

Population Dynamics and Growth in a Natural Population of *Limnonectes limnocharis* (Anura: Ranidae)

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Abstract. -The study is based on measurement of specimen, collected from nature over a period of 12 months, during 1987-88. Based on the size, the juveniles, mature males and gravid females were divided into various size groups. Except the juveniles, the female size groups were comparable with the males. In addition, the females are comparatively larger than the males of the same age group. The availability of various size groups during different months of a year, is attributed to the continuous growth of the species in natural population

Key words: Anura, *Limnonectes limnocharis*, population, growth.

Introduction

The first available information on growth study of anurans was by Wright (1914), who analyzed growth pattern of *Rana pipiens* and *Rana catesbeiana*. Since then, several other studies (Wright, 1920; Flower, 1925; 1936; Force, 1933; Hamilton, 1934; 1955; Raney and Ingram, 1941; Cowan, 1941; Raney and Lachner, 1947; Wilson, 1950; Ting, 1951; Ryan, 1953; Fitch, 1956a; 1956b; Jameson, 1956; Martof, 1956; Cohen and Howard, 1958; Durham and Bennett, 1963; Schroeder and Baskett, 1968) reported the growth pattern of anurans either in captivity or in natural environment by analyzing individuals. Turner (1960) reviewed all the above literature on anuran growth and since then additional data has become available for *Bufo hemiophrys* (Breckenridge and Tester, 1961), *Rana sylvatica* (Bellis, 1961), *Rana arvalis* (van Gelder, 1973; van Gelder and Oomen, 1970), *Rana erythraea* (Brown and Alcalá, 1970), *Rana septentrionalis* (Hedeén, 1972), *Bufo boreas* (Lillywhite et al., 1973) and *Bufo woodhousei fowleri* (Clarke, 1974). All the above studies (except Brown and Alcalá, 1970) deal with anurans from temperate zones. The present study is the second one for any Indian anurans. The first study was conducted by Sahoo (1991) on *Bufo melanostictus*.

Materials and Methods

A total of 962 specimens (388 males, 267 females and 307 juveniles) were collected over a period of 12 months, from a perennial pond near village Chakeisani, Bhubaneswar, India. Specimens ranging from 17.0-38.0 mm snout-vent length (SVL), were sexed and the rest were treated as juveniles.

Results

Out of 962 specimens sampled, the lowest (43) and the highest (110) captures were during March and September respectively. The ratio of male to female for each month

indicated more males than females, except during the month of February, when the number of males were slightly less than that of the females. Cumulative ratio was also indicative of more males. The population dynamics of juveniles indicated maximum (53) during the month of June (Table 1). Further, juvenile population decreased drastically from December through January and no juveniles were collected during February and March. The low population density of juveniles during December and January and non-availability during February and March is associated with non-breeding season, because, basically the species breeds during monsoon period (June-August) when the number of juveniles in the natural population is more than non-breeding months.

To analyze the growth pattern in natural population, size range of juvenile (J), males (M) and females (F) were recorded (Table-2) and divided into various size groups (Table-3). Specimens measuring a maximum of 16.0 mm were not sexed and were considered as juveniles. The lowest SVL (8.0 mm) of juveniles from April through September is attributed to metamorphosis time of the species during these months, because the metamorphosing froglets were found to be with a SVL of about 8.0 mm. Based on SVL, the juveniles were divided into two size groups (8.0-11.0 mm and 12.0-16.0 mm). Both the size groups were found from May to October and the former was also

available during April. This is indicative of early breeding of the species, because metamorphosed froglets were found during this month. From November until January, the larger size group juveniles were found and this indicated growth in size.

A total of 388 males were collected over a period of 12 months (Table 1) and the SVL ranged from 17.0-36.0 mm. All the males were grouped into three size groups (17.0-22.0 mm; 23.0-30.0 mm and 31.0-36.0 mm) and the first two size groups were available during all the months (except three specimens of the third group which were collected during May). The above data indicated that both the juvenile, maturing and mature males of various sizes were found in nature.

The data on female population is comparable with males, except the lower number (267) of the former, which is typical for the species. Like males, the females were also grouped into three similar size groups and all the size groups were available throughout the year. However, the number of two smaller size groups were less than the largest size group of females. The above population trend and size range is also indicative of continuous growth of the species in natural environment.

Discussion

Several previous studies (refer to introduction) reported the growth pattern of temperate climate species of anurans and some of these studies (Wright, 1914; Breckenridge and Tester, 1961; Bellis, 1961; Hedeon, 1972; Lillywhite et al., 1973; Clarke, 1974) provide data on specific species. Turner's (1960) review of available data on anuran growth pattern suggested that most of the studies have either been con-

ducted in captivity or in natural populations, by analyzing marked individuals.

In general, growth rates of anurans have been determined in three ways, depending on measurement of 1. preserved materials, 2. captive individuals and 3. individuals either marked or samples taken from the same natural population at different times during the same growing season (Turner, 1960). The present analysis of growth pattern of *L. limnocharis* fits to the third category, because specimens of *L. limnocharis* were collected from their natural population over a period of 12 months. Further, the sampling method adopted was random. A total of 962 specimens (307 juveniles, 388 males and 267 females) were sampled and the data indicated maximum number of juveniles collected during the month of June (Table 1). This could obviously be due to metamorphic event of the species during June. Dash and Mahanta (1993), while studying the community structure of ten anurans in natural populations, reported that *L. limnocharis* is the dominant anuran in paddy fields. Hence, the availability of more juveniles than males and females during May-September could be compared with population dynamics data of the species reported by Dash and Mahanta (1993).

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Appendix I

Tables 1-3

Table 1. Cumulative data on population size of specimens of *L. limnocharis* collected for 12 months.

Year/Month	Juveniles (J)	Males (M)	Females (F)	Ratio (J:M:F)
1987				
May	44	31	15	2.933:2.067:1
June	53	29	11	4.818:2.636:1
July	42	31	26	1.615:1.192:1
August	49	29	29	1.690:1:1
September	44	42	24	1.833:1.75:1

(Continued)

Year/Month	Juveniles (J)	Males (M)	Females (F)	Ratio (J:M:F)
October	25	39	18	1.389:2.167:1
November	22	35	29	0.759:1.207:1
December	9	30	18	0.500:1.667:1
1988				
January	3	32	31	0.097:1.032:1
February	0	31	33	0:0.939:1
March	0	26	17	0:1.529:1
Total	307	388	267	1.150:1.453:1

Table 2. Cumulative data on size range, mean and Standard Deviation of specimens of *L. limnocharis* collected for 12 months.

Year/Month	Sex	SVL Range (mm)	Mean \pm SD (mm)
1987			
April	J	8.0 - 10.0	8.625 \pm 0.719
	M	20.0 - 29.0	25.455 \pm 2.559
	F	31.0 - 38.0	34.750 \pm 2.543
May.	J	8.0 - 16.0	10.568 \pm 2.526
	M	18.0 - 36.0	25.645 \pm 4.742
	F	21.0 - 36.0	31.933 \pm 5.284
June	J	8.0 - 16.0	11.528 \pm 2.217
	M	18.0 - 28.0	23.621 \pm 3.201
	F	27.0 - 38.0	31.182 \pm 3.842
July	J	8.0 - 16.0	11.619 \pm 2.214
	M	18.0 - 30.0	22.839 \pm 3.928
	F	18.0 - 35.0	26.423 \pm 5.934
August	J	10.0 - 16.0	12.612 \pm 1.850
	M	18.0 - 29.0	24.793 \pm 2.920
	F	18.0 - 34.0	27.828 \pm 4.167
September	J	8.0 - 16.0	11.773 \pm 2.530
	M	17.0 - 30.0	23.262 \pm 3.818
	F	17.0 - 38.0	31.333 \pm 7.516

(Continued)

Year/Month	Sex	SVL Range (mm)	Mean \pm SD (mm)
October	J	10.0 - 16.0	12.96 \pm 1.670
	M	17.0 - 28.0	23.71fl \pm 3.266
	F	29.0 - 38.0	32.333 \pm 3.068
November	J	14.0 - 16.0	14.909 \pm 0.750
	M	17.0 - 27.0	22.543 \pm 2.941
	F	18.0 - 36.0	29.44R \pm 5.736
December	J	15.0 - 16.0	15.889 \pm 0.333
	M	17.0 - 24.0	19.667 \pm 1.795
	F	18.0 - 36.0	26.167 \pm 6.635
1988			
January	J	16.0	16.000 \pm 0.0
	M	18.0 - 30.0	23.125 \pm 4.098
	F	18.0 - 38.0	27.032 \pm 7.276
February	M	19.0 - 29.0	22.903 \pm 4.215
	F	19.0 - 36.0	24.667 \pm 6.623
March	M	20.0 - 28.0	22.923 \pm 2.481
	F	20.0 - 35.0	26.000 \pm 5.612

Table 3. Cumulative data of different size (SVL in mm) groups of *L. limnocharis* collected for 12 months.

Year/ Month	Juveniles		Males			Females			Total
	8.0- 11.0	12.0- 16.0	17.0- 22.0	23.0- 30.0	31.0- 36.0	17.0- 22.0	23.0- 30.0	31.0- 38.0	
1987									
April	16	-	5	28	-	-	-	16	65
May	29	15	9	19	3	2	1	12	90
June	29	2411	18	-	-	5	6	93	
July	22	20	13	18	-	8	12	6	99
August	16	33	8	21	-	3	21	5	107
September	22	22	20	22	-	5	1	18	110
October	5	20	10	29	-	-	8	10	82
November	-	22	17	18	-	5	7	17	86

(Continued)

Year/ Month	Juveniles		Males			Females			Total
	8.0- 11.0	12.0- 16.0	17.0- 22.0	23.0- 30.0	31.0- 36.0	17.0- 22.0	23.0- 30.0	31.0- 38.0	
December	-	9	28	2	-	8	4	6	57
1988									
January	-	3	15	17	-	15	1	15	66
February	-	-	19	12	-	22	-	11	64
March	-	-	13	13	-	6	7	4	43
Total	139	168	168	217	3	74	67	126	962

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