Habitat characteristics and population of leptophryne javanica in Curug Cisurian, Kopi Bojong, and Ciinjuk in Gunung Ciremai National Park

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Abstract. Mount Ciremai National Park (TNGC) has a high diversity of flora and fauna, one of which is Leptophryne javanica. Amphibians of the Ordo Anura are declared as new species. Habitat disturbance and destruction by natural and human activities is one of the main threats to the extinction of this species. The purpose of this study was to determine the habitat characteristics and populations of the Leptophryne javanica species in TNGC. The method used in this study is the analysis of vegetation as well as data collection on environmental physical conditions for habitats and capture mark re-capture for population data. Correlation analysis used is the rank sperman. Based on the results of research on vegetation at the tree and pole level that dominates is Nangsi (Villebrun rubescens) while at the lower plant and seedling level is Balakacida (Barreria laevis). Physical environmental parameters that significantly affect the species of Leptophryne javanica are water temperature with a value (-min) -0.953, this shows that the lower the water temperature at a certain level, the more the number of Leptophryne javanica populations will be found.

1. Introduction
Leptophryne javanica is a new species in the bufonidae family, this species was previously considered the same as Leptophryne cruentata or better known as the red frog. The striking difference between these two types is that Leptophryne cruentata has a black base color with bright red patches while Leptophryne javanica has a yellow hue with a black base color. The existence of this endemic species has several threats including its appearance in volcanic areas, namely Mount Selamet, Central Java and Mount Ciremai, West Java. Climate change, land use change is a real threat to this endemic population even though they live in conservation areas (Kusrini et al., 2018).

There are several points in the Mount Ciremai National Park that are the habitat for Leptophryne javanica, namely in the Cisurian Curug River, Bojong Coffee River and Ciinjuk River. In these three locations, it is known that there are disturbances from human activities such as the conversion of land functions to tourist attractions and the manufacture of water taps which are one of the threats to this type of habitat. Lack of attention to habitat and knowledge of habitat characteristics at the location where Leptophryne javanica species are found has a risk of habitat loss and destruction and population decline of this species.
Therefore, research is needed to obtain data on the characteristics of the habitat and population of Leptophryne javanica in the Mount Ciremai National Park area to develop conservation policies and regulations on community activities in the Mount Ciremai National Park area. The purpose of this study was to determine the Habitat and Population Characteristics of Leptophryne javanica in the Mount Ciremai National Park.

2. Methodology
This research was conducted in Mount Ciremai National Park. This research is focused on points that could potentially be the habitat of Leptophryne javanica namely Cisurian waterfall, and rivers of Kopi Bojong and Ciiunjuk.

2.1 Data collection techniques
The method used in collecting amphibian data is the Visual Encounter Survey (VES) combined with the Capture Mark Recapture method to calculate population estimates and Vegetation Analysis is carried out to calculate the species composition and vegetation structure. (Heyer et al. 1994). Techniques for implementing methods in the field are:
   a. Conduct a pre-exploration survey of the research location to determine the pathway to be used in the research.
   b. Creating a 200 m long observation path with the path width adjusted to river conditions.
   c. Measurement of habitat and population of Leptophryne javanica

2.2 Vegetation analysis, habitat data with vegetation analysis
Based on the Gentry (1982) method, the sizes to be used are:
   a. Sample plot for understory and seedling levels (A = 2m x 2m)
   b. Sample plot at stake level (B = 2m x 12.5m)
   c. Sample plot at the stake and tree level (C = 2m x 50m)

![Figure 1](image)

Environmental factors, are weather conditions at the time of data collection, air temperature, water temperature, humidity, pH of water, width of water body, depth of water body, distance to water body, substrate/environment where it is found, altitude, and threats to Leptophryne javanica habitat. Environmental factor data is taken along the path when making observations and collecting habitat and population data. Population data collection is done at 19.00-23.00 WIB and if necessary, observing the behavior of Leptophryne javanica during the day. The observation plot in this study is 200 m long following the river flow. Population data were collected using the Visual Encounter Survey (VES) method combined with the Capture Mark Recapture method.

The marking of specimens for the Capture Mark Recapture method is done manually, that is, after being caught it is inserted into the specimen bag then records the plot number or pathway and time of the capture and the sex is recorded (if possible), measured the length of the mouth to the cloaca or SVL (Snout-Vent Length). Specimen marking is done by marking it using a rubber or white thread positioned on the frog's waist. After being marked, they were released and arrested at the same location the following day.
2.3 Data analysis

Habitat data taken and analyzed and classified into two types, namely vegetation data analysis and environmental factor data analysis, namely:

a. Vegetation analysis, plant observational data by calculating the frequency, density, dominance and important value index of a plant species.

b. Data analysis Environmental factors such as weather conditions, substrates / environment where found, altitude, air temperature, water temperature, humidity, water pH, width of water bodies, depth of water bodies, distances and disturbances at the location are analyzed descriptively and if necessary, presented in graphic form.

Population data, the capture mark recapture method calculated by the equation according to Chapman (Krebs, 1989) is as follows:

Estimated population size (N):

\[ N = \frac{(M + 1)(n + 1)}{m + 1} - 1 \]

Estimation of population variation (V (N))

In the large example according to Chapman the diversity of the population approximates:

\[ V(N) = M^2 \frac{(n + 1)(n - m)}{(m + 1)^2 (m + 2)} \]

Estimated population range (KP)

The population ranges at the 95% confidence interval (α = 0.05) are:

\[ N \pm 1.96\sqrt{V(N)} \]

Information:

M : number of individuals in the first catch,
N : number of individuals catching the second,
M : number of individuals marked on the second arrest.

2.4 Correlation Analysis of Habitat and Population Correlation (Sperman rank)

The data analysis used to determine the correlation between the physical condition of the environment and the population in this study is the Sperman rank analysis method with the help of SPSS software. Environmental parameter data that has qualitative data are then scaled to ordinal with a nominal scale representation so that it can be tested using the sperman rank correlation.

3. Result and Discussion

3.1 Habitat

The habitat of Leptophryne javanica found in the Mount Ciremai National Park area is generally in rocky streams with moderate to swift flows in primary forest at an altitude of 1194-1483 masl.

3.2 Abiotic Components

Differences in the physical components of habitats in three locations suspected to be a factor affecting the population Leptophryne javanica in the National Park of Mount Ciremai observations of the physical components of habitats in three locations can be seen in Table 1 below:

| Variable | Research sites |
|----------|---------------|
| Coordinate | Cisurian river flow | Bojong Coffee river flow | Cijnjuk river flow |

Table 1. Physical factors of the distribution of Leptophryne javanica in Mount Ciremai National Park
The beginning of the plot
S 06° 56’14.5” E 108° 25’45.85”
S 06° 55’37.75” S 06° 55’39.9”
End of plot
E 108° 25’32.56” E 108° 26’13.7”
S 06° 59’14.77” S 06° 55’43.6”
E 108° 25’33.99” E 108° 26’15.2”

Weather conditions

| Deuteronomy 1 | Bright | Bright | Bright |
| Deuteronomy 2 | Overcast drizzle | Bright | Bright |
| Deuteronomy 3 | Bright | Bright | Bright |

Altitude (masl) 1194-1230 1211-1483 1194-1269
Air temperature (°C) 16.3-16.7 15-16.7 17.2-19.3
Water temperature (°C) 17.5-17.9 16-18 17.4-18.7
Moisture % 84-87 81-94 67-95
Water pH 7.6-7.9 6.1-7.3 6.3-7.1
Water flow velocity (m/s) 0.17-0.27 0.25-0.33 0.2-0.18
Water depth (cm) 15-20 0.4-0.12 11.2-41
Width of water body (m) 3-7 3.3-4.3 2.3-3.8

The distance the frog found from the ground (cm) 0-93 0-310 0-110
Distance to find the frog from the water source (cm) 0-89 0-220 0-200

Substrate
-soil (%) 1 20.9 4.9%
-stone (%) 58 27.7 45.1%
-wood (%) 15.2 28.1 11%
-Moss (%) 20 - 3.7%
-Leaves (%) 2 21.9 35.3%
Distance from human activity (m) 0-4 0-9 126

3.3 Biotic Components
The results of observations and identification of vegetation types at each research location are as follows: a total of 100 plant species were found in the three research locations with a total number of 4,469 individuals. The most types of vegetation found at the understorey level are Balakacida (Barreria laevis), saplings are Kaliandra (Cannarium challothysus), poles, and trees are Nangsi (Villebrunea rubescens). At the three research locations, after conducting a vegetation analysis, the following results were obtained:
Table 2. Types of plants with the highest IVI value at each location

| Location name  | Vegetation Level |  |
|----------------|------------------|---|
|                | Bottom plants &  |  |
|                | seedlings        |  |
| Curug Cisurian | Balakacida       | Kaliandra |
| Kopi Bojong   | Slapstick        | Kikopi and Mara |
| Ciinjuk       | Balakacida       | Pulus |
|                |                  | Nangsi |

3.4 Population

Based on the observations made in the research location, namely Curug Cisurian, Kopi Bojong and Ciinjuk, Leptophryne javanica was found in Bojong Kopi with 192 individuals, while the least number of individuals was in Ciinjuk with 82 individuals; the number of Leptophryne javanica found during the study can be seen in the table below:

Table 3. Number of *Leptophryne javanica* individuals in the three research locations

| Location  | Height     | N1 | N2 | N3 | T total | Average |
|-----------|------------|----|----|----|---------|---------|
| Cisurian  | 1194 - 1230| 32 | 41 | 32 | 105     | 35      |
| Kopi Bojong | 1211 - 1483 | 56 | 70 | 66 | 192     | 64      |
| Ciinjuk   | 1194 - 1269| 25 | 30 | 27 | 82      | 28      |

The total of all *Leptophryne javanica* individuals at the three locations in 3 replications was 379. The mean of *Leptophryne javanica* individuals at each location was 35 individuals in Cisurian, 64 individuals in Bojong Kopi and 28 individuals in Ciinjuk. After taking data using the Capture Mark Recapture method at each research location, the data that has been averaged from replications 1 to 3 can be seen in the table below:

Table 4. The average results of the 1st to 3rd replication observations at each study location

| Location      | Species name            | M | n | m  |
|---------------|-------------------------|---|---|----|
| Curug Cisurian | *Leptophryne javanica*  | 35| 57| 21 |
| Kopi Bojong   | *Leptophryne javanica*  | 64| 72| 51 |
| Ciinjuk       | *Leptophryne javanica*  | 28| 31| 19 |

Information:
M = number of individuals in the first catch,
n = number of individuals catching the second,
m = number of individuals marked on the second arrest.

3.5 Habitat and Population Relationship of *Leptophryne javanica*

Environmental parameters observed include weather conditions, altitude, air temperature, water temperature, humidity, pH and water velocity. Environmental parameter data that has qualitative data are then scaled to ordinal with a nominal scale representation so that it can be tested using the Spearman rank correlation. The data from the observations are then grouped based on the class as follows:
Table 5. Data from field observation results from the conversion of qualitative data into ordinal

| Code  | Y (N) | Weather (X1) | Height (X2) | Temperature U virgin (X3) | Temperature Water (X4) | Humidity (X5) | pH (X6) | Speed Air (X7) |
|-------|-------|--------------|-------------|--------------------------|------------------------|---------------|---------|---------------|
| ASC1  | 32    | 1            | 1194        | 16.3                     | 17.5                    | 84            | 7.6     | 0.17          |
| ASC2  | 41    | 2            | 1194        | 16.3                     | 17.5                    | 84            | 7.6     | 0.17          |
| ASC3  | 32    | 1            | 1194        | 16.3                     | 17.5                    | 84            | 7.6     | 0.17          |
| ASKB1 | 56    | 1            | 1211        | 15                       | 16                      | 81            | 6.1     | 0.25          |
| ASKB2 | 70    | 1            | 1211        | 15                       | 16                      | 81            | 6.1     | 0.25          |
| ASKB3 | 66    | 1            | 1211        | 15                       | 16                      | 81            | 6.1     | 0.25          |
| ASC1  | 25    | 1            | 1269        | 17.2                     | 17.4                    | 67            | 6.3     | 0.2           |
| ASC2  | 30    | 1            | 1269        | 17.2                     | 17.4                    | 67            | 6.3     | 0.2           |
| ASC3  | 27    | 1            | 1269        | 17.2                     | 17.4                    | 67            | 6.3     | 0.2           |

Description: ASCC (Cisurian River Stream)  
ASKB (Coffee River Stream)  
ASC (Ciinjuk River Stream)

To find out the magnitude of the relationship between environmental parameters and the population of Leptophryne javanica, the correlation value obtained from the test results is then consulted with the table of meanings of the Spearman rank correlation value as follows:

Table 6. Meaning of correlation value (r)

| Score     | Mean               |
|-----------|--------------------|
| 0.00-0.19 | Very low / very weak |
| 0.20-0.39 | Low / weak         |
| 0.40-0.59 | Moderate           |
| 0.60-0.79 | Tall / strong      |
| 0.80-1.00 | Very tall / strong |

Based on the test results, the values for the environmental parameters of altitude (X2), water temperature (X4), humidity (X5), pH (X6) and Water Velocity (X7) are 0.476, which means that the environmental parameters it has a moderate effect on the population of Leptophryne javanica. Meanwhile, the weather condition parameter (X1) has a correlation value of 0.138, which means that this parameter has a very low effect on the population of Leptophryne javanica. The water temperature parameter (X3) has a correlation value of -0.953 which means that this parameter has a significant effect on the Leptophryne javanica population.

Amphibians have a large temperature tolerance range. This difference in tolerance results in different temperature requirements for each type. Amphibians are found to live at temperatures of 0°C to 40°C (Shoemaker et al. 1989 in Stebbins et al., 1995). The min (-) value in the spearman rank correlation equation for water temperature parameters shows that the lower the water temperature at a certain level, the more Leptophryne javanica population is found. This is related to the habitat characteristics of the anura animal group in general, which like environmental temperatures which tend to be low.

Amphibians have a large temperature tolerance range. This difference in tolerance results in different temperature requirements for each type. Amphibians were found to live at temperatures of -0°C to 40°C (Shoemaker et al. 1989; Stebbins et al., 1995). While the results in the field show that Leptophryne javanica lives at a temperature of 15-19.3°C and a water temperature of 16-18.7°C.

3.6 Habitat disturbance threat
Mount Ciremai is the entry of visitors to the Leptophryne javanica habitat in the Cisurian waterfall. This allows individuals to be trampled and the trash brought by visitors will affect the quality of the...
water at this location so that it can poison larvae or tadpoles that live in the water. In the Kopi Bojong river, the threat that occurs is the construction of water reservoirs that cut this river flow so that Leptophryne javanica species gather in one plot/point. If the population of Leptophryne javanica converges at one point this allows for competition for food and mates so this is a real threat to this type of amphibian.

The presence of Leptophryne javanica in the Cinjuk river flow was found in all observation plots which were different from the other two locations, presumably because this location was minimal to disturbance by human activities so that individuals were scattered throughout the observed plots. Even though this location looks safe without threats, it is possible that in the future this location will experience disturbances from natural or human activities.

4. Conclusion
From the results of the research conducted, it can be concluded that the characteristics of the habitat and population of Leptophryne javanica sp in the Ciremai Mountain National Park (TNGC) are as follows:

a. The habitat characteristics of Leptophryne javanica sp in TNGC are generally at an altitude of 1194-1483 masl with rocky substrate and air temperature 15-19.3 °C, water temperature ranging from 16 - 18.7 °C and humidity between 67-95%. The pH of the water in the neutral study location ranged from 6.1 to 7.9. The river is 2.3-7 meters wide with a depth ranging from 0.4-20 cm. The research location which is close to human activities is in the Cisurian waterfall and Kopi Bojong, while the Cinjuk river is far from human activities. The vegetation that dominates at the tree and pole level is Nangsu (Villebrunea rubescens ) while at the understorey and seedling level is the Balakacida (Barrera laevis) type of vegetation. The condition of physical environment that significantly affect species Leptophryne javanica sp namely water temperature with the value (-min) -0.953. This shows that water temperature has a significant effect on the population of Leptophryne javanica sp. S emakin lower the water temperature at a certain level, the more the amount of population Leptophryne javanica were found.

b. Leptophryne javanica sp. Individuals found during the study were 379 individuals. The highest value was in the Cisurian waterfall with a population size of 94, population variation of 230 and a population range of 65 and a minimum and maximum size of 123. While the lowest value was in the Cinjuk river with a population size of 46, population variation of 36 and a population range of 49 and a size minimum and maximum 52 individuals.

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