

Research Article

Monitoring the Diversity of Lizards and Snakes (Reptilia: Squamata), Along the Boyong-Code River Area, Province of Daerah Istimewa Yogyakarta

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Abstract.

A reptile is a group of animal consists of testudines, crocodiles, lizards, and snakes. Most reptiles are capable of occupying wide range of habitats with different environmental conditions. One of the preferred habitats for reptiles is a river. Boyong-Code River is one of the rivers that flow across the Province of *Daerah Istimewa Yogyakarta* (DIY). Research on the diversity of lizards and snakes in the Boyong-Code River has been done in 2012. This research aims to acquire new data on the diversity of herpetofauna in the Boyong-Code River and compare it with 2012 data research. The comparison purpose is to monitor the species diversity dynamics after 5 years. The data of herpetofauna diversity were acquired using a combination of several methods, i.e., VES (Visual Encounter Survey), riverbank cruising, and transect. Sampling areas in 2012 and 2017 were divided into three locations, i.e., upstream, midstream, and downstream. Species diversity of lizards and snakes in the Boyong-Code River in 2017 consists of eight species of lizards (lacertilians: squamates: reptiles) and four species of snakes (serpents: squamates: reptiles). Species diversity dynamics were equal for lizards in 2012 and 2017; meanwhile, there were more species of snakes in 2012 compared to 2017.

Keywords: monitoring, diversity, lizards, snakes, reptiles, squamates, boyong-code river, Daerah Istimewa Yogyakarta

1. INTRODUCTION

Reptile is a group of animal consists of testudines, crocodiles, lizards and snakes. Most reptiles are capable to occupy wide range of habitats with different environmental conditions. One of the preferred habitats for reptiles is river [1]. Research on the diversity of reptiles on the Boyong-Code River has been done in 2012. Based on data in 2012 reptiles found along the river were lizards (lacertilians: squamates: reptiles) and snakes

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(serpents: squamates: reptiles) [2, 3]. Turtles and crocodiles were not found in 2012, probably due to their behavior. Turtles are slow-moving animals, tend to be passive when there is danger and sometimes catches by human to be kept as pet or consume, while Crocodiles is feared by human due to its appearance and capability to attack and eat mammals, so crocodiles are mostly catch or killed by human especially when they occur on the river which dense with human settlement [4].

The name of Boyong-Code River derived from people's perception, actually the name "Boyong" is a Code River located on the upstream, then starting the midstream which located just after the northern ring of the Ring Road highway to the downstream, people start to call it "Code River". Boyong-Code River is one of the major river crossings in the area of *Daerah Istimewa Yogyakarta (DIY)* Province. The upstream located on the southern slope of Mount Merapi, Sleman Regency. The upstream riverbank is surrounded by dense riparian vegetation but there are many activities of traditional sand mining. The midstream is located on the western part of the Campus of Universitas Gadjah Mada. The midstream bank is surrounded by dense human settlement, also along the banks is covered by retaining walls. The downstream located on the southern part of DIY Province. The downstream is surrounded by rice fields on one side and with dense riparian vegetation on the other.

This research is aimed to acquire new data on the diversity of reptiles in the Boyong-Code River and compare it with 2012 data research. The comparison purpose is to monitor the species diversity dynamics after 5 years.

2. RESEARCH METHOD

Specimens of reptiles (lizards and snakes) were collected alive from its habitats along the Boyong-Code River from the upstream to downstream. Alive specimens then identified using Manthey, 2008 and Das, 2010 [5][6]. After being identified, all specimens were documented and one adult individual of each species was taken as voucher specimen [7] and the rest were released into their natural habitat.

The research was conducted between Augusts to September of 2017. Research location was along the Boyong-Code River from upstream on Sleman Regency (northern part of DIY) to the downstream on Bantul Regency (southern part of DIY). The method used was line transect along 500 m per sampling point (location) with a combination of visual encounter surveys (VES) and river bank cruising. Transect line along 500 m was made on middle part of water body. Transect line was also made using the handheld GPS [8–11].

The sampling points and locations in 2017 were exactly the same locations as in 2012. We divided the river into three parts, i.e.: upstream, midstream, and downstream. Four sampling points (locations) were determined for upstream, and three sampling points were determined for midstream and downstream (Table 1).

At each sampling points, we had done two times sampling in the same day, which are daytime and night time sampling. Two times sampling in one day is expected to encounter more specimens and to maximize the diversity data.

TABLE 1: Sampling locations of the Boyong-Code River herpetofauna from upstream, midstream to downstream.

River part	Sampling (SP)	Point	Locality
Upstream	SP I		Hargobinangun Village, Pakem District, Sleman Regency
	SP II		Candibinangun Village, Pakem District, Sleman Regency
	SP III		Harjobinangun Village, Pakem District, Sleman Regency
	SP IV		Sardonoharjo Village, Ngaglik District, Sleman Regency
Midstream	SP I		Sinduadi Village, Mlati District, Sleman Regency
	SP II		Sinduadi Village, Mlati District, Sleman Regency
	SP III		Caturtunggal Village, Depok District, Sleman Regency
Downstream	SP I		Bangunharjo Village, Sewon District, Bantul Regency
	SP II		Timbulharjo Village, Sewon District, Bantul Regency
	SP III		Trimulyo Village, Jetis District, Bantul Regency

3. RESULT AND DISCUSSION

Lizards found in upstream of 2017 was less diverse than in 2012. There were only 2 species found in 2017 while there were 4 species found in 2012. There were two species missing in 2017, i.e., *Bronchocela cristatella* and *Cyrtodactylus marmoratus* (Table 2). *Bronchocela cristatella* is an arboreal lizard and *Cyrtodactylus marmoratus* is a terrestrial gecko. The missing of *Cyrtodactylus marmoratus* probably due to “traditional sand mining activity” on the river body and bank. This gecko habitat is on the rock and land of riverbanks, the sand mining activities destroy and disturbed the riverbanks; even trucks were entering the river body (Figure 1d).

The research conducted in 2012 was done two years after Merapi eruption. The Boyong-Code River was one of the rivers which highly affected by the volcanic materials

TABLE 2: Lizards and snakes (squamates: reptiles) of Boyong-Code River in 2012 and 2017.

No.	Classification			Code 2012			Code 2017		
	Suborder	Family	Species	up-	mid-	down-	up-	mid-	down-
1.	Lacertilia	Scincidae	<i>Eutropis multifasciata</i>	V	V	V	V	V	V
2.		Agamidae	<i>Bronchocela jubata</i>	V	V	V	V	V	V
3.			<i>Bronchocela cristatella</i>	V	V	V	-	-	-
4.			<i>Calotes versicolor</i>	-	-	-	-	V	-
5.			<i>Draco volans</i>	-	-	-	-	-	V
6.		Gekkonidae	<i>Cyrtodactylus marmoratus</i>	V	-	-	-	-	-
7.			<i>Hemidactylus frenatus</i>	-	V	V	-	V	V
8.			<i>Gekko gecko</i>	-	V	-	-	V	-
9.			<i>Gehyra mutilata</i>	-	-	V	-	V	V
10.		Varanidae	<i>Varanus salvator</i>	-	-	V	-	-	V
		Number of species		4	5	6	2	6	6
		Total species		8 species in 2012			8 species in 2017		
	Suborder	Family	Species	up-	mid-	down-	up-	mid-	down-
1.	Serpentes	Colubridae	<i>Dendrelaphis pictus</i>	V	V	V	-	V	V
2.			<i>Ptyas korros</i>	V	V	V	-	-	V
3.			<i>Ahaetulla prasina</i>	V	V	V	V	V	V
4.			<i>Coelognathus flavolineatus</i>	V	-	-	-	-	-
5.			<i>Gonyosoma oxycephala</i>	-	-	V	-	-	V
6.		Natricidae	<i>Xenochrophis piscator</i>	V	-	V	-	-	-
7.			<i>Rhabdophis subminiatus</i>	V	-	V	-	-	-
8.		Homalopsidae	<i>Homalopsis buccata</i>	V	-	V	-	-	-
9.			<i>Enhydris enhydris</i>	-	-	V	-	-	-
10.		Pythonidae	<i>Malayopython reticulatus</i>	V	-	-	-	-	-
		Number of species		8	3	8	1	2	4
		Total species		10 species in 2012			4 species in 2017		

brought in to the river body by rainfall. This material flood destroyed river body and banks. The river body and banks destroyed are the habitat of reptiles. Two years after eruption was not yet enough for natural environment to restore itself. Reptiles need good environmental conditions such as: dense riparian vegetation, slow or stagnant water, and less volcanic material floods. These conditions were not present in 2012

but it was present in 2017 (Figure 1). This condition probably caused the difference of species number found in 2012 and 2017.

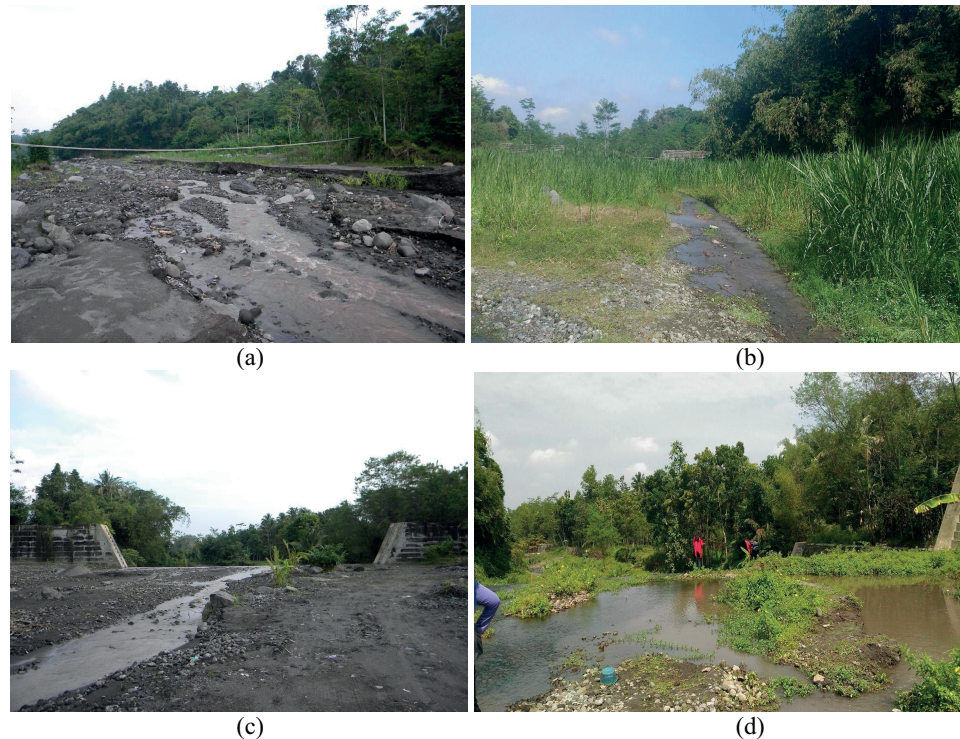


Figure 1: The condition of upstream part sampling area of Boyong-Code River: (a) Upstream SP 1 in 2012; (b) Upstream SP 1 in 2017; (c) Upstream SP 3 in 2012; (d) Upstream SP 3 in 2017.

Lizards found in midstream of 2017 were slightly higher than in 2012. There were 6 species found in 2017 while there were 5 species found in 2012. There was one species not occur in 2012 but occur in 2017, i.e., *Calotes versicolor* or oriental garden lizard (Table 2; Figure 2A). This oriental garden lizard is not native in Java Island, probably native in Sumatera Island, and it has been introduced to Java Island. In midstream of 2017 *Bronchocela cristatella* or green crested lizard was not found (Figure 2B). Two species *Bronchocela jubata* and *Bronchocela cristatella*, both are share habitat and probably also its diet. *Bronchocela cristatella* is not survived in this competition and missing in 2017.

The habitat condition of the midstream of 2012 and 2017 was not very different. But, human activities during the day in 2017 were higher than in 2012. The daytime activities on the river were: individual sand mining, kids playing along the river, and washing or bathing. Moreover, there are riverbank's retaining walls on some parts along the midstream. This retaining wall reduces riparian vegetation needed by lizard and snakes to hide from the heat, to retreat from their predators and as their resting area.



Figure 2: Lizards found and missing on the Boyong-Code River: (a) Oriental garden lizard *Calotes versicolor* only found in 2017 research; (b) Green crested lizard *Bronchocela cristatella* missing in 2017 research.

Lizards found in downstream of 2017 were the same number compare to 2012. There were 6 species found in both years. The difference was about the species, in 2017 *Bronchocela cristatella* was missing, this condition was the same with the upstream and downstream. In contrary, we found *Draco volans* or common flying dragon in 2017 (Table 2). Both species *Bronchocela cristatella* and *Draco volans* are arboreal species, both are not good bio-indicator of environmental changes, but both species can be used determine the presence of riparian vegetation on the river bank.

Snakes found in upstream of 2017 were far less diverse in the species number compare to 2012. There was only 1 snake species found in 2017 while there were 8 species found in 2012 (Table 2). In 2017 snakes missing mostly are water snakes, such as: *Xenochrophis piscator* (checkered keelback or Asiatic water snake), *Rhabdophis subminiatus* (red-necked keelback), *Homalopsis buccata* (puff-faced water snake or masked water snake), and *Enhydryis enhydryis* (rainbow water snake). Missing of all water snakes in the upstream probably due to the increase of human activity in the river, especially for sand mining and fishing. Sand mining destroy snakes' nest and habitat and fishing activity reduce water snake prey.

Snakes found in midstream of 2017 were slightly different compare to 2012. There were only 2 snake species found in 2017 while there were 3 species found in 2012 (Table 2). One species missing in 2017 was *Ptyas korros* or Chinese ratsnake or Indo-Chinese rat snake. The other two snakes found in two different research years were: *Ahaetulla prasina* or Asian vine snake or Boie's whip snake (Figure 3A) and *Dendrelaphis pictus* or painted bronzeback snake (Figure 3B). Those two snakes which encountered in two different years are arboreal snakes. Those two arboreal snakes were found during night sampling, lying on branches of riparian vegetation. It indicates that riparian vegetation

located on midstream Boyong-Code River still a potential habitat for snakes even though there are retaining walls on some part along the midstream.



Figure 3: Snakes which commonly found on the Boyong-Code River: (a) Asian vine snake *Ahaetulla prasina*; (b) Painted bronzeback snake *Dendrelaphis pictus*.

Snakes found in downstream of 2017 were far less diverse in the species number compare to 2012. There were only 4 snakes species found in 2017 while there were 8 species found in 2012 (Table 2). The snakes missing in downstream part of 2017 were the same as upstream part which were water snakes. Missing of water snakes probably due to river conditions, first river body was full of waste and second there were several men doing the fishing activity (Figure 4). Waste mostly household waste could affect the dissolved oxygen in the water. Water snakes are air breathing animal, and they need air to respire, when the river is dirty and dissolved oxygen low, then water snakes are moving away. Fisherman are also affected, when the fish are low due to intense fishing activity, then the water snakes are moving away.



Figure 4: The condition of downstream part sampling area of Boyong-Code River: (a) Downstream SP 2 in 2012; (b) Downstream SP 2 in 2017.

4. CONCLUSION

Species diversity of lizards and snakes in the Boyong-Code River in 2017 is consisted of 8 species of lizards (lacertilians: squamates: reptiles) and 4 species of snakes (serpents: squamates: reptiles). Species diversity dynamics for lizards in 2012 and 2017 was equal; meanwhile for snakes were different, there were more species of snakes in 2012 compare to the 2017. There was one introduced species found in Boyong-Code River in 2017, which is *Calotes versicolor* or oriental garden lizard. Water snakes were not found in Boyong-Code River in 2017, while in 2012 there were 4 species of water snakes. The disappearance some species of snakes may be due to intensive sand mining activities and accumulation of household waste in the river. Several parts of Boyong-Code River can be a good habitat for lizards and snakes.

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