

The Observation of Frog Species at State University of Malang as a Preliminary Effort on Frog Conservation

Dian Ratri Wulandari, Muhammad Habibi Ibrohim, Dwi Listyorini*

Biology Department, Faculty of Mathematics and Science, State University of Malang, Malang, Indonesia

ABSTRACT

Frog is an amphibian which is widely spread around the world. Indonesia houses 450 species which represent 11% of frog species in the world. In Java Island alone, there live 42 species of frogs and toads. Frogs can be used as an environment indicator in that the presence of frog in a particular place indicates that the place stays natural and unpolluted. The 1st Campus of State University of Malang, which is located in the heart of Malang District, has been developing rapidly currently. Thus, it requires the construction of new various facilities to support its huge activities. Extensive construction can be destructive even damaging to the habitat of frog, which potentially threatens the frog's life, if it does not take the environmental impact into careful consideration. This study is aimed to identify the species of frog which survives at State University of Malang with, particularly the frog species found in 1995. Species identification was conducted by observing the morphological character. This study found that there were four species with three species remained survived in 1995; those were *Duttaphrynus melanostictus*, *Polypedates leucomystax*, and *Kaloula baleta*; and one new species called *Rana chalconota*. This study also revealed that there were four species which were extinct; those were *Fejervarya cancrivora*, *Fejervarya limnocharis*, *Ingerophrynus biporcatus*, and *Occidozyga lima*. This situation shows the decreasing amount of species from 7 to 4 within the last 17 years. This result indicates that there is a serious environmental degradation which causes the losing of frog habitats. Further research is needed to study the ecological condition changing in order to save the frog species.

Keywords: *conservation, frog observation, habitat destruction*

INTRODUCTION

Frog is an amphibian which is widely spread around the world. Frog and toads inhabit in every continent, except Antarctica. Frogs are more abundant in warm, wet tropical areas, but few species are able to adapt with dry and cool climates [1]. Indonesia houses 450 species which represents about eleven percent of the total global anuran species (4100 species). In Java Island alone, there live 42 species of frogs and toads [2]. Frogs are valuable components of aquatic ecosystem as both predators and prey [1, 2, 3]. Frogs have large appetites and help to control insect pest populations. The loss of frogs from an ecosystem would be a missing link that could not be likely replaced by any other species [1]. Small frogs have been successfully reared in captivity for scientific and medical research [1, 2, 3].

*Corresponding author: Dwi Listyorini
Biology Department, Faculty of Mathematics and Science,
State University of Malang, Malang, Indonesia
Email: listyorini.alj@bio.um.ac.id

Frogs are excellent indicator species [1, 4, 5]. Habitat loss and fragmentation are major threats to frog population because of their most and permeable skin which is sensitive to numerous pollutants, and of its complex life cycle. Most scientists agree that there is a worldwide decline in frog numbers [1, 4, 5, 6, 7]. Since frogs need live in both soil and water along their life cycle, both aquatic and terrestrial habitats must be protected and restored to conserve them. Many toxins can affect tadpole's and adult's survival as shown by reports of large numbers of developmental abnormalities in frogs [1, 4]. Frog must remain in wet environment to prevent drying out, while toads can tolerate less moisture than frogs; yet, they also seek refuge from the sun by hiding themselves under the shadows of trees, stone, etc [1]. The presence of frog in a particular place indicates that the place remains natural and unpolluted.

Habitat loss can be due to many things, one of which is properties construction. Currently, The 1st Campus of State University of Malang

(hence, UM), which is located in the heart of Malang District, has been developing rapidly. Thus, it requires the construction of new various facilities to support its huge activities.

According to Zainuri (2012, personal communication), the person in charge of Procurement Services Unit (Unit Layanan Pengadaan/ULP), the development of UM is performed with regards to the green area. This facilities development is conducted by updating the buildings and adding some new constructions. Extensive construction can be destructive even damaging to the habitat of frog, which potentially threatens the frog life, if it does not take the environmental impact into careful consideration. This was study aimed to identify the species of frog which survives in UM within seventeen years, particularly the frog species found in 1995.

MATERIALS AND METHODS

This study was completed within 4 (four) months from March to June 2012. The observation of frog in its habitat was done on March 2012 in four areas around UM in the morning from 6:00 to 10:00 a.m. and in the evening from 06:00 to 09:00 p.m. Morphological observations was carried out by observing the morphological and morphometric characters. Morphological characters include the existence of the limbs, limb size, head shape, body shape,

the presence of dorsolateral folds, tympanum, the shape and color of the tympanum, shape the snout, teeth, tongue tip shape, the presence of supraorbital groove, the presence of parietal groove, dorsal skin texture, the color of the dorsal skin, ventral skin texture, ventral skin color, presence of parotoid glands, parotoid gland shape, finger shape, the presence of webbing finger, wide finger webbing the front and hind feet, metatarsal tubercle, sub-articular tubercle, and the habitat discovery of a frog. Morphometric characters include snout vent length (SVL), internarial distance (IN), snout nostril length (SNL), head width (HW), head length (HL), head depth (HD), eye nostril distance (END), eye diameter (ED), interorbital distance (IO), eye to snout distance (ES), upper eyelid width (UEW), tympanum eye length (TEL), tympanum diameter (TD), lower arm and hand length (LAL), forelimb length (FLL), body width (BW), axilla to groin distance (AG), thigh length (TL), tibia length (TBL), hind limb length (HLL), and first toe length (1TL).

RESULTS AND DISCUSSION

Study of areas

Based on the morphological characters, four species of frogs were found in UM area, namely, *Duttaphrynus melanostictus*, *Hylarana chalconota*, *Kaloula baleta*, and *Polypedates leucomystax* (Fig. 1).

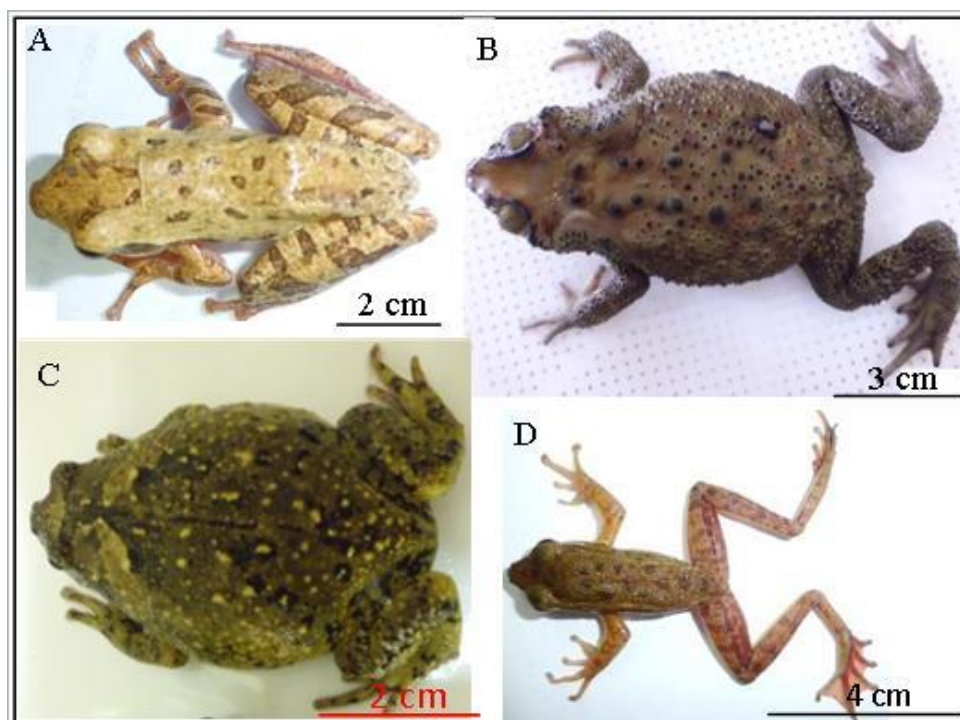


Figure 1. A. *P. leucomystax*, B. *D. melanostictus*, C. *K. baleta*, and D. *H. chalconota*.

D. melanostictus is a toad, with the following morphological characters: moderate body size (SVL ♂: 79 mm and ♀: 99 mm); black tubercles were spread all over the back; continuous supraorbital and supratympanic ridge; no parietal ridge; half-webbed toes. It was found at all observed area. *H. chalconota* is a frog with the following morphological character; small body size (SVL ♂: 43 mm); dark brown tympanum; long and slender legs; fully-webbed toes and fingers; coarsely-granular skin; and found at several ponds in observed area. *Kaloula baleta* is a brown bullfrog with the following morphological : plump-alike body (SVL ♂: 51 mm and ♀: 55 mm); short legs; spoon-shaped finger tips, hidden tympanum under the skin; webbed toes (only at the base); and found on puddle which was formed by rain. The last species is *P. leucomystax*, widely known as “stripped tree frog” , with the following morphological characters: medium-sized body (SVL ♂: 53 mm); yellowish-brown, speckled with black spots; six distinct longitudinal stripes (some), nearly fully-webbed toe; and found on the pond with surround (Supplements 1 and 2).

Mashuri reported that in 1995, seven species lived around UM [8]. They were *D. melanostictus*, *P. leucomystax*, *K. baleta*, *Fejervarya cancrivora*, *Fejervarya limnocharis*, *Ingerophrynus biporcatus*, and *Occidozyga lima*. However, this study found only three species which were survived since 1995, that is, *D. melanostictus*, *P. leucomystax*, and *K. baleta*, plus one new species called *Rana chalconota*. This study also revealed that there were four species which were extinct or lost within 17 years, namely, *F. cancrivora*, *F. limnocharis*, *I. biporcatus*, and *O. lima*.

The campus' development within the last seventeen years has triggered many environmental changes. The most important change is some natural green areas has turned into parks and buildings. It is likely to cause population declines of frogs and species reduction because habitat destruction is the most pervasive threat [5, 7] leading to the decline of amphibian population [5, 6].

This result indicates that there is a serious environmental degradation which causes the losing of frog habitats. Further research is needed to study the change in ecological condition in order to save the frog species.

CONCLUSION

This study reveals four species of frog with the three of them are survivors found in 1995; they are *Duttaphrynus melanostictus*, *Polypedates leucomystax*, and *Kaloula baleta*, plus one new species called *Rana chalconota*. This study also discloses that there are four species which are extinct, that is, *F. cancrivora*, *F. limnocharis*, *I. biporcatus*, and *O. lima*. This situation shows the decreasing amount of species from 7 to 4 and indicates the environmental degradation within the last 17 years.

ACKNOWLEDGMENTS

The authors thank to D. T. Iskandar, D. A. Rahayu, and L. Nazar for their assistance and support during this research.

REFERENCES

1. Bishop DHC (2009) Sustaining america's aquatic biodiversity, frog biodiversity and conservation. Virginia Cooperative Extension. 420-527.
2. Iskandar DT (1998) The amphibians of java and bali. Research and Development Centre for Biology-LIPI. Bogor.
3. Kusrini MD, Endarwin W, Yazid M (2007) Panduan bergambar identifikasi amfibi di jawa barat. Institut Pertanian Bogor. Bogor.
4. Andrew RB, Romansic JM, Kiesecker JM, Hatch AC (2003) Ultraviolet radiation, toxic chemicals and amphibian population decline. Diversity and Distributions. 9: 123-140.
5. Gardner T (2001) Declining amphibian populations: global phenomenon in conservation biology. Animal Biodiversity and Conservation. 24: 25-44.
6. Rodríguez-Prieto I, Fernández-Juricic E (2005) Effect of direct human disturbance on the endemic iberian frog *Rana iberica* at individual and population levels. Biological Conservation. 123: 1-9.
7. Young BE, Lips KR, Reaser JK, Ibáñez R, Salas AW, Cedeño JR, Coloma LA, Ron S, Marca EL, Meyer JR, Muñoz A, Bolaños F, Chaves G, Romos D (2002) Population declines and priorities for amphibian conservation in latin america. Conservation Biology. 15: 1213-1223.
8. Mashuri T (1995) Inventarisasi jenis katak di kampus IKIP Malang. Thesis unpublished. Universitas Negeri Malang. Malang.

Supplement 1

No	Morphological Character	Species			
		1 (toad)	2 (frog)	3 (striped tree frog)	5 (bullfrog)
1	Existence of the limbs	Presence	Presence	Presence	Presence
2	Pair of limb	2 pair	2 pair	2 pair	2 pair
3	Limb size	Short	Long	Long	Short
4	Clearly of head shape	Clear	Clear	Clear	Clear
5	Head shape	Big	Not flat	Not flat	Small
6	Body shape	Solid	Slender	Rather slender	Fat
7	Dorsolateral folds	Absence	Presence	Absence	Absence
8	Tympanum	Can seen	Can seen	Can seen	Unseen
9	Shape of tympanum	Ellipse	Circular	Circular	-
10	Color of tympanum	Brown	Brown	Brown	-
11	Shape the snout	Sharp	Sharp	Sharp	Circular
12	Vomer and maxilla teeth	-	Presence	Presence	-
13	Tongue tip shape	Uncleaved	Bifida	Bifida	Uncleaved
14	Supraorbital groove	Presence	Absence	Absence	Absence
15	Parietal groove	Absence	Absence	Absence	Absence
16	Dorsal skin texture	Spinous tubercles	Coarsely granular	Smooth	Tubercle
17	Color of the dorsal skin	Brown	Brown	Brown	Brown
18	Ventral skin texture	Spinous tubercles	Coarsely granular	Smooth	Smooth
19	Ventral skin color	White	White	White	White
20	Presence of parotoid glands	Presence	Absence	Absence	Absence
21	Parotoid gland shape	Ellipse	-	-	-
22	Finger shape	Dull	Discus	Enlarged flat	Spoon shaped
23	Presence of webbing finger on forelimb	Absence	Absence	Presence	Absence
24	Presence of webbing finger on hind limb	Presence	Presence	Presence	Presence
25	Wide finger webbing the forelimb	-	-	Half webbed	-
26	Wide finger webbing the hind limb	Half webbed	Fully webbed	Nearly fully webbed	Half webbed
27	Metatarsal and sub-articular tubercle	Presence	Presence	Presence	Presence
28	Habitat	Pond, grass, soil	Pond	Tree and pond	Puddle

Supplement 2

No.	Morphometric Character	Size (mm)							
		Species 1 (toad)		Species 2 (frog)		Species 3 (striped tree frog)		Species 5 (brown bullfrog)	
		♂	♀	♂	♀	♂	♀	♂	♀
1.	SVL: snout vent length	79	99	43	-	53	-	51	55
2.	IN: internarial distance	6	7	30	-	4	-	4	4
3.	SNL: snout nostril length	4	6	1	-	2	-	1	1
4.	HW: head width	23	32	14	-	13	-	21	21
5.	HL: head length	22	24	14	-	15	-	13	18
6.	HD: head depth	12	18	6	-	4	-	14	14
7.	END: eye nostril distance	5	6	4	-	5	-	3	4
8.	ED: eye diameter	6	6	4	-	4	-	2	2
9.	IO: interorbital distance	7	9	3	-	5	-	5	6
10.	ES: eye to snout distance	8	12	7	-	6	-	4	4
11.	UEW: upper eyelid width	6	8	3	-	3	-	3	3
12.	TEL: tympanum eye length	3	3	1	-	1	-	-	-
13.	TD: tympanum diameter	4	6	5	-	3	-	-	-
14.	LAL: lower arm and hand length	36	41	21	-	25	-	27	28
15.	FLL: forelimb length	56	59	30	-	3	-	35	41
16.	BW: body width	50	65	13	-	13	-	36	36
17.	AG: axilla to groin distance	53	55	19	-	25	-	3	3
18.	TL: thigh length	35	36	23	-	17	-	21	22
19.	TBL: tibia length	31	33	23	-	24	-	17	18
20.	HLL: hind limb length	118	121	76	-	7	-	67	72
21.	1TL: first toe length	5	5	8	-	3	-	3	4