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Taxonomic Morphology of *Sergentomyia dentata arpaklensis* Perfiliev (1933) from Pakistan (Diptera, Psychodidae, Phlebotominae)

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Abstract: During entomological surveys conducted by the present author in the whole of the Balochistan Province during 1996-2001, a single ♀ and a ♂ of *Sergentomyia (Sergentomyia) dentata arpaklensis* Perfiliev (1933) were collected at Mand-Balochistan, near border with Iran, on 09.1.2001 from a mud house through sticky traps. Its taxonomic characters are re-described and the characters not described by earlier workers are also described and illustrated. Differential diagnosis of this species is also provided. The results are compared with the data available in the existing literature.

Key words : Sandfly, *Sergentomyia dentata arpaklensis*, taxonomic characters

INTRODUCTION

Phlebotomus dentatus was described by Sinton (1933) from 2 ♀ and one ♂ from Quetta but mouth parts of the female fly were not described nor sketched. Similar sandflies were collected by Perfiliev (1933) from the Karakala District of Turkmenistan and described as *Phlebotomus minutus* var. *arpaklensis*. However, *Phlebotomus dentatus* was first recorded in 1937 from Turkmenistan by Perfiliev (1968). *Sergentomyia dentata* was also found in Georgia in 1955 and in Azarbaijan in 1958 by Perfiliev (1960). Unfortunately, it was at that time, *Sergentomyia dentata arpaklensis* Perfiliev (1933) was not differentiated from another species and was later described as *Sergentomyia sintoni* from Iraq by Pringle (1953). Russian authors often used the name *arpaklensis* for the forms of Turkmenistan and of Middle East. According to the original description of *Sergentomyia dentata arpaklensis*, the buccal cavity was having 18-20 teeth of which the median teeth were much shorter and narrower. Theodor (1958) and Theodor and Mesghali (1964) pointed out that previously *Sergentomyia arpaklensis* from Turkmenistan was considered as identical and a synonyms of *Sergentomyia dentata* Sinton, from Quetta-Balochistan, but re-examination of specimens of these species proved that lateral teeth (usually 5) of Turkmenistan form were not as large as in the type form from Quetta and also does not have well developed lateral punctiform denticles. Further, it was suggested that specimens of *P. bruchomi* from Greece seemed indistinguishable from *Sergentomyia dentata arpaklensis* and *Phlebotomus bruchomi* was considered a synonyms of this. Thus, the name of arpaklensis was reinstated as a subspecies for Middle East and Turkmenistan forms. Lewis (1967) recorded *Sergentomyia dentata arpaklensis* Perfiliev (1933) from Gwadi,

Landikotal, Peshawar and Rawalpindi areas in Pakistan, but description of labrum, hypopharynx, maxilla, mandible, cibarium and pharynx were not given nor their diagrams were provided. Aslamkhan and Rafique (1980) reported *Sergentomyia dentata* from Quetta and Sibi and Rab, *et al.* (1986) recorded *Sergentomyia dentata* from Uthal, but taxonomic characteristics of this species were neither described nor sketched. In view of the insufficient descriptions of Perfiliev (1933 and 1968), Mesghali (1961), Theodor and Mesghali (1964), Lewis (1967), Aslamkhan and Rafique (1980) and Rab *et al.* (1986), *Sergentomyia dentata arpaklensis* Perfiliev is redescribed in detail.

MATERIALS AND METHODS

During a taxonomic study of sandflies of the Balochistan conducted by the present author in 1996-2001 in the whole of the Balochistan Province, 2013 sandflies comprising of genera *Phlebotomus*, *Sergentomyia* and *Grassomyia* were collected. (Kakarsulemankhel, 2001). For processing, dissection and examination of taxonomic characters, the conventional procedures especially those used by Johnson *et al.* (1963), Lewis (1973), Killick-Kendrick (1983), Lawyer *et al.* (1991) and Killick-Kendrick *et al.* (1994) were followed. For species identification keys furnished by Perfiliev (1933 and 1968) and Lewis (1967) were followed. All the diagrams were drawn with Camera lucida and are to the given scales. Measurements are in millimeter unless otherwise indicated.

Sergentomyia (Sergentomyia) dentata arpaklensis Perfiliev (1933) (Text-Figs.1 and 2 and Table 1a)

Female: (1 specimen was examined) (Fig.1). Wing 1.28 mm long, 0.272 mm broad, $\alpha=0.16$ mm long, $\beta=0.224$ mm, $\delta=0.04$ mm, $\gamma=0.24$ mm, $\pi=0.024$ mm, alar index 0.71. Palps and antennae missing. Proboscis 0.15 mm long. Labrum

Table 1a: Comparative taxonomic characters (in mm) of *Sergentomyia dentata arpaklensis* Perfiliev (1933)

♀ Taxonomic Characters	SW Pakistan (Present study)	<i>S. dentatus</i> , from Quetta (Sinton, 1933:869)	<i>S. arpaklensis</i> from Turkmenistan (Perfiliev, 1933:221, 1968:308)	<i>S. dentata</i> , Sinton from Transcaucasia and central Asia (Perfiliev, 1960a:45, 1968:313)	<i>S. dentata</i> var. <i>mediensis</i> from Iraq (Pringle, 1953:714)
Wing length	1.28	1.643-1.71	1.46-1.5	1.30-1.55	1.5(1.31-1.65)
breadth	0.272	0.3-0.314	0.27-0.35	0.26-0.36	0.3(0.24-34)
α / β	0.71	0.55-0.6	-	-	0.39(0.24-0.6)
Antennae	Missing	Missing	-	-	-
Labrum length	0.12	-	-	-	-
Cibarium	5-6 lateral teeth, large (about 0.008 mm long) thick, pointed and 3-4 median short teeth (0.003 mm long) pointed, arranged on a sharply curved line, on the back ground of these teeth there is a broad roughly triangular dark brown pigmented patch without anterior process, 3-4 rounded punctiform denticles present at the base of lateral teeth of each side, punctiform denticles not well developed, chitinous arch absent	A curved armature consisting of four very large pointed teeth on each side and six much smaller median ones, no trace of a pigmented area could be seen. [No description of lateral denticles has given by Sinton (1933:869) but he, (Sinton, 1933:873) mentioned these teeth in the figure of cibarium	12-16 large teeth of equal size fused and standing on a line markedly convex anteriorly, a few irregularly distributed minute denticles at base of lateral teeth, pigmented area large dark brown more or less triangular, apex of pigmented area extending anteriorly in form of a lighter conical process	16-22 large pointed teeth on a line considerably convex anteriorly. The 4-6 median teeth are much smaller than the lateral teeth, two rows of fewer and very small teeth anterior to main row near the margin of buccal cavity, pigmented area large, oval and dark brown, covering te buccal teeth.	About 20 sharply pointed teeth on a deep arc with the convexity anteriorly. The medial six or eight teeth are greatly reduced in size and laterally compressed. There is a very constant dark pigmented area, shaped like the segment of an orange with the outer curve following roughly the edge of the buccal plate
Pharynx	Anterior margin of armature convex, whereas the posterior edge is almost straight, pharyngeal armature consists of numerous long slender anterior teeth and small rounded denticles posteriorly, pharynx is about 2.1 times as long as hind width which is twice as broad as its narrower anterior portion	Pharynx has a well developed armature consisting of numerous long slender teeth anteriorly, with small teeth posteriorly. The greatest width of the pharynx is about twice its narrower anterior portion and its length is about 2.5 times its greatest breadth.	Base of pharynx three times as wide as apex, pharyngeal armature well developed, posterior rows consist of small tubercles.	Base of the pharynx almost twice as wide as its apex, armature well developed with distinct teeth of uniform size which have the form of oblong pointed spinules with thicker base. Anterior margin of armature convex. Posterior margin of armature straight, the base of the armature consists of fine points which occupy a small part of the armature.	Usually about 2.3 times as long as broad, but this portion varies from 2.1 to 2.9, the armature consists of a mass of deeply pigmented strong blunt spines. The anterior rows are elongated. The posterior margin of pharynx is nearly straight.

(Fig. 1A) 0.12 mm long, 4-5 closely packed apical sensilla and a sensilla depth 0.32 mm. Hypopharynx (Fig.1B), apex 0.002 mm broad, with about 6 minute pointing teeth 0.002 mm broad, about 14 fine undulation on each side, a dental depth of 0.032 mm. Maxilla (Fig.1C) with 2 lateral and 29 ventral teeth, a dental depth of 0.076 mm. Mandible (Fig.1D) narrow, 0.006 mm broad, 5 teeth per 0.004 mm, a dental depth of 0.056 mm. Cibarium (Fig.1E) 0.05 mm broad, chitinous arch absent, cibarium with 5-6 very large pointed, thick teeth (0.008 mm long) at each sides and about 3-4 short, thick pointed median teeth (0.003 mm long) arranged on a sharp curved line, lateral punctiform denticles present, on the back ground of teeth, there was a broad roughly triangular dark brown pigmented area, anterior process absent. Pharynx (Fig.1F) 0.11 mm long

and 2.11 times as long as its hind width twice as broad as its narrower anterior portion. Pharyngeal armature consists of numerous long slender anterior teeth and small rounded denticles posteriorly. Armature occupies 3.66 times the pharynx and do not reach lateral borders of the pharynx. Spermatheca damaged.

Male: (1 specimen was examined) (Fig.2). Wings damaged. Palp (Fig.2A) 0.45 mm long, palp formula 1,2,3,4,5, palpal ratio 1:3:4.3:5:9. Proboscis=0.14 mm long. A 3 (Fig.2B) 0.11 mm long, A3/labrum=0.94, A3/ proboscis 0.785, A3/A4+5=0.733, ascoid 0.016 mm long, position of ascoid 0.636, ascoid 3/ A3=0.145, position of a single papilla on A3= 0.81. A4 (Fig.2C, lower) 0.076 mm long, ascoid=0.016 mm long, position of ascoid=0.263, ascoid 4/A4=0.21,

Table 1b: Comparative taxonomic characters (in mm) of *Sergentomyia dentata arpaklensis* Perfiliev (1933)

♂ Taxonomic Characters	(Present study)	<i>S. dentatus</i> from Quetta (Sinton, 1933:869)	<i>S. arpaklensis</i> from Turkmenistan (Perfiliev, 1933:221, 1968:308)	<i>S. dentata</i> , Sinton from Transcaucasia and central Asia (Perfiliev, 1960a:45, 1968:313)	<i>S. dentata</i> var. <i>mediensis</i> from Iraq (Pringle, 1953:714)	<i>S.S. dentata</i> Afghanistan (Artemiev, 1978)
Palp length	0.45	0.546				-
Formula	1,2,3,4,5; 1,3,4,3,5,9	1,2,4,3,5	1,2,3-4,5	1,2,3-4,5 or 1,2,4,3,5	1,2,3-4,5 or 1-2,4,3,5	
Relative length	10,30,43,3,50,90	2.7, 6.8, 11,10,19.1			1,2,5,4,4,7,7	
A3 length	0.11	The both antennae are missing.	0.13-0.16	0.12-0.18	0.145	108-128 micron
A3/A4+5	A3<A34+5		A3<A4+5	A3<A4+5	(0.13-0.168)	A3/labrum=0.88-0.94
Labrum length	0.116	-	-	-	-	-
Ascoid 4/A4	0.21	-	Less than ¼	Not more than 0.2	-	0.16-0.21.
Cibarium	About 16 small pointed teeth of equal size arranged in a row convex anteriorly a few irregularly distributed denticles at the base of teeth, a small pigmented area present chitinous arch absent.	A number of large teeth on one side, those on the other cannot be seen no trace of pigmented area was found.	It consists of 10-16 small pointed teeth of equal size on a line markedly convex anteriorly. The second row consists of fewer and smaller denticles at the base of the main row. Pigmented area small, dark brown, rounded or of irregular shape	Buccal armature with 14-18 well developed pointed teeth standing on a line markedly convex anteriorly, median teeth 3-6, shorter than the others. Tow rows of smaller and less numerous teeth of same from anterior to the lateral teeth of main row, pigmented area oval, relatively large dark brown, covering the dorsal part of the median teeth.	About 20 clearly definable teeth in the armature, about fifteen are moderately developed and the four medial teeth are small. The pigmented area is small and paler than that of the female,	With a concave row of 15-18 teeth the central teeth shorter than the lateral ones.
Pharynx	The pharyngeal armature is developed and consists of a series of short spines. The greatest width is about 1.28 times as wide as the narrower anterior part. Pharynx is about 3.33 times as long as broad.	Pharynx has several rows of stout teeth, about 6 in each anterior row and about 3 in posterior ones. The greatest width is about twice the narrow anterior portion and its length is almost 3.5 times its greatest breadth.	Narrow, little wider posteriorly and then tapers again. The posterior narrow part contains some little developed thin wavy or curved lines.	Pharynx small, bottle shaped with poorly developed armature.	More than three times as long as broad.	-
Coxite length	0.21	-	0.24-0.30	0.25-0.28	0.26 (0.25-0.27)	244-272
Coxite/labrum	1.81					1.91-2.13
Coxite/A3	1.90					2.03-2.29
Coxite/style	2.62					
Style Length	0.08, 2 apical and 2 sub apical spines, longer than the style, ventral seta very close (0.87) to apex of style, near sub apical spine.	Style bears 4 long curved spines almost as long the segment, these spines arise apically	0.08-0.10, about 1/3 the length of the coxite, terminal spines as long as the style or longer, all apical or 2 of them slightly sub apical, ventral seta close to apex of style, near terminal spines.	0.11-0.13, 2 terminal spines are apical and two sub apical, ventral seta short, situated closer to apex of the segment.	0.11 (0.10-0.12), the longest spine is about the same length as the style, 2 spines are sub terminal.	Style with 2 spines terminally and two sub terminal.
Paramere length	0.12, with rounded ends.	Its end is not so markedly beak shaped as in other species.	Thick, of uniform breadth, with rounded apex, ventral side of base of paramere with 4 or 5 hairs.	Paramere thick with a rounded apex, there distal part not narrowing.	Slightly clubbed.	Paramere with slightly hooked end.
Aedeagus length	0.08, relatively thick, each halves of aedeagus 0.016 broad, with slightly rounded tip and its distal part not narrowing.	Aedeagus has a bluntly pointed end	Straight, digit form, with blunt rounded apex.	Aedeagus relatively thick with light rounded tip and a small apical notch.	0.09-0.10	Aedeagus slightly curved.
Surstyle length	0.18	-	0.16-0.118, shorter than coxite.	0.23-0.25	-	-

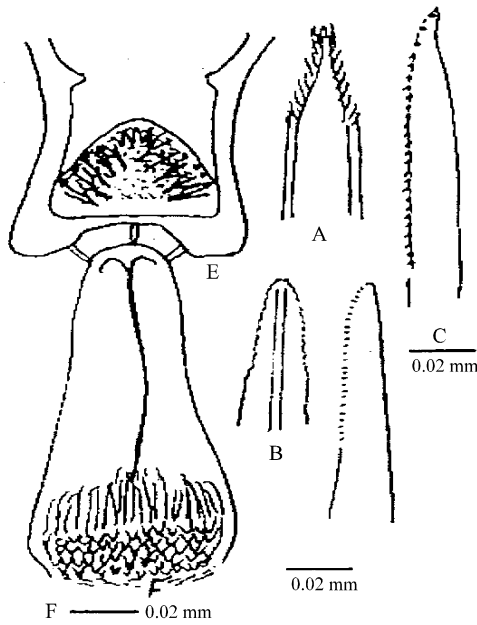


Fig. 1: Camera Lucida drawings of *Sergentomyia dentata arpaklensis* (♀) showing: labrum (A), hypopharynx (B), maxilla (C), mandible (D),

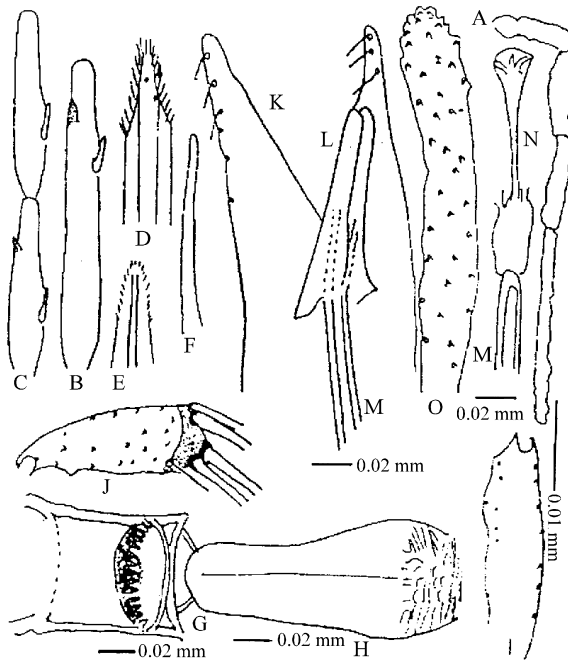


Fig. 2: Camera Lucida drawings of *Sergentomyia dentata arpaklensis* (♂) showing: palp (A), the third (B), fourth (C, lower) and fifth (C, upper) antennal segments, labrum (D), hypopharynx (E), maxilla (F), cibarium (G), pharynx (H), coxite (I), style (J), paramere (K), aedeagus (L), genital filament (M), pump (N), surstyle (O)

position of a single papilla on $A4=0.65$. $A5$ (Fig. 2C, upper) 0.074 mm long, ascoid=0.016 mm long, position of ascoid=0.27, ascoid 5/ $A5=0.21$. Labrum (Fig. 2D) 0.116 mm long and a sensilla depth 0.030 mm. Hypopharynx (Fig. 2E) 0.012 mm broad, apex pointed and a dental depth of 0.030 mm. Maxilla (Fig. 2F) smooth. Cibarium (Fig. 2G) 0.04 mm broad with about 16 small pointed teeth of equal size arranged in a row convex anteriorly, a few irregularly distributed dot like minute denticles at the base of the teeth, at the back ground of teeth, there was a small dark brown, oval shaped pigmented area, chitinous arch absent. Pharynx (Fig. 2H) 0.12 mm long and is about 3.33 times as long as broad and its widest posterior portion is 1.28 times as wide as the narrowest anterior part. There is no marked posterior dilation of this structure. The pharyngeal armature is well developed and consists of series of short spines. The spines at the posterior part are slender, while the more anterior ones are relatively stout. Pharyngeal armature occupies 0.16 of the pharynx. Male terminalia: coxite (Fig. 2I) 0.21 mm long and 0.06 mm broad, coxite / $A3=1.91$, coxite/ labrum=1.81, coxite/style=2.62. Style (Fig. 2J) 0.08 mm long, 0.026 mm broad, with 2 apical spines longer than the style (0.1 mm long) and 2 sub apical, tip of the apical spine spatulate, ventral seta 0.02 mm long and close to apex of style (0.87), near sub apical spine. Paramere (Fig. 2K) 0.12 mm long, 0.66% of the length of the paramere is about 0.03 mm broad, whereas narrow neck (0.33% of the body) was 0.01 mm broad, paramere with blunt rounded ends. Aedeagus (Fig. 2L) 0.08 mm long, relatively thick, each halves of aedeagus 0.016 mm broad, with light broad rounded tip and its distal part not narrowing. Genital filament (Fig. 2M) smooth 0.26 mm long and pump 0.08 mm long (Fig. 2N), filament to pump ratio of 3.25. Surstyle (Fig. 2O) 0.18 mm long and shorter than coxite (0.857).

Differential diagnosis of *S. dentata arpaklensis* : A shorter $A3$ than labrum ($A3 / \text{labrum}=0.94$), ascoid 4/ $A4$ (about 0.21), morphology of cibarium, pharynx and male terminalia specially shape of paramere, thick and broad aedeagus are useful diagnostic characters of ♂ of this species. However, ♀ of this species can be identified by the presence of 5-6 very large, thick, pointed cibarial teeth at each sides and 3-4 short median teeth arranged on a sharp curved line with dot like lateral denticles at the base of these teeth.

Distribution: Balochistan. New Record, Present survey: Mand. This locality is an important focus of cutaneous leishmaniasis. Flies were collected from a mud wall of residential house using sticky traps on 09 .i. 2001. N.W.F.P: Landikotal, Peshawar (Lewis,1967). Northern

Areas : Gwali (Lewis,1967). Punjab : Rawalpindi (Lewis, 1967). Iran. *S. dentata arpaklensis* has been recorded from Tabriz, Kazerun and Bander Abbas by Mesghali (1961) and Theodor and Mesghali (1964) recorded it from Gumbad-e-Kawus (north of Elburz) and Kerman in north and Neiriz in the south. Turkmenistan : KaraKala area (Perfiliev,1933).

DISCUSSION

Results of the present study are compared with the published data of this species from existing literature (Table 1b). Pharynx and cibarium of female specimens of *Sergentomyia arpaklensis* from Balochistan found to resemble with specimens from Turkmenistan (Perfiliev,1933 and1968) both in size, arrangement, number of cibarial teeth, presence of minute denticles at the base of lateral teeth and presence of a more or less conical anterior process of pigment parch. However, it slightly differs from specimens of Turkmenistan (pharynx was about 2.1 times as long as hind width, Turkmenistan=base of pharynx three times as wide as apex). However, the results of the present study show that the specimens from Pakistan resemble with the specimens from Turkmenistan, more closely than the other related sub species. Similarly, specimen ♂ *Sergentomyia arpaklensis* from Balochistan differs with specimens of this species from Turkmenistan and Central Asia (Perfiliev,1968) mainly in the shorter third antennal segments (0.11 mm) and a shorter coxite. However, it was found to resemble in ascoid 4/A4, in the arrangement and uniform size of cibarial teeth, presence of anterior denticles at the base of teeth and a short median dark brown pigment area of irregular shape. It also resembles in the morphology and measurements of pharynx, style, paramere, aedeagus and surstyle. It also resembles with *Sergentomyia dentata* from Afghanistan (Artemiev,1978) only in ascoid 4/A4.

From the original description and diagram of cibarium of *Sergentomyia dentata* (♂) from Quetta, given by Sinton (1933), it does not appear that median teeth are smaller than the laterals. Sinton (1933) further clearly states that a new variety of sandfly from Turkmenistan, *Phlebotomus minutus* var. *arpaklensis* described by Perfiliev (1933) appears to be identical with *Phlebotomus dentatus* Sinton (1933). Sinton (1933) further repeats that cibarium of *Phlebotomus dentatus* has about 15 teeth arranged in a row markedly concave backwards and pigmented area absent. Our results show that Pakistani specimens seem more closer to *Sergentomyia dentata arpaklensis* Perfiliev (1933) from Turkmenistan than to other related subspecies. Therefore, the specimens from south west Pakistan are treated as *S. dentate arpaklensis* Perfiliev (1933).

There are no published reports incriminating *S. dentata arpaklensis*, which is thought to be moderately thermophilic, hydrophilic and a possible vector of reptilian leishmaniasis (Artemiev,1978) and presumably plays no part in transmitting *Leishmania* to man.

The results of the present study revealed that *S. dentate arpaklensis* is a very rare species found near Pak-Iran boarder.

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