Diversity of Arthropods in Class Myriapoda: Chilopoda from the Balaghat Region in Dharashiv (Osmanabad), Maharashtra.

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ABSTRACT:

Arthropoda is the largest phylum in the animal kingdom which includes more than 80% of all known living species. Arthropods having segmented body with chitinous exoskeleton and jointed limbs. They vary in a various shapes and sizes, including insects, spiders, crabs, lobsters, mites, scorpions, centipedes, and millipedes. Myriapods played pivotal role in studying evolutionary relationships. Arthropods can be advantageous to people in addition to playing critical functions in the upkeep of the ecosystem. Arthropods can be advantageous to people in addition to playing critical functions in the upkeep of the ecosystem. For instance, a variety of insects help pollinate plants, create beneficial compounds, manage pests, and provide food for both humans and other animals. Others are scavengers or decomposers; they break down dead plants and animals and turn them into soil nutrients. Examples of these organisms include mites, isopods, myriapods, and insects. Due to their high human consumption, several crustacean species—including shrimp, crayfish, lobsters, and crabs—are intensively farmed for food on a commercial basis. On the other hand, some crayfish and insects are extremely invasive species that pose a major danger to biodiversity globally and call for stringent management measures. Some are hematophagous, which function as pests of stored goods and cultivated plants.

Keywords: Biodiversity, ecology, Centipedes, Millipedes, Insects, Spiders etc.

INTRODUCTION:

New insights into the morphology, systematics, and biogeography of centipedes have positioned these predatory terrestrial arthropods at the forefront of evolutionary study. Additionally, centipedes have been essential to our comprehension of high-level arthropod connections **(Adis J, Harvey MS. 2000)**. Their current global distribution can be explained by their rich evolutionary history, which spans 420 million years according to the fossil record. Evolutionary theories of their biology are supported by a stable phylogeny that has been obtained through recent analysis of combined morphological and molecular data. Studying arthropod segmentation focuses on the centipede trunk, whose first pair of legs are changed into a venom-delivering organ and then 15 to 191 leg pairs **(Anderson LI, Trewin NH. 2003)**. Significant problems in evolutionary developmental biology about the frequently group-specific fixed number of trunk segments, how some centipedes add segments following hatching, while others hatch with all of their segments, the segments that have been added by evolution, and the always odd number of leg-bearing trunk segments. The multi-legged, tracheate, terrestrial arthropods are called myriapods **(Bonato L, Minelli A. 2002.).** Four groups of myriapods, very different in morphology, ecology and behavior, are recognized: the centipedes, or Chilopoda, predators provided with poison claws; the millipedes, or Diplopoda, mainly living on decaying plant matter; and the two lesser groups, Symphyla and Pauropoda, whose representatives, of small or very small size, mainly feed on plant matters and fungal

hyphae and spores, respectively. Classified in the past as the closest ancestors of insects, myriapods are currently viewed as the sister group of the large lineage of Pancrustacea, to which both insects and crustaceans are ascribed. The unique characteristic of centipedes, which are elongated, nocturnal, multi-segmented arthropods, is that all but the last body segment has two legs. In reality, the first set of legs on the cranial segment are altered to function as forcipules, a pincer-like device that pricks prey with venom. Two filamentous caudal appendages, which are absent during envenomation, are present in the last segment. There are more than 3000 species, with body segments ranging from 15 to more than 100 and sizes ranging from 1 to 30 cm **(Arthur W, Kettle C. 2001).** Centipedes are classified into four groups: *Lithobiomorpha (*garden or rock centipedes), *Geophiulomorpha* (soil centipedes), *Scolopendromorpha* (tropical or huge centipedes), and *Scutigeromorpha* (house or feather centipedes). Of these orders, only two—*Scopendromorpha* and *Scutigeromorpha*—are found in the world.

STUDY SITE:

The field of research The Balaghats region in Maharashtra's Dharashiv (Osmanabad) district covers an area of about 100 sq. km. It is situated between longitude 76°04′25′E and latitude 18°19′10′N. The region receives average rainfall during the northeast monsoon. The area has annual temperatures between 28 and 42 degrees Celsius and rainfall between 126 and 128 millimeters. Perceived humidity in Dharashiv (Osmanabad) fluctuates a lot year-round. The muggier months of the year are defined as the 6.0 months from 07/05/2023 to 5/11/2023. At least 25% of the days during this period are muggy, stifling, or depressing. In Dharashiv (Osmanabad), July has the most humid days with 29.0 days that are at least slightly humid. February has the fewest days in Osmanabad that are hot and humid, with 0.6 days that are at least that. The research region is a deep forest mostly covered in trees, bushes, plants, and herbs with minimal anthropogenic intrusions. All study locations were selected at random: 1. Yedashi 2. Tuljapur 3. Ramling 4. Bembeli 5. Kalamb 6. Washi 7. Kati

Photoplate:1



MATERIAL AND METHODS:

Survey was conducted weekly in early morning 06:00 am to 08:00 am: and the photographs (using NIKON P510) were also generated. Population density was estimated by using field survey method and data selected from various sites were recorded for analysis. During our study, we have not disturbed the native ecosystem and obeyed the biodiversity regulations and we have untouched the bird species for the conservation. The Samples were collected in bottles and observed their morphological characters.

Photoplate:2



Scolopendra amazonica



Scolopendra morsitans



Asanada indica



Rhysida nuda

RESULT AND DISCUSSION:

Table:1

It's important to consider the ecological implications of these abundance patterns, such as the impact of environmental factors on centipede populations and the potential interactions between species, with 57 in the summer, 33 in the monsoon, and 69 in the winter, *Rhysida nuda* has the greatest abundance of any species **(Balan D, Sureshan P. 2017)**. Seasonal variations in the abundance of numerous species suggest that centipede populations are affected by them. A few species exhibit remarkable abundance in one or more seasons, including *Asanada brevicornis, Otostigmus orientalis,* and *Scolopendra amazonica* **(Vinod Khanna 2008).** Certain species exhibit low or absent occurrence

Sr.No.	Scientific Names	Summer	Monsoon	Winter	Total
1	*Scolopendra amazonica*	60	101	115	276
2	*Scolopendra morsitans*	09	16	11	36
3	*Scolopendra hardwickei*	03	0	04	7
4	*Scolopendra punensis*	07	11	01	19
5	*Scolopendra andhrensis*	01	0	02	3
6	*Cormocepbalus pilosus*	04	02	01	7
7	*Cormocepbalus nudipes*	01	0	0	1
8	*Cormocepbalus pseudonudipes*	04	0	00	4
9	*Asanada brevicornis*	17	09	05	31
10	*Asanada sokotrana*	01	00	04	5
11	*Asanada indica*	03	00	00	3
12	*Digitipes barnabasi*	00	05	02	7
13	*Otostigmus (Otostigmus) orientalis*	09	11	08	28
14	*Rhysida nuda*	57	33	69	159
15	*Rhysida Iithobioides*	04	07	16	27

throughout specific seasons, as indicated by their zero counts at such times. The ecological ramifications of these patterns of abundance must be taken into account. These include the effects of environmental conditions on centipede populations and possible interactions across species. *Rhysida nuda* is the species with the highest abundance, with 57 in the summer, 33 in the monsoon, and 69 in the winter. Seasonal differences in many species' abundance imply that they have an impact on centipede populations. A few species *Asanada brevicornis*, *Otostigmus orientalis,* and *Scolopendra amazonica* show

exceptionally high abundance in one or more seasons. Some species are rare or non-existent during some seasons, as their zero counts during those seasons suggest.

Table:2: Diversity Indices

Diversity Indices	Summer	Monsoon	Winter
Taxa_S	14	9	12
Individuals	180	195	238
Dominance_D	0.229	0.3142	0.3265
Simpson_1-D	0.771	0.6858	0.6735
Shannon_H	1.856	1.573	1.493
Evenness_e^H/S	0.4569	0.5358	0.3708
Brillouin	1.736	1.492	1.414
Menhinick	1.043	0.6445	0.7778
Margalef	2.503	1.517	2.01
Equitability_J	0.7032	0.716	0.6008
Fisher_alpha	3.548	1.95	2.665
Berger-Parker	0.3333	0.5179	0.4832
Chao-1	17	9	12.33

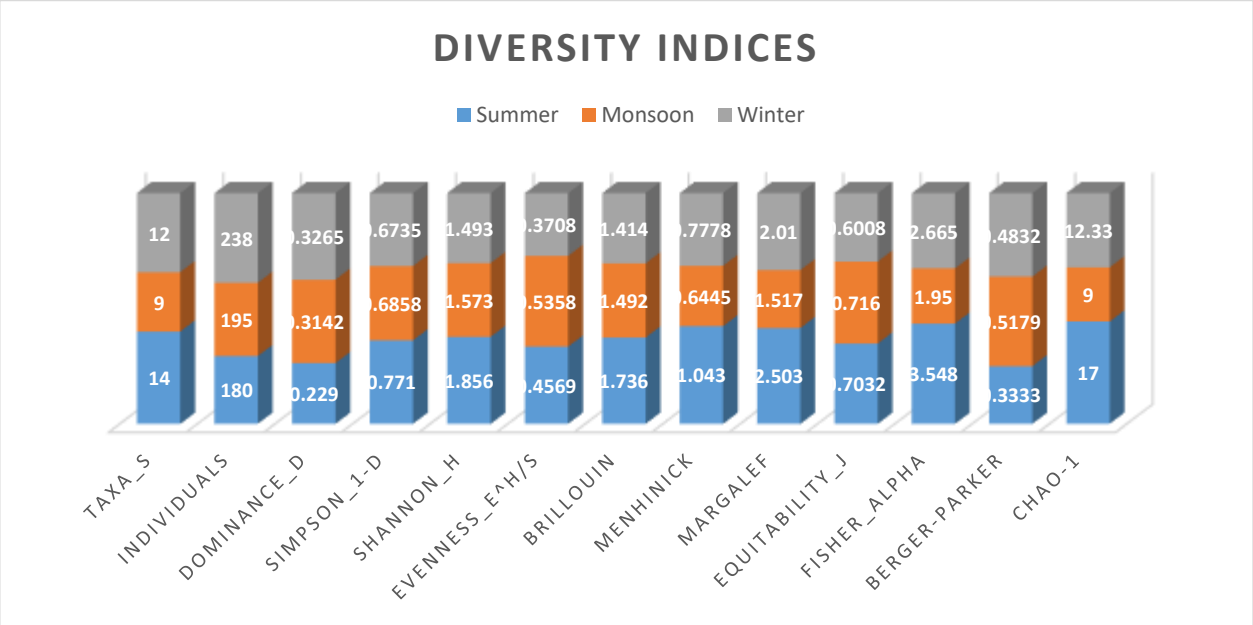


Chart:1

The provided ecological diversity indices for the three seasons (Summer, Monsoon, and Winter): The species richness is the number of different species present, Summer has the highest species richness, followed by Winter, and Monsoon. The total number of individuals in the community is highest during Winter, followed by Monsoon and Summer. Dominance values indicate the relative abundance of different species. Winter has the highest dominance, followed by Monsoon and Summer. Simpson's Diversity Index considers both species richness and evenness. Summer has the highest diversity, followed by Monsoon and Winter. Shannon's Diversity Index measures the uncertainty or entropy in the community. Summer has the highest diversity, followed by Monsoon and Winter. Evenness measures how evenly individuals are distributed among different species. Monsoon has the highest evenness, followed by Summer and Winter. The Brillouin Index is another measure of diversity considering both richness and evenness. Summer has the highest index, followed by Monsoon and Winter. Menhinick's Index measures species richness relative to the number of individuals. Summer has the highest index, followed by Winter and Monsoon. Margalef's Index measures the richness of the community relative to the number of individuals. Summer has the highest index, followed by Winter and Monsoon.

Equitability measures how evenly individuals are distributed among different species. Monsoon has the highest equitability, followed by Summer and Winter. Fisher's Alpha is a parameter of the log-series model. Summer has the highest alpha, followed by Winter and Monsoon. The Berger-Parker Index measures the dominance of the most abundant

species. Summer has the lowest dominance, followed by Winter and Monsoon.Chao-1 is a non-parametric estimator of species richness. Summer has the highest estimated richness, followed by Winter and Monsoon. The abundance of different species of centipedes (Scientific Names) in three different seasons: Summer, Monsoon, and Winter. Let's analyse and summarize the data: **Abundance:** *Rhysida nuda* has the highest abundance across all seasons, with 57 in Summer, 33 in Monsoon, and 69 in Winter. **Seasonal Variation:** The abundance of many species varies across seasons, indicating a seasonal impact on centipede populations. **Species Specifics:** Some species like *Scolopendra amazonica, Asanada brevicornis,* and *Otostigmus orientalis* show notable abundance in one or more seasons. **Zero Counts**: Some species have zero counts in certain seasons, indicating absence or low occurrence during those periods.

Chart. 2 Hierarchical Clustering

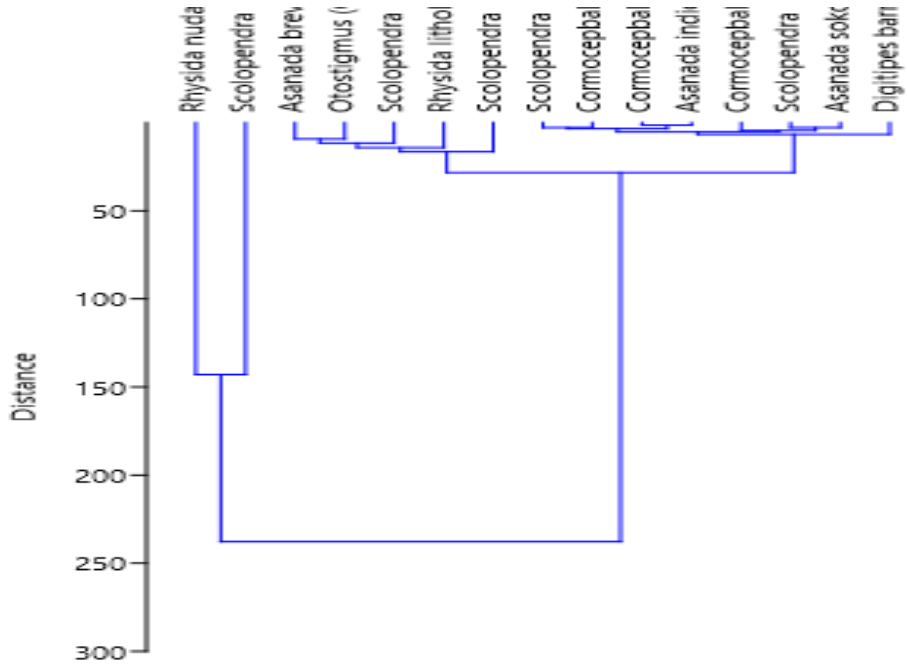


Table. 3

Species Groups	Closeness in Clustering	Interpretation
Scolopendra species	Very close	Highly similar group
Rhysida species	Close, merging later with *Scolopendra*	Related but distinct
Comocrypta & *Asanada*	Moderately related	Some shared traits but distinct
Cormocephalus species	Related to *Scolopendra*	Moderate relationship
Diglyphus species	Very distant	Likely a different taxonomic group

Several Scolopendra species grouped at a low distance show high similarity and share key genetic and morphological traits, making them close relatives within the centipede family *(Warut Siriwut,et. al,.2016)*

Detailed Relationship Analysis

1. Closely Related Species (Low Distance Merging)

- **Scolopendra species:**
  - Multiple *Scolopendra* species cluster together at a low y-value, indicating that they are very similar to each other.
  - This suggests they share key genetic or morphological traits.
- **Rhysida species:**
  - *Rhysida nuda* and other *Rhysida* species form a cluster before merging with *Scolopendra*.
  - This indicates that *Rhysida* species are closely related to each other but slightly distinct from *Scolopendra*.

2. Moderately Related Species (Intermediate Distance Merging)

- **Comocrypta and Asanada species:**
  - *Comocrypta* species are grouped together, forming a distinct branch before merging with *Asanada* species.
  - This suggests that *Comocrypta* and *Asanada* are related but have notable differences.
- **Cormocephalus species:**
  - These species form a cluster that eventually merges with *Scolopendra* and *Rhysida*, indicating a moderate relationship.

3. Distantly Related Species (High Distance Merging)

- **Diglyphus species:**
  - This species is the last to merge with the other clusters, meaning it is the most different from all other species in the dataset.
  - It might belong to a completely different genus or even a different family compared to the rest.
- **Asanada brevicornis and Asanada sokotrana:**
  - These two *Asanada* species are somewhat similar but still distinct from other centipedes.

CONCLUSION:

The ecological diversity varies across the seasons, with Summer generally having higher species richness and diversity, while Winter tends to have higher dominance and abundance. Monsoon shows intermediate values for many indices. It's important to consider multiple indices to get a comprehensive understanding of community structure and diversity.

REFERENCE:

1. Adis, J., and M. S. Harvey. 2000. "How Many Arachnida and Myriapoda Are There World-wide and in Amazonia?" *Studies on Neotropical Fauna and Environment* 35: 139–41.
2. Arthur, W., and C. Kettle. 2001. "Geographic Patterning of Variation in Segment Number in Geophilomorph Centipedes: Clines and Speciation." *Evolution & Development* 3: 34–40.
3. Attems, Carl Michael Theodor Graf von. 1930. *Myriapoda. 2. Scolopendromorpha*. Das Tierreich 54: 1–308.
4. Anderson, L. I., and N. H. Trewin. 2003. "An Early Devonian Arthropod Fauna from the Windyfield Cherts, Aberdeenshire, Scotland." *Palaeontology* 46: 457–509.
5. Bonato, L., and A. Minelli. 2002. "Parental Care in *Dicellophilus carniolensis* (C. L. Koch, 1847): New Behavioural Evidence with Implications for the Higher Phylogeny of Centipedes (Chilopoda)." *Zoologischer Anzeiger* 241: 193–98.
6. Balan, D., and P. Sureshan. 2017. "A New Species of Centipede of the Genus *Rhysida* Wood (Chilopoda: Scolopendromorpha) from South Western Ghats with a Key to the Species of *Rhysida* of the South Western Ghats (India)." [Journal details not provided.]
7. Missouri Department of Conservation. n.d. "Centipedes." Accessed October 22, 2026. https://mdc.mo.gov/discover-nature/field-guide/centipedes.
8. Khanna, Vinod. 2008. "Updated Checklist of Scolopendrid Centipedes (Chilopoda: Scolopendromorpha) from India." [Journal details not provided.]
9. Siriwut, Warut, Gregory D. Edgecombe, Chirasak Sutcharit, and Somsak Panha. 2016. "A Taxonomic Review of the Centipede Genus *Scolopendra* Linnaeus, 1758 (Scolopendromorpha, Scolopendridae) in Mainland Southeast Asia, with Description of a New Species from Laos." *ZooKeys* 590: 1–124.