



The response of earthworms towards a flood event in the home garden agroecosystems of an industrial region in Kerala, India



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Introduction

Earthworms help in carbon cycling, have an important role in soil food webs.

Earthworms abilities like mobility and tunneling ability help them to move freely through the soil

Eloor- Zone 1 (Industrial area), Zone 2 – partially industrial area, Zone 3- non-industrial area

Hypothesis 1- Floods can impact the species distribution, abundance and life cycle stages of earthworms in an urban area

Hypothesis 2- Earthworm population are resilient and can recover after a flood event

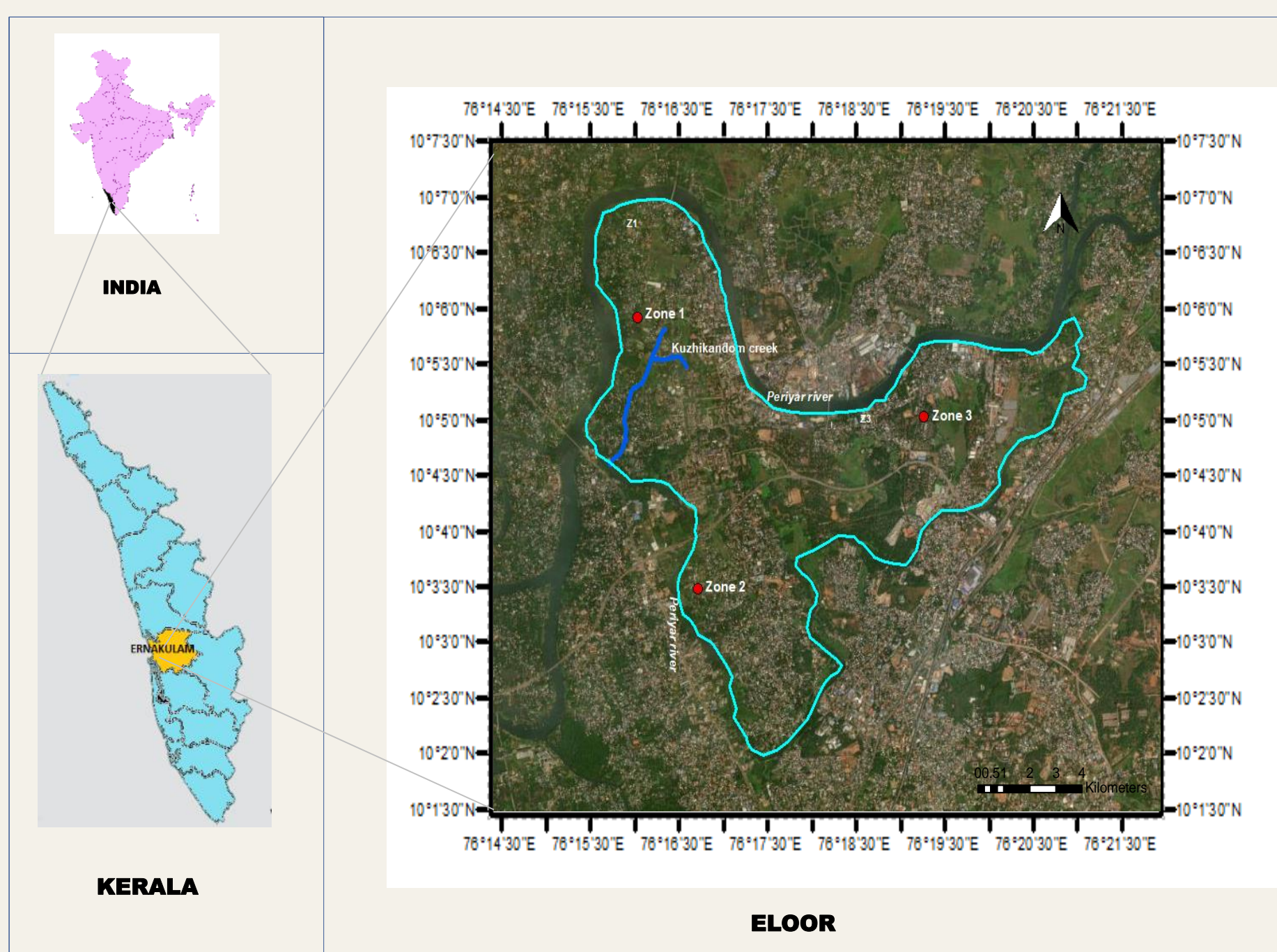


Fig 1. Study area showing the sampling locations in Eloor, Kerala, India

Materials and Methods

Soil texture and soil properties in the home gardens of three zones were determined

The species distribution and abundance of earthworms distributed three zones were assessed to study the effect of floods (2018) on earthworm

The earthworms were collected from twenty five home gardens in three zones in triplicates and abundance in each home garden noted

The earthworm abundance in home gardens before and after flood during Summer and North East monsoon in 2018

Statistical significance- ANOVA of earthworm abundance in three zones

Results

Soil texture in Eloor - sandy to sandy loam

All the home gardens were flooded in August 2018.

Species distribution varied in the home gardens

Table 1. Species distribution of earthworms in the home gardens of Eloor, Kerala, India

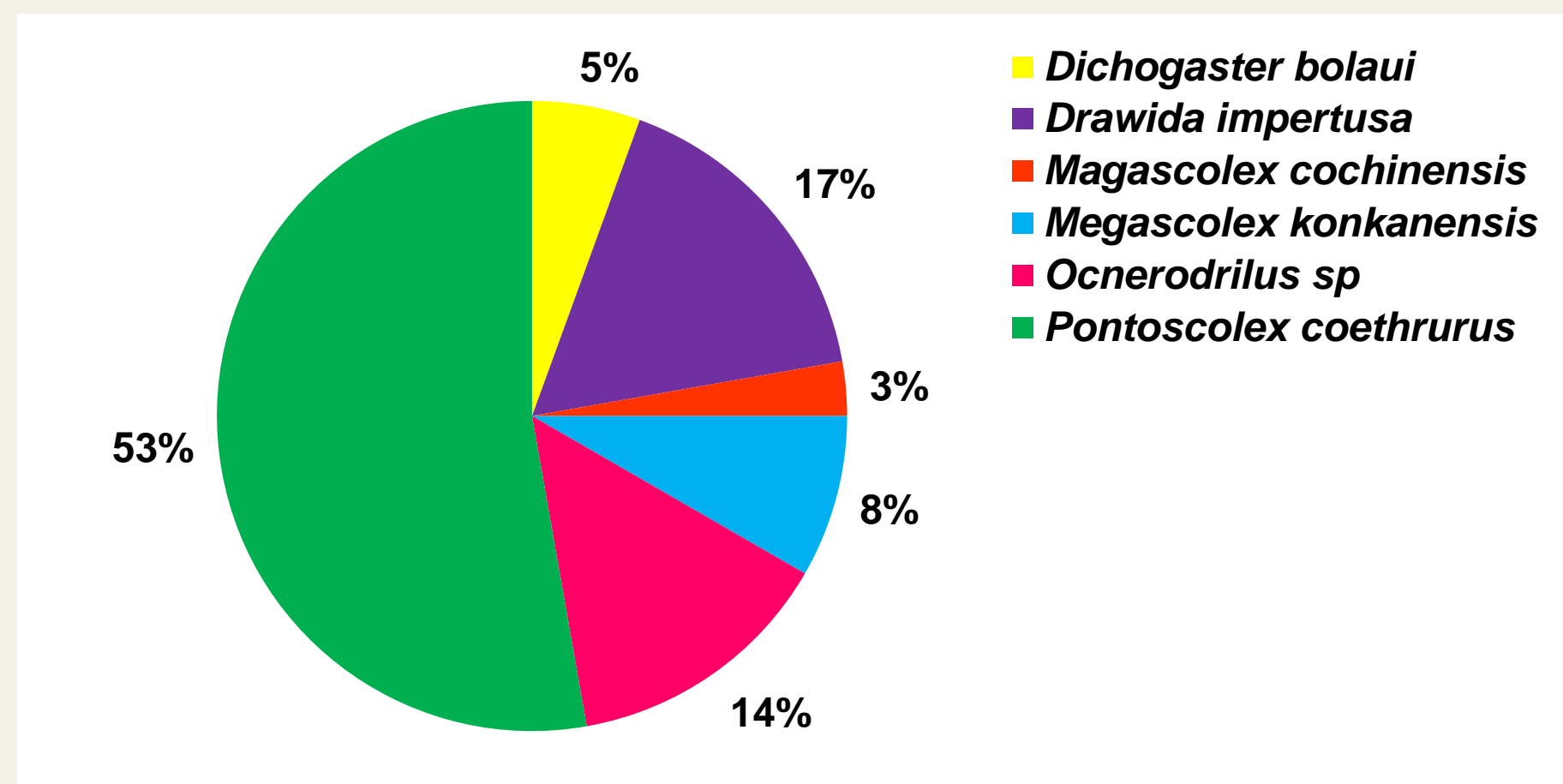
Species	Family	Ecological category	Number of home gardens
<i>Dichogaster bolau</i>	Octochaetidae	Epigeic	2
<i>Drawida impertusa</i>	Moniligastridae	Epigeic	6
<i>Megascolex cochiniensis</i>	Megascolicidae	Epigeic	1
<i>Megascolex konkanensis</i>	Megascolicidae	Epigeic	3
<i>Ocnerodrilus sp</i>	Megascolicidae	Epigeic	5
<i>Pontoscolex corethrurus</i>	Rhinodrilidae	Epigeic	19

The post-flood earthworm community comprised of six species.

These species were the same as those found before the floods.

No species was found to be absent due to flood effect

Fig 2. Percentage distribution of earthworms in the home gardens of Eloor, Kerala, India



Pontoscolex corethrurus (Invasive) was present in 53% of the home gardens

Pontoscolex corethrurus and *Ocnerodrilus* species were present in all the three zones.

Drawida impertusa was absent in Zone 1 and *Megascolex konkanensis* was absent in Zone 3.

Dichogaster bolau and *Megascolex cochiniensis* were present only in Zone 3

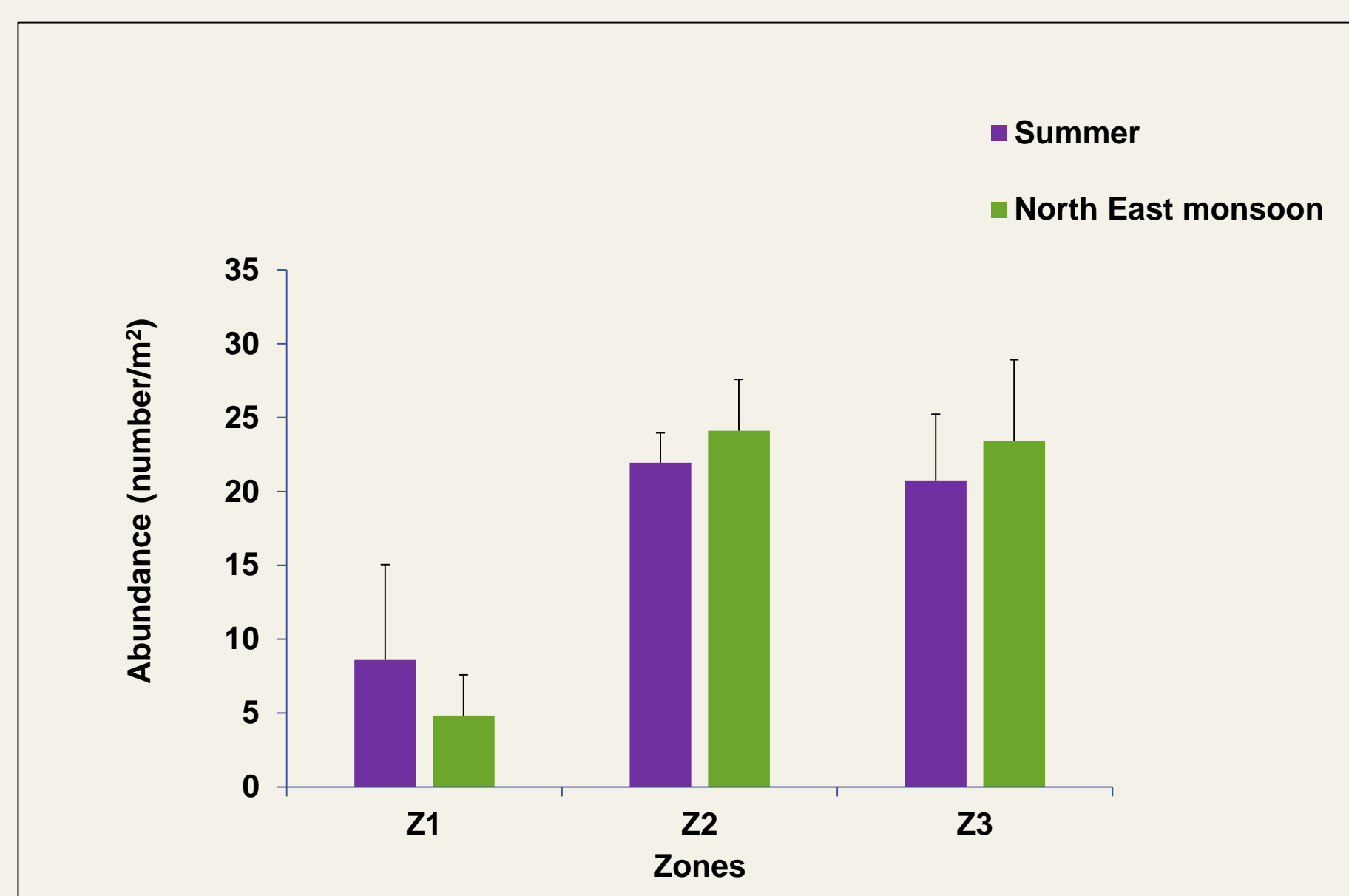


Fig 3. Comparison of earthworm abundance in the three zones of home gardens of Eloor, Kerala, India

A higher earthworm abundance was noted in North East monsoon in Zone 2 and Zone 3

Table 2. Abundance of earthworms in the flooded home gardens in Eloor (post-flood)

Zones	Home garden	Abundance	% occurrence	
			juvenile	adult
Zone 1	1	53±46	24.53	75.47
	2	93±23	43.01	56.99
	3	53±61	24.53	75.47
	4	67±61	40.30	59.70
	5	40±40	32.50	67.50
	6	80±80	66.25	33.75
	7	40±40	32.50	67.50
	8	13±23	100	0
	9	40±40	100	0
	10	40±40	32.50	67.50
Zone 2	11	67±61	40.30	59.70
	12	67±83	59.70	40.30
	13	67±61	59.70	40.30
	14	67±61	19.70	80.30
	15	40±40	32.50	67.50
	16	53±46	50.00	50.00
Zone 3	17	53±23	24.53	75.47
	18	53±46	24.53	75.47
	19	40±40	32.50	67.50
	20	40±69	67.50	32.50
	21	53±92	50.00	50.00
	22	80±40	50.00	50.00
	23	93±83	71.28	28.72
	24	80±106	50	50
	25	27±46	50	50

Home garden 8 (Zone 1) showed the least earthworm abundance

Home garden 2 (Zone 1) and home garden 23 (Zone 3) showed highest abundance.

No adult earthworms were present in the home gardens 8 and 9 in Zone 1

Table 3. Relative occurrence of juvenile and adult earthworms in the home gardens of Eloor, Kerala, India

Zones	Summer	North East Monsoon
Zone 1	0.74	0.78
Zone 2	1.06	0.89
Zone 3	1.2	0.94

Equal share of juvenile and adult abundances were reported in five home gardens.

Zone 1 showed significant difference between the abundance immediately following flood compared to both previous Summer and succeeding North East monsoon season

The post-flood abundance was lower than previous summer

Abundance increased during the North east monsoon compared to post-flood abundance

ANOVA and Tukey multiple comparison for Zone 2 showed that post-flood abundance is significantly lower than Summer and North East monsoon

ANOVA and Tukey multiple comparison for Zone 3 showed significant difference between the abundance immediately following flood than Summer succeeding North East monsoon season

The correlation analysis of soil nutrients with earthworm abundance did not reveal significant correlations

Conclusion

There is a negative effect exhibited by flood on earthworm abundance of a region (Hypothesis 1).

More than 50% of the home gardens had the invasive earthworm species *Pontoscolex corethrurus*

The population has the ability to overcome the situation and will reestablish after sometime (Hypothesis 2)

The home garden systems have resilience towards floods

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