

IMPACT OF HABITAT DESTRUCTION ON THE POPULATION OF AMPHIBIANS WITH REFERENCE TO CURRENT STATUS OF FROGS AND TOADS IN KARACHI AND THATTA, SINDH

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ABSTRACT

The present study is based on the impact of habitat destruction on the population of amphibians with reference to status of frogs and toads in Karachi and Thatta districts of Sindh. During the years 2004-2006, four species of frogs, *Euphlyctis cyanophlyctis cyanophlyctis* (Common Skittering Frog), *Hoplobatrachus tigerinus* (Tiger Frog), *Tomopterna breviceps* (Indian Burrowing Frog) and *Limnonectes limnocharis* (Indian Cricket Frog), and two toads species, *Bufo stomaticus* (Marbled Toad) and *Bufo melanostictus* (Common Asian Toad) were recorded from the area. In Thatta district, four species of frogs and two species of toads were recorded, *Euphlyctis cyanophlyctis cyanophlyctis* was rated as abundant, *Bufo stomaticus* as common, *Bufo melanostictus* as less common, while *Hoplobatrachus tigerinus*, *Tomopterna breviceps* and *Limnonectes limnocharis* were rated as rare. Three species of frogs and two species of toads were recorded in Karachi district. *Euphlyctis cyanophlyctis cyanophlyctis* was found to be abundant, *Bufo stomaticus* as common, *Bufo melanostictus* as less common, while *Hoplobatrachus tigerinus* and *Tomopterna breviceps* were rated as rare. On the basis of present study, it is concluded that due to habitat alteration, destruction of habitat, indiscriminate use of pesticides, chemical fertilizers and increase in human population, three species viz. *Hoplobatrachus tigerinus*, *Tomopterna breviceps* and *Limnonectes limnocharis* have declined and may be recorded as threatened species in Thatta district, while two species *Hoplobatrachus tigerinus* and *Tomopterna breviceps* were found to be rare in Karachi district.

Keywords: Sindh, habitat destruction, population status, frogs and toads.

INTRODUCTION

Since the 1980s herpetologists have been researching, and documenting the overall decline in the health and abundance of amphibian populations (Rabb, 1999). Global declines in amphibian populations have been attributed to a number of anthropogenic activities, including habitat destruction, habitat alteration, and introduction of exotic species, exposure to environmental contaminants, climate change, increased acid precipitation and increased UV flux associated with ozone depletion. Many studies have illustrated that declines in amphibian population health have also taken place in relatively pristine habitats such as national parks and reserves, where specific environmental stressors are not readily apparent (DAPTF, 2001). Recently SSC Red List shows that 1,895 of the planet's 6,285 amphibians are in danger of extinction, making them the most threatened group of species known to date. Of these, 39 are already Extinct or Extinct in the Wild, 484 are Critically Endangered, 754 are Endangered and 657 are Vulnerable (IUCN, 2010). Several species of amphibians provide benefit to human beings. Frogs have been used as food. Many countries in Europe and USA import large quantities of frog legs, mostly from Asia. They also provide food for fish, birds,

and mammals. Frog legs are considered to be delicacies (Martin, 2000).

Amphibians are collected for pets, food, medicines, bait, and for use in teaching. Some of the edible species include the Sardinian Discoglossid (*Discoglossus surdus*), the Tiger Frog (*Hoplobatrachus tigrina*) of Asia, and the Southeast Asian species *Limnonectes limnocharis* and *Rana hudsti*.

The impact of the frog leg trade in several countries, such as the USA, Pakistan, India and Bangladesh has been also a cause of amphibian declines (Abdulali, 1985; Pandian and Marian, 1986; Khan, 1990; Jacques, 1999). Amphibians have very porous skin, it is considered that they may be more susceptible to chemicals in the environment than many other animals. The amphibian's tadpoles living in the water and the adults being exposed to the air, it is considered that polluted chemicals in either environment may affect them.

Work has been done on bioecology, taxonomy and effect of pesticides on amphibians by Hora and Chopra (1923), Dubois and Khan (1979), Bogart (1992), Hall and Henry (1992), Barry and Shaffer (1994), Iffat (1994), Pechman

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and Wilbur (1994), Fisher and Shaffer (1996), Berrill *et al.* (1997, 1998), Didiuk (1997), Dupuis (1997), Fox *et al.* (1997), Green (1997), Khan (1987, 1997, 1999, 2000, 2001, 2003), Ovaska (1997), Waldick (1997), Conant and Collins (1998), Lannoo (1998), Marantelli and Parkes (1998), Bridges (2000), Khan and Khan (2000), Khan and Law (2005), Khan and Yasmeen (2008) and Yasmeen *et al.* (2009).

No detailed work has been reported on population and status of frogs and toads in Karachi and Thatta districts of Sindh province. The main object of present study was to investigate the impact of habitat destruction on the population of amphibians with reference to status of frogs and toads in Karachi and Thatta.

MATERIALS AND METHODS

Study areas

On the basis of preliminary surveys and baseline study, areas such as Ghullamullah Canal, Sakhro Branch, Tallah, Wadi Khar Dhund, Jafri Lake, LBOD, Mahboobshah

Lake, Dargah Shaikh Sakhi Ahmed and Daro Branch in Thatta district, Lyari River, Hub River, Ibrahim Hyderi, Hub Dam and Malir River in Karachi district were selected as study areas (see Table 1, 2, Figs. 1, 2).

Several reliable methods and surveys techniques were employed for the observation and census of frogs and toads. The observations were usually made from a raised position in order to get a clear view of the habitat. During each visit to the study areas, the population of each species of frogs and toads was recorded and relevant data collected.

COUNTING METHODS

A. DIRECT COUNTING

1. Field Surveys

Field surveys of one week duration in each district were undertaken on quarterly basis each year during the period 2004-2006 in two selected districts of Sindh Province. Nine sites in Thatta District and five sites in Karachi District were surveyed.

Table. 1. Study Areas of Thatta District.

S. No.	Sub Dist. of Thatta District	Study Areas	Co-ordinates	Habitat Type
1	Thatta	Ghullamullah Canal	24 36 20.8 N 67 49 14.8 E	Fresh Water Canal
2	Mirpur Sakhro	Sakhro Branch	24 36 2.1 N 67 49 13.9 E	Fresh Water Canal
3	Ghora Bari	Tallah	24 37 10.1 N 68 21 17.3 E	Slightly Brackish Water Lake
4	Mirpur Bathoro	Wadi Khar Dhund	24 41 44.8 N 68 7 9.1 E	Slightly Brackish Water Lake
5	Shah Bunder	Jafri Lake	24 06 24.12 N 67 54 68.15 E	Brackish Water Lake
6	Jati	Wetlands in the Left Bank Outfall Drain Area	24 18 41.8 N 68 46 51.0 E	Slightly Brackish / Fresh Water Lake
7	Sujawal	Mahboobshah Lake	24 36 51.8 N 68 15 20 E	Fresh Water Lake
8	Kharo Chan	Dargah Shaikh Sakhi Ahmed	24 38 23.9 N 68 21 36.6 E	Brackish Water Canal Near Dargah
9	Keti Bunder	Daro Branch	24 31 25.4 N 68 1 50.2 E	Brackish Water Canal

Table. 2. Study Areas of Karachi District

S. No	Districts of Karachi	Study Areas	Co-ordinates	Habitat Type
1	East	Lyari River	24 56 43.6 N 67 07 17.5 E	Fresh Water River
2	West	Hub River	24 55 02.12 N 66 43 14.5 E	Fresh Water River
3	South	Ibrahim Hyderi	24 48 23.5 N 67 10 39.2 E	Fresh Water Nala near Ibrahim Hyderi
4	Central	Hub Dam	25 14 51.8 N 67 07 24.0 E	Fresh Water Storage Reservoir
5	Malir	Malir River	24 48 14.9 N 67 05 36.2 E	Fresh Water River

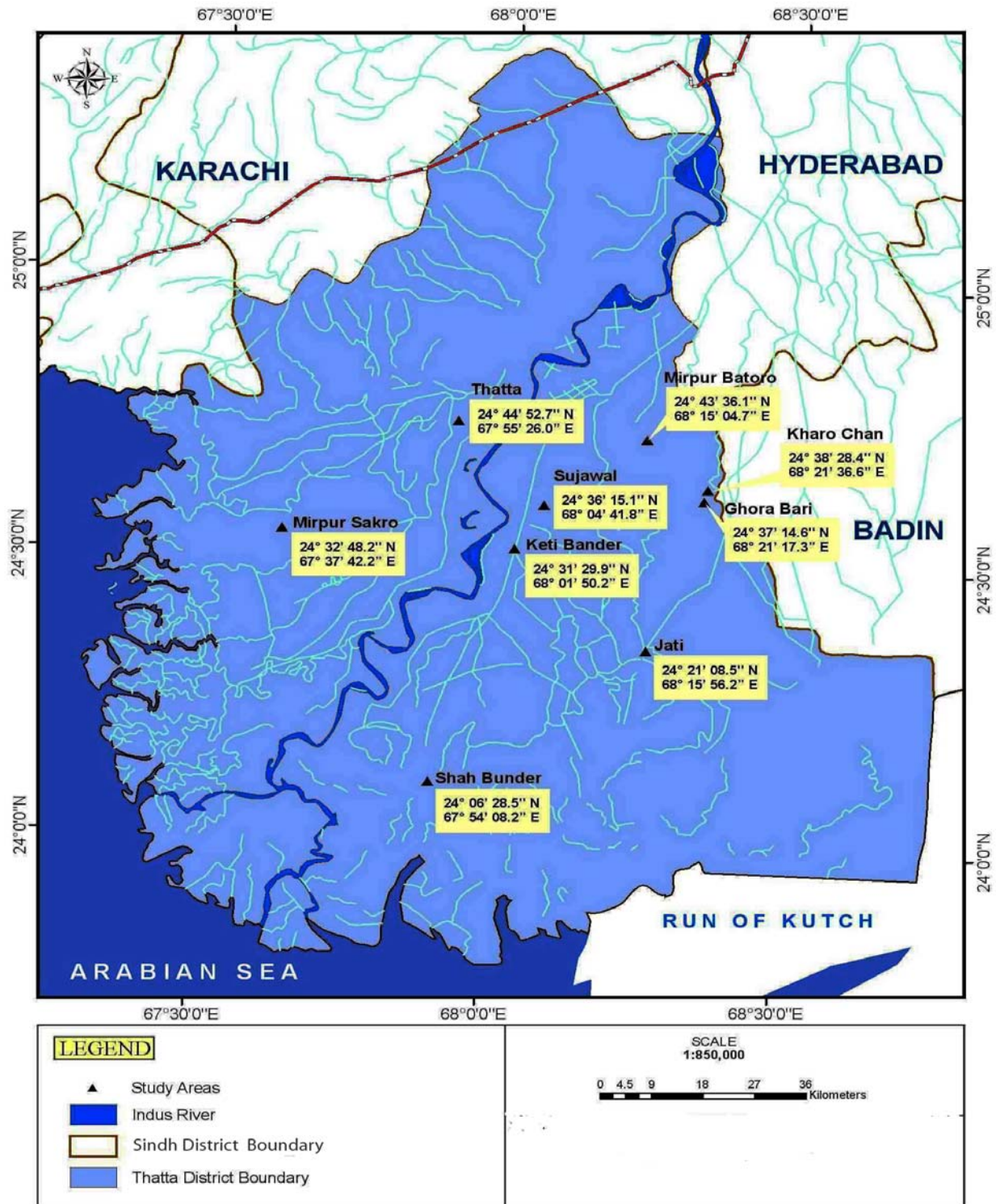


Fig. 1. Map showing Study Areas in Thatta District.

Mostly frogs were observed or netted during the day but some frogs were observed at night, while toads were observed at night. At dusk and during night, however, they prowl on the surface and were easily observed. During really warm weather periods many amphibians are most active at night.

2. Incidental Sightings

Incidental sighting is also helpful to determine the presence and population status of the species. In this way, number of species, date, time, location and habitat type were recorded.

3. Basking Behavior

This method of sitting or locating the species is the most suitable but it can be applied mostly in winter season. In winters the temperature of the water of river becomes very low. Due to cooler weather and cold water, these cold blooded amphibians avoid living in water and so they come outside the lake to enjoying sunshine to keep them warm.

B. INDIRECT COUNTING METHODS

Information from Different Sources

Information has been collected by contacting field staff of Sindh Wildlife Department, local fishermen, field staff of Irrigation Department and other members of local communities.

ESTIMATION OF POPULATION

Strip Census

This method enables to estimate animal populations by counting animals along a pre-determined line of set length. The strip census method entails walking on a pre-determined line, counting the animals observed along line and recording the distance at which they are seen (Ahmed, 1988).

RESULTS AND DISCUSSION

THATTA DISTRICT

In the present study, four species of frogs, *Euphlyctis cyanophlyctis cyanophlyctis*, *Hoplobatrachus tigerinus*, *Tomopterna breviceps* and *Limnonectes limnocharis*, and two species of toads, *Bufo stomaticus* and *Bufo melanostictus* were recorded from Thatta district (see Table 3). *Euphlyctis cyanophlyctis cyanophlyctis* was rated as abundant, *Bufo stomaticus* as common, *Bufo melanostictus* as less common, while *Hoplobatrachus tigerinus*, *Tomopterna breviceps* and *Limnonectes limnocharis* were rated as rare.

In 2004, *Euphlyctis cyanophlyctis cyanophlyctis* was recorded as 35%, *Hoplobatrachus tigerinus* as 5%, *Tomopterna breviceps* as 4%, *Limnonectes limnocharis* as 2%, *Bufo stomaticus* as 29%, and *Bufo melanostictus* as

26% (see Table 5). In the year of 2005, *Euphlyctis cyanophlyctis cyanophlyctis* was recorded as 34%, *Hoplobatrachus tigerinus* as 4%, *Tomopterna breviceps* as 4%, *Limnonectes limnocharis* as 2%, *Bufo stomaticus* as 29%, and *Bufo melanostictus* as 27% (see Table 6). In the year of 2006, *Euphlyctis cyanophlyctis cyanophlyctis* was recorded as 36%, *Hoplobatrachus tigerinus* as 4%, *Tomopterna breviceps* as 3%, *Limnonectes limnocharis* as 1%, *Bufo stomaticus* as 30% while, *Bufo melanostictus* recorded as 26% (see Table 7).

KARACHI DISTRICT

Euphlyctis cyanophlyctis cyanophlyctis was rated as abundant, *Bufo stomaticus* as common, *Bufo melanostictus* as less common, while *Hoplobatrachus tigerinus* and *Tomopterna breviceps* as rare (see Table 4).

According to data, in 2004, *Euphlyctis cyanophlyctis cyanophlyctis* was recorded as 36%, *Hoplobatrachus tigerinus* as 1%, *Tomopterna breviceps* as 0.1%, *Bufo stomaticus* as 33%, and *Bufo melanostictus* as 30% (see Table 8). In the year of 2005, *Euphlyctis cyanophlyctis cyanophlyctis* was recorded as 35%, *Hoplobatrachus tigerinus* as 1%, *Tomopterna breviceps* as 0%, *Bufo stomaticus* as 33%, and *Bufo melanostictus* as 31% (see Table 9). In the year of 2006, *Euphlyctis cyanophlyctis cyanophlyctis* was recorded as 38%, *Hoplobatrachus tigerinus* as 1%, *Tomopterna breviceps* as 0%, *Bufo stomaticus* as 32%, and *Bufo melanostictus* as 29% (see Table 10).

In Thatta district, frogs and toads belonging to two families, five genera, and six species were recorded. During the study, *Euphlyctis cyanophlyctis cyanophlyctis* was recorded as having highest population percentage (35% in 2004, 34% in 2005 and 36% in 2006) among frog species in Thatta district. *Hoplobatrachus tigerinus* as 5% in 2004, 4% in 2005 and 2006. *Tomopterna breviceps* was recorded as 4% in 2004 and 2005, and 3% in 2006. *Limnonectes limnocharis* recorded as 2% in 2004, 2% in 2005 and 1% in 2006. While *Bufo stomaticus* was recorded as 29% in 2004 and 2005, 30% in 2006. *Bufo melanostictus* recorded as 26% in 2004, 27% in 2005 and 26% in 2006.

In Karachi district, four genera, and three species of frogs and two species of toads were recorded, among frog species *Euphlyctis cyanophlyctis cyanophlyctis* was recorded as having highest population percentage (36% in 2004, 35% in 2006 and 38% in 2006). *Hoplobatrachus tigerinus* recorded as 1% in 2004, 2005 and 2006. *Tomopterna breviceps* recorded as 0.1% in 2004, 0% in 2005 and 2006. While *Bufo stomaticus* was recorded as 33% in 2004, 2005 and 32% in 2006. *Bufo melanostictus* was recorded as 30% in 2004, 31% in 2005 and 29% in 2006.

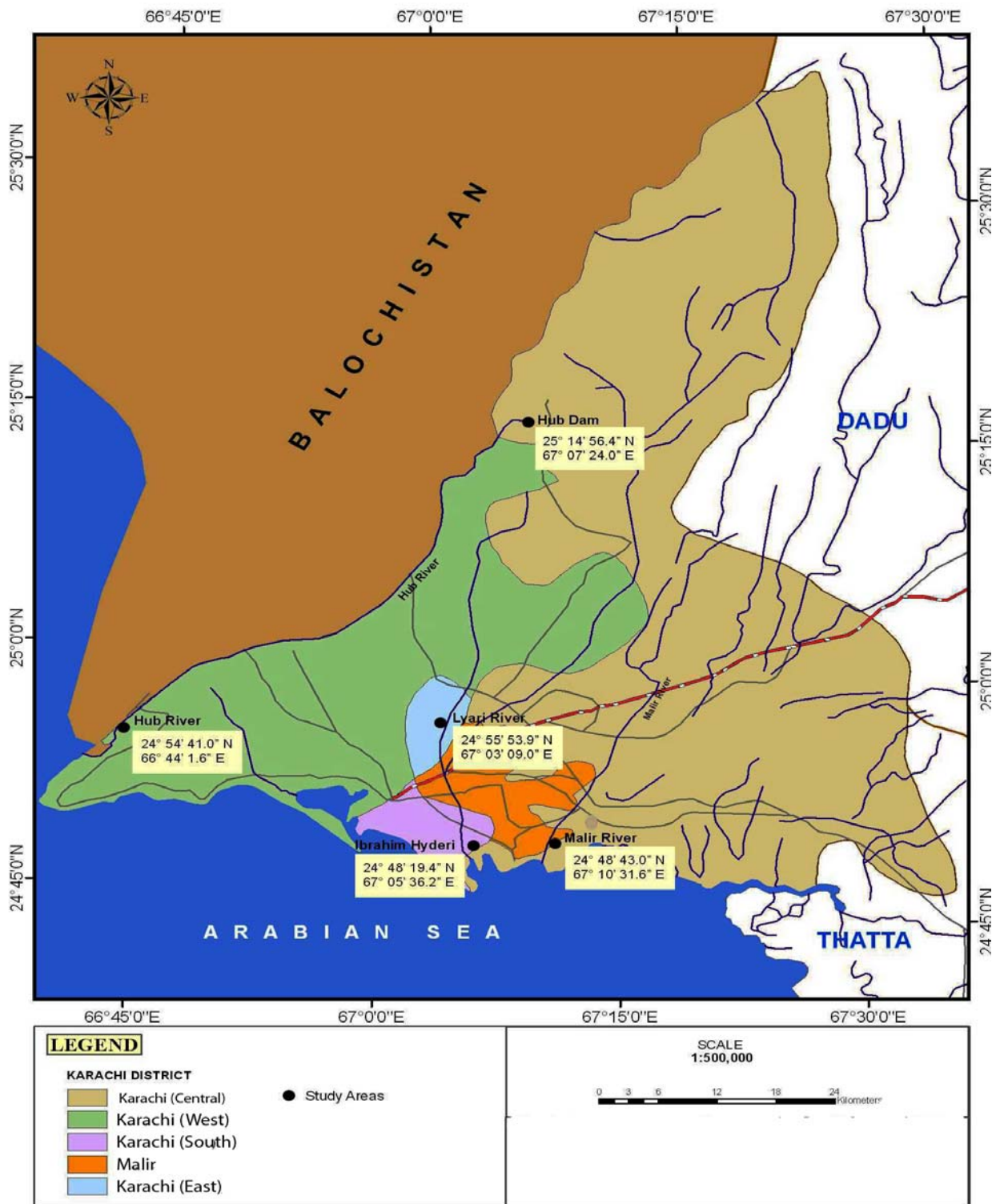


Fig. 2. Map showing Study Areas in Karachi District.

Table 3. List of Frogs and Toads recorded from Thatta District.

Family	Genus	Species	Common name
Bufonidae	<i>Bufo</i>	<i>Bufo melanostictus</i>	Common Asian Toad
		<i>Bufo stomaticus</i>	Marbled Toad
Ranidae	<i>Euphlyctis</i>	<i>Euphlyctis cyanophlyctis cyanophlyctis</i>	Common Skittering Frog
	<i>Holobatrachus</i>	<i>Holobatrachus tigrinus</i>	Tiger Frog
	<i>Limnonectes</i>	<i>Limnonectes limnocharis</i>	Indian Cricket Frog
	<i>Tomopterna</i>	<i>Tomopterna breviceps</i>	Indian Burrowing Frog

Table 4. List of Frogs and Toads recorded from Karachi District.

Family	Genus	Species	Common name
Bufonidae	<i>Bufo</i>	<i>Bufo melanostictus</i>	Common Asian Toad
		<i>Bufo stomaticus</i>	Marbled Toad
Ranidae	<i>Euphlyctis</i>	<i>Euphlyctis cyanophlyctis cyanophlyctis</i>	Common Skittering Frog
	<i>Holobatrachus</i>	<i>Holobatrachus tigrinus</i>	Tiger Frog
	<i>Tomopterna</i>	<i>Tomopterna breviceps</i>	Indian Burrowing Frog

Table 5. Population Distribution of Frogs and Toads in Thatta District -2004.

S N	Location	Observed Species						Total	%
		<i>Euphlyctis cynophlyctis cynophlyctis</i>	<i>Hoplobatrachus tigrinus</i>	<i>Tomopterna breviceps</i>	<i>Limnonectes limnocharis</i>	<i>Bufo stomaticus</i>	<i>Bufo melanostictus</i>		
1.									
2.	Thatta	210	26	23	19	198	183	659	22
3.	Mirpur Sakhro	67	8	4	5	64	57	205	7
4.	Ghora Bari	126	14	8	7	108	96	359	12
5.	Mirpur Bathoro	51	8	7	0	58	54	178	6
6.	Shah Bunder	97	14	13	0	90	78	292	10
7.	Jati	176	21	19	0	105	82	403	13
8.	Sujawal	189	24	21	11	122	117	484	16
9.	Kharo Chan	57	9	8	0	52	41	167	5
10.	Keti Bunder	106	14	12	9	96	74	311	10
	Total	1079	138	115	51	893	782	3058	
	%	35	5	4	2	29	26		

Due to habitat destruction, eutrophication, use of pesticides, chemical fertilizers, over grazing of aquatic vegetation and paucity of water, the populations of *Hoplobatrachus tigrinus*, *Tomopterna breviceps* and *Limnonectes limnocharis* have decreased. These species were recorded as rare in Thatta district while *Hoplobatrachus tigrinus* and *Tomopterna breviceps* were recorded as rare in Karachi district.

Based on present study results, *Euphlyctis cyanophlyctis cyanophlyctis* was the most common frog species in Karachi and Thatta districts, while *Bufo stomaticus* was the commonest toad, which was widely distributed in Karachi and Thatta districts. The population of *Euphlyctis cyanophlyctis cyanophlyctis*, *Bufo stomaticus* and *Bufo melanostictus* were higher than the other species of frogs and toads. So in spite of destruction of habitat and development of areas, there was no effect on their population, may be due to high tolerance against climate changes etc.

Due to habitat destruction and construction, *Hoplobatrachus tigrinus* was recorded as rare in Karachi district while, *Hoplobatrachus tigrinus*, *Tomopterna breviceps* and *Limnonectes limnocharis* were recorded as rare in Thatta District. The population status of *Tomopterna breviceps* was critical during three years of study in Karachi district. *Tomopterna breviceps* was recorded only once in 2004 in Karachi district

In Pakistan, frogs are extensively used for demonstration in schools, colleges and universities and experimentation in laboratories. Capture for biological research appears to have affected the local populations of frogs and toads.

Increased traffic on roads has contributed largely in the reduction of local population of common toads, *Bufo stomaticus*. Large number of amphibians, mainly toads, are crushed or mutilated by the passing traffic at night, thus affecting natural local populations (Khan, 1990).

Table 6. Population Distribution of Frogs and Toads in Thatta District -2005.

SN	Location	Observed Species						Total	%
		<i>Euphlyctis cynophlyctis</i>	<i>Hoplobatrachus tigerinus</i>	<i>Tomopterna brevicep</i>	<i>Limnonectes limnocharis</i>	<i>Bufo stomaticus</i>	<i>Bufo melanostictus</i>		
1.	Thatta	184	23	19	16	147	136	525	16
2.	MirpurSakhro	101	11	9	6	92	86	305	9
3.	Ghora Bari	126	19	16	10	121	110	402	13
4.	Mirpur Bathoro	92	10	9	0	85	75	271	8
5.	Shah Bunder	105	12	11	0	90	84	302	9
6.	Jati	145	19	15	0	127	121	427	13
7.	Sujawal	156	21	17	15	132	130	471	15
8.	Kharo Chan	61	10	10	0	55	62	198	6
9.	Keti Bunder	112	15	15	9	95	82	328	10
	Total	1082	140	121	56	944	886	3229	
	%	34	4	4	2	29	27		

Table 7. Population Distribution of Frogs and Toads in Thatta District -2006.

SN	Location	Observed Species						Total	%
		<i>Euphlyctis cynophlyctis</i>	<i>Hoplobatrachus tigerinus</i>	<i>Tomopterna brevicep</i>	<i>Limnonectes limnocharis</i>	<i>Bufo stomaticus</i>	<i>Bufo melanostictus</i>		
1.	Thatta	219	27	21	19	182	162	630	18
2.	Mirpur Sakhro	63	9	5	4	79	67	227	7
3.	Ghora Bari	138	17	9	6	118	106	394	12
4.	Mirpur Bathoro	61	8	7	0	81	72	229	7
5.	Shah Bunder	122	14	13	0	97	82	328	10
6.	Jati	185	19	16	0	125	110	455	13
7.	Sujawal	203	24	19	9	169	143	567	17
8.	Kharo Chan	59	9	7	0	67	51	193	6
9.	Keti Bunder	163	12	10	7	110	87	389	11
	Total	1213	139	107	45	1028	880	3412	
	%	36	4	3	1	30	26		

Table 8. Population Distribution of Frogs and Toads in Karachi District- 2004.

SN	Location	Observed Species					Total	%
		<i>Euphlyctis cyanophlyctis</i>	<i>Hoplobatrachus tigerinus</i>	<i>Tomopterna brevicep</i>	<i>Bufo stomaticus</i>	<i>Bufo melanostictus</i>		
1.	East	64	0	0	48	42	154	15
2.	West	82	3	0	79	75	239	23
3.	South	58	0	0	49	43	150	15
4.	Central	57	2	0	51	46	156	15
5.	Malir	112	8	1	107	98	326	32
	Total	373	13	1	334	304	1025	
	%	36	1	0.1	33	30		

On the basis of present study, it is concluded that due to habitat alteration, destruction of habitat, indiscriminate use of pesticides, utilization in experiments and increase in human population are major factors influencing on the populations of *Hoplobatrachus tigerinus*, *Tomopterna breviceps* and *Limnonectes limnocharis* populations.

Prior to the present study, no scientific data was available about the population, distribution and status of frogs and toads of Karachi and Thatta districts, and this is first scientific study to provide a baseline data. Hopefully, this study will serve as a springboard for further research, conservation, education and future management.

Table 9. Population Distribution of Frogs and Toads in Karachi District- 2005.

SN	Location	Observed Species					Total	%
		<i>Euphlyctis cyanophlyctis cyanophlyctis</i>	<i>Hoplobatrachus tigerinus</i>	<i>Tomopterna brevicep</i>	<i>Bufo stomaticus</i>	<i>Bufo melanostictus</i>		
1.	East	60	1	0	51	45	157	16
2.	West	79	1	0	80	75	235	24
3.	South	62	0	0	52	47	161	16
4.	Central	42	1	0	45	42	130	13
5.	Malir	103	10	0	97	99	309	31
	Total	346	13	0	325	308	992	
	%	35	1	0	33	31		

Table 10. Population Distribution of Frogs and Toads in Karachi District- 2006.

SN	Location	Observed Species					Total	%
		<i>Euphlyctis cyanophlyctis cyanophlyctis</i>	<i>Hoplobatrachus tigerinus</i>	<i>Tomopterna brevicep</i>	<i>Bufo stomaticus</i>	<i>Bufo melanostictus</i>		
1.	East	53	1	0	41	38	133	14
2.	West	90	2	0	78	68	238	25
3.	South	48	0	0	41	42	131	14
4.	Central	57	0	0	50	45	152	16
5.	Malir	122	6	0	97	89	314	32
	Total	370	9	0	307	282	968	
	%	38	1	0	32	29		

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