</th>
<th>favosus</th>
<th>glabrosporus</th>
<th>virgulatus</th>
<th>virgulatus cf.</th>
<th>chlorodactylus</th>
<th>ornatus</th>
<th>homalos</th>
<th>orakiensis</th>
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</thead>
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<td>1. Rostrum reaching distal end of femur I</td>
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<td>2. Palpus with 1 sensory rod on terminal segment</td>
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<td>3. Rostral shield with deep notch</td>
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<td>4. Rostral shield striated</td>
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<td>5. Rostral shield with 2 lateral lobes on each side</td>
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<td>6. Palpal segment III with 1 seta</td>
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<td>7. Propodosoma reticulated</td>
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<td>8. Propodosomatic setae lanceolate, serrate</td>
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<td>9. Hysterosoma reticulated</td>
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<td>10. Hysterosoma striated laterally</td>
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<td>11. Hysterosoma with striaations between central setae II and III</td>
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<td>12. Hysterosomatic setae lanceolate, serrate</td>
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<td>13. All dorsal setae shorter than the distances between their bases</td>
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<td>14. Central seta III smaller than 1 and II</td>
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<td>15. Ventral shield reticulated</td>
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<td>16. Area anterior to ventral shield between legs IV reticulated medially</td>
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<td>17. Genital shield reticulated</td>
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<td>18. Anal shield reticulated</td>
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<td>19. All anal shield setae serrate</td>
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<td>20. Genua I-IV with 3-3-1-0 setae</td>
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FIG. A: Phenogram of Pakistan species of genus *Cenopalpus* Pritchard and Baker.
and saryabiensis and their co-occurrence in the same area suggest convergence/parallel evolution. Species chiatriiensis and capacis also are taxa of high altitude and are restricted to Chitral and Naran, respectively. In other words, these two taxa are localized in occurrence and hence may be presumed to have a narrow genetic plasticity. A similar inference may be true in case of picitilis, dignus and limbatus. Species favosus although widely distributed in uphill areas yet it retains the morphological consistency to the extent that it is above 75% phenetically related to homalos. This shows a strong genetic basis of the characters used in this study.

LITTLEJOHN (1981) concluded that a discontinuous array of biological diversity exists, particularly when viewed in a spatially restricted situation and hence for understanding of mechanisms and processes responsible for the origin and maintenance of this diversity, one should look into environment to formulize a combined ecological and genetic analysis. It is with this precept that even at such an infancy stage of mite taxonomy, some assumptions have been incorporated to stimulate further studies.

This point has also been amplified by DOBZHANSKY (1940), SIMPSON (1951, 1953 and 1961) who advocated that the adaptive value (may that be morphological, ecological or physiological) of a species complex is the property of the genotyne.

### Table II: Matrix showing percentage of similarity in Pakistan species of genus Cenopalpus Pritchard and Baker

<table>
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<tr>
<th>Species</th>
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<th>ramus</th>
<th>capacis</th>
<th>favosus</th>
<th>picitilis</th>
<th>limbatus</th>
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<th>chiatriiensis</th>
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### REFERENCES


*Paru en septembre 1985.*