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# Apterygota faunal diversity of Andaman and Nicobar Islands

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## Abstract

This paper deals with the Apterygota fauna of the Andaman and Nicobar Islands which includes six new records of collembolan fauna from the Islands. The Apterygotan diversity of Andaman and Nicobar Islands represents 02 species of Archaeognatha under single genera of the family Machilidae, 01 species of Zygentoma of the family Lepismatidae and 24 species of Collembola under 16 genera of 5 families.

**Keywords:** Andaman and Nicobar Islands, Apterygota, Diversity, New Records.

## Abbreviations

Abd–Abdominal segment; Ant.–antennal segment; PAO–postantenal organ; Th–Thoracic segment; NZC –National Zoological Collection; SEM–scanning electron microscope; DIC–differential interference contrast microscope.

## Introduction

Andaman and Nicobar Islands, due to their unique geographical location and climatic conditions nourish a wide range of diverse flora and fauna, most of which are yet to be explored. The Apterygota fauna of Andaman and Nicobar Islands is dealt herewith, which consists of 24 species of Collembola, 02 species of Archaeognatha, and 01 species of Zygentoma. A review of the literature says that pioneer workers of collembolan fauna of India were Imms (1912), Carpenter (1917, 1924), Bonet (1930), Baijal and Chandra (1970), Prabhoo (1971a, 1971b, 1971c), Mitra (1973a, 1973b, 1974a, 1974b, 1975), Kinoshita (1917), Bourlet (1839), Denis (1933), Ellis and Bellinger (1973), Escherich (1905), Handschin (1928, 1929) Hazra (1980), Mandal (2008a, 2008b, 2011, 2017). Hazra and Mandal (2012) reported 18 species of Collembola under 11 genera of 3 families and 01 species, *Ctenolepisma (Ctenolepisma) longicaudatum* of Zygentoma and 02 species under the genus *Machilanus* of Archaeognatha. The present studies of Apterygota fauna of Andaman and Nicobar Islands have added 6 new records of Collembola belonging to 6 species under 5 genera of 3 families.

## Methods and Materials

Archaeognatha and Zygentoma specimens were collected by using an aspirator and hand-picking and preserved in 70% alcohol to fix them for further study. The specimens were cleared and mounted on a slide in Tendeiro solution. Identification of the specimens was done by using Phase contrast and DIC microscope. Identification was extended by using an SEM microscope where gold-coated slides were used after specimens were dehydrated with 100% alcohol. Collembolan fauna was collected with a mouth-operated aspirator, pan-trap, soil collection and bush beating. Specimens were preserved in 70% alcohol in vials. The specimens after sorting and clearing in Nesbitt's solution were fixed on a slide in Hoyer's medium. Leica DM2500 was used for identifying the slide specimen.

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## Systematic List

Class INSECTA

Order ZYGENTOMA

Family LEPISMATIDAE Latreille, 1802

1. ***Ctenolepisma (Ctenolepisma) longicaudatum*** Escherich, 1905

Order ARCHAEOGNATHA

Family MACHILIDAE Grassi, 1888

2. ***Machilanus insensilis*** Wygodzinsky, 1974
3. ***Machilanus lapidicola*** Wygodzinsky, 1974

Class COLLEMBOLA

Order PODUROMORPHA

Family HYPOGASTRURIDAE Börner, 1906

1. ***Hypogastrura indovaria*** Salmon, 1970
2. ***Xenylla obscura*** Imms, 1912

Order ENTOMOBRYOMORPHA

Family ISOTOMIDAE Schäffer, 1896

3. ***Proisotoma senetijohani*** Baijal and Chandra, 1970
4. ***Ballistrura fitchi*** (Denis, 1933) Potapov, 2001
5. ***Isotomurus balteatus*** (Reuter, 1876) Handschin 1929

Family ORCHESELLIDAE Börner, 1906

6. ***Dicranocentrus indicus*** Bonet, 1930
7. ***Alloscopus tetracanthus*** (Börner, 1906) Handschin, 1928

Family PARONELLIDAE Börner, 1906

8. ***Cyphoderus javanus*** Börner, 1906
9. ***Salina (Salina) montana*** (Imms, 1912) Salmon, 1957
10. ***Salina (Salina) striata*** (Handschin, 1928) Handschin, 1929
11. ***Salina (Salina) indica*** (Imms, 1910) Salmon, 1957
12. ***Callyntrura japonica*** (Kinoshita, 1917) Yosii, 1969
13. ***Dicranocentroides fasciculatus*** Imms, 1912
14. ***Dicranocentroides flavescens*** Yosii, 1966

Family ENTOMOBRYIDAE Schäffer, 1896 sensu Zhang F *et. al*., 2019

15. ***Epimetrura caudata*** (Carpenter, 1917) Denis, 1948
16. ***Sinella curviseta*** Brook, 1882
17. ***Lepidocyrtus (Lepidocyrtus) curvicollis*** Bourlet C, 1839
18. ***Lepidocyrtus (Lepidocyrtus) magnificus*** Carpenter, 1924
19. ***Lepidocyrtus (Ascocyrtus) suborientalis*** (Yosii 1959) Ellis, WN and Bellinger, 1973
20. ***Lepidocyrtus (Setogaster) indicus*** Handschin, 1929
21. ***Lepidocyrtus (Acrocyrtus) heterolepis*** Yossi, 1959
22. ***Lepidocyrtus (Acrocyrtus) malayanus*** Yosii, 1959
23. ***Seira (Seira) cinerea*** Yosii, 1966
24. ***Seira (Seira) indica*** (Ritter, 1911) Yosii, 1966

## Systematic Account

Class INSECTA

Order ZYGENTOMA

Family LEPISMATIDAE Latreille, 1802

Genus ***Ctenolepisma*** Escherich, 1905

**1. *Ctenolepisma (Ctenolepisma) longicaudatum*** Escherich, 1905

1905. *Ctenolepisma longicaudatum* Escherich, *Zoologica (Stuttgart),* Vol. **43**: 83.

*Diagnosis:* Body length 13 to 15 mm. The abdomen is slightly narrower than the thorax. Body colour white. The length of antennae and cerci are very long. A long and slender ovipositor is present.

*Distribution:* India: Andaman and Nicobar Islands, Andhra Pradesh, Bihar, Manipur, Sikkim, Tripura, Uttar Pradesh, West Bengal. Elsewhere: Australia, South Africa, USA.

*Remarks:* Hazra and Mandal (2012) reported this species from Ross Island of South Andaman under a tree trunk.

Order ARCHAEOGNATHA

Family MACHILIDAE Grassi, 1888

Genus ***Machilanus*** Silvestri, 1936

**2. *Machilanus insensilis*** Wygodzinsky, 1974

1974. *Machilanus insensilis* Wygodzinsky, *Amer. Mus. Nov.,* No. **2555**: 3-21.

*Diagnosis:* The first segment of maxillary palp is deeply pigmented in the hypodermal region. Antennae are shorter than the body also some antennae characters are different in males and females. The Fore tibia of males is short and possesses long spine-like setae.

*Distribution:* India: Andaman and Nicobar Islands, Andhra Pradesh and Kashmir.

*Remarks:* Hazra and Mandal (2012) reported this species from Avis Island in North Andaman under a tree trunk and an old monument building from Ross Island, South Andaman.

**3. *Machilanus lapidicola*** Wygodzinsky, 1974

1974. *Machilanus lapidicola* Wygodzinsky, *Amer. Mus. Nov.,* No. **2555**: 3-21.

*Diagnosis:* Female body length up to 13 mm. Pale yellow-coloured body. A pair of ocelli is present below the anterior margin of the eyes. Thorax is convex-shaped and present on the dorsal side of the body. Robust type ovipositor.

*Distribution:* India: Andaman and Nicobar Islands, Sikkim. Elsewhere: Pakistan

*Remarks:* Hazra and Mandal (2012) reported this species from Mount Harriet Reserve Forest, Port Blair.

Class COLLEMBOLA

Order PODUROMORPHA

Family HYPOGASTRURIDAE Börner, 1906

Genus ***Hypogastrura*** Bourlet, 1839

**1. *Hypogastrura indovaria*** Salmon, 1970

1970. *Hypogastrura indovaria* Salmon, 1970, *Trans. Biol. Sci.,* **12**(13): 149.

*Material examined:* From Literature.

*Diagnosis:* A maximum body length of 0.8 mm is observed with brownish-black spots distributed all over the body. The entire length is covered with sparse to dense simple setae that are short to long with curvicular structure. PAO shows irregularity with 4-12 disconnected lobes present indistinctly. Tenent hairs are never found to be clavate. Spoon-shaped and finely crenulate mucro is also observed with two distinct lamellae.

*Distribution:* India: Andaman and Nicobar Islands, Andhra Pradesh, Arunachal Pradesh, Manipur, Mizoram, Rajasthan, Sikkim, Uttarakhand. Elsewhere: Himalayan region.

*Remarks:* This species is widely distributed in the Himalayan and Indian regions. Hazra and Mandal (2012) reported this species from Sippighat near the Centre for Agriculture farm in Port Blair.

**Genus *Xenylla*** Tullberg, 1869

**2. *Xenylla obscura*** Imms, 1912

1912. *Xenylla obscura* Imms, *Proc. zool. Soc. London*, pp. 80-125.

*Material examined:* From Literature.

*Diagnosis:* Body is 1.4 mm long, elongated shape and indigo-blue, ventral side and segmental margins are pale. Antennal ratio as 10:12:14. PAO absent. Ridged unguis without lateral teeth, but apex has 1,1,1 inner tooth, Unguiculus absent. 4+4 setae can be found in the ventral tube. Tenent hair, 2, 2, 2 very long and capitate at the end. Distinct Dentes and Mucro are present, Mucro is short, obtuse anal blunt on apex, with a narrow rounded lamella, which is often very obscure.

*Distribution:* India: Andaman and Nicobar Islands, Arunachal Pradesh, Haryana, Himachal Pradesh, Jammu and Kashmir, Maharashtra, Manipur, Nagaland, Sikkim, Uttarakhand, Uttar Pradesh, West Bengal. Elsewhere: Australia, China, Kazakhstan, Mongolia, Myanmar, New Caledonia, Thailand.

*Remarks:* This species is widely distributed in the tropics of the New World. Hazra and Mandal (2012) reported this species from Panighat, way to Mount Harriet in Port Blair.

Order ENTOMOBRYOMORPHA

Family ISOTOMIDAE Schäffer, 1896

Genus ***Proisotoma*** Börner, 1901

**3. *Proisotoma senetijohani*** Baijal and Chandra, 1970

1970. *Proisotoma senetijohani* Baijal and Chandra, *Bull. Ent.* **11** (1): 35-36.

*Material Examined:* 2 exs. on the slide, 40 exs. in alcohol, India: Andaman and Nicobar Islands: Science centre, Port Blair, South Andaman district, 15.vii.2021, 11$^0$37'24.1572" N 92$^0$33'35.3496" E, coll. Anil Kumar Dubey, (Regn. No. 3308/H14).

*Diagnosis:* Body length is 1.0 mm. The dorsal side of the body is black whereas the ventral side is creamy white. Antennae are a little longer than the head; the antennal ratio is 2:2:3:3. Ocelli 8+8 and black. PAO elliptical. Abd. IV longer than Abd. III. Claw finely granulated and without teeth. Unguiculus about one-third the length of the claw with a broad lamella, tenet hair absent. Manubrium and mucrodens equal, dens annulated. Mucro is finely granulated, bidentate and teeth are equal, with lamella extending across the opposite side of mucro.

*Distribution:* India: Andaman and Nicobar Islands, Uttar Pradesh.

*Remarks:* Endemic to India. Previously this species was recorded from Uttar Pradesh. Now this species has been newly recorded from Andaman and Nicobar Islands.

**Genus *Ballistrura*** Börner, 1906

**4. *Ballistrura fitchi*** (Denis, 1933) Potapov, 2001

1933. *Proisotoma fitchi* Denis, *Boll. Lab. Zool. gen.agrer. Portici,* **27**: 222-322.

2001. *Ballistrura fitchi*, Potapov, *Cont. Natural History Museum Görlitz*, **73**(2): 1-603.

*Material Examined: 1 ex.* on slide, 10 exs. in alcohol, India: Andaman and Nicobar islands: Wandoor, South Andaman District.,13.xi.2001, 11.5944°N 92.61696°E, coll. S.K. Mitra (Regn. No. 3338/H14); 1 ex. on slide, 12 exs. in alcohol, India: Andaman and Nicobar islands: Chouldari, South Andaman District,13.xi.2001, 11.6331304°N 92.6599061°E, coll. S.K. Mitra (Regn. No. 3345/H14).

*Diagnosis:* Body deep blue pigmented, PAO ovulated. Unguis without any teeth, a small setae present at its base. Two clavate tenet hair present. Dens roughly globulate on the dorsal side. Mucro bidented and lamellated.

*Distribution:* India: Andaman and Nicobar Islands, Tamil Nadu, West Bengal. Elsewhere: Brazil, Cyprus, Europe, French Guiana, Guyana, Indonesia, Malaysia, Melanesia and Micronesia, Myanmar, Thailand.

*Remarks:* Newly recorded from Andaman and Nicobar Islands.

**Genus *lsotomurus*** Börner, 1903

**5. *Isotomurus balteatus*** (Reuter, 1876) Handschin 1929

1876. *Isotoma balteatus* Reuter, *Med. Soc. Fauna et. Flora Fenn.*, **1**: 82.

1929. *Isotomurus balteatus* Handschin, *The animal world of Germany,* **16**: 1-150.

*Material examined:* From Literature.

*Diagnosis:* Color with a violet with black pigment which forms a distinct transverse band on the anterior margin of tergites. Antennal ratio = 10: 15: 16 : 26; Ant. IV with two short sub-apical sense rods. PAO as large as anterior ocellus. Ocelli 8 + 8. Furcula reaches forward to the ventral tube, segments as 5: 12: 1. Dens distinctly annulated with dorsal side; mucro with a small apical, 2 large subapical and large external lateral teeth.

*Distribution:* India: Andaman and Nicobar Islands, Arunachal Pradesh, Kerala, Manipur, Tripura (West distt.). Elsewhere: Australia, Brazil, China, Cyprus, Europe, Japan, Kazakhstan, Mongolia, Polynesia.

*Remarks:* This species is widely distributed in the Mediterranean and subtropics of the New World. Hazra and Mandal (2012) reported this species from Baratang near Mud Volcano in the Middle Andaman.

Family ORCHESELLIDAE Börner, 1906

Genus ***Dicranocentrus*** Schött, 1893

**6. *Dicranocentrus indicus*** Bonet, 1930

1930. *Dicranocentrus indicus* Bonet, Sur quelques Collemboles de l'Inde., *Eos*, **6**(3): 249-273

1966b. *Dicranocentrus indicus* Yosii. *Kyoto Univ. Sci. Expd. Karakoram and Hindukush*, **8**: 330-405.

*Material Examined:* From literature.

*Diagnosis:* Body size is up to 3.2 mm. It has a reddish violet-coloured antenna. The colour of the eyes is black. Five segmented antennae are present due to subdivision

of Ant I. Ant. IV is elongated, with evident annulations. The manubrium is dorsally beset with many plumose setae. The dental spine is absent. Equal-sized bidentate mucro is present that may or may not be accompanied by a basal spine. Crenules are present on the dorsal side of the Dentes that has one blunt ciliated seta.

*Distribution:* India: Andaman and Nicobar Islands, Arunachal Pradesh, Manipur, Maharashtra (Bombay), Mizoram, Nagaland, Uttarakhand. Elsewhere: Formosa, Myanmar, Polynesia, Thailand.

*Remarks:* This species is widely distributed in the subtropics of the Indian subcontinent. Hazra and Mandal (2012) reported this species from the M. G. College campus area in the Mayabunder.

**Genus *Alloscopus*** Börner, 1906

**7. *Alloscopus tetracanthus*** (Börner, 1906) Handschin, 1928

1906. *Heteromurus (Alloscopus) tetracantha* Börner, *Mitteilungen aus den Naturhistorischen Museum in Hamburg*, XXIII. Jahrgang, 2. *Beiheft zum Jahrbuch der Hamburgischen Wissenschaftlichen Austalten*., XXIII. 1905., Hamburg, 1906, pp. 147-188.

1928. *Alloscopus tetracanthus* Handschin, *Treubia,* **10**: 267.

1971. *Alloscopus tetracanthus*: Prabhoo, *Oriental insect,* **5** (1): 33.

*Material Examined:* 1 ex. on the slide, 3 exs. in alcohol, India: Andaman and Nicobar Islands: Kadamtala forest Rangat Tehsil, North and Middle Andaman District.,19. iii.2004, 12.3467° N 92.7755° E, coll. A.K. Hazra and Party (Regn. No. 3312/H14).

*Diagnosis:* Body up to 1.6 mm long. Body colour white. Subdivided Ant. I. The Head is without eyes. Spiny and short hair present on Tenent. Furca is well developed.

*Distribution:* India: Andaman and Nicobar Islands, Puducherry, Sikkim, Tripura, West Bengal. Elsewhere: Australia, Indonesia, Malaysia, Melanesia and Micronesia, Myanmar, Thailand.

*Remarks:* Newly recorded from Andaman and Nicobar Islands.

Family PARONELLIDAE Börner, 1906

Genus ***Cyphoderus*** Nicolet, 1842

**8. *Cyphoderus javanus*** Börner, 1906

1906. *Cyphoderus javanus* Börner, *Mitt. Natt. Hist. Mus. Hamberg,* **23**: 180.

*Material examined:* From Literature.

*Diagnosis:* Non-pigmented white body. Eyes absent, elongated mucro with a well-developed lamellate anterior apical tooth. Dense possess large fringed scales, both unguis and unguiculus have enlarged wing-like teeth.

*Distribution:* India: Andaman and Nicobar Islands, Arunachal Pradesh, Kerala, Manipur, Sikkim, Uttrakhand, West Bengal (Kolkata). Elsewhere: Brazil, Indonesia, Japan, Java, Malaya, Malaysia, Melanesia and Micronesia, New Caledonia, Thailand.

*Remarks:* This species is widely distributed in the subtropics of Asia and America. Hazra and Mandal (2012) reported this species from a roadside nallah near Shyamnagar from Havelock Islands.

**Genus *Salina*** MacGillivary, 1894

**9. *Salina (Salina) montana*** (Imms, 1912) Salmon, 1957

1912. *Cremastocephalus montanus* Imms. *Proc. Soc. London, pp.* 80-125.

1957a. *Salina montana* Salmon, *Acta. Zool. Cracov*., **11**(14): 313-362.

*Material examined:* From Literature.

*Diagnosis:* Body size is up to 2 mm. Head and body ground colour are white but sometimes it could be pale yellow; the pear-shaped head has 1+1 dark ocellar field, each with 8 + 8 ocelli. Relative length index of the antennal segment = 47 : 67 : 57 : 93; Th. II: III = 29: 17; Relative length index of Abds I: II : III: IV : V: VI = 13: 23 : 4: 79 : 14: 8.5; Manubrium: Mucrodens = 58: 63; Mucro short, broad, prominently lobed into three teeth, dental scale appendage large, striated apically, sub equal to the length of mucro.

*Distribution:* India: Andaman and Nicobar Islands, Arunachal Pradesh, Manipur, Uttar Pradesh and West Bengal. Elsewhere: Himalayan region.

*Remarks:* This species is widely distributed in the Himalayan and Indian regions. Hazra and Mandal (2012) reported this species from the Hill Stream near the Kadamtala forest of North Andaman.

**10. *Salina (Salina) striata*** (Handschin, 1928) Handschin, 1929

1928**.** *Cremastocephalus striatus* Handschin, *Treubia,* **10**: 245-270.

1929. *Salina striata* Handschin, *Revue Suisse de Zool.,* **36**: 229-262.

*Material examined:* From Literature.

*Diagnosis:* Body length is up to 3 mm white in colour but inclining towards yellow; pear-shaped head dorsally, 1 + 1 frontal spines present; oceli 8 + 8. Relative length index of Antennal segment = 22: 33: 42 : Th. II: III = 15: 9. Abds I: II : III: IV : V: VI = 8 : 14: 3: 41 : 7 : 3; Manubrium: Mucrodens = 28: 33. Mucro short, broad, prominently lobed into three teeth.

*Distribution:* India: Andaman and Nicobar Islands, Arunachal Pradesh, Assam.

*Remarks:* Endemic to India. Hazra and Mandal (2012) reported this species from Mount Harriet Reserve Forest of Port Blair and 5 kms away from Chidiya Tapu Forest rest house towards Munda Pahar.

**11. *Salina (Salina) indica*** (Imms, 1912) Salmon, 1957

1912. *Cremastocephalus indicus* Imms, *Proc. Zoo I. Soc. London,* pp. 80-125.

1957. *Salina indica* Salmon, *Acta. Zool. Cracov*. **11**(14): 313-363.

*Material examined:* From Literature.

*Diagnosis:* Ground colour yellowish, terga with discontinuous violet pigmented edge line. Ocelli is 8+8 and black. General clothing of short to medium-length ciliated setae with some long, stout, and lightly flexed ciliated setae at the apex of mesotergum and along the dorsal surface of the thorax. The apex of dens with scale-like appendage. Mucro bears three plain teeth.

*Distribution:* India: Andaman and Nicobar Islands, Arunachal Pradesh, Manipur, Sikkim, Tripura (West and South distts.), Uttar Pradesh and West Bengal. Elsewhere: Indonesia, Malaysia, Timor-Leste.

*Remarks:* This species is widely distributed in the subtropics of the Indian Sub-continent. Hazra and Mandal (2012) reported this species from Hill Stream near Kadamtala Forest, one kilometer away from the Chidiya Tapu Forest rest house.

**Genus *Callyntrura*** Börner, 1906

**12. *Callyntrura japonica*** (Kinoshita, 1917) Yosii, 1969

1917. *Paronella japonica* Kinoshita, *Dobutsugaku zasshi*, **29**: 44-46.

1977. *Callyntrura japonica* Yosii, *Cont. Bio. Lab., Kyoto Univ.* **25**(2): 141-170.

*Material examined:* From Literature.

*Diagnosis:* Maximum body size is 3 mm. Creamish white body ground colour is observed. Scaled antennae. Dark coloured head whereas antennal base deep in colour. Thorax is obscurely dusky all over along the marginal area of each segment. IV$^{th}$ abdominal segments bear a narrow transverse patch. The ventral tube is deeply dark. Furca long-scaled dens without spines but with a prominent dorsal vesicle. Mucro elongated with teeth.

*Distribution:* India: Andaman and Nicobar Islands, Arunachal Pradesh, Manipur, Meghalaya. Elsewhere: China, Japan, Myanmar, Thailand.

*Remarks:* This species is widely distributed in the tropics and subtropics in Asia. Hazra and Mandal (2012) reported this species from the Hill Stream near Kadamtala in North Andaman and from the roadside nallah near Bannanalla in South Andaman.

**Genus *Dicranocentroides*** Imms, 1912

**13. *Dicranocentroides fasciculatus*** Imms, 1912

1912. *Dicranocentroides fasciculatus* Imms. *Proc. Zool. Soc. London*, pp. 80-125.

*Material examined:* From Literature.

*Diagnosis:* Head with 1 + 1 dark ocellar field. Mesothorax is characterized by reddish to brown pigments. The color of Abds III to V is dark brown; Relative length index of Th II: III is 46: 32; the Relative length index of Abds I: II : III: IV : V: VI : 21: 21 : 13: 108 : 9: 4. Manubrium: Mucrodens 85: 122; each dentes armed with an inner row of spines which transit into stiff ciliated setae distally, mucro large with 5-6 teeth.

*Distribution:* India: Andaman and Nicobar Islands, Arunachal Pradesh, Manipur, Nagaland, Sikkim and Uttar Pradesh. Elsewhere: Myanmar, Thailand.

*Remarks:* This species is widely distributed in the subtropics of the Indian subcontinent. Hazra and Mandal (2012) reported this species from Mount Harriet Reserve Forest of Port Blair and from Chidiya Tapu Forest rest house towards Munda Pahar.

**14. *Dicranocentroides flavescens*** Yosii, 1966

1966b. *Dicranocentroides flavescens.* f. n. *flavescens* Yosii. *Res. Kyoto. Univ. Sci. Exped. Karakoram and Hindukush,* 1955, **8**: 333-405.

*Material examined:* From Literature.

*Diagnosis:* Maximum body length 3.5 mm. The characteristic of the species is the presence of a dark patch on the vertex in between two ocellar fields. The body is devoid of dark patches. Ocelli 8 + 8. Relative length index of Ant.I: II : III : IV = 15 : 17 : 12 : 19. Ths. II: III = 14: 8.5. Similar legs having lanceolate unguiculus and 2 external acuminated teeth. Relative length index of Abds I: II : III: IV : V: VI = 5: 6 : 4: 39 : 5.5: 2. Anterior part of the Ventral tube has a row of microchaeta. Manubrium:Mucrodens 28: 38, inner margin of the dentes is equipped with two closely juxtaposed rows of spines; large mucro with '6' teeth on the parallel sides.

*Distribution:* India: Andaman and Nicobar Islands, Arunachal Pradesh, Kerala, Manipur, Mizoram, Nagaland, and Uttarakhand.

*Remarks:* Endemic to India. Hazra and Mandal (2012) reported this species from Mount Harriet Reserve Forest of Port Blair and Chidiya Tapu Forest rest house.

Family ENTOMOBRYIDAE Schäffer, 1896 sensu Zhang F *et al.*, 2019

Genus ***Epimetrura*** Schött, 1925

**15. *Epimetrura caudata*** (Carpenter, 1917) Denis, 1948

1917. *Lepidocyrtus caudatus* Carpenter, *Rec. Ind. Mus. Cal.*, **8**(ix): 561-568.

1948. *Ceratrimeria caudatus* Denis, *Notes Ent. chin.*, **12**: 184.

*Material examined:* From Literature.

*Diagnosis:* Specimen is pale yellow with violet patches on antennal segments, Th. II and Abd. III, IV and V could be marked with violet-coloured spots. Slightly prominent mesonotum half the size of metanotum. Abd.IV six times as long as Abd. III. Abd. VI. extend into a slender cerciform process.

*Distribution:* India: Andaman and Nicobar Islands, Arunachal Pradesh, Manipur, Sikkim, Uttarakhand. Elsewhere: Myanmar, Thailand

*Remarks:* This species is widely distributed in the subtropics of the Indian subcontinent. Hazra and Mandal (2012) reported this species from Mount Harriet, Port Blair.

**Genus *Sinella*** Brook, 1882

**16. *Sinella curviseta*** Brook, 1882

1966a. *Sinella curviseta* Yosii, *J. Coli. Arts. and Sci. Chiba. Univ.*, **4**(4): 461-531.

*Material examined:* From Literature.

*Diagnosis:* White with pigments only limited to the eyes; Red-coloured pigmented granules are scattered all over the body. Eyes with no separate patches and numerous but extremely minute blunt setae are found on the apical half of the third antennal segment. Clavate tenant hair. A minute apical tooth is present on the unguis, unguiculus acuminate and mucro has a very long basal spine.

*Distribution:* India: Andaman and Nicobar Islands, Arunachal Pradesh, Sikkim, Uttarakhand. Elsewhere: China, Europe, French Guiana, Guyana, Hawaii, Japan, Kazakhstan, Mongolia, Myanmar, North America, Thailand.

*Remarks:* This species is widely distributed in the template of the old world, tropics and subtropics of the new world and Indian sub-continent. Hazra and Mandal (2012) reported this species from the Avis Islands, North Andaman.

**Genus *Lepidocyrtus*** Bourlet, 1839

**17. *Lepidocyrtus (Lepidocyrtus) curvicollis*** Bourlet, 1839

1839. *Lepidocyrtus curvicollis* Bourlet, *Mém. Soc. R. Sci, Agri. Arts., Lille*., pp. 377-418

*Material examined:* From Literature.

*Diagnosis:* Maximum body length is 2.0 mm. slightly brown tinge on the ground color which is white. Blue-coloured antennae distally from each other. Slightly blue pigments are present on the basal two segments of each leg. Between two black eyes, a black spot is present. Ant. and head ratio is 2: 1. Ant. segment ratio is 1 : 2 :

3. Scaled antennae up to basal part of Ant. IV. Meso thorax is moderately hanging over the head. Th. II : III as 2 : 1. Abd. III/IV as 1: 4. Legs are scaled until to the tibiotarsus. Manubrium : Dens = 25 : 26. Dental appendix is not present in Dentes. A basal spine is present on the bidentate Mucro.

*Distribution:* India: Andaman and Nicobar Islands, Arunachal Pradesh, Uttarakhand. Elsewhere: Armenia, China, Cyprus, Europe, Japan, Micronesia, North America (Canada).

*Remarks:* This species is widely distributed in the Mediterranean and temperate of the Old and New World. Hazra and Mandal (2012) reported this species from a roadside nallah near Shyamnagar on Havelock Island.

**18. *Lepidocyrtus (Lepidocyrtus) magnificus*** Carpenter, 1924

1924. *Lepidocyrtus (Lepidocyrtus) magnificus* Carpenter, *Rec. Ind. Mus. Cal.,* **26**: 285-289.

*Material examined:* From Literature.

*Diagnosis:* Antennal length is two times more than that of the head, Ant. III and IV are pale yellow colored whereas Th. II, III and last abdominal segment are dark violets in color. The third antennal segment is relatively shorter than the other three segments. The mesonotum is four times as long as the metanotum. Abd. IV. seven times as long as Abd. III. Mucro is stout with strong teeth, and the dorsal spine is short.

*Distribution:* India: Andaman and Nicobar Islands, Arunachal Pradesh, Assam, Manipur, Mizoram, Sikkim, Tripura (West Distt.), Uttarakhand. Elsewhere: Myanmar, Thailand.

*Remarks:* This species is widely distributed in the subtropics of the Indian subcontinent. Hazra and Mandal (2012) reported this species from Haprigang, South Andaman.

**19. *Lepidocyrtus (Ascocyrtus) suborientalis*** (Yosii 1959) Ellis, WN and Bellinger, 1973

1959. *Ascocyrtus suborientalis* Yosii, *Contributions from the Biological Laboratory Kyoto University*, No.**10**, pp. 1-65.

1973. *Lepidocyrtus (Ascocyrtus) suborientalis* Ellis, WN and Bellinger. *Monografieën van de Nederlandse Entomologische Vereniging,* **7**: 1-74.

*Material examined:* 1 ex. on slide 14 exs. in alcohol, India: Andaman and Nicobar Islands, APWD Guest House, Diglipur, North and Middle Andaman district, 26. xi.2018 - 02. xii.2018., 13°14'41"N 92°58'32"E, coll. Rajmohana (Regn. No. 3310/H14).

*Diagnosis:* Body length is 1.8 mm. The body colour is stramineous white. Antennae are bluish throughout the length. The distal part of each segment is deeply pigmented. Eyes 8+8 and black. A black spot is between two antennal bases. Lateral margin of Th. II, III and Abd. It is with a slight violet tinge. Abd III: IV as 9:40. Ant. / Head as 55:20. Antennal segments as 25:45:35:55. Th. II: III as 2:1. The Dental lobe is well developed and a dorsal appendage is round on the apex. Ventrally, dental scales are minute. All of the dental setae are elongated and the two inner rows are more filiform than those of the outer rows. Mucro bidentate, apical and anteapical tooth subequal.

*Distribution:* India: Andaman and Nicobar Islands, Himachal Pradesh. Elsewhere: Myanmar, Thailand.

*Remarks:* This species is newly recorded from Andaman and Nicobar Islands.

**20. *Lepidocyrtus (Setogaster) indicus*** Handschin, 1929

1929. *Lepidocyrtus (Setogaster) indicus* Handschin, *Cont. S. Indian fauna,* **36** (16): 229-262.

*Material examined:* 1 ex. on slide 5 exs. in alcohol, India: Andaman and Nicobar Islands, Govinda Nagar, Great Nicobar, Nicobar district, 10. iv.2016., 07°00.050'N 93°53.752'E, coll. Dilip Mondal (Regn. No. 3311/H14).

*Diagnosis:* Body length 2 mm. yellowish-white coloured body. Abd. I and III possess diffused traces of pigment. Femur III is coloured with a distal dark ring. Mucro bidentate with basal spine. Annulated dense is present.

*Distribution:* India: Andaman and Nicobar Islands, Jharkhand, Tamil Nadu. Elsewhere: Indonesia, Malaysia, Timor-Leste.

*Remarks:* Newly recorded from Andaman and Nicobar Islands.

**21. *Lepidocyrtus (Acrocyrtus) heterolepis*** Yosii, 1959

1959. *Lepidocyrtus (Acrocyrtus) heterolepis* Yossi, *Cont. Biol. Lab. Kyoto. Univ.*, **10**: 33.

*Material examined:* From Literature.

*Diagnosis:* Body length is up to 1.6 mm. Blue-colored pigments are uniformly distributed over antennae. Along the fore margin of the head, a transverse stripe is seen. Black eyes are present. Ant. segment ratio is 15 : 30 : 28 : 48. Th. II. is slightly protruded over the head. Th. II, III as 75 : 25. Abd.III: IV as 3: 12. Manubrium: Dens as 24: 28 . Bidentate mucro having two subequal teeth and basal spine is present.

*Distribution:* India: Andaman and Nicobar Islands, Arunachal Pradesh, Manipur, Uttarakhand. Elsewhere: Indonesia, Malay, Malaysia, Thailand, Timor-Leste.

*Remarks:* This species is widely distributed in the subtropics of the Indian subcontinent. Hazra and Mandal (2012) reported this species from a roadside nallah near Shyamnagar, Havelock Islands.

**22. *Lepidocyrtus (Acrocyrtus) malayanus*** Yosii, 1959

1959. *Lepidocyrtus (Acrocyrtus) malayanus* Yosii, *Contr. Bioi. Lab. Kyoto. Univ.,* **10**: 28.

*Material examined:* From Literature.

*Diagnosis:* The size of the body is 2.5 mm with ground colour brownish white pigment, from Ant. II. The antennae have bluish pigment on the distal side. On the dorsal side of the Ant I and II scales are present. The ratio of Antennal segs. = 9: 18 : 11: 23. Eyes 6+6. Th II : III = 7 : 3; Abd. III: IV = 1: 5. Manubrium: dentes = 9: 8. The Dorsal appendix of the dental lobe is prominent, and acutely pointed in profile.

*Distribution:* India: Andaman and Nicobar Islands, Arunachal Pradesh, Manipur, Sikkim, Uttarakhand. Elsewhere: Indonesia, Malaysia, Timor-Leste.

*Remarks:* This species is widely distributed in the subtropics of the Indian subcontinent. Hazra and Mandal (2012) reported this species from a Horticulture farm near Cipighat, South Andaman.

**Genus *Seira*** Lubbock, 1870

**23. *Seira(Seira) cinerea*** Yosii, 1966

1966b. *Seira cinerea* Yosii, *Res. Kyoto U. Exped. Karakoram,* **8**: 364-365.

*Material examined:* 1 ex. on slide 5 exs. in alcohol, India: Andaman and Nicobar Islands, Chouldari, Ferrargunj Tehsil, South Andaman, 13. vii.2004, 11.6405° N 92.6611° E, coll. A.K. Hazra and Party (Regn. No. 3313/H14).

*Diagnosis:* Body length is 1.4 mm. Ground colour bluish grey, slightly brown with scales. Antennae are slightly darker upon the proximal two segments. The head is coloured ventrally. Eyes 6+6 in a common dark patch. Th. II anteriorly and Th. III-abd. II posteriorly with colored margins. A suffusion of bluish-gray pigments covering laterally from Th. III to Abd. V and colour of both sides are connected dorsally upon abd. III, where the segment is darkly pigmented all over. Ant/Head as 8:3.Ant. ratio as 25:38:35:65. Ant. IV indistinctly annulated. Unguis straight with one inner basal and two inner distal teeth. Abd. III/IV as 2:9. Unguiculus lanceolated, acute at apex. Furca ratio as 7:8. Dental annulation abruptly ending and mucro falciform.

*Distribution:* India: Andaman and Nicobar Islands, Maharashtra, Punjab, Lakshadweep, West Bengal

*Remarks:* Endemic to India. This species is newly recorded from Andaman and Nicobar Islands.

**24. *Seira (Seira) indica*** (Ritter, 1911) Yosii, 1966

1911. *Calistocyrtus indicus* Ritter, *Ann. K. K. naturh. Hofmus. Wien*, **24**: 391-394.

1966. *Siera indica* Yosii, *Kyoto Univ. Sci. Exp*. 1955, **8**: 333-405.

*Material examined:* From Literature.

*Diagnosis:* Usually Slender body,1.8 mm in length. The entire length of Abd. II, III as well as some spots of head and Th. II is covered with Yellowish brown pigments. Ant. segment ratio is 7: 9 : 9: 45. Up to III$^{rd}$ antennal segment Antenna has scales on the dorsal side whereas Ant. IV is vaguely annulated.

*Distribution:* India: Andaman and Nicobar Islands, Arunachal Pradesh, Maharashtra, Uttarakhand.

*Remarks:* Endemic to India. This species is widely distributed in the tropics and subtropics of the Old and New World. Hazra and Mandal (2012) reported this species from the Crab Islands, North Andaman.

## Discussion

The present study deals with a comprehensive detail of Apterygota fauna from the Andaman and Nicobar Islands. This paper includes six species of Collembola newly reported from Andaman and Nicobar Islands. Earlier, Hazra and Mandal (2012) reported 18 species of

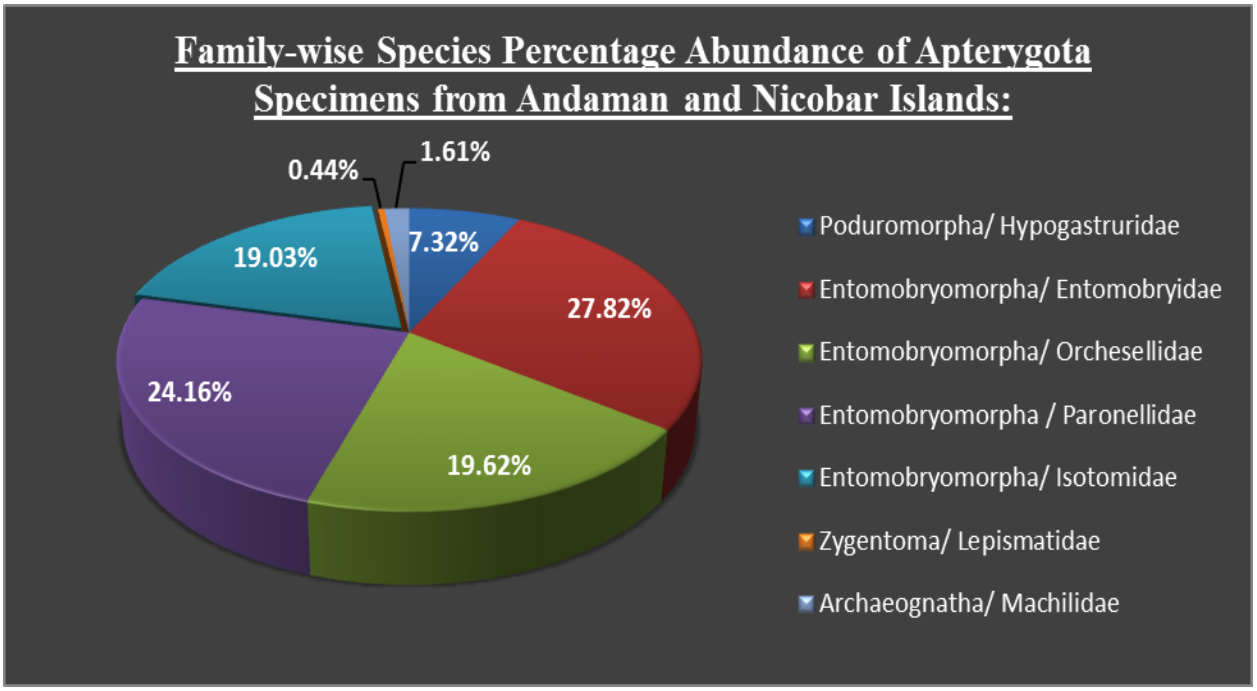


**Figure 1.** Family-wise species percentage of Apterygota fauna from Andaman and Nicobar Islands.

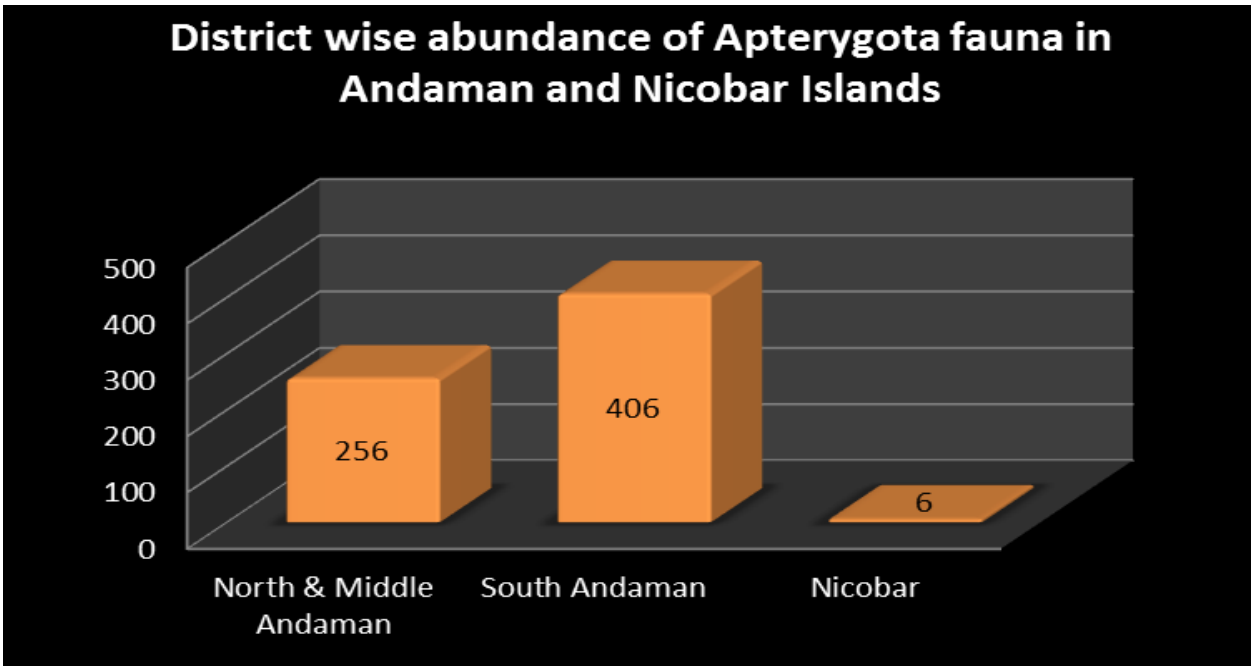


**Figure 2.** Abundance of Apterygota fauna in Andaman and Nicobar Islands (District wise).

Collembola under 11 genera of 3 families and 02 species of Archaeognatha under single genera of family Machilidae, 01 species of Zygentoma of family Lepismatidae fauna from Andaman and Nicobar Islands are mostly recorded from South Andaman and very less from Nicobar group of Islands (Figure 2). Collembolan species from the Islands are mostly studied in the middle and South Andaman group of Islands whereas very few studies have been done from the Nicobar Islands, with only one species *Lepidocyrtus (Setogaster) indicus* Handschin, 1929


**Plate 1.** **A.** *Proisotoma senetijohani* Baijal & Chandra, 1970; **B.** *Ballistrura fitchi* (Denis, 1933) Potapov, 2001; **C.** *Alloscopus tetracanthus* (Börner, 1906) Handschin, 1928; **D.** *Lepidocyrtus (Ascocyrtus) suborientalis* (Yosii 1959) Ellis, WN & Bellinger, 1973; **E.** *Lepidocyrtus (Setogaster) indicus* Handschin, 1929; **F.** *Seira(Seira) cinerea* Yosii, 1966

of family Entomobryidae with 06 specimens collected and identified from Great Nicobar Islands. Family Hypogastruridae is reported with 02 species under 02 genera of a single family. Family Isotomidae is represented by 03 species under 03 genera of which 02 species under 02 genera are new records. Family Orchesellidae is represented by 02 species under 02 genera of which 01 species are newly record. Family Entomobryidae is the largest group studied with 10 species under 03 genera (Figure 1). Genus *Lepidocyrtus* of the family Entombryidae is widely distributed in both Andaman and Nicobar Islands 07 species have been reported with 02 species newly recorded and 01 species from Genus *Seira* has been newly recorded. The family Paronellidae is represented by 07 species under 05 genera. Genus *Cyphoderus* and genus *Alloscopus* are the least studied specimens from the family Paronellidae and Orchesellidae respectively. It is found in our study that 08 species of collembola out of 24 species from these Islands are endemic to India. Therefore, more studies on the Apterygota fauna of Andaman and Nicobar Islands may be done in the future.

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