

## SYSTEMATIC INTERPRETATION AND MORPHOMETRICAL ANALYSIS OF COLLEMBOLAS OCCURRED IN THE SOIL LAYERS OF UZBEKISTAN

Elmuratova Zulxumor Urazovna

Basic Doctoral Student of the National University of Uzbekistan

Email address: siroj601@mail.ru, +99897 430 5191

Rakhimov Matnazar Shomurodovich

Doctor of Biological Sciences, Head of the Department of Zoology,

National University of Uzbekistan

Email address: Raximov.matnazar@mail.ru

### ANNOTATION

In this scientific article, 36 species of collembolas were found in the soil layers of 0-10 cm, 10-20 cm and 20-30 cm of wheat and cotton agrocenoses and natural ecosystems of southern Uzbekistan. These species, namely collembolas, belong to 3 subfamilies (Poduromorpha, Entomobryomorpha, Neelipleona), 8 families (Hypogastruridae, Onychiuridae, Neanuridae, Odontellidae, Isotomidae, Entomobryidae, Poduridae, Neelidae) and 30 Generations of (Willemia, Xenylla, Hypogastrura, Typhlogastrura, Haloxenylla, Metaphorura, Ongulonychiurus, Lophognathella, Supraphorura, Onychiurus, Axenyllodes, Xenyllodes, Adbiloba, Pseudachorutes, Archisotoma, Folsomia, Proisotoma, Vertagopus, Agrenla, Pseudofolsomia, Folsomides, Folsomina, Isotoma, Isotomodes, Isotomiella, Metisotoma, Heteromurus, Orchesellides, Tomocerus, Neelus) the Collembola family.

The territory of Southern Uzbekistan differs in the type and quantity of collembola communities in different agrocenoses and natural ecosystem soils. According to this, there are scientific data on the presence of 29 species of collembolas in the soil layers of wheat fields, 19 types of collembolas in the soil layers of cotton fields.

**Keywords:** collembola, agrocenosis, natural ecosystem, wheat, cotton, soil layers.

### INTRODUCTION

Collembolas are one of the oldest insects in the world and despite their role in the metabolism, soil condition assessment and soil formation in nature, some species in different regions of the world cause avitilliosis in farm animals due to their intermediate hosting nature for parasites [1]. In many countries around the world, a number of scientific studies are being conducted to determine the role of collembolas in assessing soil condition, studying the characteristics of intermediate hosts, their participation in the metabolism of residual substances in the soil [2, 3, 6]. Accordingly, the agrocenoses and natural ecosystems of southern Uzbekistan are of great scientific and practical importance as the leading direction of fundamental entomology in determining the fauna of collembolas in the soil layers and assessing the ecological and taxonomic composition, identification of intermediate hosts [4,5].

## RESEARCH MATERIALS AND METHODS

Research materials for 2017-2020 in Shurchi district of Surkhandarya region “Yuldosh khoji BIB”, “Firdavs Temurbek”, “Usarbobo”, “Sevinch Mardonova”, Termez district “Sharof Mohinur”, “Zuhriddin namuna”, “Gozobod sample”, “Durdona sample”, “Nurmuhammad sample” farms and “Ortik” farm of Yakkabag district of Kashkadarya region, “Khudoikulova Nazira Bozorovna” farm of Shakhrisabz were collected from agrocenoses and natural ecosystem soil layers. Samples were taken from soils of agrocenoses and natural ecosystems 0-10 cm, 10-20 cm, 20-30 cm. A total of 828 samples were taken from the layers in an amount of 1 dm<sup>3</sup>.

## RESULTS OBTAINED AND THEIR ANALYSIS

As a result of a comprehensive study of collembolas in the soils of agrocenoses and natural ecosystems of southern Uzbekistan, the total number of identified collembolas in southern Uzbekistan consists of 36 species, 30 Generations, 8 families and 3 subfamilies.

According to the above-mentioned taxonomic composition of collembolas, materials representing the morphology of the species and its distribution in the soil layers are given.

Class: Insecta Linnaeus, 1758

Category: Collembola Lubbock, 1871

Junior species: Poduromorpha Börner, 1906

Family: Hypogastruridae Börner, 1906

### 1. Generation: Willemia Börner, 1901

*Willemia denisi* Mills, 1932.

41 copies were identified of 0-10 cm, 10-20 cm, 20-30 cm soil layers of wheat agrocenoses of Yakkabag, Shakhrisabz districts: 28♀, 13♂ (9.12.2017, 13.01.2018, 23.03.2018, 20.06.2018, 2.10.2018, 10.03.2019, 14.08.2019, 10.12.2019 y).

### 2. Generation: Xenylla Tulberg, 1869

*Xenylla schillei* Börner, 1903.

39 copies were found in 0-10 cm, 10-20 cm soil layers of wheat agrocenoses in Shurchi and Termez districts: 23♀, 16♂ (9.12.2017, 12.01.2018, 22.03.2018, 19.06.2018, 13.09.2019, 4.01.2020 y.). **Generation:** Hypogastrura Bourlen, 1839

*Hypogastrura (Hypogastrura) tullbergi* Schiiffer, 1900.

39 copies were found in 0-10 cm, 10-20 cm soil layers of wheat agrocenoses located in Shurchi and Termez districts: 23♀, 17♂ (13.09.2019, 4.01.2020) and natural ecosystem 0-10 cm, 10-20 cm 42 copies were found in the soil layers: 23♀, 19♂ (12.01.2018, 22.03.2018, 19.06.2018, 13.09.2019). **Generation:** Typhlogastrura Bonet, 1930

*Hypogastrura (Typhlogastrura) mendisabali* Bonet, 1930.

46 copies were found in 0-10 cm, 10-20 cm layers of soils of natural ecosystems of Shurchi and Termez districts: 27♀, 19♂ (12.01.2018, 22.03.2018, 19.06.2018, 1.10.2018, 9.03.2019).

**Generation:** Hypogastrura Bourlet, 1839

*Hypogastrura assimilis* Krausbauer, 1898.

35 copies of wheat agrocenoses were found in 10-20 cm of soil layers of Shurchi and Termez districts: 21♀, 14♂ (9.01.2018, 9.03.2019, 11.08.2019, 1.10.2019) and 0-10 cm, 10-135 copies were identified in 20 cm, 20-30 cm soil layers: 71♀, 64♂ (11.08.2019) Natural ecosystem 0-10 cm, 35 copies in 10-20 cm soil layers: 25♀, 10♂ (9.01.2018 y).

**3. Generation:** *Haloxenylla* Gama et Deharveng, 1984

*Xenylla affiniformis* Schat, 1930.

35 copies of 0-10 cm, 10-20 cm soil layers of cotton agrocenoses of Shurchi and Termez districts: 18♀, 17♂ (11.08.2019, 4.01.2020) were identified and 0-10 cm, 10-20 cm of soils of natural ecosystems 47 copies were found in the layers: 29♀, 18♂ (12.01.2018, 1.10.2019).

**4. Generation:** *Xenylla* Tullberg, 1869

*Xenylla maritima* Tullberg, 1869.

182 copies of 10-20 cm, 20-30 cm layers of soils of wheat agrocenoses of Shurchi and Termez districts: 95♀, 87♂ (10.01.2019, 23.03.2018, 19.06.2018) and 0-10 cm of soils of natural ecosystems, 315 copies were found in layers of 10-20 cm: 173♀, 142♂ (12.01.2018, 23.03.2018, 1.10.2018, 11.08.2019).

**5. Generation:** *Hypogastrura* Bourlen, 1839

*Hypogastrura (Achorutes) viaticus* Tullberg, 1872.

33 copies were found in 10-20 cm, 20-30 cm soil layers of cotton agrocenoses of Shurchi and Termez districts: 18♀, 15♂ (23.03.2018, 19.06.2018, 9.03.2019), natural ecosystem 0-10 cm, 20-36 copies of 20-30 cm soil layers were identified: 19♀, 17♂ (19.06.2018, 11.08.2019).

**Family:** *Onychiuridae* Salmon, 1964

**6. Generation:** *Metaphorura* Stach, 1964

*Metaphorura affinis* Börner, 1902.

48 copies were found in 0-10 cm, 10-20 cm soil layers of cotton agrocenoses of Shurchi and Termez districts: 21♀, 27♂ (23.03.2018, 19.06.2018, 1.01.2019), natural ecosystem 0-10 cm, 10-43 copies of 20 cm soil layers were found: 25♀, 19♂ (12.01.2018, 23.03.2018, 6.10.2018, 11.08.2019).

**Generation:** *Ongulonychiurus* Thibaud et Massoud, 1986.

*Ongulonychiurus colpus* Thibaud et Massoud, 1986.

45 copies of 0-10 cm, 10-20 cm soil layers of cotton agrocenosis of Shurchi and Termez districts were found: 28♀, 17♂ (12.01.2018, 22.03.2018, 19.06.2018, 11.08.2019) and natural ecosystem 0- In the soil layers of 10 cm, 20-30 cm, 354 copies were found: 23♀, 11♂ (11.08.2019, 1.10.2019).

**7. Generation:** *Lophognathella* Börner, 1908

*Lophognathella choreutes* Börner, 1908.

Natural ecosystem in Shurchi, Termez districts 0-10 cm, 10-20 cm 43 copies from soil layers: 22♀, 21♂ (12.01.2018, 9.03.2019, 13.08.2019), 10-20 cm, 20 of cotton agrocenoses 20-30 cm, 38 copies from soil layers: 21♀, 17♂ (22.03.2018, 1.10.2018, 9.03.2019), 10-20 cm from wheat agrocenoses, 40 copies from 20-30 cm soil layers: 21♀, 19♂ (1.10.2019) found.

**Generation:** Supraphorura Borner, 1901

Supraphorura furcifera Borner, 1901.

43 copies of 0-10 cm, 10-20 cm layers of soils of natural ecosystems of Shurchi and Termez districts: 25♀, 18♂ (12.01.2018, 9.03.2019, 13.08.2019), 0-10 cm, 10- of wheat agrocenoses 34 copies were found in 20 cm soil layers: 15♀, 19♂ (19.06.2018, 12.08.2019, 1.10.2019).

**8. Generation:** Onychiurus Martyanova, 1976.

Onychiurus taimyrica Martyanova, 1976.

41 copies in 0-10 cm, 10-20 cm soil layers of natural ecosystems in Shurchi and Termez districts: 29♀, 12♂ (22.03.2018, 10.03.2019, 2.10.2019)

**Family:** Odontellidae Massoud 1967

**9. Generation:** Axenyllodes Stach, 1949

Xenyllodes bayeri Kseneman, 1935.

Natural ecosystem of Shurchi, Termez districts 10-20 cm, 20-30 cm from soil layers 37 copies: 25♀, 12♂ (12.01.2018, 9.03.2019, 14.08.2019), 0-10 cm of wheat agrocenoses, 10- 47 copies of 20 cm, 20-30 cm soil layers: 32♀, 15♂ (22.03.2018, 1.10.2019), 46 copies of 10-20 cm, 20-30cm soil layers of cotton agrocenoses: 31♀, 15♂ (19.06.2018, 12.08.2019, 1.10.2019).

**Generation:** Xenyllodes Axelson, 1903

Xenyllodes armatus Axelson, 1903.

39 copies of 0-10 cm, 20-30 cm soil layers of natural ecosystems of Termez and Shurchi districts: 25♀, 14♂ (23.03.2018, 19.06.2018, 1.01.2019), 0-10cm, 10-20 of cotton agrocenoses cm, 39 copies of soil layers of 20-30cm: 31♀, 8♂ (23.03.2018, 19.06.2018, 1.01.2019) were found.

**Family:** Neanuridae Deharaverg, 1983

**10. Generation:** Adbiloba Stach, 1951 sensu Cassagnau, 1979

Achorutes sokolowi Philipschenko, 1926.

Natural ecosystems in Termez, Shurchi districts 10-20 cm, 20-30 cm from soil layers 38 copies: 19♀, 19♂ (1.10.2018, 9.03.2019, 12.08.2019), 10-20 cm, 20-30 cm of wheat agrocenoses 38 copies were found in the soil layers: 22♀, 16♂ (23.03.2018, 19.06.2018, 1.10.2019).

**11. Generation:** Pseudachorutes Tullberg, 1871

Pseudachorutes subcrassus Tullberg, 1871.

31 copies from 0-10 cm, 20-30 cm soil layers of natural ecosystems of Termez, Shurchi districts: 19♀, 12♂ (1.10.2018, 9.03.2019, 12.08.2019) 0-10 cm, 10-20 cm of wheat agrocenosis , 36 copies were found in 20-30cm soil layers: 21♀, 15♂ (22.03.2018, 19.06.2018, 1.10.2018, 9.03.2019).

**Junior species:** Entomobryomorpha Borner, 1913

**Оила:** Isotomidae Martinova, 1971

**12. Generation:** Archisotoma Linnaniemi, 1912

Isotoma besselsi Packard, 1877.

39 copies of 0-10 cm, 10-20 cm soil layers of natural ecosystems of Termez and Shurchi districts: 19♀, 20♂ (12.01.2018, 22.03.2018, 12.08.2019, 1.10.2019), 0-10 cm of wheat agrocenoses , 49 copies of 10-20 cm, 20-30cm soil layers were found: 21♀, 28♂ (12.01.2018, 22.03.2018, 9.03.2019, 1.10.2019).

**Generation:** Folsomia Willem, 1902

Folsomia nana Gisin, 1957.

41 copies: 21♀, 20♂ (19.06.2018, 22.03.2018, 1.10.2018, 1.10.2019) were found in 0-10cm, 20-30cm soil layers of cotton agrocenoses of Termez and Shurchi districts.

**Generation:** Proisotoma Börner, 1901

*Isotoma minuta* Tullberg, 1871.

47 copies were found in 0-10cm, 20-30cm soil layers of cotton agrocenoses of Termez and Shurchi districts: 27♀, 20♂ (12.01.2018, 19.06.2018, 12.08.2019, 1.10.2019).

**Generation:** Proisotoma, Christiansen et Bellinger, 1980

*Proisotoma vesiculata* Folsom, 1937.

38 copies of 10-20cm, 20-30cm soil layers of cotton agrocenoses of Termez, Shurchi districts: 21♀, 17♂ (19.06.2018, 12.08.2019, 1.10.2019).

**Generation:** Vertagopus Börner, 1906

*Desoria cinerea* Nicolet, 1842.

36 copies of 10-20 cm, 20-30 cm layers of soils of natural ecosystems of Shurchi and Termez districts: 24♀, 12♂ (5.01.2020, 9.03.2019, 14.08.2019), 0-10 cm of wheat agrocenoses, 10- 52 copies of 20 cm, 20-30 cm soil layers: 37♀, 15♂ (22.03.2018, 9.03.2019, 4.10.2019), 0-10 cm of cotton agrocenoses, 49 copies of 20-30 cm soil layers: 29♀, 20♂ (9.03.2019, 12.08.2019, 1.10.2019) were found.

**13. Generation:** Agrenla Börner, 1906

*Isotoma bidenticulata* Tullberg, 1876.

40 copies of 0-10cm, 10-20 cm soil layers of natural ecosystems in Termez and Shurchi districts: 23♀, 17♂ (9.03.2019, 12.08.2019, 1.10.2019), 0-10cm, 10-20 cm of cotton agrocenoses, 174 copies were identified in soil layers of 20-30cm: 92♀, 82♂ (23.03.2018, 19.06.2018, 1.10.2019).

**14. Generation:** Proisotoma Palissa, 1964

*Proisotoma tuberculata* Schat, 1947.

288 copies were found from 0-10 cm, 10-20 cm, 20-30 cm layers of soils of natural ecosystems of Shurchi and Termez districts: 155♀, 133♂ (12.01.2018, 9.03.2019, 12.08.2019), 0-10 of wheat agrocenoses cm, 10-20 cm, 20-30cm 62 copies from soil layers: 37♀, 25♂ (19.06.2018, 9.03.2019, 1.10.2019, 4.01.2020). **Generation:** Pseudofolsomia Martynova, 1967.

*Pseudofolsomia acanthella* Martynova, 1967.

34 copies of 10-20 cm, 20-30 cm layers of soils of natural ecosystems of Shurchi and Termez districts: 24♀, 10♂ (12.01.2018, 9.03.2019, 12.08.2019), 0-10 cm, 10- of cotton agrocenoses 31 copies of 20 cm soil layers: 20♀, 11♂ (19.06.2018, 12.08.2019, 1.10.2019).

**Generation:** Folsomides Stach, 1922

*Folsomides parvulus* Stach, 1922.

43 copies of 0-10 cm, 10-20 cm soil layers of natural ecosystems of Shurchi and Termez districts: 24♀, 19♂ (12.01.2018, 22.03.2018, 1.10.2018, 9.03.2019, 12.08.2019), wheat agrocenoses 49 copies of 0-10 cm, 10-20 cm, 20-30 cm soil layers: 37♀, 12♂ (22.03.2018, 19.06.2018, 9.03.2019, 1.10.2019), 0-10 cm of cotton agrocenoses, 36 specimens were found in 20-30 cm soil layers: 19♀, 17♂ (19.06.2018, 12.08.2019, 1.10.2019).

**15. Generation:** Folsomina Denis, 1931.

*Folsomina candida* Willem, 1902.

33 copies from 0-10 cm, 10-20 cm layers of soils of natural ecosystems of Shurchi and Termez districts: 19♀, 14♂ (10.01.2019, 9.03.2019, 14.08.2019), 0-10 cm, 10-20 of wheat agrocenoses cm 36 copies were found in the soil layers: 19♀, 17♂ (4.10.2019).

**Generation:** *Isotoma Tullberg*, 1876.

*Isotoma sensibilis* Tullberg, 1876.

56 species were found in 0-10 cm, 20-30 cm soil layers of natural ecosystems of Shurchi and Termez districts: 24♀, 22♂ (10.01.2019, 9.03.2019, 14.08.2019).

**Generation:** *Isotomodes Linnaniemi*, 1907.

*Isotoma producta* Axelson, 1906.

36 copies of 10-20 cm, 20-30 cm soil layers of natural ecosystems of Termez and Shurchi districts: 19♀, 17♂ (1.10.2019), 35 copies of 0-10 cm, 10-20 cm soil layers of cotton agrocenoses: 23♀, 12♂ (1.10.2019).

**Generation:** *Isotomiella Bagnal*, 1939.

*Isotomiella (Isotoma) minor* Schaffer, 1896.

27 copies of 10-20 cm, 20-30 cm soil layers of soils of natural ecosystems of Termez and Shurchi districts: 16♀, 11♂ (1.10.2019), 213 copies of 10-20 cm, 20-30 cm of soil layers of wheat agrocenoses: 118 ♀, 95♂ (1.10.2019) was identified.

**16. Generation:** *Metisotoma Maynard*, 1951

*Metisotoma spiniseta* Maynard, 1951.

44 copies from 20-30cm soil layers: 25♀, 19♂ (14.08.2019), in Termez, Shurchi districts natural ecosystem 0-10cm, 20-30 cm from soil layers 37 copies: 20♀, 17♂ (1.10.2019), wheat agrocenoses 0-10cm, 20-30cm from soil layers 43 copies: 23♀, 20♂ (14.08. 2019), 39 copies of cotton agrocenoses in soil layers of 10-20 cm, 20-30 cm: 27♀, 12♂ (23.03.2018, 19.06.2018, 4.10.2019).

**17. Generation:** *Heteromurus Wankel*, 1860

*Heteromurus margaritarius* Wankel, 1860.

350 copies of 10-20 cm, 20-30 cm soil layers of the natural ecosystem of Termez and Shurchi districts: 194♀, 156♂ (1.10.2019), 60 from soil layers of wheat agrocenoses 0-10cm, 10-20 cm, 20-30cm copy: 31♀, 29♂ (1.10.2019) found.

**Family:** Entomobryidae Borner, 1913.

**18. Generation:** *Heteromurus Wankel*, 1860

*Heteromurus nitidus* Templeton, 1835.

35 copies of 0-10cm, 10-20 cm layers of soils of natural ecosystems of Termez and Shurchi districts: 21♀, 14♂ (1.10.2019), 36 copies of 10-20cm, 20-30 cm of soil layers of wheat agrocenoses: 19♀, 17♂ (1.10.2019) were identified.

**19. Generation:** *Orchesellides Bonet*, 1930

*Orchesellides baraoi* Bonet, 1930.

34 copies of 0-10 cm, 20-30 cm layers of soils of natural ecosystems of Termez and Shurchi districts: 20♀, 14♂ (1.10.2019), 43 copies of 0-10 cm, 10-20 cm soil layers of wheat agrocenoses: 26♀, 17♂ (1.10.2019) were identified.

**Family:** Tomoceridae Szeptycki, 1979

**35. Generation:** *Tomocerus Nicolet*, 1842.

*Tomocerus sibiricus* Reuter, 1891.

0-10cm, 10-20 cm, 41 copies of soil layers of natural ecosystems of Termez, Shurchi districts: 20♀, 21♂ (1.10.2019), 41 copies of 0-10cm, 10-20cm soil layers of wheat agroecosystems: 25♀, 16♂ (1.10.2019) was found.

**Junior species:** *Neelipleona* Massoud, 1971

**Family:** Neelidae Willem, 1900

**36. Generation:** *Neelus* Folsom, 1896

*Neelus murinus* Folsom, 1896.

0-10cm, 10-20 cm, 41 copies of soil layers of natural ecosystems of Termez, Shurchi districts: 20♀, 21♂ (1.10.2019), 41 copies of 0-10cm, 10-20cm soil layers of wheat agroecosystems: 25♀, 16♂ (1.10.2019) was found.

Conclusion. The Poduromorpha subfamily of the Collembola family belongs to the Hypogastruridae family (8 species), the Onychiuridae family - (5 species), the Odontellidae family - (2 species), the Neanuridae family - (2 species), the Entomobryomorpha family (14 species), Entomobryidae family - (3 species), Tomoceridae family - (1 species), *Neelipleona* subspecies Neelidae family - (1 species). Studies have shown that Entomobryomorpha and Poduromorpha subfamilies are rich in species. The diversity of collembola species was found to be 18 in these subcategories.

## REFERENCES

1. Бабенко, А. Б. Ногохвостки (Hexapoda, Collembola) тундровых ландшафтов Кольского полуострова // Зоологический журнал. – Ленинград, 2012. – Т. 91, № 4. – С. 411–427.
2. Chernov A. V. Naselenie kollembol Vostochnoevropeyskikh shirokolistvennykh lesov Collembolan population of Eastern European broad-leaved forests // Zoological Journal. – 2010. – Vol. 89, No. 5. – P. 559–573.
3. Кузнецова Н.А. Организация сообществ почвообитающих коллембол. Москва: Прометей, 2005. – 244с.
4. Рахимов М.Ш. Фауна и сезонная динамика численности коллембол северо-востока Узбекистана. // Научное обозрение. Биологические науки. –Москва, 2019. – № 2 – С. 35–40.
5. Rakhimov M.Sh., Elmuratova Z.U. Fauna and seasonal dynamics of the collembolas of Uzbekistan //«International Journal of Advanced Science and Technology» Австрия. №28. 2019. – P. 68-87.
6. Raximov M.Sh. Fauna, distribution features and ecology of the Collembola family in Northeastern Uzbekistan. Tashkent, 2019. -200 p.