

MORPHOLOGICAL VARIATIONS IN THE LOCAL POPULATIONS OF THE SOIL COLLEMBOLA *PROISOTOMA (CLAVISOTOMA) FITCHIOIDES* (DENIS 1947) (INSECTA) IN KERALA

N. R. PRABHOO

Department of Zoology,
University of Kerala, Kariavattom 695581, India

(Received 29 April 1976)

Morphological variations in *Proisotoma (Clavisotoma) fitchioides* collected from soils of two neighbouring localities are presented. Form A obtained from one locality was well pigmented while form B from the other locality was poorly pigmented in comparison with the former. Variations exist in the mean body length and in the mean ratios, antennal length/head diagonal, trunk/tibiotarsus III, trunk/furcula and manubrium dens + mucro. Application of 't' test showed that while the difference in the mean body length between form A and form B was insignificant, the difference in the mean of the ratios was highly significant. Together with the reduction in the pigmentation of the body a tendency for the reduction in the length of the appendages in relation to the body length and a reduction in the number of a setae in the trunk segments was noted in form B. The patchy distribution of the species was thought to be responsible for maintaining the kind of variations observed in the species studied.

INTRODUCTION

Proisotoma fitchioides was described by DENIS (1947) from Nilgiri hills in India. YOSII (1966) recorded the species from Burma and from Bombay, transferred it to *Subisotoma* and gave the genotypical characters of the genus. According to ELLIS (1970) the genus *Subisotoma sensu* YOSII is not acceptable as it excludes *S. pusilla* (SCHAEFFER) from the definition, *pusilla* being the type species of the genus. Consequently ELLIS (1970) synonymized *Subisotoma* with *Clavisotoma* PALISSA (1964) a subgenus of *Proisotoma*, redefined *Clavisotoma* and designated *Proisotoma tuberculata* STACH (1947) as the type species of *Clavisotoma*. He also listed 25 species belonging to this subgenus. Following ELLIS (1970) *Subisotoma fitchioides* (DENIS) is considered here as *Proisotoma (Clavisotoma) fitchioides*.

Proisotoma (Clavisotoma) fitchioides (DENIS) seems to have a limited distribution in Kerala. Earlier studies of Collembola from

Kerala (PRABHOO, 1971 a, b) did not reveal the presence of this species in the localities sampled. It was subsequently recorded from two localities sampled near Trivandrum viz., Kariavattom and Kesavadasapuram, which are about 8 km apart. Study of the individuals of this species from the two localities mentioned above revealed the existence of some degree of differentiation of the two populations which is the subject of the present contribution.

MATERIAL AND METHODS

Several individuals from a grass plot at Kariavattom were obtained from the surface of water collected in a pit after a heavy rain fall in June 1972. From humus soil around a coconut plant at Kesavadasapuram 13 examples were collected in June 1972. The individuals were fixed in 80% alcohol and were examined in GISIN'S (GISIN, 1960) temporary mountant. Measurements were made of ten individuals each from the two populations using an eye-piece micrometer. The 't' test was used to measure the significance of the difference in the mean values as the sample was small. For statistical test the procedure given in MORONEY (1956) was followed.

RESULTS

For convenience the individuals in the population of Kariavattom and Kesavadasapuram were designated forms A and B respectively. The colour pattern was strikingly different. Form A showed dirty white ground colour with bluish black pigment uniformly distributed on the dorsal and lateral sides of the body (Fig. 1). Intersegmental areas were almost devoid of pigment. On the head ocellar fields were not clearly distinguishable from neighbouring pigmented regions. Some individuals which could be definitely identified as females, because of the presence of eggs in the abdomen, were lighter in colour and somewhat intermediate in the colour scheme between that described above and that of B. In form B (Fig. 2) the pigment had low intensity but it was distributed in a manner more or less similar to that of A, there being much less pigment laterally on the trunk segments and on the legs and furcula. The ocellar fields were clearly distinguishable from the neighbouring pigment on the head. Ant. I with a complete row of short setae and one sense rod ventrally. The second row with only a short seta in A but in B there were at least two setae. Ant. II with two complete rows of setae and a proximal incomplete row with two setae. Ventrally there was also a sense rod. Ant. III organ with 2 short sense rods and 2 sense setae. Ant. IV apically without sensory papilla but with 12-15 subapical sense rods, some of which were well differentiated. Labrum (Fig. 3) with 2/5, 5, 4 setae of which the distal two rows were papillate. Eyes 8+8. Pao elliptical and slightly longer than the diameter of the anterior ocellus. Claw (Fig. 4) without teeth. Unguiculus with fairly developed lamellae. Tibiotarsal tenent hairs 1, 2, 2, which were distinctly knobbed at the tip. Trunk covered with short setae. Abd. I-III with 6, 5, 5, or 5, 5, 5, rows of setae in A.

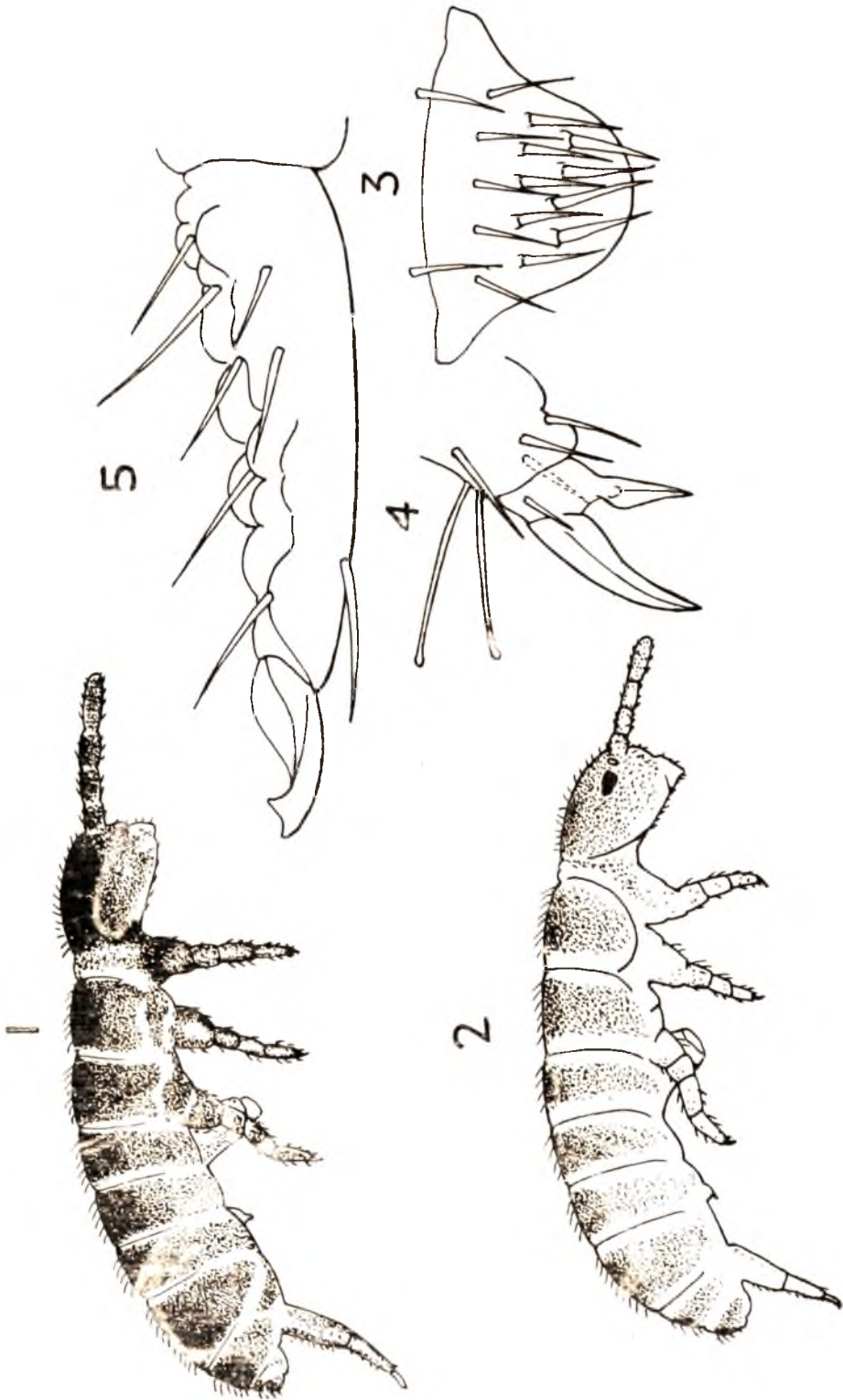
while in B there were only 5, 4, 4 or 4, 4, 4 or 4, 4, 3 rows of setae. Ventral tube without anterior setae, with 1+1 posterior setae and the lateral flap with 3 or 4 setae in A but only 3 setae in B. Cami tenaculi with 3+3 dents and 1 seta on the corpus. Manubrium dorsally with about 20 pairs of setae and ventrally without seta. Dens (Fig. 5) dorsally with about 10 integumentary swellings and 7 setae arranged as 1, 2, 2, 1, 1 and a prominent subapical ventral seta. Mucro bidentate, clearly demarcated from the dens and with the inner lamella broadly rounded near the base.

The range of measurements of the body parts, the mean, the standard deviation (S), the 't' value (t) and the probability (P) are given below.

The body length in form A ranged from 1.065 - 1.119 mm (mean = 1.084, S = 19.19) and in form B the range was 1.031 - 1.116 mm (mean = 1.064, S = 29.9); $t = 1.71$ and P between 20% and 10%. The ratio Antennal length/Head diagonal in A was 1 - 1.297, mean = 1.0618, S = 0.0954; in B 0.6884 - 0.9104, mean = 0.8076, S = 0.0848; $t = 6.22$, $P < 0.1\%$. The ratio Trunk/Tibiotarsus III in A 11.15 - 11.80, mean = 11.483, S = 0.1714; in B 14.50 - 16.66, mean = 15.347, S = 0.6754; $t = 16.65$, $P < 0.1\%$. The ratio Trunk/Furcula in A 3.819 - 4.097, mean = 3.120, S = 0.4262; $t = 8.73$, $P < 0.1\%$. The ratio Manubrium/Dens + Mucro in A 0.9080 - 1.0180, mean = 0.9533, S = 0.03; in B 1.104 - 1.153, mean = 1.123, S = 0.17; $t = 14.76$, $P < 0.1\%$.

DISCUSSION

The information presented above indicates that individuals from two localities which are separated only by a short distance from each other showed morphological differences some of which are well marked. Variability of colouration was one of intensity and with



Figs. 1-5. *Proisotoma (Clavisotoma) fitchioides*
 Fig. 1, form A in profile; Fig. 2, form B in profile; Fig. 3, labrum of form A;
 Fig. 4, hind claw of form A; Fig. 5, dens and macro of form A (pigment not represented)

a tendency to produce intermediate forms. The variability in length was not significant. On the other hand difference in mean of the ratios of body parts was found to be highly significant. Together with a reduction in the body pigment in form B it was found that the appendages had shown a tendency to become shorter in relation to the total length of the body. Further there was also a reduction in the number of the setae in the thoracic and abdominal segments. In spite of the differences mentioned above there was little doubt that the two populations belonged to the same species. The key characters of the species are the number and distribution of setae on the dens, presence of clavate tenent hairs on tibiotarsi of legs and the claws without teeth, which were found to be similar to the condition described by DENIS (1947). As stated above the species has a limited distribution in Kerala. Even at Kariavattom it was confined to certain fields and occasional samples of soil collected from a locality between Kariavattom and Kesavadasapuram did not reveal the species. The variations were therefore of the kind that could be expected when panmictic populations of a species were distributed in territories which were not continuously inhabited. These are to be distinguished from variations like those found, for instance, by PRABHOO (1971 b) in the colour pattern of *Lipothrix indicus* and by GROW & CHRISTIANSEN (1974) in the chaetotaxy of *Friesea grandis* which were likely to be due to polymorphism. It may also be mentioned here that *Proisotoma* (*Clavisotoma*) *canituda* (SALMON) (*Subisotoma canituda* (SALMON) *sensu* PRABHOO (1971 a) which was found to be widely distributed in Kerala, showed little morphological variations (PRABHOO, 1971 a). The shortening of appendages and reduction in the body setae shown by form B were the type of modifications of the body suitable for penetrating into deeper layers of the soil.

Proisotoma (*Clavisotoma*) *fitchioides* also showed variations which were of a geographic nature. Thus the mean length of the body recorded by DENIS (1947) was 0.825mm for material from Nilgiris. Individuals from Bombay and Burma had a length of about 1.4 mm (YOSII 1966) while the present examples were intermediate in size. Further, in Yosii's material there were two clavate tenent hairs on leg I and the three hind ocelli showed reduction while in the examples from Nilgiris and from Kerala there was only one clavate tenent hair on leg I and the ocelli appeared to be normal in the examples studied.

Acknowledgement:—I am thankful to Professor K. M. ALEXANDER for facilities provided in the Department.

REFERENCES

- DENIS, J. R. (1947) Deux *Proisotoma* de l'Inde. *Proc. R. ent. Soc. Lond.*, **16** B: 101-104.
- ELLIS, W. N. (1970) *Proisotoma filifera* DENIS in Holland, with a note on its classification (Collembola Isotomidae). *Ent. Ber., Amst.*, **30**: 18-24.
- GISIN, H. (1960) *Collembolanfauna Europas*. Museum D'Histoire Naturelle, Geneve, 312 pp.
- GROW, A. B. & K. CHRISTIANSEN (1974) Chaetotaxy in nearctic *Friesea* (Collembola Neanurinae) with a note on taxonomic use of chaetotaxy. *Rev. Ecol. Biol. Sol.*, **11**: 377-396.
- MORONEY, M. J. (1956) *Facts From Figures*. Penguin Books, 472 pp.
- PRABHOO, N. R. (1971 a) Soil and litter Collembola of South India. 1—Arthropleona. *Oriental Ins.*, **5**: 1-46.
- PRABHOO, N. R. (1971 b) Bark and moss Collembola of South India. *Bull. Ent.*, **12**: 41-47.
- YOSII, R. (1966) On some Collembola of Afganistan, India and Ceylon collected by the Kuphe Expedition, 1960. *Results Kyoto Univ. Scient. Expedition Karakoram Hindukush*, **1955**: 333-405.