Microhabitat of *Leptophryne borbonica* (Tschudi, 1838) (Anura: Bufonidae) and it’s calling behaviour in Sumatera

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Abstract. Microhabitat use of amphibians have been widely neglected among studies on herpetofauna. The microhabitat structure is important when it served as reproduction site. Here we survey the microhabitat characteristics of *Leptophryne borbonica* and the mating calls. We observed 15 individuals perching on the rock in the middle of the stream and two others have been observed far from stream and other water bodies. The calling males perch on the moist and dry rocks. Interestingly, this species always calls on the rock which is located right in front of the water that fall from two intersecting rocks, creating the small-like waterfall with very noisy backsound. It might suggest the behavior of hiding from predators detection through the sound of environment.

1. Introduction

The management for amphibian conservation requires a deep information of the habitat characteristics and the calling site. Habitat characteristics of amphibians in southeast asia are poorly studied compare to their taxonomic position and phylogenetics. The less information about how the species occur in a given habitat and how they utilize the unique matrices of microhabitat could drive the declining of population without the unrecognized reasons. It might be true if the microhabitat served as reproduction site of the species.

*Leptophryne borbonica* (Tschudi, 1838) is widely distributed in the region of Southeast asia, from Java in the north and Thailand in the south. This species inhabit in leaf litter of seepage areas in forest below 400 masl [¹], in marshy, in wet areas and in slowly moving waters [²] and the stream in high upland in 2019 masl [³]. Previous study showed that the species inhabit six types of substrate in a river in the west of Java, but mostly they found on the rocks and leaf litter [⁴]. The population from east of Java also use the similar substrate for activity where mostly occured on the moist rock on the banks of slow water current stream [⁵]. The conspecific, *L. javanica* [⁶] also inhabited similar habitat to those from abovementioned populations.

On the other hand, although this species is quite common in Sumatera [¹,³,⁷] but the evaluation of their microhabitat is missing from the region. In this study we evaluate the microhabitat characteristics with notes on their calling behavior.
2. Methods

2.1 Study site
We conducted survey from August to September 2020 in a rocky river of Sumatera Barat province. The river is located in the Resort Anai, latitude 028'49.8"S 10019'22.3"E, elevation ca. 784 masl. The river with (Figure 1) a width of 5-6 meters consist of rocks with various size (Figure 1). The study site located in the foothill of mount Tandikat, surrounded by the secondary forest, is a tourism object maintaining wild forest.

![Figure 1. A part of the rocky stream provided the habitat for L. borbonica.](image)

2.2 Field survey and data collection
The visual encounter survey technique was performed during 3 hours observation in the location from 08.00-11.00 pm. Four to six persons search systematically along the the as well as put attention the sounds of calling males. Once we spotted an individual with mating call, we record the call and measure the abiotic factors. We measured air temperature, humidity, water temperature, water pH, water conductivity by using digital equipments. Interestingly, this species always calls on the rock which is located right in front of the water that fall from two intersecting rocks, creating the small-like waterfall with very noisy backsound. We decided to bring the species to the forest and let them emitted the calls then been recorded with SONY. We measured the snout vent length (SVL) of each individuals in millimeter (mm) and then released them back to the river. The calling sound was analyzed by using RAVEN Pro v1.6 (Cornell Lab of Ornithology, Ithaca, NY, USA) software. The data is described descriptively.
3. Result and Discussion
We collected 17 individuals that consist of 3 females (SVL = 33-43 mm) and 14 males (SVL = 21-26 mm). All females and most of the males were found perch on the rock in the middle of the stream. Two males were found far from standing body water where they perch on the ground with no other *L. borbonica*. These findings corroborate previous research that showed that most *L. borbonica* individuals were on rock. However, the difference is that the population from Sumatra is in the middle of the river, not on the bank like the population of West Java [4] and East Java [5]. The width of the perch varies from 30-80 cm. Their perches are always in front of a stream like a waterfall because of the intersecting rock, with a distance of 20-40 cm from that water. Some of the anura species found in this river are *Limnonectes kuhlii, Odorrana hosii, Megophrys nasuta, Pulchrana fantastica, Leptobrachium* sp. and *Cyrtodactylus* sp. on the rocky river wall. The stone substrate was chosen by a group of anura partly because the stones do not dampen the sound of the call being emitted [8] and the separate stones are used to define territorial areas and the distance between male individuals [9].

Our observations also show that there is no satellite behavior in this species. Mating was carried out with an axillary amplexus attached to a rock substrate (Figure 2). However, recording calls in the natural habitat was very difficult due to noise water near calling site so we took them to the forest near the river. The noise level of water currents near the calling site is 60 dB, the temperature ranges from 19-23°C. In addition, no more than one male found on the same rock.

Voice analysis showed that this species emitted 2 types of call, type 1 and type 2. Type 1 is a complex call with two different note types, note 1 and 2, while Type 2 consists of simple calls with only one type of note. Note 1 in call type 1 consist of distinct pulses, separated by interval while note 2 consist of distinct pulses, separated by interval, near the end the pulses partly fused and then distinctly separated from the last pulse (Figure 3). Call type 2 consist of pulsatile in the beginning of calls and then several distinct pulse and lasted in two separated pulse by interval (Figure 4).

**Figure 2.** Axillary amplexus by mating pair occured on a sloping rock.
Figure 3. Sonogram of call type 1 consisting two different type of notes.

Figure 4. Sonogram of call type 2 consisting one note which is begin by pulsatile.

There are several species that inhabit noisy rivers and even near waterfalls [10, 11, 12]. Some of these species include Amolops torrentis, Odorrana tormota, Odorrana hosii. Group of Odorrana made a high frequency sound because it was near a very noisy stream. Odorrana hosii also makes sound calls during the day [13]. Odorrana tormota can emits various types of calls containing ultrasonic harmonics. The male can change the frequency and amplitude rapidly in response to increasing noise levels. This suggests that signal characteristics that depend on noise levels have evolved to respond to noise fluctuations [14]. However, in another species, Amolops torrentis, only the frequency increases when the noise increases while the amplitude is constant [15]. This shows that there have been various adaptations in frogs living in noisy environments.

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