

Analysis of the Diagnostic Parameters of the Pakistani Species of the Subgenus *Parratomyia* (Diptera, Psychodidae, Phlebotominae)

JUMA-KHAN KAKARSULEMANKHEL

Sandflies, Leishmaniasis and Mosquitoes Laboratory / Zoology, University of Balochistan, Quetta, Pakistan

Correspondence e-mail: jumakhankakar@yahoo.co.uk

ABSTRACT

During an extensive taxonomic study conducted by the author in the whole of the Balochistan Province in 1996-2001, five species of the genus *Sergentomyia* subgenus *Parratomyia* were collected. Detailed analysis of 24 male and 26 female diagnostic characters is given in the present paper to facilitate their identification.

Key Words: Sandfly; Subgenus *Parratomyia*; Diagnostic characters

INTRODUCTION

Lewis (1967) classical work was based on the sandflies of Punjab, N. W. F. P. and Sindh Provinces, but Balochistan Province, the biggest one of the country, was left un-surveyed. In view of the insufficient work of Lewis (1967), the present author surveyed the whole of the Balochistan Province in 1996-2001 to study the fauna of the sandflies (Kakarsulemankhel, 2001). Comparison of diagnostic parameters of the five species of the subgenus *Parratomyia* viz., *Sergentomyia babu babu* Annandale (1910), *S. palestinensis* Adler and Theodor (1927), *S. baghdadis* Adler and Theodor (1929), *S. grekovi* Khodukin (1929) and *S. fretownensis* Sinton (1930) var. are presented here.

MATERIALS AND METHODS

Sandflies were collected from in-doors as well as from out doors using suction tubes, sticky paper and light traps. Flies were processed, preserved, dissected and mounted according to the conventional methods especially those adopted by Johnson *et al.* (1963), Lewis (1973), Killick-Kendrick (1983) and Killick-Kendrick *et al.* (1994). For species identification, keys furnished by Lewis (1967, 1978, 1982) and Artemiev (1978) were consulted. Specimens are housed with the Author's Collection of Sandflies, Department of Zoology, University of Balochistan, Quetta.

RESULTS AND DISCUSSION

Twenty-four parameters of the male and 26 characters of female specimens were studied, compared and are presented in the given Table I.

In male specimens, characters like eye breadth / head length, wing length, alar index, A3, positions of ascoid on

A4 and A5, hypopharynx dental depth, pharyngeal armature / pharynx length and surstyle / coxite of *S. babu babu* were found to be more greater. Labrum length, sensilla depth, A3 / labrum, ascoid 4 / A4, ascoid 5 / A5, position of papilla on A4, pharynx hind width / forewidth, coxite length / breadth, coxite / labrum, coxite / style of *S. baghdadis* were noted to be larger. Similarly, positions of ascoid and papilla on A3, coxite / A3 and genital filament / pump ratio of *S. palestinensis* were observed to be greater. However, a greater number of cibarial teeth were observed in *S. babu babu*.

In female specimens, features like A3, A3 / labrum, A3 / A4 + A5, position of papilla on A3, palps length and maxillary dental depth of *S. babu babu* were found to be greater. Pharynx hind width as compare with fore width and spermatheca of *S. baghdadis* were observed to be broader. Similarly, pharynx length / breadth and pharyngeal armature height / pharynx length of *S. palestinensis* were observed to be greater. Ascoid 4 / A4, ascoid 5 / A5, positions of ascoids on A4 and A5 and position of papilla on A4 of *S. grekovi* were noted to be larger. Positions of ascoids on A3 of *S. fretownensis* var. were observed to be greater. A greater number of cibarial teeth were found in *S. fretownensis* var.

CONCLUSION

In conclusion, it is suggested that in addition to the conventional characters (A3, pharyngeal and cibarial structures and their armatures and male and female genitalia) extra features like alar index, positions of ascoid and papillae on the antennal segments, A3 / labrum, A3 / A4 + A5, structures, teeth and dental depth of hypopharynx, maxilla and mandibles, dilation of the hind part of the pharynx and its ration with anterior part, coxite length / breadth, coxite / style, surstyle / coxite and filament / pump ratio should also be taken into consideration while

Table I. Comparison of Taxonomic features and morphometrics (in mm) of the Pakistani species of the Subgenus *Parratomyia***A. Male**

Key Characters	<i>S. babu babu</i>	<i>S. palestinensis</i>	<i>S. baghdadis</i>	<i>S. grekovi</i>	<i>S. fretownensis</i> var.
1. Eye				Not known from Pakistan	Not known from Pakistan
length	0.195-0.22	–	0.17-0.21		
breadth	0.15-0.185	–	0.13-0.16		
distance between eyes	0.20-0.22	–	0.165-0.22		
2. Head					
length	0.344-0.41		0.32-0.38		
breadth	0.40-0.44		0.38-0.41		
3. Wing					
length	1.237-1.60	1.12-1.20	1.19-1.4		
alar index	0.535-0.714	0.4-0.657	0.458-0.681		
4. Labrum					
length	0.12-0.14	0.12-0.14	0.13-0.15		
sensilla depth	0.032	0.036	0.04		
5. Antenna length	0.14-0.19	0.12-0.16	0.14-0.18		
6. A3 / labrum	1.269	1.0-1.142	1.142		
7. A3 / A4+5	0.97	0.74-0.96	0.963		
8. A3 / Wing length	0.121	–	0.124		
9. Ascoid / A3	0.109	0.10-0.13	0.112		
10. Ascoid / A4	0.211	0.19-0.195	0.204-0.228		
11. Ascoid / A5	0.211	0.195-0.20	0.21-0.228		
12. Single ascoid and its position on A3	0.687	0.8	0.699		
position on A4	0.375	0.24	0.333		
position on A5	0.3	0.243	0.291		
13. Single papilla and its position on A3	0.912	0.925	0.906		
position on A4	0.75	0.9	0.809		
14. Hypopharynx	18 teeth on each side	apex pointed	6 central and 11 lateral teeth, strongly undulating		
dental depth	0.034	0.028	–		
15. Maxilla					
breadth	0.045-0.056	0.052	0.043-0.05		
dental depth	–	–	0.028		
16. Cibarium	0.045-0.056	0.052	0.043-0.055		
breadth	16-18	hardly visible	12-13 uniform short	16 minute	hardly
teeth	minute teeth on a convex row, additional denticles at the bases of teeth	teeth on a straight line, additional denticles present at the bases of teeth	teeth on a straight line, additional denticles present at the bases of teeth	teeth on a convex line, denticles present at bases of teeth	teeth on a convex line, 6-8 denticles present at bases of teeth
17. Pigment patch	Absent	Weakly marked	absent		
18. Anterior process	Long	absent	absent		
19. Pharynx	lamp glass shaped	lamp glass shaped	Lamp glass shaped		
length / breadth	3.04-3.33	3.0-3.33	–		
hind width / fore width	1.437-1.461	1.33-1.38	1.533-1.583		
armature	Weak, confined to posterior part	to little developed	weak	Not known from Pakistan	Not known from Pakistan
armature / length	0.19-0.228	----	0.183-0.184		
20. Coxite length / breadth	2.91-3.16	3.33-3.43	3.28-3.66		
coxite / A3	1.07-1.35	1.375-1.66	1.27-1.57		
coxite / labrum	1.45-1.58	1.57-1.66	1.53-1.69		
coxite / style	2.04-2.11	2.2-2.22	2.3-2.44		
21. Style					
spines	2 terminal and 2 sub terminal	2 apical and 2 sub apical	2 terminal, 2 sub terminal		
ventral seta at	0.711	0.8	0.75		
22. Paramere					
length	0.14-0.16, bends like a bird's head	0.13 with hooked end	0.13- 0.15, bends like a bird's head		
ventral tubercle width	0.016-0.02	–	0.012-0.018		
23. Genital filament	transverse striations	slight striations	no striations		
filament / pump	2.22-2.50	3.0-3.5	2.5-2.545		
24. Surstyle / coxite	0.897	0.77-0.85	0.768		

B. Female	<i>S. babu babu</i>	<i>S. palestinensis</i>	<i>S. baghdadis</i>	<i>S. grekovi</i>	<i>S. fretownensis</i> var.
Key Characters					
Female					
1. Eye					
length / breadth	1.24	–	–	1.6	–
distance between eyes	0.21-0.24	–	0.21-0.23	0.112	–
2. Head length / breadth	–	–	0.933-0.956	1.09	–
3. Wing length / breadth	0.956	4.0- 416	3.94-4.11	Wings missing	4.11-4.4
4. Alar index	0.615-0.75	0.5-0.55	0.571-0.712	–	0.625-0.642
5. Proboscis length	0.18-0.20	0.14-0.155	0.19-0.20	–	–
6. A3 length	0.16-0.19	0.13-0.14	0.14-0.16	0.13	0.11-0.12
7. A3 / labrum	1.078	1.08-1.16	0.887	0.70	0.785
8. A3 / A4+5	1.059	0.915-0.95	0.98	0.189	0.841
9. A3 / wing length	0.117-0.128	–	0.103	–	0.083
10. Ascoid / A3	0.026-0.030	0.123-0.128	0.147	0.30	0.207
11. Ascoid / A4	0.329	0.20-0.22	0.287	0.555	0.349
12. Ascoid / A5	0.337	0.21-0.22	0.33	0.555	0.365
13. Two ascoids and their positions on A3	0.673	0.63	–	0.66	0.716
A4	0.3	0.28	–	0.40	0.322
A5	0.25	0.22	–	0.39	0.312
14. Single papilla and its position on A3	0.88	0.84	–	0.78	–
A4	0.6	0.67	–	0.73	–
15. Palp length	0.58-0.72	0.52-0.54	0.65-0.69	–	0.48-0.50
16. Labrum length	–	0.12, very broad	0.15-0.18	0.185	0.13-0.14, 0.028 broad
sensilla depth	0.028	0.036	0.032	0.032	0.036
17. Hypopharynx	smooth margins	0.022 broad, about 19 re-curved undulations at sides	smooth margins	0.014 broad	weak undulation
dental depth	–	0.032	–	0.028	–
18. Maxilla	9 lateral, 28 ventral teeth	0.012 broad, 10 lateral teeth (the 6 th , the bigger one 0.005 long), 19 ventral teeth	8 lateral, 26 ventral teeth	–	9 lateral and 35 ventral teeth
dental depth	0.08	0.17 long, very broad	0.076	–	0.07
19. Mandible	long, narrow, 4 fine uniform teeth per 0.004	0.17 long, very broad (0.024), 9 teeth per 0.008	less broad (0.012), 4 re-curved teeth per 0.004	8 teeth per 0.008	0.011 broad, minute uniform teeth, 7 re-curved teeth per 0.008
dental depth	0.056	0.036	0.056	0.048	–
20. Cibarium	0.05-0.065	0.044-0.05	0.06-0.076	0.046	0.058-0.06
breadth	a convex row of 30-32 equal sized teeth (27 broader base, 5 central thinner teeth)	straight line of 15-18 teeth with long points, each with a nodular thickening near its center, another row of 19-21 punctiform denticles at bases of longer teeth, postero-lateral edges of cibarium knob like	14-16 broad pointed teeth on a convex line (5-6 smaller central, 8-9 larger lateral teeth)	11 long teeth on a straight row, a few punctiform denticles at bases of teeth	60-70 comb like parallel straight teeth, extreme laterals bigger than the medians standing on an arc concave posteriorly, a row of denticles at the bases of teeth
21. Pigment patch	ill developed	large and conical	ill developed	triangular, dark	crescent shaped, dark
22. Anterior process	absent	short, bifid	absent	irregular broad forward extension	long triangular
23. Pharynx					
length / breadth					
hind width / fore width	3.04-3.42	3.45-3.68	2.765-3.04	3.33	2.4-2.6
armature height / pharynx length	1.461-1.533	2.25-2.27	1.516-1.562	1.5	2.08
length	0.207	0.27-0.29	0.214	0.1	0.166-0.184
24. Spermatheca	oblong, thick walled	rounded	more or less oval	small (0.008 long), almost oval	0.022 long, elongated
fore width	0.016-0.018	–	–	–	0.009
central width	0.032-0.034	0.013	–	–	0.009
basal width	0.018-0.02	0.032-0.04	0.04-0.04	0.006	---
		–	0.02-0.026	–	–
25. Genital furca length	0.08-0.084	0.08-0.084	0.08	0.056	0.068-0.084
26. Genital atrium width	0.032-0.05	0.035-0.038	0.05	--	0.04-0.048

identifying the species of the subgenus *Parratomyia* as these characters facilitate the correct identification of the flies.

Acknowledgements. The author wishes to thank Professors Drs. Killick-Kendrick, R.; David, J. Bradley; R.W. Ashford; R.P. Lane and Dr. David Evans for their

encouragement and valuable guidance on sandflies. My sincerest thanks are also due to respected Joanna Kapusta (BMNH), Linda Huddleston (BMNH), Dr. J.-P. Dedet (France), Dr. Farrokh Modabber (WHO) and Prof. Dr. V.N. Neronov (Russia) for providing the literature on sandflies.

REFERENCES

- Adler, S. and O. Theodor, 1927. On a collection of *Phlebotomus* sp. of the *minutus* group. *Ann. Trop. Med. Parasitol.*, 21: 61–8.
- Adler, S. and O. Theodor, 1929. The distribution of Sandflies and leishmaniasis in Palestine, Syria and Mesopotamia. *Ann. Trop. Med. Parasitol.*, 23: 269–306
- Annandale, N., 1910. The Indian species of papataci fly (*Phlebotomus*). *Rec. Indian Mus.*, 4: 35–52.
- Artemiev, M.M., 1978. *Sandflies (Diptera, Psychodidae, Phlebotominae) of Afghanistan*. Kabul, p: 91.
- Johnson, P.T., E. McConnell and M. Hertig, 1963. Natural infections of leptomonad flagellates in Panamanian *Phlebotomus* sandflies. *Exp. Parasitol.*, 14: 107–22.
- Kakarsulemankhel, J.K., 2001. The Fauna of the Phlebotomine Sandflies (Diptera, Psychodidae) of Balochistan, Pakistan and the disease cutaneous leishmaniasis. p: 389. *Ph. D. Thesis*, Department of Zoology, University of Balochistan, Quetta
- Khodukin, N.I., 1929. *The main problems of the epidemiology of kala-azar in connection with the epidemiology of leishmaniasis of dogs in Central Asia*. p: 146. *Medskaya mysl'* Tashkent, Suppl.
- Killick-Kendrick, R., 1983. Investigation of Phlebotomine sandflies-vectors of Leishmaniasis. In : *Proceedings of the Indo-UK Workshop on leishmaniasis*. pp: 72–83. Patna, India, December, 6–10, 1982
- Killick-Kendrick R., Y. Tang, M. Killick-Kendrick *et al.*, 1994. Phlebotomine sandflies of Kenya (Diptera, Psychodidae) III. The identification and distribution of species of the sub genus *Larrousius*. *Ann. Trop. Med. Parasit.*, 88: 183–96.
- Lewis, D.J., 1967. The Phlebotomine sandflies of West Pakistan (Diptera, Psychodidae). *Bull. Brit. Mus. Nat. Hist. (Ent.)*, 19: 1–57
- Lewis, D.J., 1973. Phlebotomidae and Psychodidae. In: K.G.V. Smith, (Ed.), *Insects and other arthropods of medical importance.*, pp: 159–79. British Museum Natural History, London.
- Lewis, D.J., 1978. The Phlebotomine sandflies (Diptera, Psychodidae) of the Oriental Region. *Bull. Brit. Mus. Nat. Hist. (Ent.)*, 37: 217–343.
- Lewis, D.J., 1982. A taxonomic review of the genus *Phlebotomus* (Diptera, Psychodidae). *Bull. Brit. Mus. Nat. Hist. (Ent.)*, 45: 121–209.
- Sinton, J.A., 1930. Some new species and records of *Phlebotomus* from Africa. *Indian J. Med. Res.*, 18: 171–93

(Received 10 August 2004; Accepted 20 September 2004)