

길쭉먼지벌레의 개체군 변동

(딱정벌레目: 먼지벌레科)

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Population Dynamics of the Genus *Pterostichus*
(Coleoptera, Harpalidae)

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Abstract

Most species were occurred at the low altitude in June and at the high altitude in August. And then, in September, they occurred abundantly at the low sites as the same case in June. The trends in population density of 4 species of *Pterostichus* from Mt. Tögyusan, S. Korea, were revealed various tendencies of fluctuation. Generally most species showed the seasonal prevalence in some extent of degree as their characteristic appearance.

Key words: Population dynamics, Coleoptera, Harpalidae, *Pterostichus*, Tögyusan, Korea

Introduction

Most investigations on the species composition with seasonal and altitudinal abundance on ground beetles in different habitats have been conducted mainly in Europe (Thiele, 1977). And also, recently,

the studies were carried out in a forage crop field and fig orchard in Japan (Ishitani *et al.*, 1994; Ishitani and Yano, 1994).

However, the knowledge of the species composition and seasonal activity or occurrence of harpalid ground beetles were not discussed yet from Korea. So,

preliminary investigation of population dynamics were carried out to find the activities of some species of *Pterostichus* by seasons and altitudes based on environmental factors at a given area in southern part of Korea.

The present study began in 1991 as a part of the ecological study on the genus *Pterostichus* in Tögyusan, southern part of Korea.

Materials and Methods

This survey was conducted to find the

dynamics and occurrence of population. Totally 8 sampling sites were chosen from Mt. Tögyusan (1614m), S. Korea, as the following altitudes: ca. 600m, 700m, 800m, 900m, 1000m, 1100m, 1200m and 1300m above sea level (Fig. 1). The materials were collected by pitfall traps in June, August and september, and also the traps were exposed for two days. The trap was a plastic cup of 7cm in top diameter and 9.5cm in height. Each site was consisted of a twenty cups, they were buried at about 8 - 10m intervals at each traps.

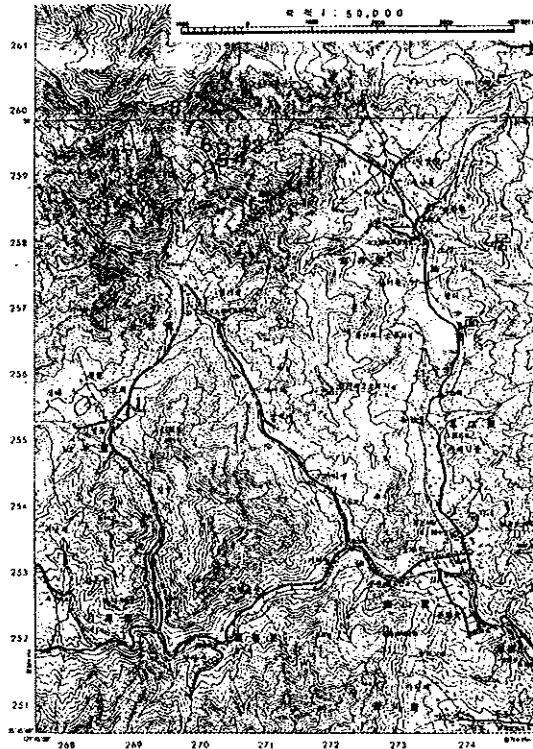


Fig 1. The map of Mt. Tögyusan showing 8 investigated sites along altitude.

Results

A total of 583 individuals belonging to 4 species of *Pterostichus* were collected in this investigation. These 4 species were *Pterostichus ishikawai*, *P. audax*, *P. bellator* and *P. scurrus*, in decreasing order of dominance. The mean individual numbers of per day and per trap were 1.61.

The seasonal collected number and composition of ground beetles were summarized in the Table 1.

P. audax was occurred from all sites except for in September. It has 2 emptied sites. In June, this species was numerously collected at lower sites than high sites. Among them, site 2 (700m), site 3 (800m) and site 4 (900m) were revealed relatively high density. Whereas, in August, it was abundantly trapped at middle and high altitudes of more than 1000m. And also, the collected percentage of *P. audax* in September was increased at the lower sites of less than ca 1000m, as the similar case of June (Fig. 2: A).

P. scurrus was mostly found in all the traps from June to September without revealing distinct fluctuations. But, as a rule, *P. scurrus* was more increased in June at low sites (600m, 700m, 800m). In August, it showed to increase in all the sites, except for site 4 (900m) and 7 (1200m), of which the beetles were rarely collected than in other sites. Whereas, the species was abundantly trapped at middle (900m, 1000m) and

high sites (1200m, 1300m) in September (Fig. 2: B).

P. bellator was numerously collected at site 3 (800m), site 6 (1100m), site 7 (1200m), and site 8 (1300m) from all seasons during the survey. Especially at low sites, it was collected abundantly in June. Whereas, the species was trapped richly at high sites in August. And also, in September, it was occurred abundantly at site 2, site 3, site 4, site 6, and site 7 (Fig 2: C).

P. ishikawai was trapped mostly as similar numbers at all sites, except for site 1 and site 7 in June. But, the appearance in August was relatively abundant at all sites. Among them, lower sites (site 1, 2, 3) and middle site (site 5) showed to more richness in the species abundance. The site 8 was the peak point of the density in this species. In September, mostly collected specimens were gained from low site (Fig. 2: D).

In June, the largest collected population of the species was the *P. audax*, and most species occurred at lower sites (Fig 3: A). In August, the collected percentage of all the species revealed a tendency of small relative increase at high sites (Fig. 3: B). Whereas, the trapped densities of *P. audax* and *P. ishikawai* were increased at low sites in September. On the other hand, they decreased at high sites step by step (Fig 3: C). Generally, this investigation showed the occurrence patterns, which revealed

more trapped populations at lower and

higher sites than at middle sites. However, some species showed indistinct fluctuation of population density

regardless of all collecting sites during the survey (Fig. 3: D).

Table 1. The number of individual harpalid ground beetles caught in Mt. Tōgyusan, Southern part of Korea.

Species	Alt(m)	June	August	September
<i>P. audax</i>	site 1	4	2	4
	2	14	6	8
	3	19	6	5
	4	13	1	4
	5	11	14	0
	6	9	12	1
	7	2	22	0
	8	7	18	5
<i>P. scurrus</i>	1	4	3	2
	2	3	2	3
	3	3	4	0
	4	2	1	8
	5	0	3	2
	6	2	3	1
	7	1	1	6
	8	2	8	5
<i>P. ishikawai</i>	1	0	19	0
	2	5	18	9
	3	3	17	6
	4	4	0	6
	5	9	16	2
	6	4	5	4
	7	0	10	1
	8	3	48	0
<i>P. bellator</i>	1	2	2	0
	2	5	2	3
	3	8	3	4
	4	0	0	2
	5	2	4	0
	6	4	12	2
	7	3	21	3
	8	1	10	0

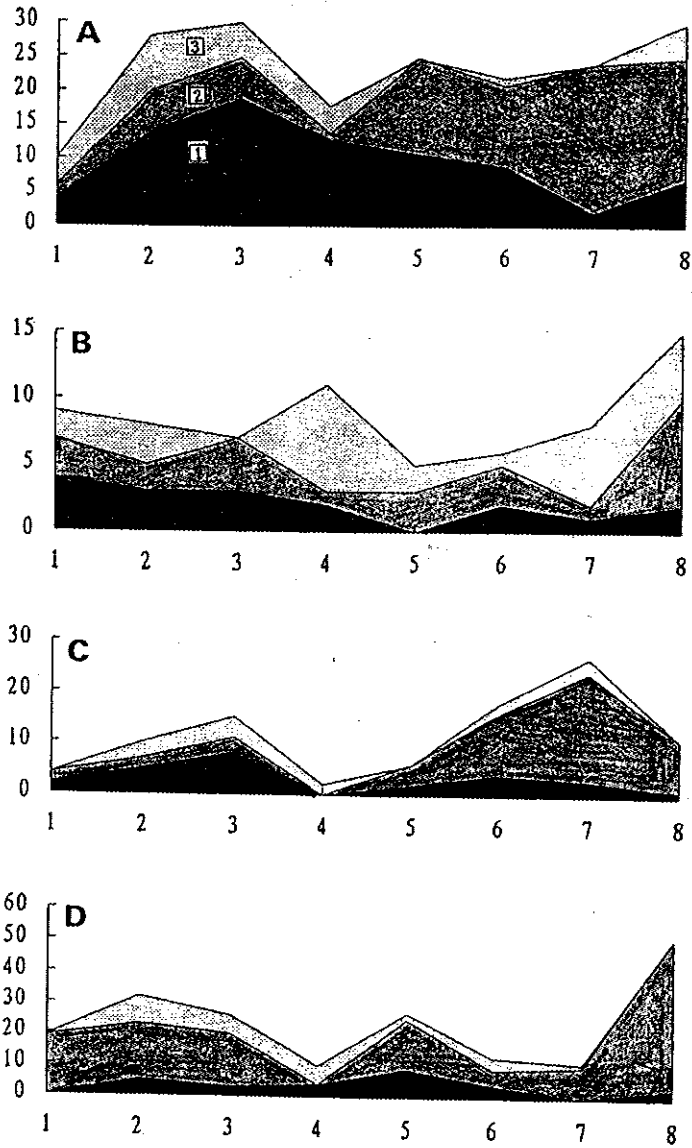


Fig 2. Population fluctuation of 4 Pterostichus species by different season. A: *audax*: B: *scurrus*: C: *bellator* : D: *ishikawai* (1: June, 2: August, 3: September).

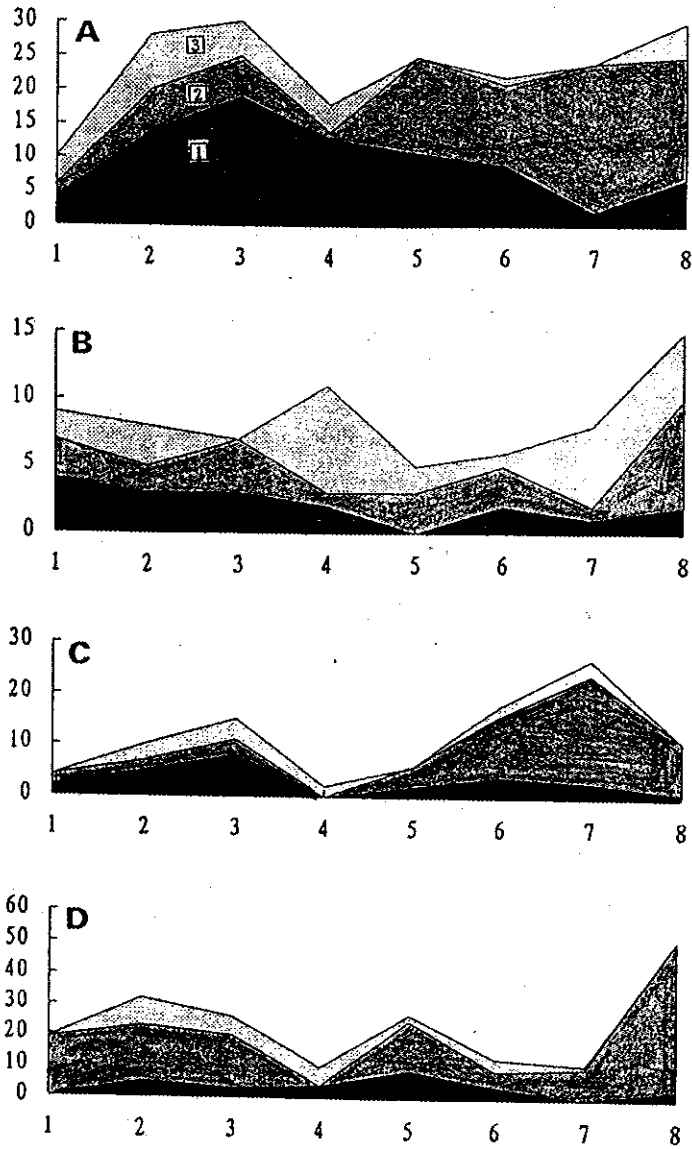


Fig 3. Relative comparison of population dynamics of 4 *Pterostichus* species. A: June; B: August; C: September; D: all seasons (1: *audax*, 2: *scurrus*, 3: *ishikawai*, 4: *bellator*).

Discussion

As for the annual fluctuation tendency of the seasonal and altitudinal patterns, *P. audax* revealed as a typical type of insect in activity by temperature investigated in Korea. It was occurred from low sites in June to high sites in August. And then, in September, it revealed abundant population at low sites as the same case in June. This is probably due to the air temperature. On the other point of view, the different breeding patterns would effected to the annual appearance of ground beetles. Sota (1987) explained this phenomenon as follows: The delay of new adult emergence at the higher altitude is probably due to the extended larval and pupal period under low temperature at high altitude.

Autumn populations were usually caught in June, whereas spring breeders appeared in late March. But, some species of Autumn breeders were occurred without revealing any distinct fluctuations from June to November (Ishitani and Yano, 1994). However, this investigation was not focused on the breeding patterns.

As a rule, the seasonal fluctuation patterns and species compositions of the *Pterostichus* spp. were revealed as one of the common types, except for *P. ishikawai* and *P. scurrus*, during this survey.

Generally, most species were occurred from low altitude in June to high altitude

in August. And then, in September, they occurred abundantly at low sites again as the same case in June.

적 요

덕유산 지역을 대상으로 길쭉먼지벌레류 4종에 대한 고도별, 계절별 분포 및 이동상을 조사해본 결과 *P. ishikawai*가 가장 많은 밀도를 나타내었다. 대부분 종들에서 6월은 저고도에서 많은 빈도를 나타내었으며, 반대로 8월에는 높은 고도에서 많이 채집되는 경향을 보였다. 그리고 9월에서는 6월과 마찬가지로 저고도에서 다소 많은 양이 채집되었다. 조사된 길쭉먼지벌레류 4종중에서 *P. audax*가 전형적인 곤충의 계절별, 고도별 이동 경향을 나타내었다.

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