SOME FRESH-WATER OLIGOCHAETA FROM BOMBAY CITY AND ENVIRONS[1]

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(*With fifty-eight text-figures*)

Introduction

Stephenson (1923) has listed the known species of oligochaetes from the nine regions of the Indian sub-continent, in which the Western region, comprising of Goa to Cutch, the ghats to the sea has only 5 species of fresh-water oligochaetes known, all belonging to family Naididae. The other eight regions have the following number of species of fresh-water oligochaetes noted against them.

	Aeolos-omatidae	Naidiade	Tubific idae	Phrae odril idae	Total
1. North Western Territory	2	15	2	0	19
2. North Eastern Frontier Region	0	0	2	0	2
3. Western Himalaya Region	0	5	0	0	5
4. Indo-gangetic Plain	1	16	2	0	19
5. Burma, Andaman & Nicobar	0	3	1	0	4
6. Main Peninsular Area	0	4	2	0	6
7. Southern Region	0	5	2	0	7
8. Sri Lanka (Ceylon)	1	3	1	1	6

Naidu (1961 and 1966) tabulated the fresh-water oligochaetes then known to the above nine regions, in which no additions were observed in respect of N.W. Territory, Western Himalayan Region, N.E. Frontier Region, Main Peninsular Area, Western Region and Sri Lanka, while in three other regions, *viz.* Indo-Gangetic Plain it had increased from 19 to 22 species, Burma, Andaman and Nicobar from 4 to 6 species, and Southern Region from 7 to 51 species.

The fresh-water oligochaetes known from the Western Region at present are:

1. *Chaetogaster langi* Bretscher, 1896 from Satara
2. *Chaetogaster limnaei bengalensis* Annadale, 1905 from Khandala
3. *Nais communis* Piguet, 1906 from Khandala
4. *Aulophorus furcatus* (Muller, 1773) from Bombay and Khed
5. *Pristina longiseta longiseta* Ehrenberg, 1828 from Bombay

With a view to study the fresh-water oligochaetes of Bombay, one of us (K.V.N.) made some collections in the summer of 1965 in and around Bombay city. In addition Dr. U. Obai-

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LOCALITIES FROM WHICH F.-W. OLIGOCHAETES WERE COLLECTED, LATES OF COLLECTION, ETC.

Name of locality	Species collected	Type of worm	Date of collection	Name of the collector
1. Vehar Lake	1. *Aeolosoma hemprichi*	3 non-sexual	28.4.65	K.V.N.
	2. *Chaetogaster crystallinus*	2 non-sexual	29.4.65	K.V.N.
	3. *Dero cooperi*	3 non-sexual	29.4.65	K.V.N.
	4. *Pristina evelinae*	3 non-sexual	29.4.65	K.V.N.
	5. *Pristina proboscidea*	4 non-sexual	29.4.65	K.V.N.
	6. *Dero nivea*	5 non-sexual	3.5.65	K.V.N.
	7. *Branchiura sowerbyi*	3 non-sexual	28.4.65	K.V.N.
			29.4.65	
	8. *Pristina longiseta longiseta*	2 non-sexual	29.4.65	K.V.N.
2. Powai Lake	1. *Chaetogaster crystallinus*	3 non-sexual	1.5.65	K.V.N.
	2. *Dero digitata*	11 non-sexual	28.4.65	
			1.5.65	K.V.N.
			24.4.65	
			20.5.65	U.O.H.
	3. *Dero cooperi*	6 non-sexual	28.4.65	K.V.N.
	4. *Dero zeylanica*	3 non-sexual	2.5.65	K.V.N.
	5. *Dero indica*	4 non-sexual	20.5.65	U.O.H.
	6. *Aulophorus hymanae*	3 non-sexual	1.5.65	K.V.N.
	7. *Allonais gwaliorensis*	3 non-sexual	28.4.65	K.V.N.
	8. *Allonais rayalaseemensis*	4 non-sexual	28.4..65	K.V.N.
	9. *Pristina synclites*	5 non-sexual	28.4.65	K.V.N.
			20.5.65	U.O.H.
	10. *Pristina longiseta longiseta*	4 non-sexual	28-4-65	K.V.N.
	11. *Pristina proboscidea*	3 non-sexual	28.4.65	K.V.N.
			5.5.65	
	12. *Aulodrilus pluriseta*	8 sexual	1.5.65	K.V.N.
3. Bandra Tank	1. *Dero cooperi*	2 non-sexual	1.5.65	K.V.N.
	2. *Dero nivea*	2 non-sexual	1.5.65	K.V.N.
	3. *Dero digitata*	2 non-sexual	1.5.65	K.V.N.
	4. *Aulophorus furcatus*	6 non-sexual	1.5.65	K.V.N.
	5. *Aulophorus michaelseni*	5 non-sexual	1.5.65	K.V.N.
	6. *Allonais gwaliorensis*	4 non-sexual	1.5.65	K.V.N.
	7. *Pristina longiseta longiseta*	6 non-sexual	1.5.65	K.V.N.
	8. *Branchiura sowerbyi*	3 non-sexual	1.5.65	K.V.N.
	9. *Limnodrilus hoffmeisteri*	2 sexual	1.5.65	K.V.N.
4. Castle Mill Pond, Thana	1. *Dero digitata*	3 non-sexual	22.4.65	U.O.H.
	2. *Dero cooperi*	3 non-sexual	22.5.65	U.O.H.
	3. *Aulophorus hymanae*	5 non-sexual	22.5.65	U.O.H.
	4. *Allonais gwaliorensis*	6 non-sexual	22.5.65	U.O.H.
	5. *Allonais rayalaseemensis*	3 non-sexual	22.5.65	U.O.H.
5. Railway Station Pond, Thana	1. *Aulophorus hymanae*	5 non-sexual	22.5.65	U.O.H.
	2. *Allonais rayalaseemensis*	3 non-sexual	22.5.65	U.O.H.
	3. *Allonais gwaliorensis*	5 non-sexual	22.5.65	U.O.H.

6.	Bio-filter Purification Works, Dadar	1. *Aeolosoma bengalense*	4 non-sexual	20.5.65	U.O.H.
		2. *Dero digitata*	2 non-sexual	20.5.65	U.O.H.
		3. *Allonais rayalaseemensis*	4 non-sexual	20.5.65 22.5.65	U.O.H.
		4. *Pristina synclites*	3 non-sexual	20.5.65	U.O.H.
7.	Fish Tank, Colaba	1. *Limnodrilus hoffmeisteri*	2 sexual	28.4.65	K.V.N.

dulla Hussainy (U.O.H.) of Melbourne, Australia, then working at the Zonal Laboratory of National Environmental Engineering Research Institute, Bombay, had made some collections of fresh-water ologochaetes and sent them for examination. All these collections when studied, revealed the existence of 21 species of fresh-water oligochaetes, 2 Aeolosomatids, 15 Naidids and 4 Tubificids. Of these 2 species are already known for the Western Region and hence 19 species are new to this region. They are :

1. *Aeolosoma bengalensis* Stephenson, 1911, 2. *Ae. hemprichi* Ehrenberg, 1831, 3. *Chaetogaster crystallinus* Vejdovsky, 1883, 4. *Dero digitata* (Muller, 1773), 5. *D. coopri* Stephenson, 1932, 6. *D. nivea* Aiyer, 1930, 7. *D. indica* Naidu, 1962, 8. *D. zeylanica* Stephenson, 1913, 9. *Aulophorus hymanae* Naidu, 1963. 10. *A. michaelseni* Stephenson, 1923, 11. *Allonais gwaliorensis* (Stephenson, 1920), 12. *A. rayalaseemensis* Naidu, 1963, 13. *Pristina evelinae* Marcus, 1943, 14. *Pr. proboscidea* Beddard, 1896, 15. *Pr. synclites* Stephenson, 1925, 16. *Branchiura sowerbyi* Beddard, 1892, 17. *Limnodrilus hoffmeisteri* Claparede, 1862, 18. *Aulodrilus pluriseta* (Piguet, 1906) and 19. *A. pigueti* Kowalewski, 1914. With the addition of these 19 species, the Western Region now has a total of 24 species of fresh-water oligochaetes.

Material and Methods

Aquatic plants, decaying leaves, wood, etc., algae and bottom mud samples from different water sources in Bombay city and from the Vehar Lake and Powai Lake were collected and placed in beakers submerged in water for a day. The worms from them settled on the walls of the beakers near the surface of the water. The worms were examined under the compound microscope in living condition for the number and characters of the setae, colour of epidermal glands, shape of the prostomium, position and shape of stomach, pigmentation of the body, number and shape of the gills, position of the dorsal blood vessel and contractile lateral vessels, presence or absence of coelomocytes, shape and position of spermathecae, atria, etc. They were later narcotised and preserved in formalin for further study of length and diameter of the worms, number of segments, position of fission zones, etc.

Systematic Section

Aeolosomatidae

1. **Aeolosoma bengalense** Stephenson, 1911. (Figs. 1-2).

Stephenson, 1923, p. 41. Aiyer, 1926, p. 131-136, fig. 1-3; 1929, p. 18. Michaelson and Boldt, 1932, p. 589. Marcus, 1944, p. 16-17, fig. 2A-B. Herlant-Meewis, 1954, p. 80. Yamaguchi, 1953, p. 280-281, fig. 1. Dioni, 1961, p. 112. Naidu, 1961, p. 648-649, fig. 1A-B; 1965a, p. 16; 1966, p. 209, 222. Costa, 1967, p. 39. Bunke, 1967, p. 229-235, fig. 17-18.

length (preserved) = 0.9-1.0 mm; diameter (preserved) = 0.15 mm; s (number of seg-

ments) = 12-14; n (number of segments behind which budding zone forms) = 8-10.

Worms pale white, transparent with variously shaped dirty yellow and greenish yellow epidermal glands in integument. Prostomium rounded, wider than body diameter. Hair setae (Figs. 1-2) all bayonet shaped, unequal, longer in dorsal bundles than in ventral bundles, 2-3 long seta per bundle of 200-300 μ and 2-4 short setae of 150-200 μ long dorsally, 2-3 of 100-150 μ and 80-100 μ long ventrally. Intestine dilated in $\frac{1}{2}$ IV—$\frac{1}{2}$ IX, narrow behind.

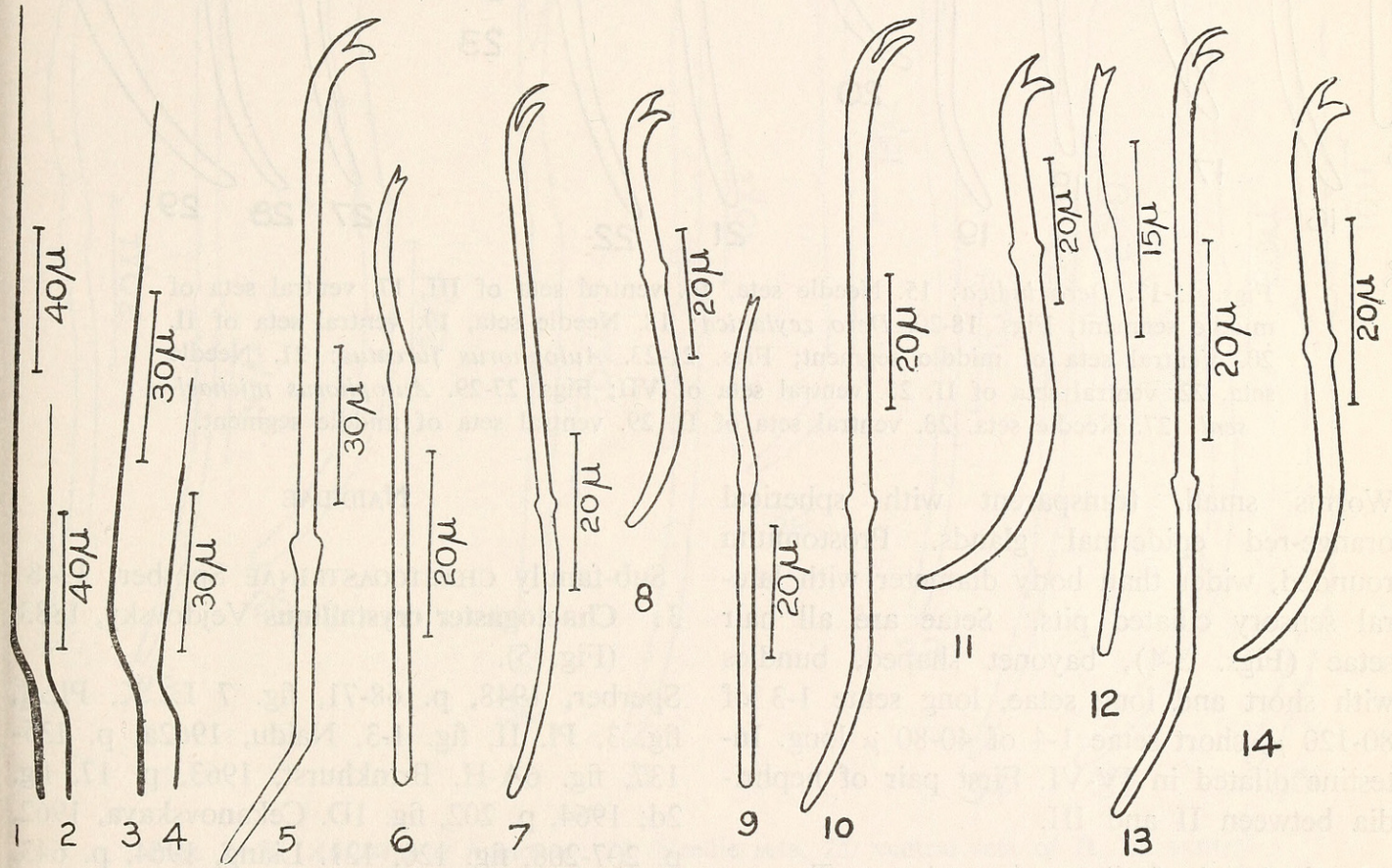
Distribution in Indian sub-continent: Sri Lanka (Ceylon); Travancore, Cuddapah, Bangalore (S. India); Nagpur (C. India); Calcutta (E. India); now reported from Bombay (W. India).

Further distribution: Germany (Europe); China, Java, Japan (Asia); Canada (N. America); Brazil, Paraguay, Uruguay (S. America).

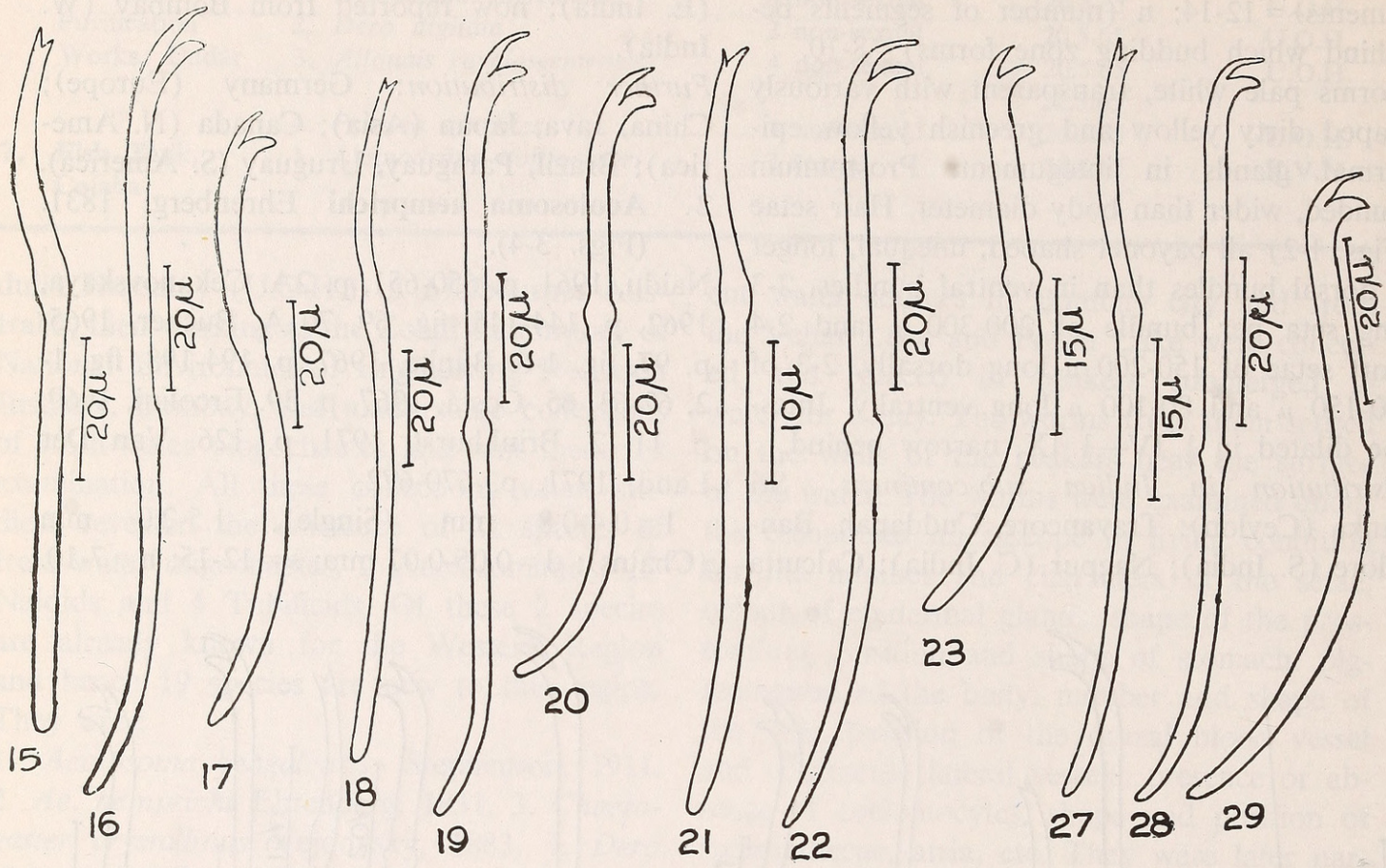
2. **Aeolosoma hemprichi** Ehrenberg, 1831. (Figs. 3-4).

Naidu, 1961, p. 650-651, p. 2A. Cekanovskaya, 1962, p. 144-145, fig. 69, 70 A. Bucher, 1965, p. 97, fig. 1-6. Bunke, 1967, p. 194-198, fig. 1-2, 62-63, 65. Costa, 1967, p. 39. Ercolini, 1969, p. 11-12. Brinkhurst, 1971, p. 126. Van Der Land, 1971, p. 670-672.

1 = 0.4-0.8 mm (Single), 1.5-2.0 mm (Chains); d = 0.05-0.07 mm; s = 12-15; n = 7-10.



Figs. 1-2. *Aeolosoma bengalense*: 1. Long hair seta, 2. short hair seta; Figs. 3-4. *Aeolosoma hemprichi*: 3. Long hair seta, 4. short hair seta; Fig. 5. *Chaetogaster crystallinus*: 5. Ventral seta of II segment; Figs. 6-8. *Dero digitata*: 6. Needle seta, 7. ventral seta of II, 8. ventral seta of posterior segment; Figs. 9-11. *Dero cooperi*: 9. Needle seta, 10. ventral seta of II, 11. ventral seta of posterior segment; Figs. 12-14. *Dero nivea*: 12. Needle seta, 13. ventral seta of II, 14. ventral seta of VII.



Figs. 15-17. *Dero indica*: 15. Needle seta, 16. ventral seta of III, 17. ventral seta of middle segment; Figs. 18-20. *Dero zeylanica*: 18. Needle seta, 19. ventral seta of II. 20. Ventral seta of middle segment; Figs. 21-23. *Aulophorus furcatus*: 21. Needle seta, 22. ventral seta of II, 23. ventral seta of VII; Figs. 27-29. *Aulophorus michaelseni*: 27. Needle seta. 28. ventral seta of II, 29. ventral seta of middle segment.

Worms small, transparent with spherical orange-red epidermal glands. Prostomium rounded, wider than body diameter with lateral sensory ciliated pits. Setae are all hair setae (Figs. 3-4), bayonet shaped, bundles with short and long setae, long setae 1-3 of 80-120 μ, short setae 1-4 of 40-80 μ long. Intestine dilated in IV-VI. First pair of nephridia between II and III.

Distribution in Indian sub-continent: Travancore, Cuddapah, Bellary, Kakinada (S. India); Lahore (Pakistan).

Extralimital distribution: Europe, Asia, Africa, Australia, North and South America.

NAIDIDAE

Sub-family CHAETOGASTRINAE Sperber, 1948

3. **Chaetogaster crystallinus** Vejdovsky, 1883. (Fig. 5).

Sperber, 1948, p. 68-71, fig. 7 E, K, Pl. I, fig. 3, Pl. II, fig. 1-3. Naidu, 1962a, p. 135-137, fig. 6A-H. Brinkhurst, 1963, p. 17, fig. 2d; 1964, p. 202, fig. 1D. Cekanovskaya, 1962, p. 207-208, fig. 120, 121. Liang, 1964, p. 643. Costa, 1967, p. 40. Brinkhurst and Jamieson, 1971, p. 311-312, fig. 7.1 L-N. Ali and Issaque, 1975, p. 55.

l = 4-5 mm (Chains); d = 0.3-0.4 mm; s = 14-17; n = 8-9.

Worms are transparent. Prostomium inconspicuous with a median incision. Dorsal setae and ventral setae of III-V are absent. Ventral setae (Fig. 5) in II 5-8 per bundle, 130-160 μ long, in others 2-6 per bundle, 90-120 μ long. Stomach in V-VII with 20-24 transverse ducts. Brain with a statocyst.

Distribution in Indian sub-continent: Sri Lanka (Ceylon); Cuddapah, Bangalore (S. India); Calcutta (N. India); Dacca (Bangladesh).

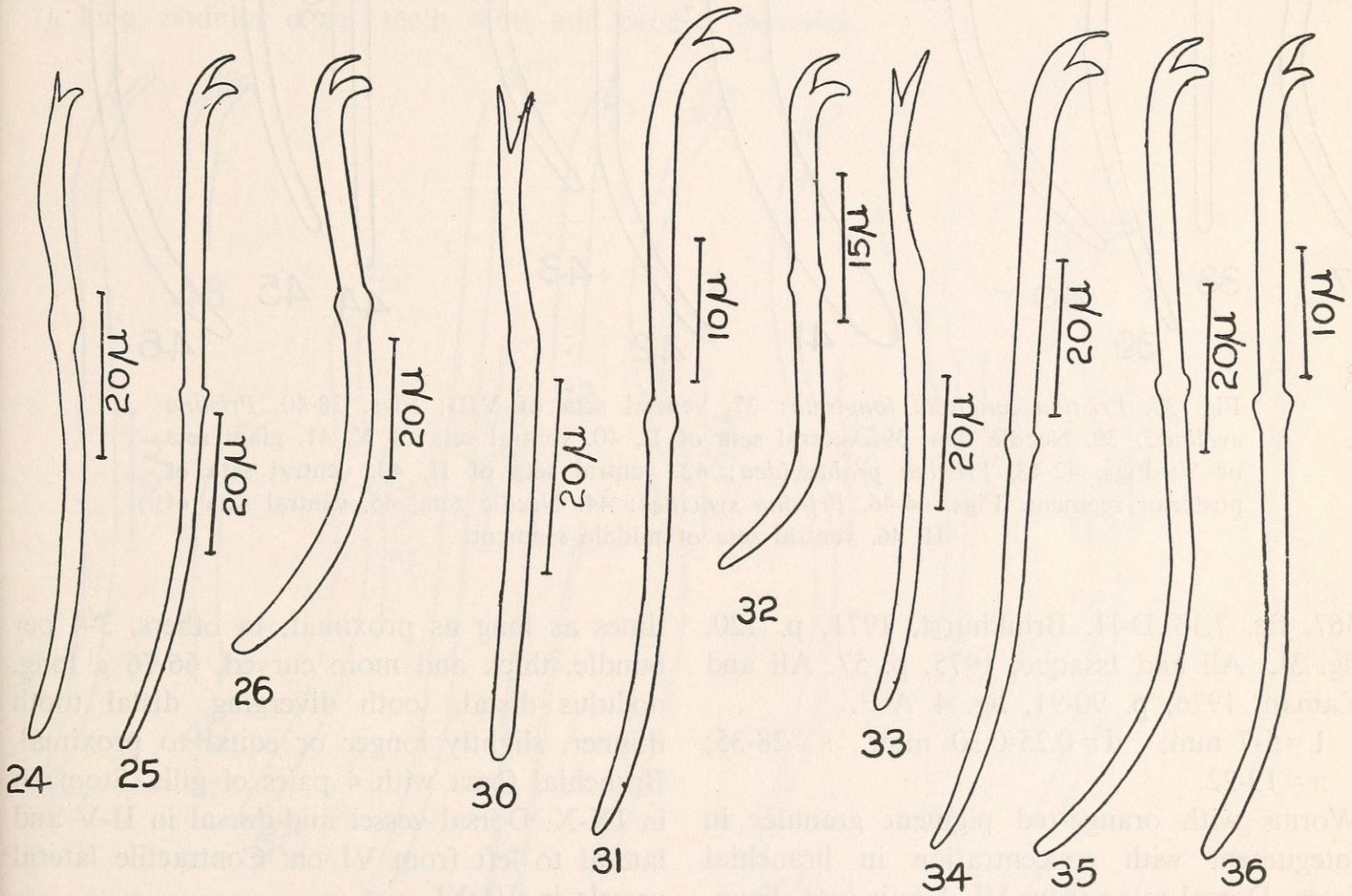
Extralimital distribution: Europe, Asia, Africa, N. America.

NAIDINAE Lastockin, 1924

Dero Oken, 1815

Subgenus *Dero* Oken, 1815

4. **Dero digitata** (Muller, 1773). (Figs. 6-8). Sperber, 1948, p. 165-178, fig. 19A-E, 27A, Pl. XIV, fig. 2-5, Pl. XV-XVIII, fig. 1-3, 6; 1958, p. 49. Cekanovskaya, 1962, p. 170-171, fig. 89. Naidu, 1962b, 531-533, fig. 13 A-H. Brinkhurst, 1964; p. 212-213, fig. 2B. Hrabe, 1966, p. 377-378, fig. 10-16. Ercolini, 1969, p. 16-18, fig. 6-8, 17-19; 1970, p. 276-279, fig. 2-7. Brinkhurst and Jamieson, 1971, p. 365-



Figs. 24-26. *Aulophorus hymanae*: 24. Needle seta, 25. ventral seta of II, 26. ventral seta of VII; Figs. 30-32. *Allonais gwaliorensis*: 30. Needle seta, 31. ventral seta of II, 32. ventral seta of X; Figs. 33-35. *Allonais rayalaseemensis*: 33. Needle seta, 34. ventral seta of II, 35. ventral seta of VIII; Fig. 36. *Pristina longiseta longiseta*: 36. ventral seta of III.

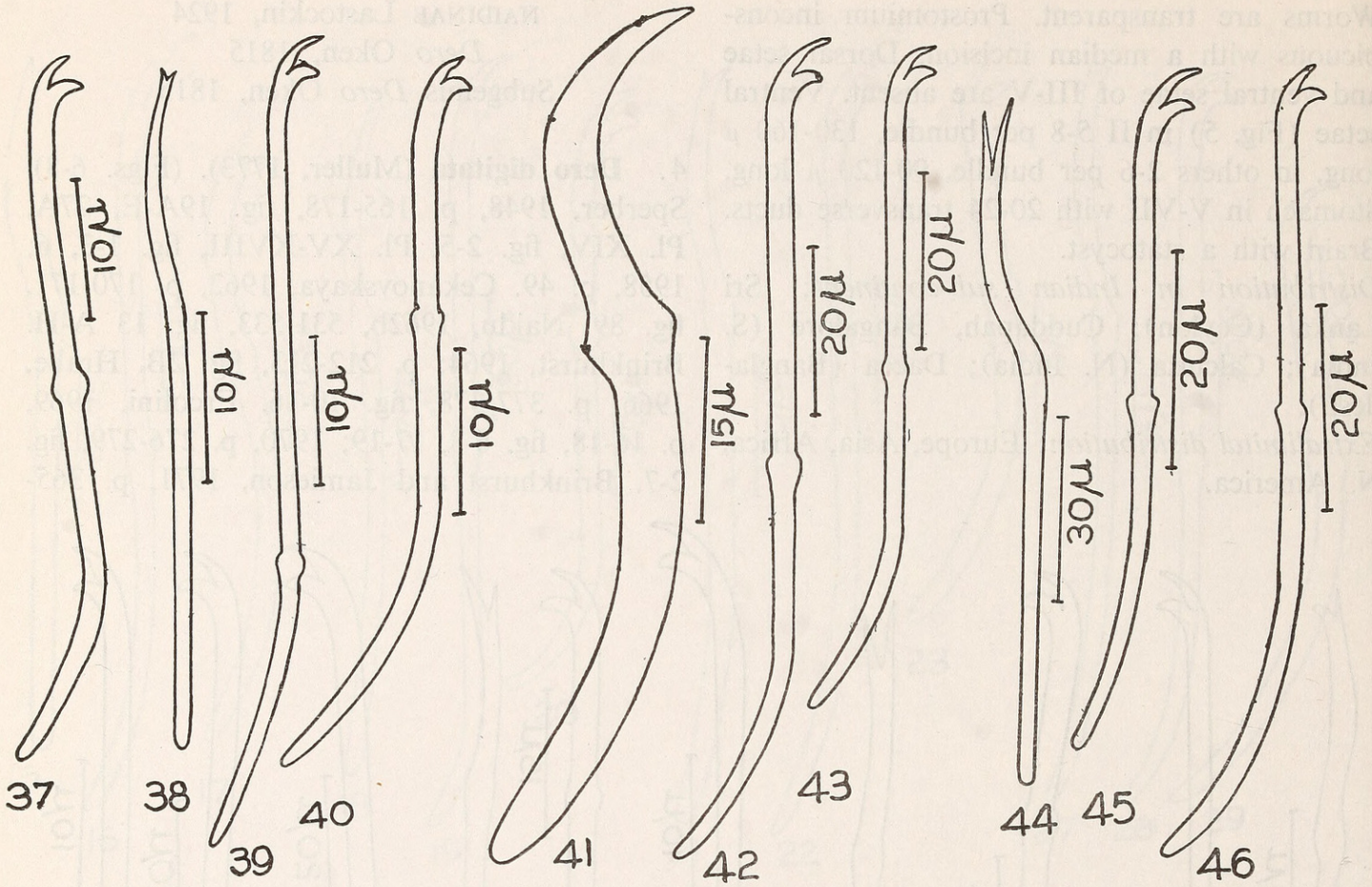


Fig. 37. *Pristina longiseta longiseta*: 37. ventral seta of VIII; Figs. 38-40. *Pristina evelinae*: 38. Needle seta, 39. ventral seta of II, 40. ventral seta of X, 41. giant seta of V; Figs. 42-43. *Pristina proboscidea*: 42. ventral seta of II, 43. ventral seta of posterior segment; Figs. 44-46. *Pristina synclites*: 44. Needle seta, 45. ventral seta of II, 46. ventral seta of middle segment.

367, fig. 7.13 D-H. Brinkhurst, 1971, p. 120, fig. 3L. Ali and Issaque, 1975, p. 57. Ali and Zaman, 1976, p. 90-91, fig. 4 A-E.

l = 5-7 mm; d = 0.25-0.30 mm; s = 28-35; n = 19-22.

Worms with orange-red pigment granules in integument with concentration in branchial fossa. Dorsal setae from VI, 1 hair seta, bayonet-shaped, 170-200 μ long and 1 bifid needle seta (Fig. 6), 60-66 μ long, nodulus 1/3 from distal end, distal tooth 1½ times as long as proximal. Ventral setae (Figs. 7-8) in II-V, slender and less curved, 90-100 μ long, nodulus proximal, teeth parallel, distal tooth 1½ times as long as proximal; in others, 3-4 per bundle, thick and more curved, 66-76 μ long, nodulus distal, tooth diverging, distal tooth thinner, slightly longer or equal to proximal. Branchial fossa with 4 pairs of gills. Stomach in IX-X. Dorsal vessel mid-dorsal in II-V and lateral to left from VI on. Contractile lateral vessels in VI-XI.

Distribution in Indian sub-continent: Trivandrum, Kottayam, Cuddapah, Bellary, Bangalore (S. India); Dacca (Bangladesh).

Extralimital distribution: Europe, Asia, Africa, Australia, N. and S. America.

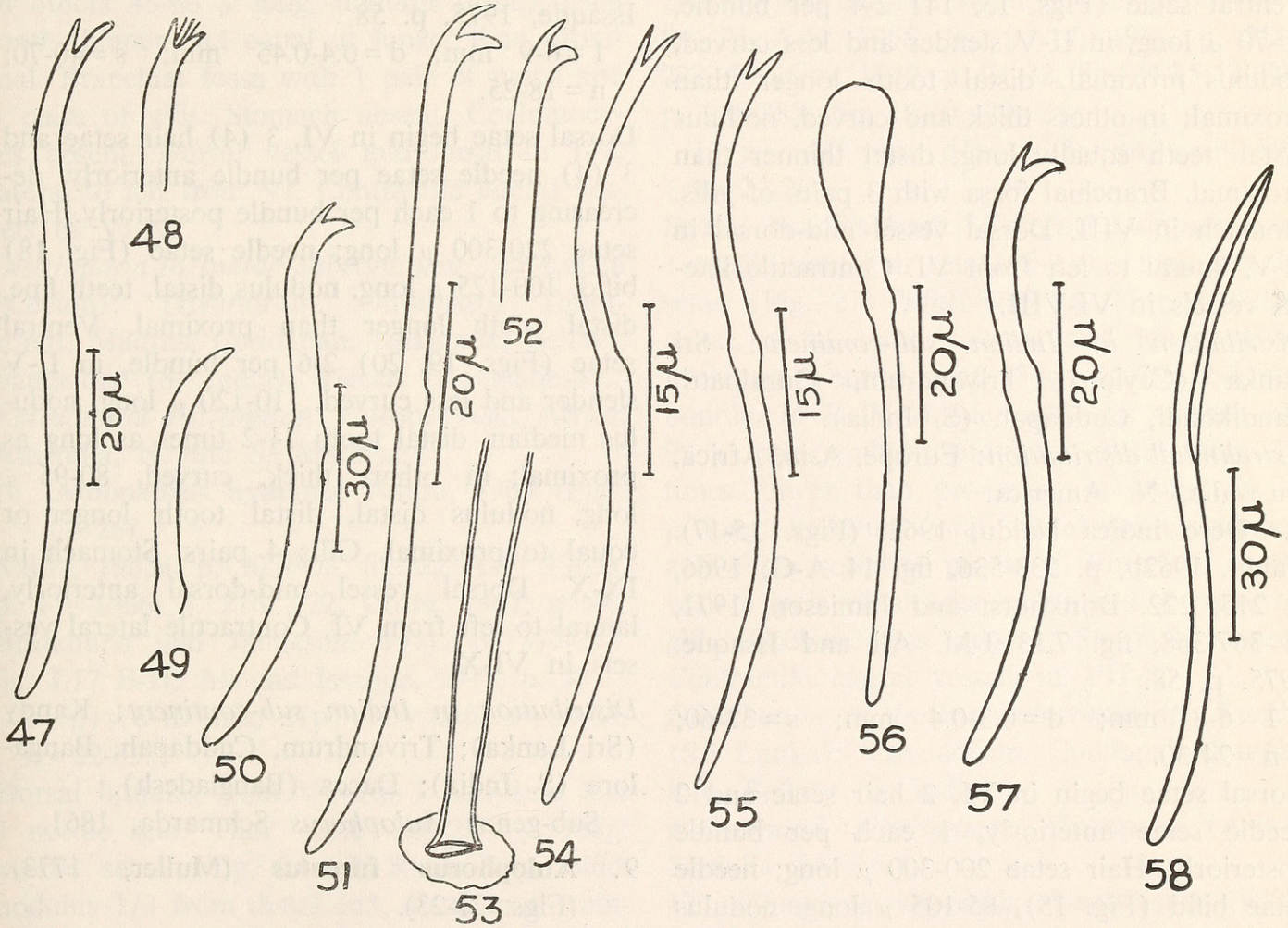
5. **Dero cooperi** Stephenson, 1932. (Figs. 9-11).

Sperber, 1948, 170-180. Naidu, 1962b, p. 538-540, fig. 16 A-I, Brinkhurst, 1966, p. 138. Costa, 1967, p. 43. Brinkhurst and Jamieson, 1971, p. 369, fig. 7.14 B-E.

l = 3.5-5.0 mm; d = 0.25-0.30 mm; s = 30-50; n = 20-26.

Worms with red pigment spots lateral to dorsal bundles. Dorsal setae from VI, 1 hair seta and 1 needle seta per bundle. Hair setae 180-210 μ long; needle setae (Fig. 9) bifid, 72-75 μ long, nodulus distal, teeth short and equal. Ventral setae (Figs. 10-11) 3-5 per bundle, in II-V slender, less curved, 100-120 μ long, nudulus proximal; in others thick, more curved, 70-75 μ long, nodulus distal, distal tooth thinner, equal to or longer than proximal. Branchial fossa with 4 pairs of gills. Stomach in IX-X. Dorsal vessel mid-dorsal in II-V, lateral to left from VI. Contractile lateral vessels in VI-X.

Distribution in Indian sub-continent: Sri Lanka (Ceylon); Cuddapah, Bangalore (S. India); Agra (N. India); Lahore (Pakistan). *Extralimital distribution*: Africa, Europe, S. America.



Figs. 47-50. *Branchiura sowerbyi*: 47. bifid needle seta, 48. pectinate needle seta, 49. ventral seta of II, 50. ventral seta of X; Figs. 51-53. *Limnodrilus hoffmeisteri*: 51. Dorsal seta, 52. ventral seta, 53. chitinous penial tube; Figs. 54-55. *Aulodrilus pluriseta*: 54. Needle seta, 55. ventral seta; Figs. 56-58. *Aulodrilus pigueti*: 56. Needle seta, 57. ventral seta, 58. penial seta.

6. **Dero nivea** Aiyer, 1930. (Figs. 12-14).
Sperber, 1948, p. 184-186, fig. 196, pl. XVIII, fig. 4; 1958, p. 49, fig. 5-7. Naidu, 1962b, p. 540-541, fig. 17 A-C; 1965a, p. 17. Cekanovskaya, 1962, p. 173-174. Brinkhurst, 1964, p. 214, fig. 4D. Costa, 1967, p. 44. Brinkhurst and Jamieson, 1971, p. 370-371, fig. 7.14 J-M. Brinkhurst, 1971, p. 120, fig. 3 M.

l = 3-4 mm; d = 0.14 mm; s = 20-28; n = 14-16.

Dorsal setae begin in VI, 1 hair seta and 1 needle seta per bundle. Hair setae are 95-110 μ long; needle setae bifid (Fig. 12), 40-45 μ long, nodulus distal, teeth equal and small. Ventral setae (Figs. 13, 14) 2-4 per bundle, 60-70 μ long, in II-V slender and less curved, nodulus proximal, distal tooth longer than proximal; in others thick and curved, nodulus distal, teeth equally long, distal thinner than proximal. Branchial fossa with 3 pairs of gills. Stomach in VIII. Dorsal vessel mid-dorsal in II-V, lateral to left from VI. Contractile lateral vessels in VI-VIII.

Distribution in Indian sub-continent: Sri Lanka (Ceylon); Trivandrum, Ouralpatti, Tandikondi, Cuddapah (S. India).

Extralimital distribution: Europe, Asia, Africa, Australia, N. America.

7. **Dero indica** Naidu, 1962. (Figs. 15-17).
Naidu, 1962b, p. 533-536, fig. 14 A-G; 1966, p. 215, 222. Brinkhurst and Jamieson, 1971, p. 367-368, fig. 7.13 I-M. Ali and Issaque, 1975, p. 58.

l = 6-8 mm; d = 0.3-0.4 mm; s = 32-60; n = 24-30.

Dorsal setae begin in VI, 2 hair setae and 2 needle setae anteriorly, 1 each per bundle posteriorly. Hair setae 200-300 μ long; needle setae bifid (Fig. 15), 85-105 μ long, nodulus 1/3 from distal end, distal tooth longer and thinner than proximal. Ventral setae (Fig. 16, 17) 2-5 per bundle, of II-V slender and less curved, 110-130 μ long, nodulus proximal to middle, distal tooth $1\frac{1}{2}$ times as long as proximal; in others 80-100 μ long, nodulus distal, distal tooth thinner and longer than proximal. Branchial fossa with 4 pairs of gills. Stomach in IX-X. Dorsal vessel mid-dorsal in I-V, lateral to left from VI. Contractile lateral vessels in VI-X.

Distribution in Indian sub-continent: Cuddapah, Bangalore (S. India); Dacca (Bangladesh).

8. **Dero zeylanica** Stephenson, 1913. (Figs. 18-20).
Sperber, 1948, p. 178-179. Naidu, 1962b, p. 536-538, fig. 15 A-K. Brinkhurst and Jamieson, 1971, p. 368, fig. 7.13 N-P, 7.14 A. Ali and Issaque, 1975, p. 58.

l = 6-9 mm; d = 0.4-0.45 mm; s = 40-70; n = 18-25.

Dorsal setae begin in VI, 3 (4) hair setae and 3 (4) needle setae per bundle anteriorly, decreasing to 1 each per bundle posteriorly. Hair setae 220-300 μ long; needle setae (Fig. 18) bifid, 100-125 μ long, nodulus distal, teeth fine, distal tooth longer than proximal. Ventral setae (Figs. 19, 20) 2-6 per bundle, in II-V slender and less curved, 110-120 μ long, nodulus median, distal tooth $1\frac{1}{2}$-2 times as long as proximal; in others thick, curved, 80-95 μ long, nodulus distal, distal tooth longer or equal to proximal. Gills 4 pairs. Stomach in IX-X. Dorsal vessel mid-dorsal anteriorly, lateral to left from VI. Contractile lateral vessels in VI-X.

Distribution in Indian sub-continent: Kandy (Sri Lanka); Trivandrum, Cuddapah, Bangalore (S. India); Dacca (Bangladesh).

Sub-genus *Aulophorus* Schmarda, 1861.

9. **Aulophorus furcatus** (Muller, 1773). (Figs. 21-23).
Sperber, 1948, p. 191-194, fig. 20 b-d; 1958, p. 49. Cekanovskaya, 1962, p. 175, fig. 93. Naidu, 1963a, p. 899-902, fig. 20 A-G. Hrabe, 1966, p. 381-382, fig. 29-32. Costa, 1967, p. 45. Ercolini, 1969, p. 19-21, fig. 13-15, 23;

1970, p. 281-285, fig. 11-15. Brinkhurst and Jamieson, 1971, p. 376-377, fig. 7.17 A-D. Brinkhurst, 1971, p. 120, fig. 4A. Ali and Issaque, 1975, p. 58.

1(p) = 2-4 mm; d(p) = 0.22 mm; s = 30-40; n = 16-20.

Dorsal bundles from V and 1 hair seta and 1 needle seta; hair setae 130-150 μ long; needle setae bifid (Fig. 21) 48-56 μ long, nodulus 1/3 from distal end, distal tooth thinner and shorter than proximal. Ventral setae (Figs. 22-23) 2-4 per bundle, in II-IV slender and less curved, 62-70 μ long, nodulus median, distal tooth 1½ times longer than proximal; in others 48-60 μ long, nodulus distal, distal tooth thinner and equal or longer than proximal. Branchial fossa with 1 pair of palps and 3 pairs of gills. Stomach absent. Coelomocytes absent. Dorsal vessel mid-dorsal in I-V, lateral to left from VI. Contractile lateral vessels in VI-X.

Distribution in Indian subcontinent: Sri Lanka (Ceylon); Trivandrum, Ouralpatti, Tandikondi, Madras, Cuddapah, Kakinada, Bellary, Bangalore (S. India); Dacca (Bangladesh).

Extralimital distribution: Europe, Asia, Africa, Australia, N. and S. America.

10. **Aulophorus hymanae** Naidu, 1963 (Figs. 24-26).

Naidu, 1963a, p. 905-908, fig. 22 A-F; 1965a, p. 17; 1966, p. 216, 222. Costa, 1967, p. 46. Brinkhurst and Jamieson, 1971, p. 377-378, fig. 7.17 E-H. Ali and Issaque, 1975, p. 58.

1 (p) = 8-10 mm; d(p) = 0.4 mm; s = 50-80; n = 22-35.

Dorsal bundles from V with 1 hair seta and 1 needle seta. Hair setae 220-270 μ long; needle setae (Fig. 24) 72-80 μ long, bifid, nodulus 1/3 from distal end, distal tooth thinner and longer than proximal. Ventral setae (Figs. 25, 26) 2-5 per bundle, in II-IV slender and less curved, 90-100 μ long, nodulus median, distal tooth 1½ times longer than proximal; in others thick and curved, 72-88 μ long, nodulus distal, distal tooth thinner and about equal in length to proximal. Branchial fossa with 1 pair of palps and 3 pairs of gills. Coelomocytes absent. Stomach absent. Dorsal vessel mid-dorsal in I-V, lateral to left in others. Contractile lateral vessels in VI-XI.

Distribution in Indian sub-continent: Sri Lanka (Ceylon); Cuddapah, Bangalore (S. India); Dacca (Bangladesh).

Extralimital distribution: Singapore (Asia).

11. **Aulophorus michaelseni** Stephenson, 1923. (Figs. 27-29).

Stephenson, 1923, p. 93-94, fig. 35. Aiyer, 1930, p. 43, fig. 18. Naidu, 1963a, p. 902-904, fig. 21 A-E; 1965, fig. p. 17; 1966, p. 216, 222. Ercolini, 1969, p. 21-22, fig. 24-25; 1970, p. 285-288, fig. 16-19, 29, 31.

1 (p) = 4-5 mm; d(p) = 0.3 mm; s = 40-50; n = 23-26.

Dorsal bundles from V with 1 hair seta and 1 needle seta; hair seta 175-230 μ long, needle setae (Fig. 27) bifid, 64-70 μ long, nodulus distal, distal tooth thinner and longer than proximal. Ventral setae (Figs. 28-29) 2-4 per bundle, in II-IV slender and less curved 80-98 μ long, nodulus proximal, distal tooth 1½ times longer than proximal; in others 60-74 μ long, nodulus distal, distal prong thinner and about equal to proximal. Branchial organ with a pair of slender palps and 4 pairs of gills. Coelomocytes present. Stomach absent. Contractile lateral vessels in VII-X.

Distribution in Indian Sub-continent: Kandy (Sri Lanka); Trivandrum, Cuddapah, Bangalore, Bellary (S. India).

Extralimital distribution: Singapore (Asia); Somalia (Africa).

12. **Allonais gwaliorensis** (Stephenson, 1920). (Figs. 30-32).

Sperber, 1948, p. 205-206; 1958, p. 50, fig. 10-12. Naidu, 1963a, p. 919-921, fig. 27 A-F; 1965, p. 20, fig. 1a. Ercolini, 1970, p. 292-296,

fig. 38-42. Brinkhurst and Jamieson, 1971, p. 387, fig. 7.20 D-G.

l = 4-10 mm; d = 0.2 mm; s = 24-60; n = 29. Dorsal bundles from VI with 1-2 hair setae and 1-2 needle setae; hair setae 140-180 μ long; needle setae bifid (Fig. 30) 60-68 μ long, nodulus weak 1/3 from distal end, distal tooth longer than proximal. Ventral setae (Figs. 31-32) 4-6 per bundle, in II-V thinner and less curved, 56-65 μ long, nodulus middle, distal tooth longer than proximal; in others thick and curved, 50-56 μ long, nodulus distal, distal tooth thinner about equal in length to proximal. Coelomocytes present. Stomach in IX-X. Dorsal vessel mid-dorsal in I-VI and lateral to left in others. Contractile lateral vessels in VI-VIII.

Distribution in Indian sub-continent: Cuddapah, Kakinada (S. India); Gwalior (C. India). *Extralimital distribution*: China, Sunda Island, Singapore (Asia); Madagascar, Somalia (Africa).

13. **Allonais rayalaseemensis** Naidu, 1963. (Figs. 33-35).

Naidu, 1963a, p. 917-919, fig. 26A-F; 1965, p. 19; 1966, p. 217, 223. Costa, 1967, p. 46.

l = 16-20 mm; d = 0.35-0.4 mm; s = 90-120; n = 48-54.

Dorsal setae from VI, 1-2 hair setae and 1-2 needle setae per bundle. Hair setae 240-370 μ long; needle setae (Fig. 33) bifid, 90-106 μ long, nodulus distal, distal tooth thinner and half as long as proximal. Ventral setae (Figs. 34, 35) 4-7 per bundle, 85-105 μ long, in II-V nodulus about middle, distal tooth longer than proximal; in others nodulus distal, distal tooth thinner and longer than proximal. Coelomocytes present. Stomach in XI-XII. Dorsal vessel mid-dorsal in I-V and lateral to left in others. Contractile lateral vessels in VI-XI.

Distribution in Indian sub-continent: Sri Lanka (Ceylon); Cuddapah, Bellary, Kakinada (S. India).

Sub-family Pristininae Lastockin, 1924

14. **Pristina longiseta longiseta** Ehrenberg, 1828. (Figs. 36-37).

Sperber, 1948, p. 236-237, pl. XXI, fig. 2, 6. Naidu, 1963b, p. 216-219, fig. 34 A-K. Costa, 1967, p. 47.

Pristina longiseta Ehrenberg. Liang, 1964, p. 650. Brinkhurst and Jamieson, 1971, p. 402-403, fig. 7.21 J, 7.25 E-I. Brinkhurst, 1971, p. 124, fig. 4 G.

l = 2-3 mm (single), 4.5 mm (chains); d = 0.12 mm; s = 22-28; n = 14-17.

Prostomium with a median proboscis. Dorsal bundles from II with 1-3 hair setae and 1-3 needle setae. Hair setae of III especially long, non-serrate, 650-720 μ long, of others serrate 200-300 μ long. Needle setae simple pointed distal part gently curved, 35-50 μ long, without nodulus. Ventral setae (Figs. 36, 37) 3-7 per bundle, in II longest, 62-66 μ long, nodulus proximal; in others 48-56 μ long, nodulus median to distal, distal tooth twice as long as proximal in II, III and thinner and longer than proximal in others. Stomach in anterior half of VIII, pear-shaped with intracellular canal Coelomocytes present. Dorsal vessel mid-dorsal. Contractile lateral vessels in II-VII.

Distribution in Indian sub-continent: Bheemnagar, Trivandrum, Ouralpatti, Tandikondi, Cuddapah, Bangalore (S. India); Bombay (W. India); Gwalior (C. India); Calcutta (E. India); Lahore (Pakistan).

Extralimital distribution: Europe, Asia, Africa, Australia, Paraguay (S. America).

15. **Pristina evelinae** Marcus, 1943. (Figs. 38-41).

Sperber, 1948, p. 232, fig. 25. Naidu, 1963b, 214-216, fig. 33A-D. Costa, 1967, p. 48. Brinkhurst and Jamieson, 1971, p. 401-402, fig. 7.24 H, 7.25 A-D.

l = 2-4 mm; d = 0.13 mm; s = 18-24; n = 13-16.

Prostomium with a median proboscis. Dorsal bundles from II with 1 hair seta and 1 needle seta. Hair setae 90-165 μ long; needle setae (fig. 38) bifid, 35-40 μ long, nodulus 1/3 from distal end, teeth fine and short. Ventral setae (Figs. 39, 40) 4-7 per bundle, in II longest 50-55 μ long, in III shortest, 38-40 μ long, in V giant setae (Fig. 41) 70-77 μ long, in others 42-46 μ long; in II nodulus proximal, distal tooth is longer than proximal, in others nodulus distal, distal tooth thinner and equal to proximal. Stomach in ½ VII-VIII, pear shaped with intra-cellular canals. Dorsal vessel mid-dorsal. Contractile lateral vessels in VI and VII.

Distribution in Indian sub-continent: Sri Lanka (Ceylon); Trivandrum, Cuddapah, Bangalore (S. India).

Extralimital distribution: Brazil (S. America).

16. **Pristina proboscidea** Beddard, 1896. (Figs. 42-43).

Sperber, 1948, p. 239-240. Naidu, 1965a, p. 20-21. Ercolini, 1970, p. 302-304, fig. 27-28, 47-49. Brinkhurst and Jamieson, 1971, p. 405-406, fig. 7.21 N-Q. Brinkhurst, 1971, p. 124, fig. 4 F.

Pristina proboscidea f. *typica* Beddard. Ali and Issaque, 1975, p. 59. Ali and Zaman, 1976, p. 91, fig. 2 A-D.

l = 3-5 mm; d = 0.35-0.40 mm; s = 28-35; n = 16-20.

Prostomium with proboscis. Dorsal bundles from II with 1-3 serrated hair setae of 300-400 μ long and 1-4 simple pointed needle setae of 46-50 μ long, without nodulus. Ventral setae (Figs. 42, 43) 3-7 per bundle, distal tooth longer than proximal, in II 94-100 μ long and thick, in others 65-76 μ long and thin. Stomach in anterior half of VIII, pear shaped with intra-cellular canals. Coelomocytes present. Dorsal vessel mid-dorsal.

Distribution in Indian sub-continent: Sri Lanka (Ceylon); Trivandrum (S. India); Dacca (Bangladesh).

Extralimital distribution: Europe, Asia, Australia, Africa, N. and S. America.

17. **Pristina synclites** Stephenson, 1925. (Figs. 44-46).

Sperber, 1948, p. 225. Naidu, 1963b, 208-210, Fig. 30 A-D. Brinkhurst and Jamieson, 1971, p. 397, fig. 7.23 C-E.

l = 4-6 mm; d = 0.3-0.35 mm; s = 40-60; n = 18-22.

Prostomium with proboscis. Dorsal bundles from II with 1-2 hair setae, smooth 200-300 μ long and 1-2 bifid needle setae (fig. 44) 70-98 μ long, nodulus weak 1/3 from distal end, distal footh shorter than proximal. Ventral setae (Figs. 45, 46) 2-4 per bundle, in II-III 62-66 μ long, in others 73-84 μ long, distal tooth thinner and about equal to proximal, nodulus middle in II-IV and distal in others. Stomach in ½ VII-VIII. Dorsal vessel mid-doral. Contractile lateral vessels in IV-VII.

Distribution in Indian sub-continent: Cuddapah, Bellary, Bangalore, Mysore (S. India).

Tubificidae

Sub-family Banchiurinae Hrabe, 1966

18. **Branchiura sowerbyi** Beddard, 1892. (Figs. 47-50).

Cekanovskaya, 1962, p. 291-292, fig. 184, 185. Naidu, 1965b, p. 473-475, fig. 4 a-j. Brinkhurst and Jamieson, 1971, p. 563-564, fig. 8.36 D-F. Brinkhurst, 1971, p. 114, fig. 2 H. Ali and Issaque, 1975, p. 60. Ali and Zaman, 1976, p. 92-93, fig. 9 A-F.

l = 30-40 mm; d = 1.0-1.1 mm; s = upto 150. Dorsal bundles start in II, 3-4 hair setae of 200-280 μ long and 3-6 needle setae of 85-100 μ long anteriorly, hair setae decrease in number and disappear about the middle, needle setae (Figs. 47, 48) are simple pointed and bifid anteriorly, bifid and pectinate in later

segments, distal tooth is thinner and shorter than proximal. Ventral setae (Figs. 49, 50) 6-8 simple pointed setae anteriorly, 4-6 bifid setae in the middle decreasing to 1-2 setae posteriorly per bundle, nodulus distal, 70-110 μ long. Posterior third of the worm has mid-dorsal and mid-ventral tubular gills with vascular loops. Stomach absent. Dorsal vessel lateral mostly and mid-dorsal in I-VI. Lateral contractile vessels in IX and X.

Distribution in Indian sub-continent: Madras, Cuddapah (S. India); Calcutta, Manipur (E. India); Agra, Lucknow (N. India); Lahore (Pakistan); Dacca (Bangladesh). Now reported from Bombay (W. India).

Extralimital distribution: Europe, Lake Inle (Burma), Asia, Africa, Australia, N. and S. America.

Sub-family TUBIFICINAE Eisen, 1879.

19. **Limnodrilus hoffmeisteri** Claparede, 1862. (Figs. 51-53).

Naidu, 1965b, p. 477-479, fig. 6a-g; 1965a, p. 21. Brinkhurst, 1971, p. 112-113, fig. 2D. Brinkhurst and Jamieson, 1971, p. 464-467, fig. 8.3 M; 8.4 C, H, I; 8.5 E. Ali and Issaque, 1975, p. 59. Ali and Zaman, 1976, p. 91, fig. 5A-D.

l = 24-30 mm; d = 0.6-0.8 mm; s = upto 120. Dorsal and ventral setae (Figs. 51 and 52) are all alike, 6-8 per bundle anteriorly and decreasing to 1-2 posteriorly, 66-90 μ long, nodulus distal, distal tooth thinner and longer or shorter than proximal. Stomach absent. Contractile lateral vessels in VIII-IX. Clitellum in XI-XII. Vasa deferentia are long and coiled, atrium small spindle shaped, ejaculatory duct ending with chitinous penial sheath (Fig. 53) 8 times as long as wide. Spermathacae in X, club-shaped and curved.

Distribution in Indian sub-continent: Kandy (Sri Lanka); Adoni, Bellary, Cuddapah, Bangalore (S. India); Calcutta, Belgachi (E. India); Lahore (Pakistan); Dacca (Bangladesh).

Extralimital distribution: Europe, Asia, Africa, Australia, N. and S. America.

sub-family AULODRILINAE Brinkhurst and Jamieson, 1971

20. **Aulodrilus pluriseta** (Piguret, 1906). (Figs. 54-55).

Cekanovskaya, 1962, p. 225, fig. 135. Naidu, 1965b, p. 466-467, fig. 2 a-e. Brinkhurst, 1971, p. 114, fig. 2 I. Brinkhurst and Jamieson, 1971, p. 525-526, fig. 8.23 J-N. Ali and Zaman, 1976, p. 92, fig. 10 A-F.

l = 10-16 mm; d = 0.5 mm; s = 70-100. Dorsal bundles from II with 4-8 hair setae of 100-160 μ long and 6-8 bifid needle setae (Fig. 54) of 60-74 μ long, nodulus distal, distal tooth shorter than proximal. Ventral setae (Fig. 55) 6-10 bifid setae of 50-65 μ long nodulus distal, distal tooth shorter and thinner than proximal. Stomach absent. Lateral contractile vessels in VI. Hind part of the worm is without setae and highly vascularised. Clitellum in VI-VIII. Atria spherical with thick eversible pseudopenes. Spermathecae in VI, ampullae cylindrical and thin walled, its duct thin walled. Penial setae absent.

Distribution in Indian sub-continent: Sri Lanka (Ceylon); Travancore, Bellary (S. India); Burhanpur (C. India); Dacca (Bangladesh). Now reported from Bombay (W. India).

Extralimital distribution: Europe, Asia, Australia and N. America.

21. **Aulophphorus pigueti** Kowalewski, 1914. (Figs. 56-58).

Brinkhurst and Jamieson, 1971, p. 526-527, fig. 8.23 I.

Aulodrilus remex Stephenson. Stephenson, 1921, p. 753-757, fig. 2-6, Pl. XXVIII, 1923, p. 107-108, fig. 42-44. Aiyer, 1925, p. 35, fig. 5; 1929, p. 81-86, p. IV, fig. 1-9. Naidu,

1965b, p. 470-473, fig. 3A-E. Lauzanne, 1969, p. 100. Ali and Issaque, 1975, p. 60.

1(p) = 10-16 mm; d(p) = 1.0 mm; s = about 100.

Worms are reddish, posterior third pale yellow without setae and highly vasculised. Dorsal setae begin in II with bayonet-shaped hair setae 85-115 μ long and needle setae (Fig. 56) simple pointed, bifid and oar-shaped, 60-80 μ long, nodulus distal. Ventral setae (fig. 57) are bifid, 55-80 μ long, nodulus distal, upper tooth thinner and shorter than lower tooth. Stomach absent. Lateral vessels in VI. Clitellum in $\frac{1}{2}$ VI-$\frac{1}{2}$ VIII (2 segments). Atria are elongate ovoid with prostate glands opening a little in front of short ejaculatory duct. Male pores open close to each other ventrally in a genital fossa in VII. Spermathecae are ovoid. Penial setae (Fig. 58) 1-2 per bundle in VII.

Distribution in Indian sub-continent: Sri Lanka (Ceylon); Travancore, Adoni, Bellary, Cuddapah (S. India); Burhanpur (N. India); Dacca (Bangladesh).

Extralimital distribution: Europe; China in Asia; Lake Tchad in Africa; Australia; Lake Eire in N. America; Brazil in S. America.

Summary

Twenty-one species of fresh-water oligochaetes belonging to three families Aeolosomatidae, Naididae and Tubificidae from Bombay city and environs of the Western region are described. Of these nineteen species are new to the Western region.. With the addition of these, the total number of species known for the Western region has increased from 5 to 24 species. The descriptions of the species include details of size of worm, number of segments, length and position of nodulus of the setae, etc. Geographical distribution in Indian sub-continent and in the world is given.

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