

The Weather Condition for the First Spawning of *Hynobius queelpartensis* in Warm-Temperate Forest: Temperature and Precipitation

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I. Introduction

The *Hynobius queelpartensis*, which range from lowland to Baengnokdam Crater Lake, the top of the Mt. Halla and the southern parts of Korean Peninsula, is usually found in Jeju Island (Oh *et al.*, 2007; Ko *et al.*, 2009). The amphibian has globally decreased due to the direct or indirect effects of global warming (Wake, 1991; Alford *et al.*, 2007). These climate changes tend to make the greatest impacts on the amphibian including *Hynobius queelpartensis*.

This study examined the first spawning day of *Hynobius queelpartensis* and the weather condition, such as temperature and precipitation for first spawning of *Hynobius queelpartensis* in warm-temperate forest.

II. Materials and Methods

2.1. Study Area

Hannam research experimental forest ranging from an altitude of 320 m to 780 m is located in Hannam-ri, Namwon-eup of the city of Seogwipo and has an area of 1,203 ha. This survey was conducted at the stagnant pool of the small valley located within forest (Fig. 1).



Fig. 1. The whole view of survey area.

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2.2. Methods

The study was conducted between 2008 and 2013, visiting the wetland where the *Hynobius quepartensis* laid eggs from the early of January for confirming the eggs. Temperature and precipitation were obtained from an AWS of National Typhoon Center of the Meteorological Administration located approximately 3 km from our survey area because Oseen and Wassersug(2002) used this method.

III. Results

The first spawning day of *Hynobius quepartensis* was 27 January, 2008, 2 February, 2009, 23 January, 2010, 26 February, 2011, 6 February, 2012, 7 January, 2013 (Fig. 2). The weather condition during 11 days including first spawning day revealed that daily mean temperature was more than 5 degrees, which was lasted up to seven days and daily maximum temperature including the first spawning day was more than 5 degrees as well. Accumulated precipitation was more than 20mm during 11 days (Table 1, Fig. 3).



Fig. 2. A female of *Hynobius quepartensis* (left) and eggs attached on the rock (right).

Table 1. Meteorological data for 11 days including first spawning day of *Hynobius quepartensis*

Date	Temperate (°C)	Temperate _Max.(°C)	Temperate _Min.(°C)	Wind speed(m/s)	Precipitation (mm)
20080117	-0.4	3.4	-3.8	6.4	0
20080118	0.1	2	-1.3	8.4	0
20080119	3.5	5.9	0.1	5.1	3.5
20080120	6	7.1	5.3	4.9	19
20080121	6.4	7.4	5.4	4.7	25
20080122	6.3	8.3	4.9	5.8	19
20080123	2.3	5.7	0.2	6.8	1
20080124	-2	0.3	-3	8.2	0
20080125	-1.3	0.6	-2.4	7.3	0
20080126	-0.7	2.1	-2.1	7	0
20080127	0.9	5.8	-1.3	5.9	0
20090123	-2.8	6.9	-6.2	8.9	2.5
20090124	-3.6	0.2	-6.3	3.9	7.5
20090125	-0.3	2.5	-3.5	3.3	0.5
20090126	0.5	2.1	-1.2	5.8	0
20090127	-0.2	3.2	-2.8	5.2	0
20090128	4	10.1	-2.4	4.1	0
20090129	9.2	11.2	2.5	4.6	13.5
20090130	9.3	11.4	8.5	5.7	19
20090131	7.3	11.2	2.6	4.3	0
20090201	5.7	9.8	2.5	3.6	0
20090202	6.7	9.8	1.9	2.8	3
20100113	-3.5	-1.4	-5.3	3.4	9.5
20100114	0.2	4.2	-3.2	3.5	0
20100115	3.7	7.6	0.8	5.3	0
20100116	1.6	7.6	-1.2	5.1	0
20100117	3.8	9	-0.8	3.6	0
20100118	4.3	10.7	1	3.2	0
20100119	10	13.9	1	3.3	0
20100120	14	15.2	12.4	4.7	20
20100121	5.4	14.1	1.7	8	0
20100122	1.6	4.9	-0.5	6.6	0
20100123	0.9	3.6	-0.7	6.8	0
20110216	4.8	8.7	-1.5	2.6	12.5
20110217	4	8.3	0.9	7.1	6.5
20110218	3.8	7.1	0.4	5.8	0
20110219	4.8	10.2	0.5	4.2	0
20110220	6.5	11	-0.3	4.2	0
20110221	6	8.1	3.5	5.4	0
20110222	6.7	9.3	5	4	0
20110223	8.2	11.8	5.8	3.3	0
20110224	10.3	16.8	5.3	3.4	0
20110225	9.9	15.9	4.3	5.7	0
20110226	9.3	12.3	6.5	3.8	1.5
20120127	2.4	7.6	-3.7	3.5	0
20120128	3.2	5.3	1.9	6.3	0
20120129	2.8	6.6	0.2	5.4	0
20120130	0.4	3.4	-1.5	7.9	0
20120131	3.1	6.9	-1.5	4.6	0
20120201	-0.6	5	-5	6.1	0
20120202	-5.4	-3.3	-6.5	4.7	5
20120203	-2	3.1	-5.2	5.1	0
20120204	0.4	5.8	-4.5	3	0
20120205	3.8	6.2	-2.1	3.4	1.5
20120206	6.9	9.3	4.6	3.9	22
20121228	7	11.9	4.6	6	27
20121229	6.7	11.1	3.1	3.4	7
20121230	1.3	6	-0.8	7	8.5
20121231	1.2	3.2	-1.1	4.7	2
20130101	4.2	9.5	0	3.3	0
20130102	2.7	6.4	-1.4	6.3	0
20130103	-1.6	0.5	-2.7	6.4	0
20130104	-0.2	4	-2.5	6	0
20130105	1.8	5.9	-0.9	6.5	0
20130106	2.8	5.7	0.7	6.2	0
20130107	2.7	5.2	0.5	4.8	0

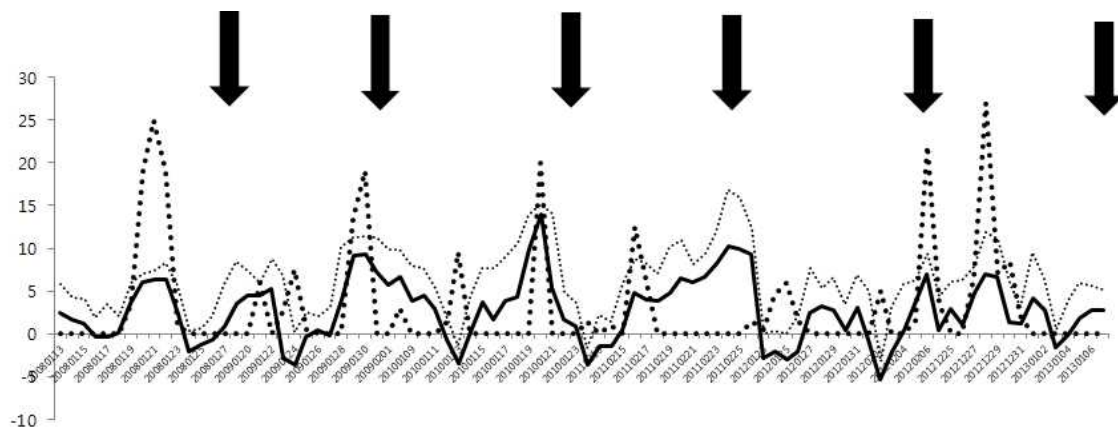


Fig. 3. Average daily temperature ($^{\circ}\text{C}$), the maximum temperature ($^{\circ}\text{C}$) and daily amount of precipitation (mm) for 11 days including first spawning day of *Hynobius quelpartensis* (solid line: average daily temperature, dot line: the maximum temperature, dark dot line: daily amount of precipitation, arrow: first spawning day).

References

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