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Herpetofauna Community in The Karst Area of Pucung Village, Eromoko District, Wonogiri Regency

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Abstract. *Pucung Village is located in Eromoko District, Wonogiri Regency, part of the Gunung Sewu karst area with diverse biodiversity, including herpetofauna (amphibians and reptiles). Limited information on the distribution patterns and abundance of herpetofauna is the focus of this study. This study examined herpetofauna diversity across three habitat types (river, forest, and field). Using Visual Encounter Surveys (VES) and line transects, 455 individuals from 19 species (10 families, 2 orders) were recorded. Forests exhibited the highest species diversity (H' = 2.152 in Mijil, 1.873 in Dunggudel) and richness (R = 2.962 in Mijil, 2.392 in Dunggudel), attributed to structural complexity and niche availability. Fields showed high abundance but low diversity, dominated by Fejervarya cancrivora and Fejervarya limnocharis, indicating anthropogenic influence. River habitats displayed intermediate diversity, with variability linked to water quality and disturbance levels. Species similarity between habitats was moderate (53%), with the highest overlap between river and field habitats (72.73% in Mijil). Dispersed distribution patterns were observed, driven by water availability during the rainy season. Canonical Correspondence Analysis (CCA) revealed that water pH, temperature, and humidity significantly influenced herpetofauna presence, particularly for amphibians in field habitats. Future research should incorporate functional diversity metrics and long-term monitoring to assess climate and land-use effects.*

Keywords: *abundance, distribution pattern, habitat preference*

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INTRODUCTION

Indonesia is one of the countries with high biodiversity. In addition to high biodiversity, Indonesia also has quite varied geological forms. The variety of geological forms includes karst mountains. One of the karst mountains in Indonesia is the Gunung Sewu Karst, which covers three provinces, including the Special Region of Yogyakarta (Gunung Kidul), Central Java (Wonogiri), and East Java (Pacitan) (Prakarsa & Ahmadin, 2017). Wonogiri is one of the areas included in the Mount Sewu Karst landscape, which is named Wonogiri Karst. Wonogiri Karst lies in the Northern Cretaceous Mountains region, a series of mountains in southern Java (Kurniawan & Kebumian, 2017).

One aspect of biodiversity in the Wonogiri Karst is the presence of various types of animals belonging to the order Herpetofauna. Herpetofauna derives from the Latin term “herpeton," referring to a group of slithering animals that includes amphibians and reptiles (Irwanto et al., 2019). Pucung Village is located in the Eromoko District of Wonogiri Regency, which shows potential for herpetofauna diversity (reptiles and amphibians). Herpetofauna plays a crucial role in maintaining an area's ecosystem and ecological balance as part of biodiversity. Furthermore, various types of reptiles and amphibians hold significant positions in the food chain and the environments they inhabit (Arroyyan et al., 2020).

If environmental changes disrupt the balance of the food chain, herpetofauna populations and the surrounding ecosystem will be negatively affected. The status and health of herpetofauna populations serve as indicators of wider environmental issues, including water and air pollution, deforestation, and climate change (Subeno, 2018). Additionally, the abundance of herpetofauna can serve as a significant indicator for assessing a species' density in a particular area (Wulandari & Kuntjoro, 2019). This abundance is significantly influenced by various environmental factors, meaning that changes in the environment can directly affect the population density of herpetofauna in a given area. Furthermore, environmental changes can impact specific herpetofauna habitats, which subsequently affects their survival (Siahaan & Sardi, 2014). Moreover, the distribution patterns of herpetofauna are significantly impacted by the availability of essential natural resources, including food sources, the degree of competition, environmental stability, and the level of habitat heterogeneity (Muslim et al., 2018). Therefore, it is essential to monitor the population, abundance, and distribution of herpetofauna in order to comprehend the impact of environmental changes and to preserve the ecosystem balance.

This study aimed to determine the potential presence of herpetofauna and explore the environmental factors influencing its presence in the area. Understanding herpetofauna presence is essential because these conditions contribute to ecological knowledge and are crucial for biodiversity conservation. Additionally, this study serves as a reference for future researchers interested in similar topics in comparable geographical areas.

MATERIALS AND METHODS

Time and Place

The research was conducted during the rainy season from January to March 2023, precisely in Mijil and Dunggudel Hamlets, Pucung Village, Eromoko District, Wonogiri Regency, Central Java. Data collection was carried out from 08.00 PM to 00.00 AM. This time was selected because many herpetofauna species, particularly amphibians and nocturnal reptiles, exhibit increased activity during the night.

Tools and Materials

The equipment used in this study includes a rolling meter, GPS, headlamp or flashlight, boots, field clothes, gloves, snake hook, camera, thermohygrometer, pH meter, plastic rope/raffia, ruler, digital scales, plastic specimens, specimen bottles, basin, tissue, rangefinder, hagameter, diameter tape, road board, stationery, tally sheet, and identification book. The material used was 98% alcohol.

Data Collection Techniques

Data collection in this study used a combination method: a Visual Encounter Survey (VES) with a line transect. VES is a method of collecting animal data based on encounters used to determine species richness in an area, compile a species list, and pay attention to the relative abundance of species found (Heyer et al., 1994). Data were collected using the VES method with a transect length of 500 meters on each line and the width of the left and right lines adjusted to field conditions. Data was collected in two hamlets (Mijil Hamlet and Dunggudel Hamlet) in Pucung Village, Eromoko District, Wonogiri Regency. The observation locations were in three habitat types: rivers, forests, and fields. One transect was created in each habitat, and repeated data collection was done three times in each transect. The observations were done simultaneously, where the specific team observed each transect, and the observation was started at the exact time. It was done to minimize bias and prevent double counting. Environmental variables were collected before each herpetofauna observation, including air temperature, humidity, altitude, and water pH. Then, the environmental data were analyzed in qualitative descriptive ways.

Data Analysis

Species diversity index (H’) (Krebs, 1989)

$$\mathbf{H'} = -\Sigma[pi \,.\ln pi], \text{ where } pi = (ni/N)$$

Description, *H’*: Species diversity index, *Pi*: proportion of the number of individuals of the i-th species to the total number, *N*: total number of individuals of all species, *ni*: number of individuals of the i-th species, *ln*: logarithm natural.

Species Richness Index (R) (Magurran, 1988)

$$\mathbf{R} = \frac{S-1}{(ln\,(N)}$$

Description, *R*: Species Richness Index, *S*: Number of species found, *N*: total number of individuals of all species, *ln*: logarithm natural.

Relative Abundance (Psi) (Brower & Zar, 1997)

$$PSi = \frac{ni}{N}\, x\, 100\%$$

Description, *Psi* : Relative Abundance, *ni* : Number of individuals of each species, and *N*: Total number of individuals.

Jaccard's index of similarity (Magurran, 1988)

$$IS = \frac{C}{A+B-C} \times 100\%$$

Description, *IS* : Jaccard's index of similarity *C* : Same number of species in both plots, *A* : Number of species from plot A, and B : Number of species from plot B. Community similarity criteria (IS): (Odum, 1993; Indriyanto, 2006).

1- 30% : Low category
31- 60% : Medium category
61- 91% : High category
> 91% : Very high category

Average Nearest Neighbor

$$\text{Z score} = \frac{D}{\sigma_{obs}}$$

Description, *Z* score: Nearest neighbor average distribution pattern, *D*: Average distance between individuals and the nearest individual, and σobs : Standard deviation of the observed distance. The average nearest neighbor spatial analysis application uses ArcGIS 10.3 software to create a distribution map and determine the shape of the existing distribution pattern. The criteria for the average nearest neighbor distribution pattern are as follows:

Z score = 1 means the event is randomly patterned

Z score < 1 means clustered occurrence.

Z score > 1 means the event is dispersed (Johnston et al., 2001)

Canonical Correspondence Analysis (CCA)

Canonical Correspondence Analysis (CCA) aims to determine environmental factors affecting herpetofauna. The application of CCA analysis uses Past 4.03 software to determine the environmental parameters that affect the presence of herpetofauna.

RESULTS AND DISCUSSION

Species of Herpetofauna

There were 455 herpetofauna individuals of 19 species with two different orders, namely the *Squamata* and *Anura* orders (Table 1). In the river habitat, there were 153 individuals; in the forest habitat, there were 84 individuals; and in the field habitat, 218 individuals were found (Table 1). The herpetofauna species were classified into 10 families, namely Agamidae (1 species), Bufonidae (1 species), Colubridae (4 species), Dicroglossidae (3 species), Elapidae (1 species), Gekkonidae (3 species), Microhylidae (2 species), Ranidae (1 species), Rhacophoridae (1 species), and Scincidae (2 species).

Herpetofauna Species Diversity Index

Based on Table 2, the results of calculations using diversity index analysis in three habitat types in Mijil Hamlet showed that despite the lowest abundance (N = 41), forest habitat displayed the highest diversity (H’ = 2.152), indicating a more equitable species distribution. While field habitat recorded the second-highest abundance (N = 122), it had the lowest diversity (H’ = 1.313). This was due to field habitats that tend to be dominated by individuals of *F. cancrivora* and *F. limnocharis*, so the value of species diversity decreased. Following the statement of Kusmana and Istomo (1997), the higher the dominance of a species, the lower its diversity.

Table 2. Herpetofauna Species Diversity Index

Location	Habitat	Number of Individuals	Diversity Index (H')
Mijil	River	113	1.667
	Forest	41	2.152
	Field	122	1.313
Dunggudel	River	40	1.603
	Forest	43	1.873
	Field	96	1.415

On the other hand, the river habitat in Dunggudel Hamlet demonstrated lower abundance (N = 40) and diversity (H’ = 1.603) compared to Mijil’s river habitat, possibly due to differing ecological conditions (Table 2). Even though forest habitat showed slightly higher abundance (N = 43) than the river, with a moderately high diversity (H’ = 1.873), reinforcing the trend of forests supporting diverse communities. Meanwhile, field habitat diversity is consistent with the pattern

Table 1. Herpetofauna species in Pucung Village

Ordo	Family	Species	Scientific Name
Squamata	Agamidae	Great Crested Canopy Lizard	*Bronchocela jubata*
	Colubridae	Oriental Ratsnake	*Ptyas mucosa*
		Indo-chinese Ratsnake	*Ptyas korros*
		Oriental Whip Snake	*Ahaetulla prasina*
		Painted Bronzeback	*Dendrelaphis pictus*
	Elapidae	Malayan Krait	*Bungarus candidus*
	Gekkonidae	Javan Bent-Toed Gecko	*Cyrtodactylus marmoratus*
		Common House Gecko	*Hemidactylus frenatus*
		Gecko	*Gekko gecko*
	Scincidae	East Indian Brown Skink	*Eutropis multifasciata*
		Short-Limbed Supple Skink	*Lygosoma quadrupes*
Anura	Microhylidae	Javanese Bullfrog	*Kaloula baleata*
		Palmated Chorus Frog	*Microhyla palmipes*
	Ranidae	Brown Stream Frog	*Hylarana chalconota*
	Rhacophoridae	Striped Tree Frog	*Polypedates leucomystax*
	Bufonidae	Asian Common Toad	*Duttaphrynus melanostictus*
	Dicroglossidae	Sumatran Puddle Frog	*Occidozyga sumatrana*
		Paddy Field Frog	*Fejervarya limnocharis*
		Crab-eating Frog	*Fejervarya cancrivora*

observed in Mijil. From the results of the diversity index value in Dunggudel Hamlet, it is known that forest habitat had the highest value while field habitat had the lowest value. These results had similarities with Mijil Hamlet. This resulted from the habitat similarity between two hamlets in all three habitat types, so they showed similar results. Environmental factors affecting herpetofauna species' similarity are the distance between habitats, the same vegetation composition, food resources, climate, micro-habitats, and sunlight (Hofer et al., 2000).

The data reveal a clear inverse relationship between abundance and diversity in specific habitats, particularly in fields where high abundance coincides with low diversity. This pattern is characteristic of disturbed or anthropogenically altered ecosystems, where a few generalist species dominate (Magurran, 2004). In contrast, forest habitats exhibit higher diversity despite lower abundance, likely due to structural complexity and niche availability (Tilman, 1999). The disparity in river diversity between Mijil (H’ = 1.667) and Dunggudel (H’ = 1.603) may reflect differences in water quality, flow regimes, or anthropogenic pressures. Rivers with intermediate disturbance levels often support higher diversity (Connel, 1978), suggesting that Mijil’s river may represent a more stable or less disturbed system.

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Herpetofauna Species Richness Index

The margalef species richness index refers to the number of species found, so the more species are found, the higher the richness index. Based on the calculation results, the margalef species richness index values in Mijil Hamlet were river habitat 1,692, forest habitat 2,962, and field habitat 1,873 (Table 3). Forest habitats had the highest species richness value compared to other habitats. This shows that the types of herpetofauna in forest habitats are more varied. Meanwhile, Dunggudel Hamlet had a species richness index of 1.897 in river habitat, 2.392 in forest habitat, and 1.533 in field habitat (Table 3). The high species richness in Mijil's forest (R = 2.962) surpasses values reported for some karst forests in Vietnam (R = 2.4; Nguyen et al., 2020), possibly due to differences in canopy structure or conservation status.

Forests in both hamlets exhibited the highest species richness despite lower abundance, a phenomenon also documented in karst forests of Southeast Asia (Clements et al., 2006). This was because the forest habitat type had a dense land cover with shrubs on the forest floor, compared to river and field habitat types, which tend to have an open land cover type. Forests have higher herpetofauna species richness than other habitat types (Kwatrina, 2019). Karst forests' structural complexity and microhabitat diversity likely contribute to this trend, providing niches for various species (Zhang et al., 2013). In contrast, fields showed high abundance but lower species richness, mirroring observations in other karst agricultural areas (Wang et al., 2015). This is often attributed to anthropogenic pressures such as monoculture farming or invasive species dominance, which reduce habitat heterogeneity. Overall, the richness and species diversity indexes were directly proportional. The higher the species richness index, the higher the species diversity index (Abdillah et al., 2022).

Table 3. Herpetofauna Species Richness Index

Location	Habitat	Number of Individuals	Species Richness Index (R)
Mijil	River	113	1.692
	Forest	41	2.962
	Field	122	1.873
Dunggudel	River	40	1.897
	Forest	43	2.392
	Field	96	1.533

Herpetofauna Abundance

Based on the calculation of the relative abundance value (Psi), it was found that the highest percentage of anura order abundance in Mijil Hamlet was *F. cancrivora* (S = 26.55%; H = 26.83%; L = 45.08%) and *F. limnocharis* (S = 23.89%; H = 19.51%; L = 39.34%) (Table 4). The two herpetofauna species, including their natural habitats, were most commonly found in agricultural fields. The type of habitat classified as large fields has abundant food sources and water availability. Making it easy for the two species to adapt, and most are found. In the squamata order, the most commonly found species is *B. jubata* (S = 26.55%; H = 14.63%; L = 4.10%) (Table 4). The presence of *B. jubata* was primarily found in river habitats and the lowest in fields. *B. jubata* was generally found resting on the branches of towering trees. In line with research conducted by Findua et al., (2016), *B. jubta* was found on tree branches.

Table 4. Percentage of Herpetofauna Abundance in Mijil Hamlet

Species	Total	Habitat		
		River	Forest	Field
Occidozyga sumatrana	5	0.88%	-	3.28%
Kaloula baleata	3	-	4.88%	0.82%
Bronchocela jubata	41	26.55%	14.63%	4.10%
Cyrtodactylus marmoratus	3	-	4.88%	0.82%
Hemidactylus frenatus	1	-	2.44%	-
Eutropis multifasciata	6	1.77%	4.88%	1.64%
Lygosoma quadrupes	3	-	7.32%	-
Polypedates leucomystax	20	14.16%	4.88%	1.64%
Fejervarya cancrivora	96	26.55%	26.83%	45.08%
Fejervarya limnocharis	83	23.89%	19.51%	39.34%
Hylarana chaconota	6	3.54%	2.44%	0.82%
Gekko gecko	1	-	2.44%	-
Ptyas mucosa	1	0.88%	-	-
Dendrelaphis pictus	7	1.77%	4.88%	2.46%

Table 5. Percentage of Herpetofauna Abundance in Dunggudel Hamlet

Species	Total	Habitat		
		River	Forest	Field
Occidozyga sumatrana	12	-	2.33%	11.46%
Kaloula baleata	3	5.00%	-	1.04%
Bronchocela jubata	19	17.50%	27.91%	-
Cyrtodactylus marmoratus	1	2.50%	-	-
Hemidactylus frenatus	4	-	2.33%	3.13%
Eutropis multifasciata	1	-	-	1.04%
Polypedates leucomystax	5	5.00%	6.98%	-
Fejervarya cancrivora	61	45.00%	25.58%	33.33%
Fejervarya limnocharis	55	17.50%	16.28%	42.71%
Duttaphrynus melanostictus	1	2.50%	-	-
Microhyla palmipes	2	-	-	2.08%
Ptyas korros	1	-	2.33%	-
Ahaetulla prasina	1	-	2.33%	-
Dendrelaphis pictus	12	5.00%	11.63%	5.21%
Bungarus candidus	1	-	2.33%	-

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Dunggudel Hamlet had a similar percentage of abundance to Mijil Hamlet, namely in the anura order, namely in the species of *F. cancrivora* (S = 45%; H = 25.58%; L = 33.33%) and *F. limnocharis* (S = 17.5%; H = 16.28%; L = 42.71%) Table 5). However, in the river habitat, the abundance of *F. limnocharis* had a percentage of 17.5%. While in the order of *Squamata*, the highest rate was *B. jubata* (S = 17.50%; H = 27.91%) (Table 5). The vegetation type in the river habitat was the most decisive influence on why *B. jubata* was found. Trees that line the banks of the river and a relatively large expanse of river habitat cause *B. jubata* to have the highest percentage value of abundance.

Table 6. Abundance of Herpetofauna in Each Hamlet

Species	PC1	PC2
Occidozyga sumatrana	1.81%	6.70%
Kaloula baleata	1.09%	1.68%
Bronchocela jubata	14.86%	10.61%
Cyrtodactylus marmoratus	1.09%	0.56%
Hemidactylus frenatus	0.36%	2.23%
Eutropis multifasciata	2.17%	0.56%
Lygosoma quadrupes	1.09%	-
Polypedates leucomystax	7.25%	2.79%
Fejervarya cancrivora	34.78%	34.08%
Fejervarya limnocharis	30.07%	30.73%
Duttaphrynus melanostictus	-	0.56%
Hylarana chaconota	2.17%	-
Microhyla palmipes	-	1.12%
Gekko gecko	0.36%	-
Ptyas mucosa	0.36%	-
Ptyas korros	-	0.56%
Ahaetulla prasina	-	0.56%
Dendrelaphis pictus	2.54%	6.70%
Bungarus candidus	-	0.56%

Description: PC1=Mijil hamlet, PC2=Dunggudel hamlet

The overall percentage results found that the highest abundance of the anura order in the two hamlets was similar, namely in the Anura order *F. cancrivora* (PC1 = 34.78%; PC2 = 30.73%) and *F. limnocharis* (PC1 = 30.07%; PC2 = 30.73%). While in the order Squamata, the highest abundance was *B. jubata* (PC1 = 14.86%; PC2 = 10.61%) (Table 6). The effect of seasonality increased the population of certain species of herpetofauna. *B. jubata*, F. cancrivora, and *F. limnocharis* were among the herpetofauna that experienced an increase in population numbers due to the influence of the season. Research indicates that B. jubata is more abundant in the rainy season compared to the dry season (Ashari et al., 2014). Similarly, *F. cancrivora* and *F. limnocharis* also show greater abundance during the rainy season than in the dry season (Kurniati & Sulistyadi, 2017). According to Amarasinghe et al.

(2021), the presence of herpetofauna in the rainy season has a higher number than in the dry season. This is because, during the rainy season, the availability of abundant water becomes a natural habitat favored by herpetofauna. Kwatrina (2019) stated that water is one of the factors affecting herpetofauna's existence.

Similarity of Herpetofauna Species

The calculation results of the herpetofauna species similarity index for each habitat type found that field and river habitats in Mijil Hamlet had the highest percentage value of herpetofauna species similarity of 72.73%. Both habitat types tend to have similarities in the observation location. The river and forest habitat types had the smallest percentage in Mijil Hamlet, which was 50% (Table 7). This was because the habitat differences between the two habitat types were quite significant. The forest habitat type had a hilly and slightly steep observation location and had dense bushes on the forest floor. The river habitat type had observation locations that tend to be flat and bushes that are less dense than the forest habitat type. This results in the similarity of the kinds between habitat types in Mijil Hamlet, having the smallest percentage of the others.

Tabel 7. Similarity of Herpetofauna Species in Mijil Hamlet

Habitat	River	Forest	Field
River	-	50.00%	72.73%
Forest	-	-	69.23%
Field	-	-	-

Dunggudel Hamlet had an average percentage of similarity of types of each habitat tends to be lower than Mijil Hamlet. There was the highest similarity value in Dunggudel Hamlet, with a rate of 38.46% in river and forest habitat types and forest and field habitat types. In terms of area, Dunggudel Hamlet had a larger area than Mijil Hamlet. Thus, the region's size results in the distance between observation locations tending to be farther and can accommodate more types of herpetofauna. This was thought to result in the similarity of herpetofauna species in each habitat tending to be lower. Referring to the statement of Quammen (1996) states that the wider an area, the more species it will accommodate and can survive. In comparison, the similarity of types in river and field habitat types had the lowest percentage of 33.33% (Table 8).

Tabel 8. Similarity of Herpetofauna Species in Dunggudel Hamlet

Habitat	River	Forest	Field
River	-	38.46%	33.33%
Forest	-	-	38.46%
Field	-	-	-

Overall, the similarity index value of herpetofauna species in Pucung Village in Mijil Hamlet and Dunggudel Hamlet showed a value of 53%, which was classified in the moderate category. Of the 19 species of herpetofauna found, 10 exist in both hamlets. These species include *O. sumatrana*, *K. baleata*, *B. jubata*, *H. frenatus*, *C. marmoratus*, *E. multifasciata*, *P. leucomystax*, *F. cancrivora*, *F. limnocharis*, and *D. pictus*. One of the factors for the similarity of herpetofauna species in the two hamlets was habitat similarities. Ecologically and landscape-wise, Mijil Hamlet and Dunggudel Hamlet have similar habitats. In addition, abundant water in both hamlets also affects the types of herpetofauna.

Distribution Pattern of Herpetofauna

The results showed that the distribution pattern using nearest neighbor analysis in Pucung Village was divided into two parts, namely Mijil Hamlet and Dunggudel Hamlet. The results of the two hamlets were similar, forming a dispersed distribution pattern with an N-ratio value from the calculation of 4.27 in Mijil Hamlet and 4.71 in Dunggudel Hamlet (Figure 1). The dispersed distribution pattern in each hamlet was caused by several factors, one of which was water availability. This was because the research was conducted during the rainy season, which caused standing water in each transect. According to Subeno (2018), humid conditions in puddles allow herpetofauna to be found easily. In addition, secondary forests and agricultural areas have the highest number of herpetofauna because they have water sources (Muslim et al., 2018). Abundant food sources in artificial ecosystems also cause herpetofauna distribution patterns to tend to spread. Fatmawati et al. (2022) stated that artificial ecosystems have a homogeneous habitat, so food availability is sufficient for herpetofauna. In line with the statement of Indriyanto (2006), natural forests generally have heterogeneous habitat types that form grouped distribution patterns.

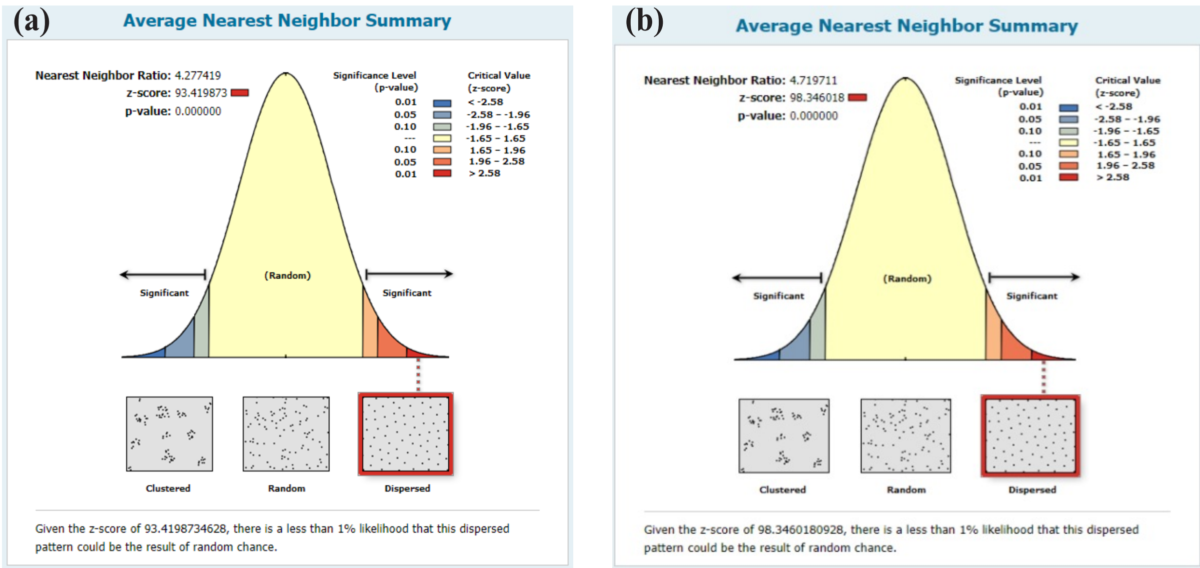

Figure 1. (a) Herpetofauna Distribution Pattern of Mijil Hamlet and (b) Herpetofauna Distribution Pattern of Dunggudel Hamlet

Influence of Environmental Parameters on Herpetofauna Presence

Environmental parameters that affected the presence of herpetofauna species in this study were water pH, air temperature, humidity, and altitude (Table 9). In Mijil Hamlet, the average pH value of water reaches 7.6-8.3, and the pH of the water tends to be expected. According to Ani and Harahap (2022), the standard pH value ranges from 6.8 to 8.5. The air temperature ranges from 22.5-24°C and humidity 95%-97.6%. The temperature and humidity of the air are classified into the optimal temperature for the survival of herpetofauna. In the order of anura, the ideal air temperature ranges from 22-35°C and humidity between 56%-100% (Kusrini, 2008; Rohadian et al., 2022). The altitude of the observation location in Mijil Hamlet ranged from 500-540 meters above sea level.

Dunggudel Hamlet had a water pH value ranging from 7.8-8.5; the pH of the water was classified as high and alkaline (Table 10). In the river habitat, the high pH value of water was thought to be caused by the disposal of kitchen waste and livestock manure. This was because the river habitat is directly adjacent to the houses and livestock pens of residents in Dunggudel Hamlet. Following the statement of Dameanti et al. (2022), cow dung waste directly discharged into the river without processing can impact the quality of the surrounding environment, especially rivers. Dunggudel Hamlet had a higher elevation than Mijil Hamlet. Dunggudel Hamlet ranged from ± 568-600 meters above sea level and had an average air temperature lower than Mijil Hamlet, which is 22.3°C-22.95°C. Air humidity in Dunggudel Hamlet ranged from 97%-99%. Field habitats have the highest humidity value of 99%, and forests have the lowest humidity of 97%.

Table 9. Environmental Parameters of Mijil Hamlet

Mijil Hamlet	Temperature	Humidity	Altitude	Water pH
River	24°C	97.6%	531	7.6
Forest	23.8°C	96.3%	540	7.8
Field	22.5°C	95%	500	8.3

Table 10. Environmental Parameters of Dunggudel Hamlet

Dunggudel Hamlet	Temperature	Humidity	Altitude	Water pH
River	22.95°C	97.5%	568	8.1
Forest	22.75°C	97%	600	7.8
Field	22.3°C	99%	585	8.5

Environmental parameter data were calculated using Canonical Correspondent Analysis (CCA). In the CCA graph, Axis 1 represents different types of herpetofauna, while Axis 2 represents various environmental parameters. In Mijil Hamlet, *F. cancrivora*, *F. limnocharis*, and *O. sumatrana* are most commonly found in field habitats. The existence of the three types of herpetofauna was influenced by the pH of the water, which was 8.3. The species of *K. baleata*, *C. marmoratus*, and *D. pictus* were unaffected by the water pH factor. *C. marmoratus* and *D. pictus* were not included in amphibian species that are not in direct contact with water. In river habitats, there were types of *H. chalconota*, *B. jubata*, and *P. leucomystax*, which were affected by air temperature and humidity. At the same time, the type of *P. mucosa* did not affect temperature and humidity. However, the presence of *P. mucosa* affects the availability of food. *P. mucosa* includes snakes that can wander everywhere for food (Sidik, 2006). This can be seen in the Canonical Correspondent Analysis graph in Figure 2.

Like Mijil Hamlet, the species of *F. cancrivora*, *F. limnocharis*, and *O. sumatrana* were found in the fields of Dunggudel Hamlet. Field habitats are influenced by environmental conditions, namely water pH and air humidity. It was supported by environmental conditions that allowed for survival. *M. palmipes* and *H. frenatus* were not affected by environmental factors. This is because *M. palmipes* has a high level of adaptation. So that it can live in disturbed areas (Kusrini, 2013). Meanwhile, *H. frenatus* is a reptile that easily adapts to disturbed environments (Kusrini, 2020). In river habitats, air temperature significantly influences the presence of the *K. baleata* species.

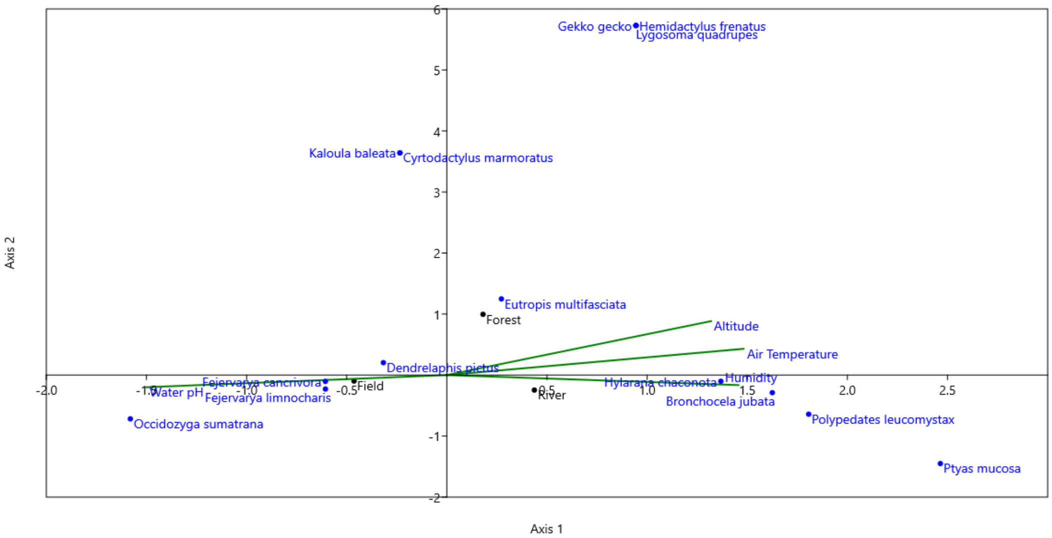

Figure 2. Influence of environmental parameters on herpetofauna presence using Canonical Correspondence Analysis (CCA) in Mijil Hamlet

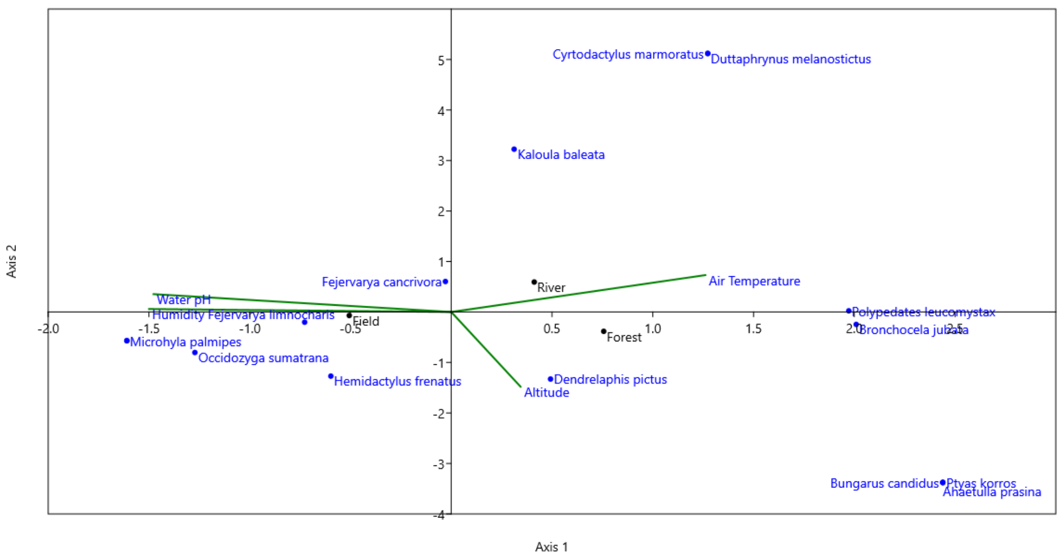

Figure 3. Influence of environmental parameters on herpetofauna presence using Canonical Correspondence Analysis (CCA) in Dunggudel Hamlet

K. baleata was found in river areas that were slightly inundated by water. *C. marmoratus* and *D. melanostictus* were species not affected by air temperature in river areas. The type of *C. marmoratus* has good adaptability and can survive in acidic and dry environmental conditions (Grismer et al., 2018). This was illustrated in detail in the CCA graph in Figure 3.

CONCLUSION

Based on the results of data collection in Mijil Hamlet and Dunggudel Hamlet in three types of herpetofauna habitat (rivers, forests, and fields), 455 herpetofauna individuals were found consisting of 19 species, 10 families, and two different orders, namely the *Squamata* order and the *Anura* order. It is known that the highest diversity and species richness index values in Mijil Hamlet and Dunggudel Hamlet are in forest habitats with values of 2.152 and 1.873 (species diversity), 2.962 and 2.392 (species richness), respectively. The highest percentage of relative abundance of the anura order in Mijil Hamlet and Dunggudel Hamlet had similarities, namely in the *Anura* order *F. cancrivora* and *F. limnocharis*. Meanwhile, in the Squamata order, the highest abundance is *B. jubata*. The most extensive species similarity index in Mijil Hamlet is 72.73% between river and field habitat types. Dunggudel Hamlet had the most extensive species similarity index with a percentage of 38.46% in river and forest habitat types and forest and field habitat types. Overall, the two hamlets had a species similarity index of 53%, which is classified as moderate. Dispersed distribution patterns were observed, driven by water availability and food resources during the rainy season. Environmental parameters, particularly water pH, temperature, and humidity, significantly influenced herpetofauna presence, as Canonical Correspondence Analysis (CCA) revealed. Future research should incorporate functional diversity metrics and long-term monitoring to assess climate and land-use effects.

AUTHOR CONTRIBUTION

M.F.S. collected and analyzed the data and wrote the manuscript, while **G.M.** designed the research, wrote and edited the manuscript, and supervised the entire process. **I.N.N** contributed to the research design and supervised the overall process.

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CONFLICT OF INTEREST

The authors declare that there are no conflicts of interest to disclose.

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