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COMMON FROG (*RANA TEMPORARIA* L.) SPAWN AND TADPOLES SURVIVAL RATES IN SMALL TRANSIENT BASINS

The following study defines common frog (*Rana temporaria* L.) survival rates at various development stages in small transient basins situated in the southern part of the Republic of Karelia, Russia. Low survival rates indicate insufficient reproduction capability in transient basins during droughty seasons.

Key words: Amphibia, Ranidae, development stages, survival rate, reproduction of population, reproductive basins

The maturing succession stages of anura are eggs, tadpoles and adults. Their living environment differs. Therefore they represent segregated aqueous and terrestrial ecological populations [8]. The following factors affect the number of survivors at each stage of development: the variety of heterogeneous environmental determinants as well as the quantity of creatures from the previous phase.

It is well known that the majority of common frogs perish at the early stages of ontogenesis [4]. Still, the exact common frog spawn and tadpoles survival rates in different types of basins are rare to obtain in literature.

The purpose of this study is to evaluate common frog (*Rana temporaria* L.) spawn and tadpoles survival-rates in transient basins in the southern regions of Karelia.

MATERIAL AND METHODS

Monitoring was conducted at three different locations (transient basins) in the vicinity of Petrozavodsk city (61^{o}30' *N*, 34^{o}25' *W*') in the course of two observation intervals in 2002 and 2003. Basin 1 and 3 were represented by eroded and flooded ruts of a dirt road. Basin 3 was a small sand-pit at the dirt road side. The maximum area of each basin during the spring water filling was estimated up to 20–30 m^2 with the water volume around 15–20 m^3. During the summer partial drying up of the basins caused the area (1.5–3 times less) and volume (to 5–7 m^3) reduction.

The total amount of laid eggs in each basin ($N_{e.}$) was calculated by multiplication of the number of layings ($N_{l.}$) by the average number of eggs in one laying ($N_{e./\,l.}$). The value of $N_{e./\,l.}$ was calculated using an ordinary «volume method» [5].

The absolute number of tadpoles ($N_{t.}$) in the basins was determined by mark-and-recatching method [2]. A total of 533 larvae were marked by vital dye followed by the second catching next day [7]. The survival rate estimations at germinal stages were based on the following calculation: $S_{e.} = N_{t.} / N_{e.}$

The absolute number of lately metamorphosed and dissipating young frogs (N_{0+}) was estimated by means of total catching in two basins fenced with polythene membranes. The survival rate of tadpoles was defined by the following formula: $S_{t.} = N_{0+} / N_{t.}$

The combined embryonic and larval survival rate was calculated as $S_{tot.} = N_{0+} / N_{ov.}$

RESULTS

The general common frog death-rate dynamics at its tadpoles stage is convenient to observe on the basin 2 samples taken in 2002 (Table). From the total number of 73.390 eggs only 753 matured to larva stage, i.e. *S*o. = 1 %. Then, only 107 larvae had survived to become yearlings and leave the basin (S_t. = 14). So the general spawn survival rate equals S_{tot}. = 0.15 %.

Common frog eggs and tadpoles survival rates in small transient basins

	Reservoir			
	Basin # 1	Basin # 2	Basin # 2	Basin # 3
	2002	2002	2003	2003
number of layings, $N_{l.}$	189	82	58	110
average eggs number in a laying, $N_{e./l.}$	1264±88	895±158	1159±107	1254±136
number of eggs, $N_{e.}$	238896±16632	73390±12956	67222±17334	137940±29104
number of tadpoles, $N_{t.}$	3212	753±114	–	–
survival rate of eggs, $S_{e.}$, %	1.3	1.0	–	–
survival rate of tadpoles, $S_{t.}$, %	–	14	–	–
number of lately metamorphosed young frogs, N_{0+}	–	107	86	850
total embryonic and larval survival rate, $S_{tot.}$, %	–	0.15	0.13	0.62

The analysis of all obtained data shows the following results: the survival rate at larva stage equals $S_{t.}$ = 1.0–1.3 %, whereas the general survival rate varies within the limits of $S_{tot.}$ = 0.13–0.62 %.

These estimations are close to those presented in literature: 6.00–0.015 % [3], [8], [6]. Lower survival rates were observed in small transient basins where relatively high concentration of spawn and tadpoles was presented. The same results were observed in our study. However, it should be noted that summers of 2001–2003 were abnormally warm in Karelia and resulted in considerable transient basins drying up. Probably, in more rainy years the survival rates might be higher.

In conclusion let us examine common frog reproduction potency in the basins studied. For instance, in basin 2 (year of 2002) the number of lately metamorphosed frogs that had left the basin was approximately one and a half times lower than the number of adult frogs who came to spawn to the basin originally (82 x 2 = 164). In basin 3 the situation developed in a better way for the number of lately metamorphosed frogs surpassed the number of parents by four times. Nevertheless just a few of them will survive to maturity because the young frogs survival rate during first weeks of their terrestrial life reaches 30–70 % [1] following by the yearlings survival rate up to 50 % [9]. Therefore it would be fair to infer that conditions in the basins studied are disadvantageous and do not provide common frogs reproduction. Probably such basins serve only as temporary bases on the frontier of species expansion.

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