

**Project 202404:
Ecology and Conservation of Frogs of
Mount Gede Pangrango National Park**

First Year

Final Report: October 2005



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By

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Summary

During the last several decades, amphibians have declined even in the most pristine areas, generating much attention. However, in order to determine whether frogs are declining in any location, it is necessary to have a basic knowledge of the frog fauna. In Mount Gede Pangrango National Park, which is one of the last remaining pristine areas in the highly populated province of West Java, little is known of the local frog fauna, despite the high degree of biodiversity reported within the park. The latest frog inventory was performed during the 1960's and there has been no further research since then. In this survey we found 18 species of frogs. Four species recorded by Liem in the 60's have not been found in this survey: *Fejervarya cancrivora*, *Bufo bipocartus*, *Microhyla palmipes* and *Rana nicobariensis*. However we recorded three additional species: *Rana hosii*, *Leptophryne borbonica* and *Limnonectes macrodon*. From this survey the number of the endemic frog *Leptophryne cruentata* is very low compared with survey by Liem. There is a possibility that *L. cruentata* is declining, therefore there is a need to more more research to ensure conservation of this species. The project also provided frog conservation education to school children in 3 *Sekolah Dasar* (primary school) near the national park and trained national parks officers in frog identification methods.

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1. Background

Although there is good evidence that amphibian declines are a global problem, frogs are still considered abundant, particularly in the underdeveloped regions of the world (Blaustein and Wake, 1990; Alford and Richards, 1999). Most reported amphibian declines have occurred in developed countries or in countries that have a strong research culture. Many of these declines have occurred in relatively undisturbed habitats (Alford and Richards 1999). No declines have been reported in most Asian countries, however this may be due to a lack of research and long term monitoring in these regions.

Mount Gede Pangrango National Park, Java, ranges from 1,400 to 3,400 m above sea level, and is one of the last remaining pristine habitats in West Java. The area is mostly humid tropical rain forest, and is surrounded by production forest, tea plantations, agricultural land and human settlements. Although it is a protected area, it is under high pressure from the rapidly growing human population, such as illegal collection of forest products (Toxopeous, 1999). Liem (1971) described 19 species of amphibian in this area on his surveys from 1961 to 1964. Since Liem's work, there has been no significant research on the amphibians in the area, and their conservation status is poorly known. Reports on frog communities in the areas surrounding Mount Gede National Park are also limited. Thus, there is the possibility that species that occurred in the park in the 1960's are absent or becoming rare. Iskandar (1998) mentioned in his book "Frogs of Java and Bali" that *Leptophyrne cruentata*, one of the species endemic to this area had disappeared from the Cibeureum waterfalls, one of the most visited areas in the park. Therefore, there is a need to assess the current status of amphibians in this area and also to map human disturbance in the area to determine its impact on the distribution of amphibians.

2. Aims and Objectives

The aims of this project are to collect data on frog diversity in Mount Gede Pangrango National Park or *Taman Nasional Gede Pangrango* (later in this report will be cited as TNGP), which has been lacking for several decades, as a basis for further research and monitoring programs.

The objectives of this project are:

1. To produce a current inventory of anuran species in TNGP;
2. To collect baseline information on the relative abundance of each species
3. To characterize the ecology of each species and examine habitat associations and distribution of the anurans in TNGP,
4. To increase schoolchildren's awareness of frog conservation issues
5. To train TNGP Officers in frog research methodology

3. Methods

a. Locations

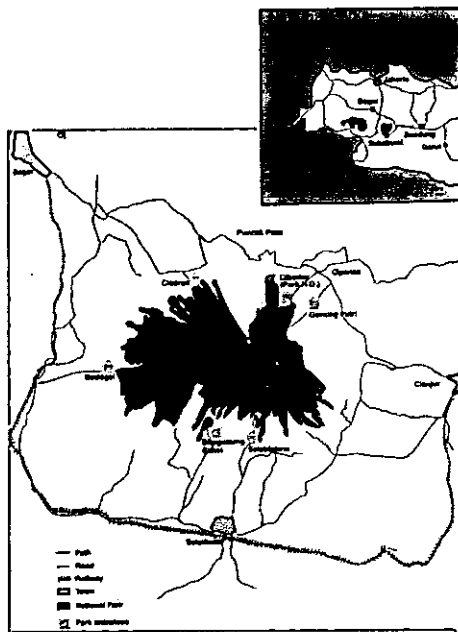


Fig. 1. Map of Gede Pangrango

Gede Pangrango National park or Taman Nasional Gede Pangrango (TNGP), established in March 1980, evolved from several reserves in Indonesia. It originated from Cibodas Nature reserve (established in 1889) covering 240 ha. It was then extended to include Cimungkat Nature Reserve, Situgunung Recreational Park, and Mount Gede Pangrango nature reserve. In 2003, by the decree from the Ministry of Forestry Number 174/Kpts-II/2003, the Park was extended from 15,196 ha to 21,975 ha. The park itself is situated between longitudes 106°51'-107°02' East and latitudes 6°41'-6°51' South. Administratively, it is shared between the Regencies of Bogor, Cianjur

and Sukabumi.

Preliminary surveys were conducted in 14th of July 2004 to check two locations in the Cibodas resort (Telaga Biru and Cibeureum waterfalls), from 26-29 July 2004 to check two locations outside the Cibodas resort (Bodogol and Selabintana) and later on from 9 – 13 August we checked another 4 locations in the vicinity of the Cibodas Resort (Rarahan Vilage, Cibodas Botanical garden, Rawa Denok, and The Valley of Surya Kencana on the summit of the mountain Gede). In this preliminary survey we failed to find Lebak Saat (one of Liem's location). However, with the help of one national officer we managed to find it a few months later.

We revisited Liem's survey locations to check the occurrence of frogs mentioned in his study. Locations were selected not only to compare current result with Liem's result but also to cover the available range of elevations character and types of habitat. In total we visited 9 locations (table 1); two locations in the regency of Sukabumi (Bodogol and Selabintana) and six locations within the national park boundary in the Cibodas plus 1 other location outside the national park (Rarahan village in Cibodas) in the regency of Cianjur which we called as the Cibodas Trail. The Cibodas Trail consist of locations surveyed previously by Liem in the 1960's. Detailed information on each location can be found in the supplement of this report.

b. Data collection

Data on the presence and absence of amphibians were derived from frog surveys. We used a combination of methods to conduct frog surveys: nocturnal surveys, diurnal surveys and pitfall trapping. The occurrence of a species were determined by finding adults or larvae, or, if possible, by male vocalization. Methods for surveying frogs are mostly taken from Heyer et al. (1994), the foremost reference on amphibian biodiversity sampling. Searches were include forest floor, water bodies, and surrounding vegetation.

We measured weight and snout vent lenth (SVL) of each frog captured. We also recorded sex (if possible), microhabitat, position along transects, and the behavior of each individual, along with measurements of environmental conditions (water, air and substrate temperatures, humidity) at the time of capture. Frogs were released after examination at the point of capture, except for a small number which were caught and preserved as voucher specimens, especially for species which have not been found before. Voucher specimens are stored in Muzeum Zoologicum Bogoriense. Frog species were identified using several books such as Inger (1966), Berry (1975), Liem (1971) and Iskandar (1988). Names recorded were those used by Iskandar & Colijn (2000).

Aquatic frogs

Stream frogs were surveyed during the day and at night, four days in a row during each sampling period. Surveys were carried out once for each locations. In streams, we used a 200 m transect, where data were collected by walking down the line and counting all frogs seen on either side of the line. Stream frogs were surveyed in 8 locations, excluding the Telaga Biru which its main habitat is small lake. We used time searches to survey frogs around ponds or lake. Ponds and lake frogs were surveyed in the ponds of Cibodas Botanical Garden and Telaga Biru.

Terrestrial frogs



Fig. 2. Pitfall traps, with plastic as drift fences material

To search ground dwelling frogs we used three different methods: Pitfall trapping, quadrat sampling and timed searches. Pitfall traps were only constructed in Bodogol. It is set with drift fences to guide frogs into the traps. The pitfalls were opened at night and searched in the morning. Unfortunately the materials of drift fences were stolen. We decided to change the locations. Again, although we had changed the material to plastic, it was stolen once more. Therefor, we decided to abandoned

the pitfall traps and closed it. Most of terrestrial area in Bodogol were then surveyed using timed seaches. Quadrat sampling were conducted in Telaga Biru and Selabintana using each 48 quadrats of 2x2 m which were selected randomly within the area. We then searched the quadrats for amphibians by turning logs and raking the leaves. Timed searches were done by walking through the forest randomly by two investigators and searching for frogs for a total of two hours.

Table 1. Sites surveyed in Gede Pangrango National Park

No	Time of survey	Location & coordinate	Habitat description	Elevation (asl)
1	25-28/9 2004	Selabintana S 06°50,460' E 106°57,842'	Stream: width 5.2 - 11.3 m, mostly fast flowing water with rock and gravel substrates. Depth 5 - 42 cm. Most of the streams are shaded. The area is steep; the only flat areas are reserved for camping ground (there is a big camping ground here). It was also managed as plantation forest before integrated into TNGP management.	1186 m
2	9/10-12/10 2004	Bodogol S 06°46,214' E 106°51,095'	Cikaweni Stream, substrates gravel and rocks, vegetation mostly <i>pinus merkusii</i> and bamboo. The area was managed as plantation forest before integrated into TNGP. Steep gradient. Leopard habitat. Conservation education areas managed by CI and TNGP; the only canopy trail in this national park.	703 - 814 m
3	4 - 7/10 2004	Curug Cibeureum S 06°45,232' E 106°59,177'	Waterfall (50 - 75 m high); creek width = 3-4 m, rocky substrates	1685 m
4	30/9 - 3/10 2004	Telaga Biru S 06°44,909' E 106°59,644'	Small lake with small creek along the side	1571 m
5	12 - 15/12 2004	Rawa Denok S 06°45,580' E 106°59,026'	Fast flowing stream with big rock substrate water. Small waterfall (= 2-3 m). Stream width = 4-6 m. Probably has high sulphur compound, rock yellowish in color. Steep forest gradient.	1699 - 1795 m
6	4 - 8/1 2004	Rarahan Village S 06°43,781' E 107°00,472'	Village. Agriculture site (no rice fields, mostly corns, carrot and other vegetable plants) and streams.	1258 m
7	16 - 19/12 2004	Lebak saat	Montane forest. No water when surveyed.	2250 - 2500 m
8	31/1 - 5/2 2005	Kebun Raya Cibodas (KRC) S 06°44,368' E 107°00,682'	Botanical garden. Habitat: ponds (12), stream and field plant	1361 - 1420 mdpl
9	6-9/2 2005	Alun Alun Surya Kencana S 06°47,728' E 106°59,143'	Valley, about 20 m from the summit and adjacent to crater. Small creek. Grassland meadow with low herbaceous plant.	2748 mdpl

Problems during survey were mostly due to weather and wildlife. Several times during our survey, heavy rains occur and we have to stop taking data because of the risk of being swept away in the stream and poor visibility. Bodogol is one of the areas frequently visited by leopard (*Panthera pardus*), as such, the forest surveyed is not random, taking caution to avoid the area where the leopards are usually sighted.

4. Results

a. Microclimate

The temperature in location varied, ranging from 13.5 – 28 °C in the morning to 9 – 26 °C at night. The temperature was lower in higher altitude. In general, Bodogol is warmer than the rest of the locations. The humidity in all locations is high, ranging from 63 – 100%. Table 2 illustrates the range of air and water temperature and relative humidity (RH) during sampling.

Table 2. Range of air and water temperature and RH in all location

Location	Date	Air temp. (Range °C)		Water temp. (Range °C)		Relative Humidity	
		Morning	Night	Morning	Night	Morning	Night
Rarahan	5-8/1 05	19 - 24.5	18-9.8	19 - 19.5	18 - 19.5	78 - 98	80-100
Cibodas Botanical Garden	31/1 - 5/2 05	19.5-23.5	15.5-19	17.5 - 20	16 - 19	63 - 83	79-100
Telaga Biru	30/9-3/10 04	17.5 - 19	14 - 17	17.2 - 19	16 - 18	95- 100	92-100
Cibeureum	4-7/10 04	15.2 - 19	14-16.5	16.2 - 19	16.5 - 19	81 - 95	85-100
Rawa Denok	12-15/12 04	16-17.5	15.5-17.8	18 - 20.2	16.8 - 20	92 - 97	90-98
Lebak Saat	16-19/12 04	13.5-15.5	11.5-14	13.5- 15.5	12 - 15	94 - 98	89-100
Alun-alun Suryakencana	6-9/2 05	14 - 16	9- 11.5	14.5 - 16	13.5 - 14	66- 100	79-100
Selabintana	25-28/9 04	19 - 22	16-19	17 - 19	16.5 - 18	75 - 95	88-95
Bodogol	9-12/10 04	22 - 28	20-26	22 - 23	21 - 23.5	78 - 96	84-96

Note: morning= from 10 – 12 am , night from 10 pm – 1 am.

b. The anurans of Gunung Gede Pangrango National Park

In total we found 18 species of frogs from 5 family (Table 2). Nine individuals from Telaga Biru which were first reported in the initial report as *Fejervarya limnocharis* were re-identified and put as *Limnonectes microdiscus*.

Species accumulation curve shows how many new species were added each day (Fig. 3). Number of species found are less with finding by Liem (1971) and species composition differs. Four species from Liem's result were not found in this study: *Fejervarya cancrivora*, *Bufo bipocartus*, *Microhyla palmipes* and *Rana nicobariensis*. Instead we found additional species: *Rana hosii*, *Leptophryne borbonica*, and *Limnonectes macrodon*. Species account is given in the supplementary of this report.

Table 3. Total anuran diversity found in TNGP

Family	Species
Bufonidae	<i>Bufo asper</i>
	<i>Bufo melanostictus</i>
	<i>Leptophrine borbononica</i>
	<i>Leptophrine cruentata</i>
Ranidae	<i>Huia masonii</i>
	<i>Rana chalconota</i>
	<i>Fejervarya limnocharis</i>
	<i>Limnonectes kuhlii</i>
	<i>Limnonectes macrodon</i>
	<i>Limnonectes microdiscus</i>
	<i>Rana hosii</i>
Megophryidae	<i>Megophrys montana</i>
	<i>Leptobranchium haselti</i>
Microhylidae	<i>Microhyla achatina</i>
Rhacophoridae	<i>Polypedates leucomystax</i>
	<i>Rhacophorus javanus</i>
	<i>Rhacophorus reinwardtii</i>
	<i>Philautus aurifasciatus</i>

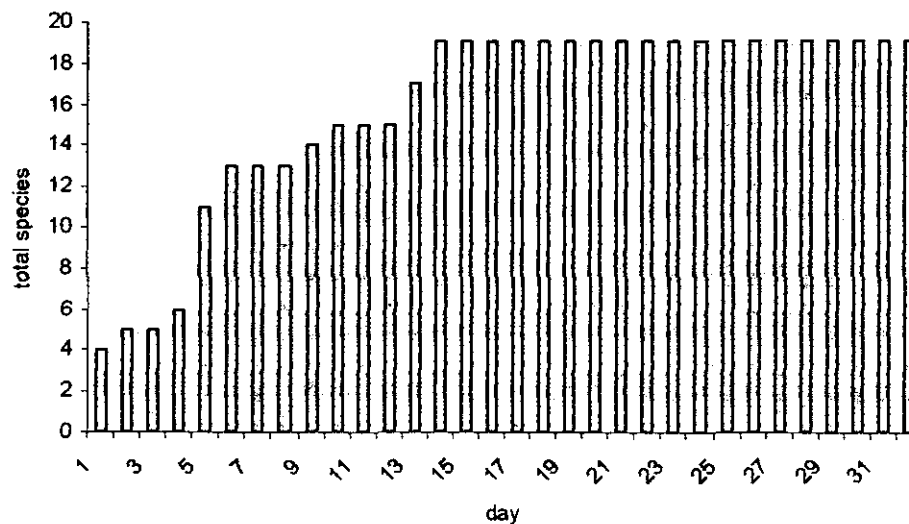


Fig. 3. Species accumulation curve of frogs found in TNGP from 25 September 2004 to 6 February 2005.

The 18 species found in this study only represents approximately half of species presents in Java (Iskandar, 1998). Fig. 3 shows that sampling had reach plateau, however sampling data per location indicated that most of it had not reached a plateau. This suggests that more species would have been recorded with further field time (Fig. 4). For instance, additional survey by the student's Herpetofaunal Groups in Bodogol found 2 additional species not observed during the actual survey: *Megophrys*

montana and *Polypedates leucomystax*. Therefore, additional monitoring would probably increase the probabilities of sighting other species.

The duration of surveying at TNGP can be only considered sufficient as a preliminary frog survey of the region, however we are confident that the most common species have been sampled and the data will be sufficient for baseline data for long-term future monitoring.

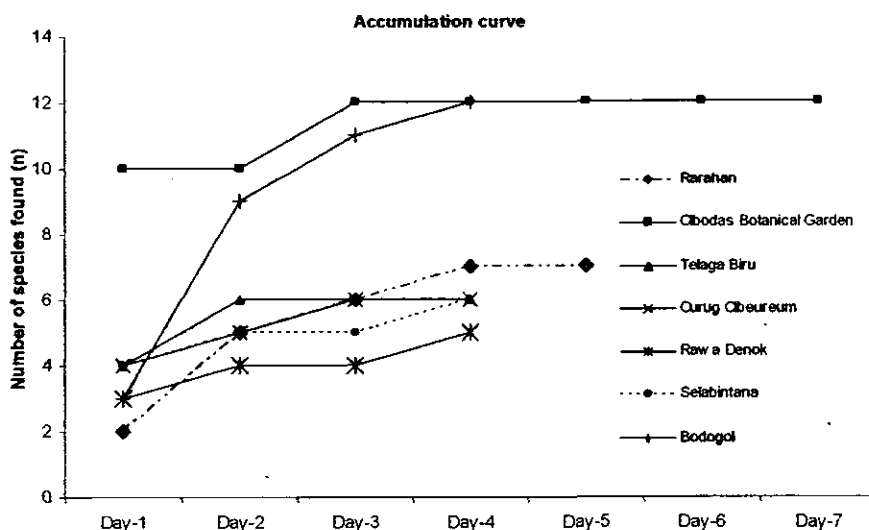


Fig. 4. Species accumulation curve of species found in each sites.

Species composition differs due to several reasons: 1) change of habitat, 2) differences in survey locations and 3) differences in sampling methods and effort. For instance during Liem's survey, most of landscape of Rarahan consist of ricefields and vegetable gardens. Nearly 40 years later the ricefields are gone and transformed into villas. There are still vegetable gardens and additional ornamental plants garden. Thus rice field frogs like *Fejervarya limnocharis* and *F. cancrivora* is less abundant than before. We did not survey Rawa Gajonggong, which probably the reason why we missed *Microhyla palmipes*, which based on Liem's account was restricted to Rawa Gajonggong. Liem also did not survey Selabintana and Bodogol. The methods of Liem's survey is sketchy but it seems that he used opportunistic method, in which he walked along the trail of Cibodas to find frogs for several days at a time. In his research note he mentioned that survey was conducted in 1961-1962 and more intensive surveys in August 1963, March and May 1964.

In Liem's survey, the highest altitude frogs found was in Lebak Saat. No frogs were found in Lebak Saat or Alun-Alun Surya Kencana during our survey. Thus the highest elevation that we recorded frog was in Rawa Denok. The differences of this finding probably due to the differences of habitat condition between Liem's survey and our survey. However, there is a need to do further monitoring before concluding that no frogs occur above 2,000 m limit.

This surveys also confirm Liem's result that vegetation plays a major role in the distribution of frog in Cibodas Trail. Species like *Bufo melanostictus*, *Rhacophorus reinwardtii* and *Polypedates leucomystax* which occur primarily in the non-forest area are not found in the forested area or vice versa. The highest diversity off frogs in Cibodas trail was found in Cibodas Botanical Garden (13 species compared with Liem's result 8 species), thus confirming the Botanical Garden as transitional zone between non-forested area and forested area. Higher species richness in Cibodas Botanical Garden in our survey compared to Liem's are probably caused by our greater effort to sampling frog in this area. Table 4 shows the comparison of our survey and Liem's survey in Cibodas Trail.

Table 4. A comparison of altitudinal distribution of frog in the Cibodas Trail of Mt. Gede-Pangrango National Park

Species	Cultivated land 1,250 – 1,350 m		Botanical Garden 1,350 m		Primary Rain Forest					
					1,600-1,700 m		1,800-2,000 m		2,250 – 2,500 m	
	DL	MDK	DL	MDK	DL	MDK	DL	MDK	DL	MDK
<i>Bufo melanostictus</i>	+	+	+	+	-	-	-	-	-	-
<i>B. bipocartus</i>	+	NA	-	NA	-	NA	-	NA	-	NA
<i>B. asper</i>	+	+	-	-	-	-	-	-	-	-
<i>Leptophryne cruentata</i>	-	-	-	-	+	+	+	+	+	-
<i>Megophrys montana</i>	-	-	-	+	+	+	+	-	-	-
<i>Leptobrachium hasseltii</i>	-	-	-	+	+	+	+	-	-	-
<i>Microhyla achatina</i>	+	+	+	+	-	+	-	-	-	-
<i>M. palmipes</i>	-	NA	-	NA	+	NA	-	NA	-	NA
<i>Fejervarya limnocharis</i>	+	+	-	-	-	-	-	-	-	-
<i>F. cancrivora</i>	+	NA	-	NA	-	NA	-	NA	-	NA
<i>Limnonectes kuhlii</i>	-	+	+	+	-	+	-	+	-	-
<i>L. microdiscus</i>	-	-	-	+	+	+	-	-	-	-
<i>L. macrodon</i>	NA	+	NA	-	NA	-	NA	-	NA	-
<i>Rana chalconota</i>	+	-	+	+	+	+	-	-	-	-
<i>R. nicobariensis</i>	+	NA	-	NA	-	NA	-	NA	-	NA
<i>Rana hosii</i>	NA	-	NA	+	NA	-	NA	-	NA	-
<i>Huia masonii</i>	-	+	-	+	+	+	+	+	-	-
<i>Philautus aurifasciatus</i>	-	-	+	+	+	+	+	+	-	-
<i>Rhacophorus javanus</i>	-	-	+	+	+	+	-	+	-	-
<i>R. reinwardtii</i>	+	-	+	+	-	-	-	-	-	-
<i>Polypedates leucomystax</i>	+	-	+	+	-	-	-	-	-	-
Total Number of species	10	8	8	13	9	10	5	5	1	0

NA: Not available (not found during the survey)

DL: David Liem survey in the 1960's.

MD: Our Survey in 2004/2005

The most abundant frog found were *Rana chalconota* and *Bufo melanostictus*. Both species were mostly found in disturbed habitat. *Bufo melanostictus* were found only in Rarahan, Cibodas Botanical Garden and Bodogol. *Rana chalconota* are found in the same location with *Bufo melanostictus* plus Telaga Biru.

Two speies of endemic frog were found, *Rhacophorus javanus* and *Leptophryne cruentata*. The number of *Leptophryne cruentata* found during the survey are low. Table 3 shown the total number of frogs found in each location during survey.

Table 5. Total frogs found during the survey

Species	Rrh	CBG	TB	Cbr	RD	Slbt	Bdgl	Grand Total
<i>Bufo asper</i>	1						3	4
<i>Bufo melanostictus</i>	174	70					3	247
<i>Fejervarya limnocharis</i>	1						1	2
<i>Huia masonii</i>	5	7		37	6	20	5	80
<i>Leptobranchium haselti</i>		1	1			4	1	7
<i>Leptophrine borbonica</i>							1	1
<i>Leptophrine cruentata</i>				3	1			4
<i>Limnonectes kuhlii</i>	1	35		8	12	3		59
<i>Limnonectes macrodon</i>	1							1
<i>Limnonectes microdiscus</i>		3	10			1	3	17
<i>Megophrys montana</i>		1	1					2
<i>Microhyla achatina</i>	1	44	13	3			7	68
<i>Philautus aurifasciatus</i>		1	14	16	5		1	37
<i>Polypedates leucomystax</i>		4						4
<i>Rana chalconota</i>	53	456	156				1	666
<i>Rana hosii</i>		5				58	2	65
<i>Rhacophorus javanus</i>		22	5	5	2	1		35
<i>Rhacophorus reinwardtii</i>		16					4	20
Grand Total	237	665	200	72	26	87	32	1319
Number of species	8	13	8	6	5	6	12	18

Note: Rrh = Rarahan Village, CBG = Cibodas Botanical Garden, TB = Telaga Biru, Cbr = Cibeureum, Rd = Rawa Denok, Slbt = Selabintana, Bdgl = Bodogol

Aquatic frog

The most abundant frog pond frog found is *Rana chalconota*. It is not only found during the night but can be seen easily during the day in the pond of Cibodas Botanical Garden or around the pond of Telaga Biru. It seems that this frog is diurnal, compared to others that mostly nocturnal.

Huia masonii and *Limnonectes kuhlii* appear widespread and relatively abundant in all stream location. Adult males *H. masonii* are usually seen perching in leaves, or branches in plants on the side of a stream side, whilst the females usually seen doing amplexing with males in the stream. *Limnonectes kuhlii* are usually found perched in rocks or rocky walls of a stream. *Rana hosii* were mostly found in stream of Selabintana and it was the most abundant species in Selabintana, followed by *Huia masonii*. It is usually found in rocks or trees in the stream. *Limnonectes macrodon* is known as edible frog and only found in the stream of Rarahan.

Treefrog

The endemic javan treefrog, *Rhacophorus javanus* is found widespread in forested area of Cibodas Trail up to Rawa Denok and also in Selabintana, whereas *R. reinwardtii* is found in disturbed area such as the Cibodas Botanical Garden and Bodogol. *Rhacophorus javanus* could be found in shrubs and trees up to 3 m high and during the day sometimes can be seen sleeping between leaves. Both species could be found relatively

abundant in Cibodas Botanical Garden mostly around pond number 8 and number 10, in which more than one frog can be found in one plant. On 3 February 2005 we found a group of *R. reinwardtii* near pond number 8 in Cibodas Botanical Garden, several pair are amplexing. In Bodogol, several tadpoles of *R. reinwardtii* were found in temporary ditch on the dirt road. *Philautus aurifasciatus* was also found widespread in forested area of Cibodas Trail up to Rawa Denok. On the other hand, *Polypedates leucomystax* is only found in Cibodas Botanical Garden, mostly in pond number 10.

Terrestrial frogs

Bufo melanostictus are found in abundance in disturbed habitat. It can be found not only at night but also during the day. *Leptobrachium hasseltii* and *Megophrys montana* are mostly found in forested area. *Microhyla achatina* were found mostly among grasses near pool or lakes.

c. Conservation Issues

None of the TNGP frog is presently considered as endangered, in fact none of Indonesian frog is considered under threats. With the apparent declining of frog population elsewhere in the world it is important to have historical information on distribution and abundance of frog in TNGP. The information is necessary to assess the nature and extent of declines, if there are any. Unfortunately although Liem reported the distribution, he did not explicitly mentioned the abundance of frog in his survey. However, from his paper he mentioned the number of specimens examined. Considering that in the 1960's researcher usually captured all frog sighted and turn it into museum's collection, a comparison of relative abundance can be made for frogs from the Cibodas Trail. Table 6 shows the comparison of frogs found in the Cibodas Trail.

From table 6, it is obvious that the low number of *Leptophryne cruentata* observed in this survey is caused for concern. *Leptophryne cruentata* is a moderate frog (SVL adult females 25-40 mm, adult males 20-30mm; Iskandar 1988) with no report on the breeding biology such as time of breeding and number of eggs per clutch. In the 1960's *Leptophryne cruentata* is found in abundance by Liem (total number of specimens examined 149). It was the second most abundant species of frog after *Rana chalconota*. Nearly 40 years later, *Rana chalconota* is still the most abundant frog encountered, but the number of *L. leptophryne* observed has declined sharply. In 1998, Iskandar mentioned in his book that *L. cruentata* is already absent from Curug Cibeureum. Our survey showed that *L. cruentata* is still observed occasionally in this area. It is possible that somewhere along the time the population of this frog in the Cibodas Trail especially in Curug Cibeureum has crashed, however the occurrence of this species presently gives a hope that it might recover albeit slowly.

Table 6. Comparison on relative abundance of frog observed in the Cibodas Trail

Species	Number of specimen examined by Liem	Number of frogs found in our survey
<i>Bufo melanostictus</i>	8	244
<i>Bufo asper</i>	3	1
<i>Bufo bipocartus</i>	5	0
<i>Leptophryne cruentata</i>	149	4
<i>Megophrys nasuta</i>	56	2
<i>Leptobrachium haseltii</i>	12	6
<i>Microhyla achatina</i>	46	59
<i>Microhyla palmipes</i>	126	0
<i>Fejervarya cancrivora</i>	12	0
<i>Fejervarya limnocharis</i>	12	2
<i>Limnonectes kuhlii</i>	101	56
<i>Limnonectes microdiscus</i>	30	12
<i>Limnonectes macrodon</i>	0	1
<i>Rana chalconota</i>	215	665
<i>Rana nicobariensis</i>		0
<i>Rana hosii</i>	0	5
<i>Huia masonii</i>	43	55
<i>Rhacophorus reinwardtii</i>	21	16
<i>Rhacophorus javanus</i>	106	34
<i>Polypedates leucomystax</i>	6	4
<i>Philautus aurifasciatus</i>	18	36

There are several potential threats for frog in TNGP. Anthropogenic threats in form of habitat modification are relatively absent, given the fact that all habitats inside surveyed area are protected. The only possible habitat modification occurs outside the TNGP which is Cibodas Botanical Garden and Rarahan. However, it seems that Cibodas Botanical garden is quite established and no significant habitat modification occurred in the last 40 years. Rarahan probably experienced significant land use change, which explained the change of frog composition.

Other potential threats are human visitation in the national park. TNGP is popular for hiking and sites such as Telaga Biru and Curug Cibeureum are mostly popular for a one day outing. Every year thousands

of visitor visit the Curug Cibeureum or hikes to the summit of TNGP. It is estimated that around 30,000 visitors climb the summit annually (Whitten et al., 1996) The pressure is quite high, which prompted the TNGP management to close hiking permit to the summit for several months in a year, mostly during heavy rainy seasons. The threats from human visita-



Fig. 5 Rubbish in Telaga Biru

tion include trampling of bottom substrate which probably acted as nesting sites and most importantly pollution, mostly in form of solid waste such as plastics and empty tin cans. During our survey we found a lot of rubbish near Telaga Biru and Curug Cibeureum.

Other threats that could possibly affect frog are diseases. Chytridiomycosis, a skin disease caused by *Batrachochytrium dendrobatidis* or known as the chytrid fungus has been implicated as the cause of frog decline in Australia, New Zealand, Central America countries and elsewhere (Berger et al., 1998, Berger et al., 1999). There are no reported chytrid infections in Indonesia, which is probably because there are no attempts to investigate the fungus. It is quite understandably because previous method requires offensive handling (cutting of frog's finger) and rigorous laboratory work which require skills and specific equipments that most Indonesian researchers did not possess. The cause of population decline of *L. cruentata* is not known. It is worthwhile in the future to check the occurrence of this pathogen through cooperation with international organizations that had the expertise to analyze chytrid infection using newer methods such as skin swabbing.

Environmental stress also serves as potential threats. It might be interesting to point out that 2 out of 3 *L. cruentata* that we found in Curug Cibeureum are missing one of its limbs either forelimb or hindlimb. Knowledge of the population dynamics and biology of the frogs in this report is generally poor. Therefore, there is a need to do more research to ensure conservation of these species, and in particular, for determining the cause of decline of *L. cruentata*.

d. Management Implications

There are several implications arising from this study:

- a) that regular monitoring of frog population of these sites must be continued on an annual basis to provide an on-going assessment of the populations of frog especially *L. cruentata*
- b) that intensive monitoring of *L. cruentata* in known sites must be carried out and also more research on its ecology
- c) that area surveyed need to be enlarged, including locations missed such as Rawa Gajonggong and Mount Pangrango
- d) that time of survey need to be intensified to at least 6 days for each locations
- e) revise the endangered species list and propose *L. cruentata* in protected status
- f) launch public education campaigns and increase public participations

5. Other Project Components

a. Local participations

Most of the team are students or alumni of the Faculty of Forestry, Institut Pertanian Bogor. Herpetological studies in this University is still in their infancy, although there are now several research staff and students with herpetological interest. The students themselves has organized a herpetological club



Fig. 6. Erecting tents during survey

called Kelompok Pemerhati Herpetofauna (KPH). All students member and some of the volunteers in this project come from KPH.

The project has given the students opportunities to gain valuable research experience, not only by doing surveys in the fields but also in learning skills like using GPS and organizing an expedition. The project has also gained interest from other non-IPB students. At least 2 of the volunteers that we had are from general public.

b. Training for the National Park Officer: 13 July 2004



Fig. 7. Anisa Fitri giving lecture

Due to limited funds, we cancelled frog research methodology training for National park officers and modified it into short (one-day) training on how to identify frogs in the field. Fourteen National Park officers from 4 resorts attended the training. The training includes a 3 hours lecture in the National Park office in Cibodas, which

consist of introduction to ecology and

conservation of frogs and how to identify them, given by team leader Mirza D. Kusri and another member, Anisa Fitri. Later on, during late afternoon all participants and organizers hiked up to the Curug Cibeureum waterfalls, around 1 hour from Cibodas. In the evening (starting at 7 pm) we divided the participants into 3 groups, in which each groups look for frogs



Fig. 8. National park officers learning to weigh frog in the field

around the Cibeureum waterfall until 9 pm.

All frogs captured were identified on-site

and then released. It was the first time that they learn about frogs and they soon realised that identifying frog species is not easy as they thought before. It took them until midnight before they finished the exercise, in which afterwards they went down to Cibodas to have a rest. All participants were excited and remarked that the training was too short. Most were glad that they were able to learn about frog, although some of

them remarked that catching slimy-hopping things at night is probably not an occupation that they will choose.



Fig. 9. Our team and the national park officers who participated in the training

b. Public Awareness and Education

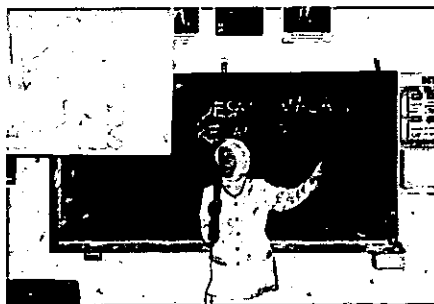


Fig. 10. A welcoming note from the teacher

Although some children seemed uncomfortable, many were excited and curious enough to try to hold it with their own hands. In each school we stayed for over 2.5 hours in one class with around 50 selected children from grade 4,5, and 6. However in one school (SD Rarahan) we gave presentation to a bigger class, which comprises of almost 100 children in one class.

Frog conservation education was conducted on the 1st of February 2005 to three primary schools (SD Rarahan, SD Jayagiri and SD Girimukti) in Cibodas. In each school, we gave presentation using powerpoint slides that depicting the life and diversity of frogs and we also bought small terrarium with real frogs to school.

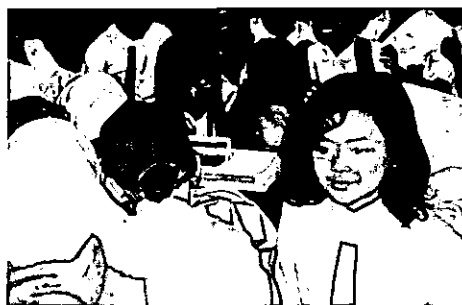


Fig. 11. Crowds of curious schoolchildren looking at frogs inside the terrarium

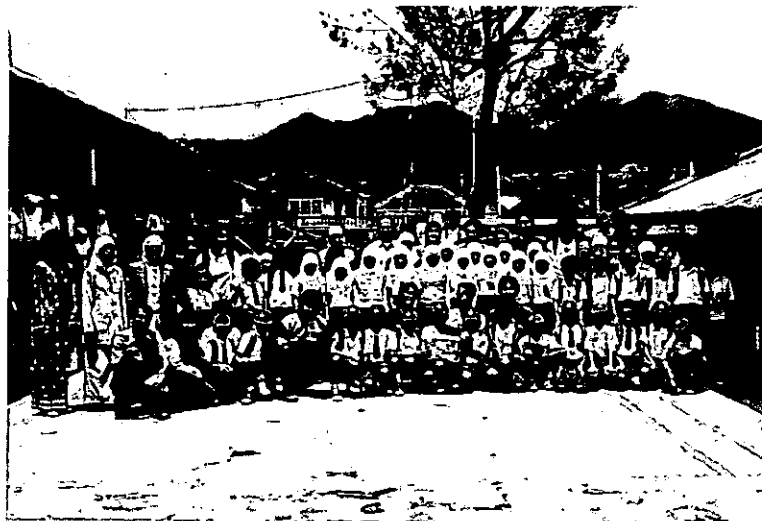


Fig. 12. Team and schoolchildren and teachers of SD Girimukti, Rarahan.

6. Output

1. We will prepare at least one publication for scientific journal from this result. We have sufficient quantitative data on species richness and relative abundance.
2. Presentation. We are planning to give a variety of presentations on the importance and results of this project in forms of general

lectures or posters in appropriate conferences, university students' societies meeting, or seminar groups.

7. Personnel

Due to some concern on the safety of the international participants and problems related to study, the personnel in this project have undergone some changes. Nicole Kenyon, from James Cook University has declined her participation early and her position is replaced by Kim Hauselberger (also from James Cook University). However, in the end both Jodi Rowley and Kim Hauselberger also were unable to come to Indonesia. Thus there are no International personnel in this first year study.

The Indonesian team has also undergone some changes. Wim Ikbai, Adininggar and Nevridedi Endri had unable to participate fully in this project due to their study and they were replaced by Dede M. Nasir, Dadi Ardiansyah, Vivien Lestari and Reddy Rachmadi.

By the end of February 2005, Mirza Dikari Kusrini is no longer at James Cook University. Mirza had resumed her position as lecturer at Bogor Agricultural University, Indonesia.

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