The changes in Amphibians and reptile species living in the tank environment effect from The Renovation of small Tanks in Dry Zone in Sri Lanka (Case Study In Galgamuwa Division in Kurunegala)

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Abstract
From ancient time, malty propose institutes and organizations had involved to small tanks renovation in Sri Lanka. Nawdays Department of Agrarian Development, Irrigation Department, Samurdi Authority, Gamanaguma project and NGO's were involved for small tank renovation. They applied Remove soil from tank, Renovate tank bund, Remove plant cover on the tank, Slues repairing, Wana (spill) Repairing and Channel repairing as types of tank renovation. This renovation steps directly effect on amphibians and reptile species living in the tank environments. This research has been identified amphibians and reptile species changes living in the tank environment after small tanks Renovation. The study was conducted on 12 small tanks in Galgamuwa DS division in Kurunegala district where 77 no's of renovated tanks during last 15 years are located. Small tanks in Sri Lanka are those having an irrigated command area of 80 ha (1 ha = 2.47 acres) or less. Questionnaire survey for 150 households, 12 PRA activities and field plot transects were used for data collection. Crocodile distribution after the renovation has not changed. Before and after renovation crocodiles are only rarely seen. Tank renovation has negatively affected on the distribution and population of Viper and Monitor. However other species including Iguana species, Water snake, Skink species, Chameleon species and Python can be seen in the tank surroundings abundantly before and after the tank renovation. According to the above facts small tank renovation has not influenced the populations of many reptile and amphibian species except Monitor and Viper. Reptiles and amphibian populations have declined only in the Bulnawa tank.

Key words: Small tanks., Renovation, Amphibians, Reptiles

Introduction
There are number of small tanks in the north part of the Kurunagala district which preserve the water requirement of people. In Galgamuwa DS division this minor irrigation system is providing not only the water needs but also it conserve the environmental quality of the whole area of dry zone. Therefore it is a man made Eco friendly ecosystem which is uncared in recently. This can be developed as a solution for the water scarcity of dry zone area is under study.

Further identifying of this Study is The changes in amphibians and reptile species living in the tank environment effect from the renovation that was taken place after the dilapidating of small tank which compare with past significant of eco friendly environment of small tanks. The finding can be used to other development programs of small tanks to concern with their eco friendly environment which is help to improve the village ecology and economy.

And this experience can be applied in other development programs such as reservoirs. So this problem is very important to be studied.

Small tanks are used for collecting runoff water during the monsoon for irrigation and domestic water supply. They are created by constructing an earthen bund across a natural drainage basin. According to Aheeyer (2005) and Ausadahami (1999),Darmasena (1991, 1995), MaddumaBandara (1980,1985), Thennakoon (2002, 2004) tanks are developed in response to the need for more intensive cultivation when traditional forms of extensive cultivation can no longer support the growing population. Small tanks in Sri Lanka are those having an irrigated command area of 80 ha (1 ha = 2.47 acres) or less.

General Objective

By identifying the factors that affect the amphibians and reptile species living in the tank environment due to renovation of small-scale tanks.

Methodology

Study area

The selected site is located in Kurunegala District of North West Province in Sri Lanka covering an area of 278km. The area is representative of a wider agro ecological region known as the Lowland Dry Zone, which experiences high levels of rural poverty associated with short rain fed growing seasons and degrading, nutrient-poor red soils. North West Province is the Province in Sri Lanka most richly endowed with small-scale tank systems which situated between and $7^0$50' north latitude and $8^0$15' and 79 ^{0}57' and $80^0$45' East longitude and 300m above sea level.

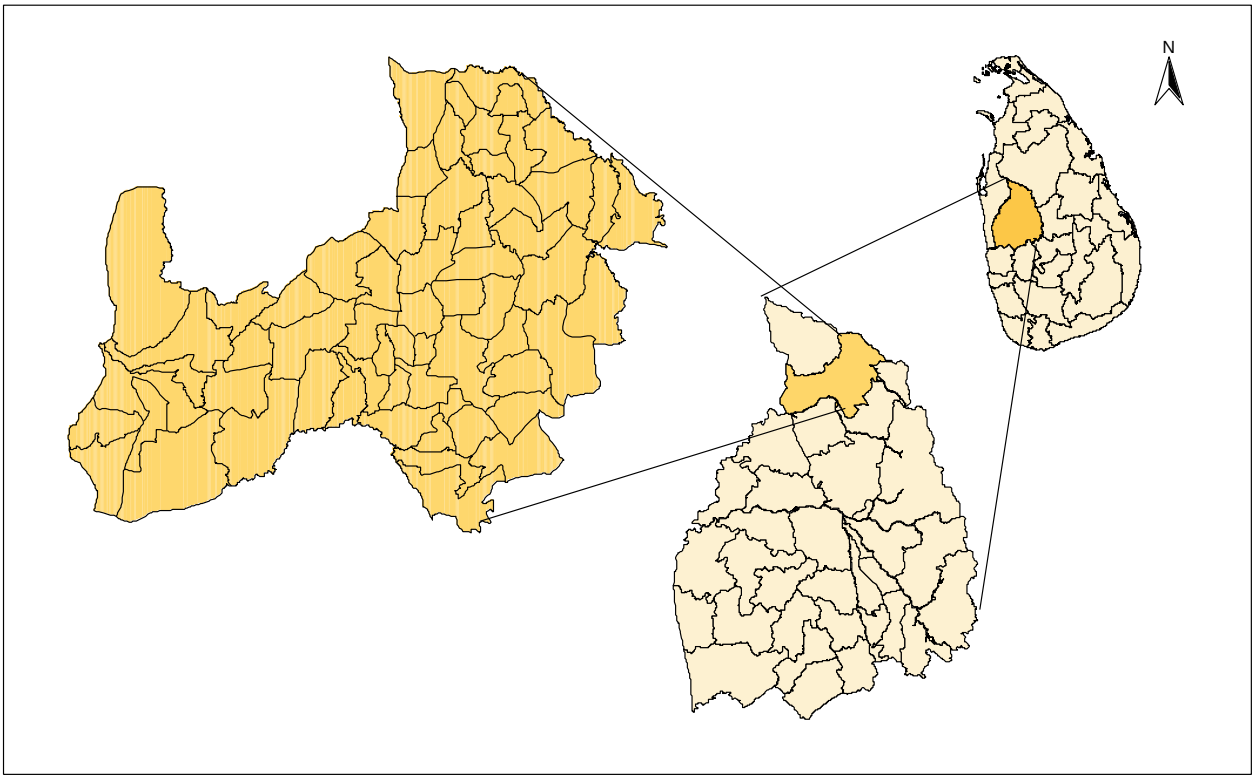

Figure 1: Location of the study area and Gramaniladhari divisions (GN) of selected tanks

Source-: Land-use planning unit- Kurunegala

The Division has 182 nos. of small villages and 62 nos. of Gramaniladhari Divisions with the number of service Institutes such as Police Stations, Banks, Schools, Hospitals, etc;

Methods used for Data collection

The study has being used primary and secondary data to collect the information. Primary data refers the data which researcher collect by individually with his own survey. There are several techniques to collect primary data.

- Questionnaire Method
- PRA

- Focus Group Discussion
- Interviewing
- Observing
- Field plot transects

Secondary data refers the data which were directly taken from Government or non-government publications. They are also several types.

- Government Publications
- Institutional Publications
- News Magazines
- Journals
- Internet

The primary data for this research will be conducted by the questionnaire method. Each questionnaire will be filled by the researcher while he discuss with the people in towel small tank villages, selected using stratified random sampling techniques (table 1,2,and 3).Further Focus group discussion may be including in the primary data. It also make discussions with group of people while supervise the tank environment. Those facts also collected for this research paper.

Next primary data methods are field observation and field plot transects, the researcher will get an idea about the exact field by observing them.

Selection method for Tank samples (Step I)

Table 1

No of farmers Command area (Akers)	0 - 59	60 - 119	120 - 189	190 - 249	Total
0 – 35	55	3	1	0	59
36 – 71	10	3	0	0	13
72 – 107	0	3	0	1	04
108 – 143	0	1	0	0	01
Total	65	10	01	01	77

Table 2: **Selection method for Tank samples(Step II)**

No of farmers Command area (Akers)	0 - 59	60 - 119	120 - 189	190 - 249	Total
0 – 35	55/77 ×12 = 8	0	0	0	08
36 – 71	10/77× 12 = 2	3/77 × 12 = 1	0	0	03
72 – 107	0	3/77 × 12 = 1	0	0	01
108 – 143	0	0	0	0	00
Total	10	02	00	00	12

Table 3: **Name of selected tanks using random table and no of selected farmers for sample**

In no	Random No	Name of The Tank	No of Farmers	Command area (Akers)	no of selected farmers for sample
01	118	PahalaPulachchiyawewa	58	08	15
02	87	Ihalagamawewa	13	08	3
03	41	Pahalakoonwewa	31	34	8
04	05	IhalaPalukendawawewa	40	12	10
05	11	Ottukulamawewa	18	18	5
06	83	Dullawawewa	49	30	13
07	16	Kurundankulamawewa	35	35	9
08	10	Monnankulamawewa	46	27	12
09	02	PahalaPalukendawawewa	35	35	9
10	29	Bulnewawewa	59	54	16
11	90	Medawachchiyawewa	105	71	27
12	93	Mahagalkadawalawewa	90	75	23
		Total	579		150

Secondary data

It will do by using Government reports, periodicals & other publications which have published by Government or any other institutions. The divisional secretariat office, Galgamuwa also vital in providing data for the research. And also the agrarian office and other sub institution which relevant to farmers affaires provide much secondary data.

Results and Discussion

Changes in amphibians and reptiles living in and around the tank surroundings

Some amphibians and reptiles that lived in the tanks few years ago have either reduced in population or disappeared due to various reasons. Few of the reasons for these changes are limitation of the area covered by bushes and high grass, reduction of aquatic plant cover (hydrophytes) in the tank, reduction of the water level in the tank during the dry periods, and increasing farming activities etc.(IUCN, 2007; Kudavidanage, 2012). Some amphibians and reptile species living in the studied small tanks and the surroundings are given in Table 4.

Table 4 Amphibian and reptile species identified by the tank villagers and selected for the study

Common name (English)	Common Name (Sinhala)	Species Name
Marsh Crocodile	Halakibula	*Crocodylus palustris*
Monitor	Kabaraya	*Varanus salvator*
Iguana	Thalagoya	*Varanus cepedianus*
Tortoise	Galibba	*Melanochelystrijuga*
	Kiriibba	*Lissemyspunctata*
Water snake	Diyanaya	*Xenochorophispiscator*
Chameleon	Palakatussa	*Calotescalotes*
	Garakatussa	*Calotesversicolor*
Skink	Vairanhikanala	*Mabuyabeddomii*
	Lehikanala	*Mabuyabibronii*
	Garadihikanala	*MabuyaCarinata*
Cobra	Naya	*Najanaja*
Viper	Polanga	*Viperaaspis*
Python	Pimbura	*Phytthonmolurus*

Source -: Field observation 2017

Questionnaire survey analysis and PRA analysis of amphibians and reptiles

The Crocodiles that could be seen in large numbers at water environments of Sri Lanka are rare in the small tank environments used by the people. Field studies clarified that after the tank renovation, Crocodiles are not available (97 percent of the respondents) although some respondents reported their availability before the tank renovation (84 percent of the respondents).As per the hypothesis testing (Mann-Whitney Test) performed, it was revealed that Crocodile distribution after the renovation has not changed. Before and after renovation crocodiles are only rarely seen. The slight reduction in the presence of crocodiles could be due to dredging and remove of aquatic plant cover on the tank in the renovation process, and increase in the use of tanks by the villagers.

Table 5: Evaluation of the changes in amphibians and reptiles living in the tank environment before and after renovation

Amphibian and Reptile species	Step of Renovation	Villagers' Response*				Significant change in population**
		1	2	3	4	
Marsh crocodile	Before Renovation	84	16	0	0	No
	After Renovation	97	3	0	0	
Monitor	Before Renovation	0	26	73	1	Yes (N)
	After Renovation	2	56	42	0	
Iguana	Before Renovation	0	23	77	0	No
	After Renovation	0	45	54	1	
Tortoise	Before Renovation	0	8	87	5	Yes (N)
	After Renovation	3	49	47	1	
Water snake	Before Renovation	0	7	91	2	No
	After Renovation	0	5	92	3	
Chameleon	Before Renovation	0	98	2	0	No

	After Renovation	0	99	1	0	
Skink	Before Renovation	0	100	0	0	No
	After Renovation	0	100	0	0	
Cobra	Before Renovation	0	69	31	0	Yes (N)
	After Renovation	1	96	3	0	
Viper	Before Renovation	0	66	34	0	Yes (N)
	After Renovation	1	99	0	0	
Python	Before Renovation	1	97	2	0	No
	After Renovation	1	98	1	0	

Source -: field data 2018

Tank villagers' observations

1 (Not present) 2 (1-2 per month) 3 (3 -4 per month) 4 (More than 4 per month)

Yes(N) = Negative change Yes(P) = Positive change ** 5 percent significance level

Tortoise species can be seen in large numbers at surrounding areas of tanks. As per the hypothesis testing (Mann-Whitney test) it is revealed that the tank renovation has negatively affected on the distribution and population of Tortoise. Eighty seven percent of the villagers said that Tortoises were in large numbers before the renovation but only 47 percent of them said that Tortoise population is in large numbers even after the renovation. The Tortoise population can be affected negatively due to the increasing use of tanks by the villagers for non-agricultural activities. The unavailability of hiding sites for these tortoises exposed them to the people not only RT villages but also NRT villages who hunted them for meat.

According to the experiences of the tank villagers, the distribution of the monitor has changed. Only 42 percent of the villagers reported that monitor was seen in large numbers after the renovation though 72 percent reported their abundance before the renovation. The hypothesis testing (Mann-Whitney test) revealed that the tank renovation has negatively affected on the distribution of monitor. In a similar manner, Iguana species, Water snake, Skink species, Chameleon species and Python can be seen in the tank surroundings abundantly before and after the tank renovation. With the ability of cultivating both the *Yala* and *Maha* seasons, uncultivated areas with shrubs is limited, but there are sufficient habitat available for these reptiles and amphibians to live in and around the tanks. Such areas include non-cultivated areas specially the tank catchments. There are no significant negative changes in the population of fauna and ecosystem around the small tanks due to the renovation.

As per the PRA results shown in Table 6, the reptile with the highest population before and after the tank renovation is Water snake. There is no significant change in water snake population after the tank renovation. Before the tank renovation, the Monitor was the second abundant reptile but it has reduced to the sixth most abundant species after the tank renovation. Viper and Crocodile is the rarest reptile species found from the tank environments before and after the renovation process. Viper and Cobra populations are also negatively changed after the tank renovation. In RT 10,reptile population has reduced while in RT 11 and RT 12their population has increased after the tank renovation which could be attributed to higher percentage of abandoned paddy fields, protection of the forest cover in the tank catchments and scattered settlements. The PRA matrix shows that there is few decreasing trend of all the reptile species with the renovation process. It is also revealed in the Figure 2.

Table 6: Evaluation of abundance of amphibians and reptiles before and after renovation of small tanks using ranking matrix PRA tool and t test

Reptile species → / Tank Name ↓	Renovation*	Crocodile	Monitor	Iguana	Tortoise	Water snake	Skink	Chameleon	Cobra	Viper	Python	Total Marks	Rank For Tank	P value	Significant change in 95 percent
RT 1	B	2	3	3	2	3	3	3	2	2	2	25	8	0.081	No
	A	1	3	3	2	3	2	3	2	2	1	22	9		
RT 2	B	1	3	3	3	3	3	3	2	2	2	26	7	0.343	No
	A	1	2	3	2	3	2	3	3	2	2	23	8		
RT 3	B	1	2	2	2	4	3	3	3	2	2	27	6	0.591	No
	A	1	2	3	3	3	3	3	2	2	2	24	7		
RT 4	B	1	2	2	3	3	2	2	1	2	2	21	12	1.000	No
	A	1	2	2	2	3	2	2	2	2	2	20	12		
RT 5	B	1	3	3	3	4	3	3	3	3	2	28	5	0.081	No
	A	1	3	3	3	3	3	3	2	2	2	25	5		
RT 6	B	1	3	2	2	4	2	3	2	2	2	22	11	0.168	No
	A	1	2	2	2	3	2	3	2	2	2	21	11		
RT 7	B	1	3	2	2	3	3	3	2	2	2	23	10	0.591	No
	A	1	2	3	3	3	3	3	2	2	2	24	6		
RT 8	B	2	3	3	3	4	3	3	3	3	2	29	4	0.081	No
	A	1	3	3	3	4	3	3	2	2	2	26	4		
RT 9	B	1	3	2	3	3	2	3	2	3	2	24	9	0.193	No
	A	1	2	2	2	3	3	2	2	2	2	21	10		
RT 10	B	2	4	4	4	4	3	3	3	2	3	32	1	0.015	YN
	A	1	3	3	3	4	3	3	3	2	2	27	3		
RT 11	B	2	4	3	3	4	4	3	3	3	2	31	2	0.193	No
	A	2	3	3	4	4	3	3	2	2	2	28	1		
RT 12	B	2	4	3	3	4	3	4	2	3	2	30	3	0.081	No
	A	2	3	3	3	4	3	3	2	2	2	27	2		
Total Marks	B	17	37	32	33	42	34	36	28	29	25	318		0.055	**No**
	A	14	30	33	32	40	32	34	26	24	23	288			

Rank for reptiles	B	10	2	6	5	1	4	3	8	7	9		YP = Significantly change /Positive YN = Significantly change/ Negative No = Significantly no change
	A	10	6	3	5	1	4	2	7	8	9		
P value			0.082	0.002	0.586	0.003	0.082	0.339	0.166	0.038	0.017	0.166	0.057	
Significant change of 95percent			No	YN	No	YN	No	No	No	YN	YN	No	**No**	

Source -: field data 2018

Tank villagers' observations

Marks= 1 (Not present) 2 (1-2 per month)3 (3 -4 per month)

4 (More than 4 per month)

* B = Before Renovation A = After Renovation

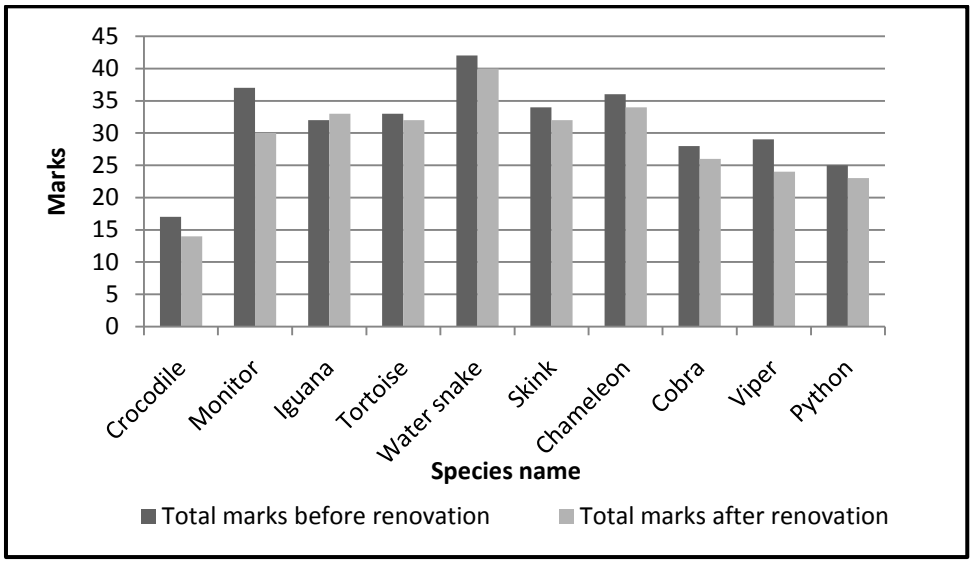

Figure: 2Abundance of amphibians and reptiles before and after renovation of small tanks using ranking matrix PRA tool

According to the t-test at 5 percent significance level, there is no significant difference in the abundance of amphibians and reptiles between the tanks before and after the renovation of the tanks (P = 0.055). In addition, there is no significant difference in the abundance of amphibians and reptiles according to the total rank marks received for the tanks.

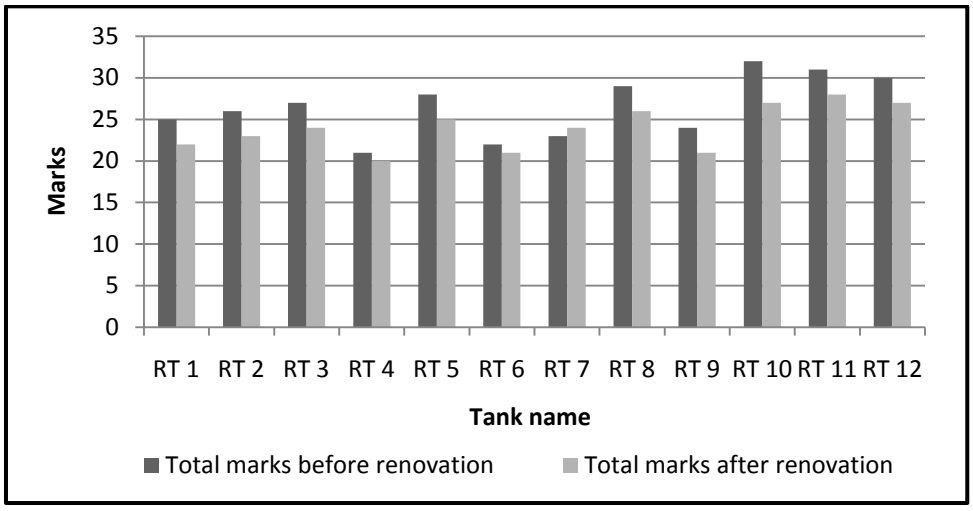

Figure: 3 Evaluation of tanks according to abundance of amphibians and reptiles before and after renovation of small tanks using ranking matrix PRA tool

Statistical analysis has confirmed that the tank renovation has not critically affected the reptiles and the amphibians living around the tank ecosystems. Although valuable ecosystems have been created at the small tanks that were built many centuries ago, the main objective of those tanks was just to get the human needs fulfilled such as food production and water availability. When renovating a tank either by the government or any other organization, the main consideration of the program was to create the maximum efficiency for community needs. After the renovation of the tanks, human activities necessarily increased affecting the population of amphibians and reptiles living around the tank. The changes that happened in the long-standing environment have affected some animals in a positive manner in terms of food supply, growing their population and the safety of them and vise versa. As mentioned before, with the increase of the water level and the removal of the aquatic plant cover, an environment that is not suitable for the needs of some animals have emerged.

The animals like crocodile and tortoise lost their habitat when the human activities were increased. As crocodile is identified as a risky animal, inhabitants place no room for the growth or population build up of the crocodiles. The villagers consume some of these reptiles such as tortoises. With the increase of the activities of the tank, the possibility of the tortoise of being a pray to human get increased. However according to the PRA analysis, the population of all the reptiles and amphibians changed slightly after the tank renovation but not significant. (Total marks reduced from 318 to 288 in Table 6).

Out of the tanks that were selected for this study, the highest animal populations can be seen in and around RT 12, RT 11, RT 10, RT 8 and RT 5 tanks (Figure 3). Main reason for this higher population is availability of a larger catchment area, non-availability of roads in the catchment and upper side of the tank and non- availability or least number of human settlements in the catchment areas.

Table 7 shows the changes in the population of reptiles and amphibians that are living in and around non-renovated small tanks. The populations of Monitor and Viper living in and around the renovated tanks have reduced, but the population of reptiles and amphibians living in and around the non-renovated small tanks have not changed. Although the populations of some of the species have least changed in the renovated tank environments, there are no changes in the non- renovated tank

environments at 5 percent of significance level. The higher human activities in the area of renovated small tanks have led to this change in the renovated tank environments. Tank renovation influences changes in populations of reptiles and amphibians at the beginning of the renovation process but the population recovers again after few years from the renovation (Babaradeniya et al., 2004).

Table 7: Changes in amphibians and reptiles living in the non-renovated tank environments during last 10 years

Amphibian and reptile species	Time duration	Villagers' Response*				Significance change in population**
		1	2	3	4	
Crocodile	Before 10 years	6	82	12	0	No
	Present situation	16	80	4	0	
Monitor	Before 10 years	0	24	71	5	No
	Present situation	0	28	64	8	
Iguana	Before 10 years	0	18	80	2	No
	Present situation	0	35	63	2	
Tortoise	Before 10 years	0	24	70	6	No
	Present situation	0	32	64	4	
Water snake	Before 10 years	0	5	92	3	No
	Present situation	0	6	88	6	
Chameleon	Before 10 years	0	96	4	0	No
	Present situation	0	97	3	0	
skink	Before 10 years	0	80	20	0	No
	Present situation	0	78	22	0	
Cobra	Before 10 years	0	62	38	0	No
	Present situation	0	64	36	0	
Viper	Before 10 years	0	66	34	0	No
	Present situation	1	99	0	0	
Python	Before 10 years	1	87	12	0	No
	Present situation	4	86	10	0	

Source -: Field data 2018

Tank villagers' observations

1 (Not present) 2 (1-2 per month) 3 (3 -4 per month) 4 (More than 4 per month)

Yes (N) = Negative change Yes (P) = Positive change ** 5 percent significance level

Transect analysis of fauna around the tanks (amphibians, reptiles and mammals)

According to the questionnaire survey, field observation and PRA study Monitor, Tortoise, Cobra, and Viper species shared reduction in their populations after the small tank renovation. These species are very sensitive to environmental changes (IUCN, 2007). Increase in settlements and development of agricultural activities have negatively affected population of these species. Population of tortoise species has decreased in the renovated tanks according to the questionnaire survey, field observation and PRA study. Population of amphibian and reptile species in the settlement area in the dry zone in Sri Lanka were decreased during the following decades due to several reasons (Kudavidanage, 2012).

Table 8 shows the comparison of the terrestrial fauna around the renovated and non-renovated tanks selected for the study. The frequency, relative frequency, density, relative density and abundance of the fauna species including amphibians and reptiles around the renovated and non-renovated small tanks were calculated and compared using pared t test. According to the results (Table 8), there are no changes between the values of frequency, relative frequency, density, relative density and abundance of the fauna species in the renovated and non-renovated small tanks. It means that there was no significant ecosystem damage related to amphibian and reptile populations that inhabit small tanks after the renovation.

Table 8: Comparison statistics of abundance of terrestrial fauna around the renovated and non-renovated tanks in Galgamuwa DS division

Local name	Species name	Frequency		Relative frequency		Density		Relative density		Abundance	
		RT	NRT	RT	NRT	RT	NRT	RT	NRT	RT	NRT
Iguana	*Varanus cepedianus*	36.1	36.1	8.4	7.7	36.1	38.9	6.2	5.4	100.0	107.7
Chameleon	*Calotes calotes*	27.8	36.1	6.5	7.7	30.6	36.1	5.3	5.0	110.0	100.0
Chameleon	*Calotes versicolor*	11.1	5.6	2.6	1.2	11.1	2.8	1.9	0.4	100.0	50.0
Skink	*Mabuya beddomii*	38.9	44.4	9.1	9.5	47.2	50.0	8.1	7.0	121.4	112.5
Cobra	*Naja naja*	13.9	13.9	3.2	3.0	13.9	11.1	2.4	1.6	100.0	80.0
Viper	*Vipera aspis*	5.6	11.1	1.3	2.4	5.6	11.1	1.0	1.6	100.0	100.0
Python	*Phytthon molurus*	0.0	2.8	0.0	0.6	0.0	2.8	0.0	0.4	0.0	100.0
Elephant	*Elephas maximus zeylanicus*	22.2	27.8	5.2	5.9	27.8	38.9	4.8	5.4	125.0	140.0
Deer	*Axis axis ceylonesis*	5.6	11.1	1.3	2.4	5.6	13.9	1.0	1.9	100.0	125.0
Deer	*Muntiacus muntjak*	16.7	19.4	3.9	4.1	16.7	22.2	2.9	3.1	100.0	114.3
Mongoose	*Smithu zeylanicus*	27.8	38.9	6.5	8.3	27.8	41.7	4.8	5.8	100.0	107.1
Rabbit	*Lepus nigricollus*	38.9	36.1	9.1	7.7	41.7	52.8	7.2	7.4	107.1	146.2
Fox	*Canis auranus*	13.9	13.9	3.2	3.0	19.4	16.7	3.3	2.3	140.0	120.0
Wild boar	*Sus scrofa*	22.2	19.4	5.2	4.1	27.8	22.2	4.8	3.1	125.0	114.3
Giant squirrel	*Ratufa macroura melanochra*	13.9	16.7	3.2	3.6	16.7	16.7	2.9	2.3	120.0	100.0
Elk/Sambur	*Cervus unicolor unicolor*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Barking deer	*Tragulus memminna*	22.2	19.4	5.2	4.1	22.2	19.4	3.8	2.7	100.0	100.0
Fishing cat	*Felis viverrius*	2.8	8.3	0.6	1.8	2.8	8.3	0.5	1.2	100.0	100.0
Golden palm cat	*Paradoxorus zeylonensis*	5.6	2.8	1.3	0.6	5.6	2.8	1.0	0.4	100.0	100.0
Lepperd	*Felis viverrius*	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bat	*Cynopterus marginatus*	44.4	55.6	10.4	11.8	147.2	250.0	25.4	34.9	331.3	450.0

Rilawa	*Macaca spp.*	13.9	8.3	3.2	1.8	27.8	13.9	4.8	1.9	200.0	166.7
Garadiya	*Ptyas mucosa maximus*	16.7	11.1	3.9	2.4	16.7	11.1	2.9	1.6	100.0	100.0
Unknown 1		16.7	16.7	3.9	3.6	16.7	16.7	2.9	2.3	100.0	100.0
Unknown 2		8.3	13.9	1.9	3.0	11.1	16.7	1.9	2.3	133.3	120.0
Total		427.8	469.4	100.0	100			100.0	100		
P value		0.082		0.814		0.204		0.986		0.443	
Significantly difference at 5 percent		No		No		No		No		No	

Source -: Field transect data 2018 RT – Renovated tanks NRT- Non-renovated tanks Number of 36 (5m × 5m) transect plots were used

Table 9 shows the diversity of amphibians, reptiles and mammals around the renovated and non-renovated tanks selected for the study. The richness (S), evenness (J), diversity (H′) and dominancy (1-J) of amphibians and reptiles in the renovated and non-renovated study tanks were calculated and included in the table 9. There is no difference between the renovated and non-renovated small tanks in related to amphibians and reptiles. Richness (S), evenness (J), diversity (H′) and dominancy (1-J) of fauna including amphibians and reptiles around the renovated tanks are not changed due to renovation process. This confirms that there is no serious damages reported to the ecosystem relation to amphibian and reptile fauna due to the renovation processes. Table 10 presents comparative analysis of the diversity of fauna including amphibians and reptiles around the renovated and non-renovated tanks.

The t tests conducted reveal that there is no significant difference taken place in the terrestrial faunal populations when renovated tanks are compared with the non-renovated tanks. The diversities of Cobra and Viper in the renovated small tanks are comparatively lower than the diversities in the non-renovated tanks. However, according to the statistical comparison, (Table 11) the diversities of these communities in the renovated and non-renovated small tanks are not significantly different.

Table 9: Transect plot diversity of fauna around the renovated and non-renovated tanks

	Transect plots Indicators	Plot 1	Plot 2	Plot 3	Plot 4	Plot 5	Plot 6	Plot 7	Plot 8	Plot 9	For total
RT 5	Diversity (H′)	0.69	1.1	1.61	1.55	1.48	0.64	0.69	2.2	1.15	2.73
	Richness (S)	4	3	5	7	7	7	4	13	7	57
	Evenness (J)	0.50	1.00	1.00	0.80	0.76	0.33	0.50	0.86	0.59	0.68
	Dominancy (1-J)	0.50	0.00	0.00	0.20	0.24	0.67	0.50	0.14	0.41	0.32
RT 9	Diversity (H′)	1.56	1.39	1.67	1.61	1.23	1.23	1.95	0.87	1.33	2.31
	Richness (S)	6	4	8	5	10	10	7	6	6	62
	Evenness (J)	0.87	1.00	0.80	1.00	0.53	0.53	1.00	0.49	0.74	0.56
	Dominancy (1-J)	0.13	0.00	0.20	0.00	0.47	0.47	0.00	0.51	0.26	0.44
RT 10	Diversity (H′)	1.07	1.39	1.04	1.33	1.1	1.1	1.61	1.1	1.1	2.68
	Richness (S)	3	4	4	5	3	3	5	3	3	33
	Evenness (J)	0.97	1.00	0.75	0.83	1.00	1.00	1.00	1.00	1.00	0.77
	Dominancy (1-J)	0.03	0.00	0.25	0.17	0.00	0.00	0.00	0.00	0.00	0.23
RT 12	Diversity (H′)	2.03	1.24	1.15	1.73	2.02	2.02	0.64	1.55	0.95	2.57
	Richness (S)	13	6	7	9	11	11	3	7	5	72
	Evenness (J)	0.79	0.69	0.59	0.79	0.84	0.84	0.58	0.80	0.59	0.60
	Dominancy (1-J)	0.21	0.31	0.41	0.21	0.16	0.16	0.42	0.20	0.41	0.40
NR T 4	Diversity (H′)	1.73	0.69	1.29	1.2	1.65	1.39	1.19	0.57	1.54	2.17
	Richness (S)	8	4	5	7	8	4	6	6	13	60
	Evenness (J)	0.83	0.50	0.80	0.62	0.79	1.00	0.66	0.32	0.60	0.53
	Dominancy (1-J)	0.17	0.50	0.20	0.38	0.21	0.00	0.34	0.68	0.40	0.47
NR T 8	Diversity (H′)	1.77	1.79	1.33	1.56	1.33	1.09	1.79	1.67	1.39	2.56
	Richness (S)	11	6	5	8	5	3	12	14	4	65
	Evenness (J)	0.74	1.00	0.83	0.75	0.83	0.99	0.72	0.63	1.00	0.61
	Dominancy (1-J)	0.26	0.00	0.17	0.25	0.17	0.01	0.28	0.37	0.00	0.39

NR T 9	Diversity (H′)	1.04	1.33	1.09	1.55	2.03	1.33	1.48	0.91	1.35	2.28
	Richness (S)	4	5	10	7	17	5	7	16	14	85
	Evenness (J)	0.75	0.83	0.47	0.80	0.72	0.83	0.76	0.33	0.51	0.51
	Dominancy (1-J)	0.25	0.17	0.53	0.20	0.28	0.17	0.24	0.67	0.49	0.49
NR T 10	Diversity (H′)	0.64	1.21	1.15	1.04	1.21	1.04	1.1	1.39	0.41	2.19
	Richness (S)	3	8	7	4	8	4	3	4	7	48
	Evenness (J)	0.58	0.58	0.59	0.75	0.58	0.75	1.00	1.00	0.21	0.57
	Dominancy (1-J)	0.42	0.42	0.41	0.25	0.42	0.25	0.00	0.00	0.79	0.43

Source -: Field transect data 2018

Table 10: Comparison statistics of transect plot diversity of fauna including amphibians and reptiles around the renovated and non-renovated tanks

Transect plots	Mean for richness		Mean for evenness		Mean for dominancy		Mean for diversity	
	RT	NRT	RT	NRT	RT	NRT	RT	NRT
Plot 1	6.5	6.5	0.78	0.73	0.22	0.28	1.34	1.3
Plot 2	4.25	5.75	0.92	0.73	0.08	0.27	1.28	1.26
Plot 3	6	6.75	0.79	0.67	0.22	0.33	1.37	1.22
Plot 4	6.5	6.5	0.86	0.73	0.15	0.27	1.56	1.34
Plot 5	7.75	9.5	0.78	0.73	0.22	0.27	1.46	1.56
Plot 6	7.75	4	0.68	0.89	0.33	0.11	1.25	1.21
Plot 7	4.75	7	0.77	0.79	0.23	0.22	1.22	1.39
Plot 8	7.25	10	0.79	0.57	0.21	0.43	1.43	1.14
Plot 9	5.25	9.5	0.73	0.58	0.27	0.42	1.13	1.17
T value	-1.41		1.74		-1.7		1.01	
P value	0.197		0.121		0.128		0.342	
5 present significance difference	No		No		No		No	

Source -: Field transect data 2018

Table 11: Comparison statistics of the diversity of amphibians reptiles and mammals around the renovated and non-renovated tanks in Galgamuwa DS division

Local name	**Species name**	**Pi×PlnPi for Renovate tanks**				**Pi×lnPi for Non-renovated tanks**				**Pi×lnPi for total species of RT**	**Pi×lnPi for total species of NRT**
		RT 5	RT 9	RT 10	RT 12	NRT 4	NRT 8	NRT 9	NRT 10		
Iguana	*Varanus cepedianus*	-0.16	-0.16	-0.20	-0.18	-0.18	-0.14	-0.14	-0.17	-0.17	-0.16
Chameleon	*Calotes calotes*	-0.12	-0.22	-0.16	-0.11	-0.18	-0.17	-0.12	-0.13	-0.15	-0.15
Chameleon	*Calotes versicolor*	-0.07	-0.07	-0.10	-0.07	0.00	-0.06	0.00	0.00	-0.08	-0.02
Skink	*Mabuya Carinata*	-0.19	-0.22	-0.20	-0.20	-0.21	-0.22	-0.14	-0.17	-0.20	-0.19
Cobra	*Naja naja*	-0.07	-0.12	-0.10	-0.07	-0.07	-0.06	-0.05	-0.08	-0.09	-0.06
Viper	*Vipera aspis*	0.00	-0.07	-0.10	0.00	-0.11	-0.06	-0.05	0.00	-0.04	-0.06
Python	*Phytthon molurus*	0.00	0.00	0.00	0.00	0.00	-0.06	0.00	0.00	0.00	-0.02
Elephant*	*Elephas maximus zeylanicus*	-0.24	-0.07	-0.16	-0.07	-0.15	-0.17	-0.14	-0.17	-0.15	-0.16
Deer	*Axis axis ceylonesis*	-0.07	0.00	-0.10	0.00	0.00	-0.14	-0.09	0.00	-0.04	-0.08
Deer	*Muntiacus muntjak*	-0.07	-0.12	-0.10	-0.11	-0.15	0.00	-0.14	-0.08	-0.10	-0.11
Mongoose	*Herpesteslanka/Smithu zeylanicus*	-0.16	-0.16	-0.16	-0.11	-0.18	-0.11	-0.17	-0.21	-0.15	-0.17
Rabit	*Lepus nigricollus*	-0.16	-0.22	-0.20	-0.18	-0.18	-0.27	-0.14	-0.13	-0.19	-0.19
Fof	*Canis auranus*	-0.07	-0.07	-0.10	-0.18	-0.07	-0.14	-0.05	-0.08	-0.11	-0.09
Wild boar	*Sus scrofa*	-0.12	-0.16	-0.16	-0.15	-0.15	-0.06	-0.09	-0.13	-0.15	-0.11
Giant squirrel	*Ratufa macroura melanochra*	-0.07	-0.07	-0.10	-0.15	-0.07	-0.11	-0.05	-0.13	-0.10	-0.09
Elk/Sambur	*Cervus unicolor unicolor*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Barking deer	*Tragulus memminna*	-0.12	-0.12	-0.16	-0.11	-0.11	-0.14	-0.05	-0.08	-0.12	-0.10
Fishing cat*	*Felis viverrius*	0.00	0.00	-0.10	0.00	0.00	0.00	-0.09	-0.08	-0.03	-0.05

Golden palm cat	*Paradoxorus zeylonensis*	-0.07	0.00	0.00	-0.07	0.00	0.00	-0.05	0.00	-0.04	-0.02
Lepperd	*Felis viverrina*	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bat	*Cynopterus marginatus*	-0.33	-0.36	-0.33	-0.35	-0.36	-0.35	-0.36	-0.36	-0.35	-0.37
Rilawa	*Macaca spp.*	-0.19	0.00	0.00	-0.23	-0.07	0.00	-0.14	0.00	-0.15	-0.08
Garadiya	*Ptyas mucosa maximus*	-0.07	-0.12	-0.10	-0.11	-0.07	-0.06	-0.05	-0.08	-0.10	-0.06
Unknown 1		-0.16	-0.07	-0.10	-0.07	-0.11	-0.11	-0.05	-0.08	-0.10	-0.09
Unknown 2		-0.12	0.00	0.00	-0.11	-0.11	-0.11	-0.09	0.00	-0.08	-0.09
Unknown 3		-0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.03	-0.05
Total		-2.73	-2.41	-2.71	-2.60	-2.53	-2.56	-2.28	-2.19	-2.72	-2.50
Richness (S)		57	62	33	72	60	65	85	48	224	258
H max		4.04	4.13	3.50	4.28	4.09	4.17	4.44	3.87	5.41	5.55
Evenness (J)		0.68	0.58	0.78	0.61	0.62	0.61	0.51	0.57	0.50	0.45
Dominancy (1-J)		0.32	0.42	0.22	0.39	0.38	0.39	0.49	0.43	0.50	0.55
Shannon diversity		2.73	2.41	2.71	2.6	2.53	2.56	2.28	2.19	2.72	2.50
T - value										**-1.11**	
P - value										**0.279**	
Significantly different at 5 present										**No**	

Source -: Field transects data 2018 * Observed their waste

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