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Temporal Change in the Number of Longicorn Beetles (Coleoptera, Cerambycidae) Captured on Flowers at the Intervals of Three Hours over Six Days

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Abstract Cerambycid beetles were captured on two flower species, *Aruncus sylvester* (yamabuki-shôma) and *Angelica polyclada* (shishi-udo), at the intervals of three hours during six days from the 10th to 16th August, 1993 in a Japanese beech (*Fagus crenata*) forest, at Minakami, Gunma Prefecture, Japan. During the six days, 577 individuals of 11 species, belonging to the Lepturinae only, were captured. *Pidonia takechii* had the greatest number of individuals (475; 82.3%). In most of the species almost constant number of individuals were captured every day from the wild flowers. The number of total beetle individuals, as well as those of all the beetle species, decreased considerably and sometimes none were obtained at night.

Flowers are utilized as important food source by many beetle species, among which are cerambycids, above all, most species of the subfamily Lepturinae and some of the subfamily Cerambycinae. On a flower, they not only eat its nectar and pollen, but utilize it as a mating site (KANDA, 1981; KUBOKI, 1987). On the other hand, cerambycid beetles are important pollinators for flowering plants so that they are contributing the natural regeneration of forests in some parts of the world. Although the relations between cerambycid beetles and flowers are not so obligatory and specific in comparison with those between bees or moths and flowers, many cerambycid species visit flowers of certain species at a certain locality and season (WATANABE, 1969; KUBOKI, 1978, 1990; KANDA, 1980, 1989, 1991; SAITO *et al.*, 1981 a, b). On the other hand, degree of activity of cerambycid beetles on flowers changes with time and weather within a day (WATANABE, 1976; KUBOKI, 1978). In this connection, however, no reports have been made on a day-and-night observation of cerambycid beetle community on flowers, their night behavior being very unfamiliar to us.

We have reported comparison of beetle samples captured by insect traps with benzyl acetate (possessing a floral scent) and community of manually captured beetles on flowers in Japan in order to clarify limitation in the use of traps in studying field beetle communities (SAKAKIBARA *et al.*, 1996). In close connection with this, we report here the temporal change of appearance of cerambycid beetles on flowers at the intervals of

three hours over six days.

Materials and Method

1. *Study site.*

Investigation was conducted in close connection with the one that was reported elsewhere (SAKAKIBARA *et al.*, 1996) in a Japanese beech (*Fagus crenata* BLUME) forest along the Tashirozawa forest road (altitude 1,400 m), Minakami, Gunma Prefecture, Japan. This natural forest is in a well preserved primary condition, where felling has been done only partly in the past.

2. *Capture of beetles on flowers.*

During the six days from the 10th to 16th August 1993, cerambycid beetles were captured from flowers every three hours (0:00, 3:00, 6:00, 9:00, 12:00, 15:00, 18:00 and 21:00), where the interval (3 hours) is regarded as "bout". The flowers belonged to *Aruncus sylvester* KOSTEL (yamabuki-shôma; 20 plants) and *Angelica polyclada* FRANCH (shishi-udo; 1 plant), which were blooming at the side of the forest road. They were captured by hand so as to avoid damaging flowers, with a net placed beneath the flowers to prevent beetle flight. During the same period, meteorological factors such as weather, wind strength, temperature and humidity were recorded (see SAKAKIBARA *et al.* (1996) for the detailed methods). The beetles captured on flowers were preserved in a vial with 75% ethanol.

Results

Over the six days, 577 cerambycid individuals of 11 species, all belonging to the subfamily Lepturinae, were captured (Table 1). The genus *Pidonia* was the dominant

Table 1. Total individual number of each species captured on flowers.

Species	Number of individuals
Gaurotes dorsi BATES	4
Pidonia obscurior (PIC)	3
P. takechii KUBOKI	475
P. grallatrix (BATES)	36
P. aegrota (BATES)	1
P. miwai (MATSUSHITA)	3
P. amentata (BATES)	2
P. masakii HAYASHI	30
Corennys sericata BATES	1
Leptura mimica BATES	2
Parastrangalis nymphula (BATES)	20
Total	577

with 7 species (64%) and 550 individuals (95%). *Pidonia takechii* KUBOKI had the greatest number of individuals (475; 82%). Among the other species with comparatively large number of individuals (more than 10) are *P. grallatrix* (BATES) (36; 6.24%), *P. masakii* HAYASHI (30; 5.2%) and *Parastrangalis nymphula* (BATES) (20; 3.47%).

Changes in the number of individuals of these four dominant species are shown in Fig. 1. As for *P. takechii*, the number of individuals captured showed a single peak within each day, although the peak on the 13th was very obscure, with similar number of individuals being captured over 4 bouts from 9:00 to 18:00. The capture peak always occurred in the 5th bout (12:00–15:00) except for the 14th when it occurred in the 7th bout (18:00–21:00). The number of individuals captured decreased considerably from daytime toward night to give nothing after midnight in most of the days. The weather changed considerably during the period of study (Fig. 2). However, as is seen from a comparison of Figs. 1 and 2, our trial failed to detect any similar meteorological sequences among days, nor any correlations between the capture pattern and the weather pattern.

As for the other species, details of capture pattern were not clearly presented on account of a small number of individuals captured per bout. They were not captured at night except that a few individuals of *P. masakii* were found on the flowers around midnight.

The results shown in Fig. 1 were rearranged in Fig. 3 by combining 8 intervals into one, that is, one day being regarded as a long bout. The correlation coefficients of the total number of individuals captured on each day with the temperature (mean and maximum) and humidity (mean and minimum) were as follows: for *P. takechii*, mean temp. $r=-0.349$, max. temp. $r=-0.957$, mean hum. $r=0.698$, min hum. $r=-0.831$; for *P. grallatrix*, mean temp. $r=0.726$, max. temp. $r=0.677$, mean hum. $r=0.309$, min. hum. $r=0.105$; for *P. masakii*, mean temp. $r=0.412$, max. temp. $r=0.450$, mean hum. $r=0.225$, min. hum. $r=0.2$; for *P. nymphula*, mean temp. $r=-0.250$, max. temp. $r=-0.219$, mean hum. $r=0.556$, min. hum. $r=0.492$. Of these, only significant was the negative correlation between the individual number of *P. takechii* and the maximum temperature ($p<0.02$).

On the other hand, the total number of individuals captured on each day did not vary significantly (for *P. takechii*, $\chi^2=5.493$, $df=4$, $p>0.2$; for *P. masakii*, $\chi^2=7.2$, $df=4$, $p>0.1$; for *P. nymphula*, $\chi^2=2.556$, $df=4$, $p>0.5$) except for *P. grallatrix* whose individual number varied significantly ($\chi^2=9.5$, $df=4$, $p<0.05$).

Discussion

Although most species of the Lepturinae are diurnal flower-visiting cerambycids in Japan, some species of the genus *Pidonia* have been reported to be active at night (TAKAI, 1983; MAKIHARA & SAITO, 1988). In the present study, however, the number of individuals of *Pidonia* spp. decreased considerably on the flowers and none were obtained at most nights. It is supposed that some *Pidonia* species have a potentiality of

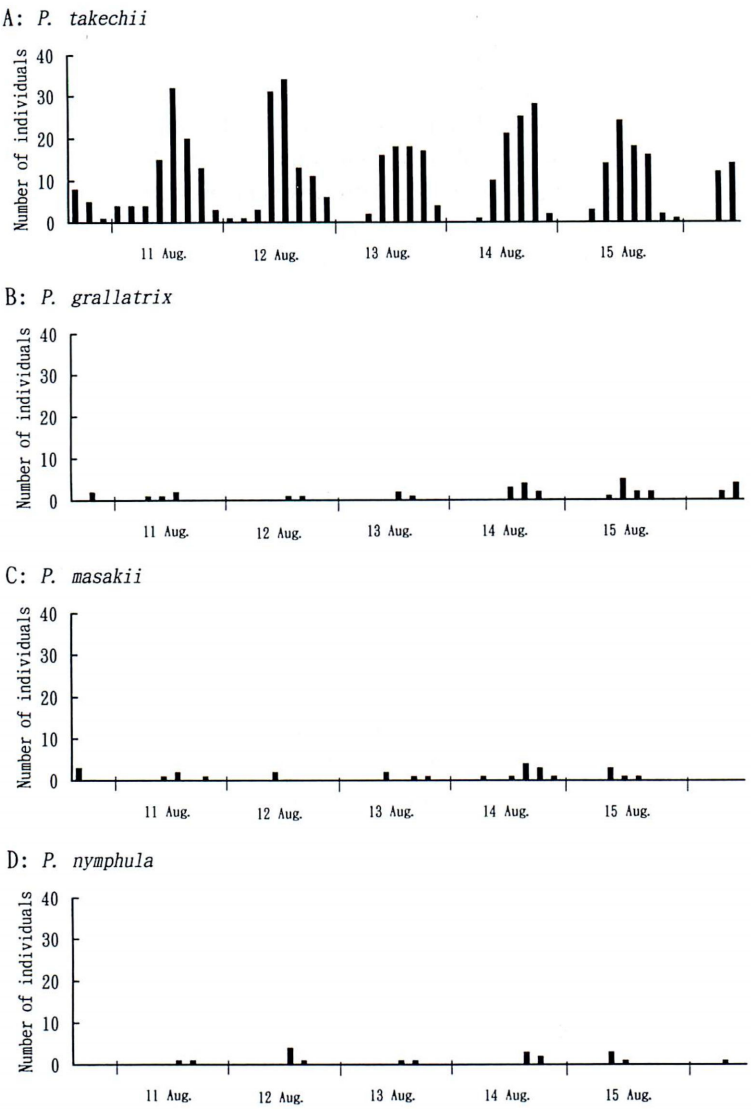

Fig. 1. Temporal changes of the numbers of individuals of cerambycid beetles captured on flowers during the six day study period at the intervals of three hours.

nocturnal activity which may be limited by circumstances; the nocturnal activity of *Pidonia* species proved to be uncommon, and their occurrence on flowers at night is possibly ascribed to their prolonged stay from the daytime.

In the present study, medium-sized lepturine species, such as *P. takechii* and *P. grallatrix*, dominated on the flowers in number, while the large-sized species appeared

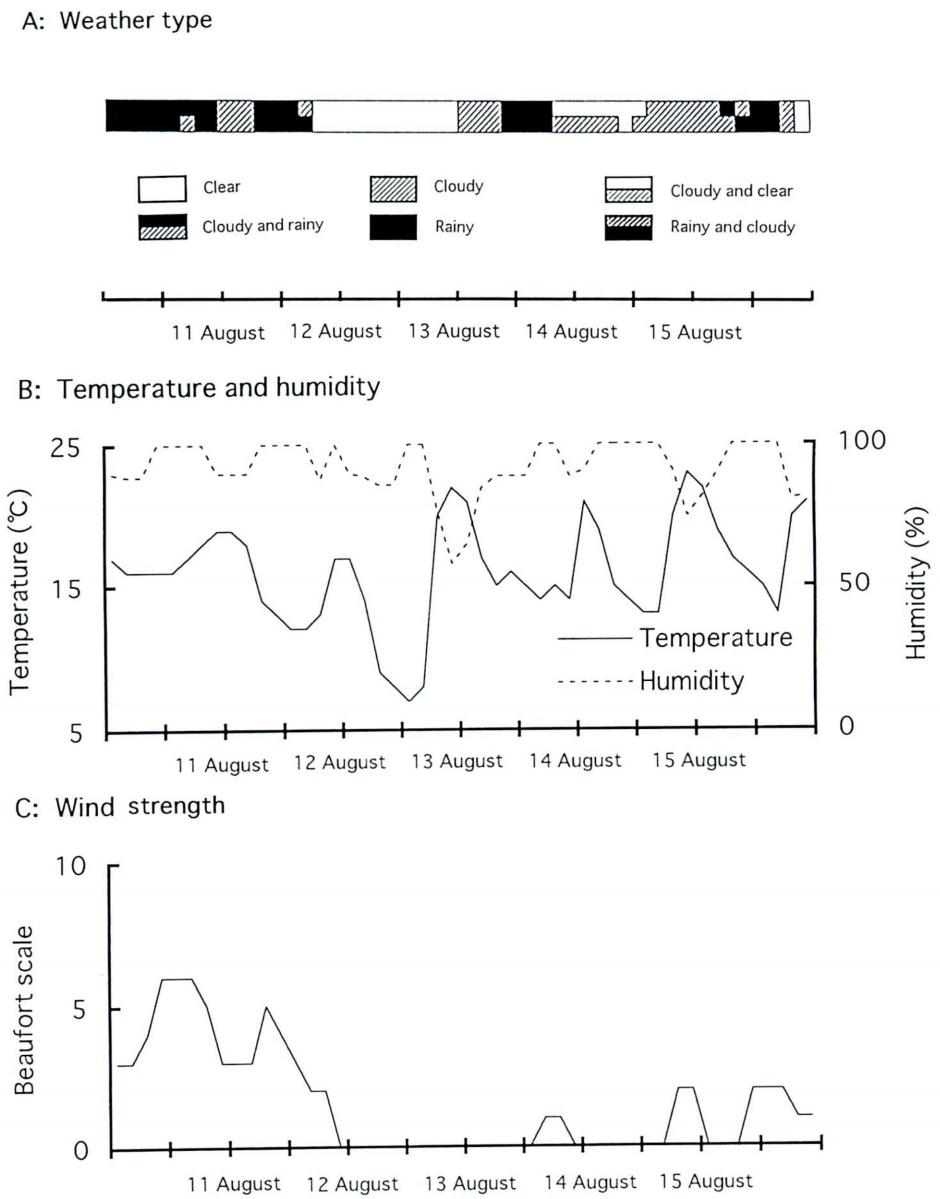

Fig. 2. Temporal changes of meteorological factors during the six day study period at the intervals of three hours (SAKAKIBARA *et al.*, 1996).

in limited numbers (*e.g.* genus *Leptura*). During the connected investigation with traps from July 23rd to August 23rd, 1993 (SAKAKIBARA *et al.*, 1996), other 11 species of cerambycid beetles were captured by the traps in addition to the 11 species captured on

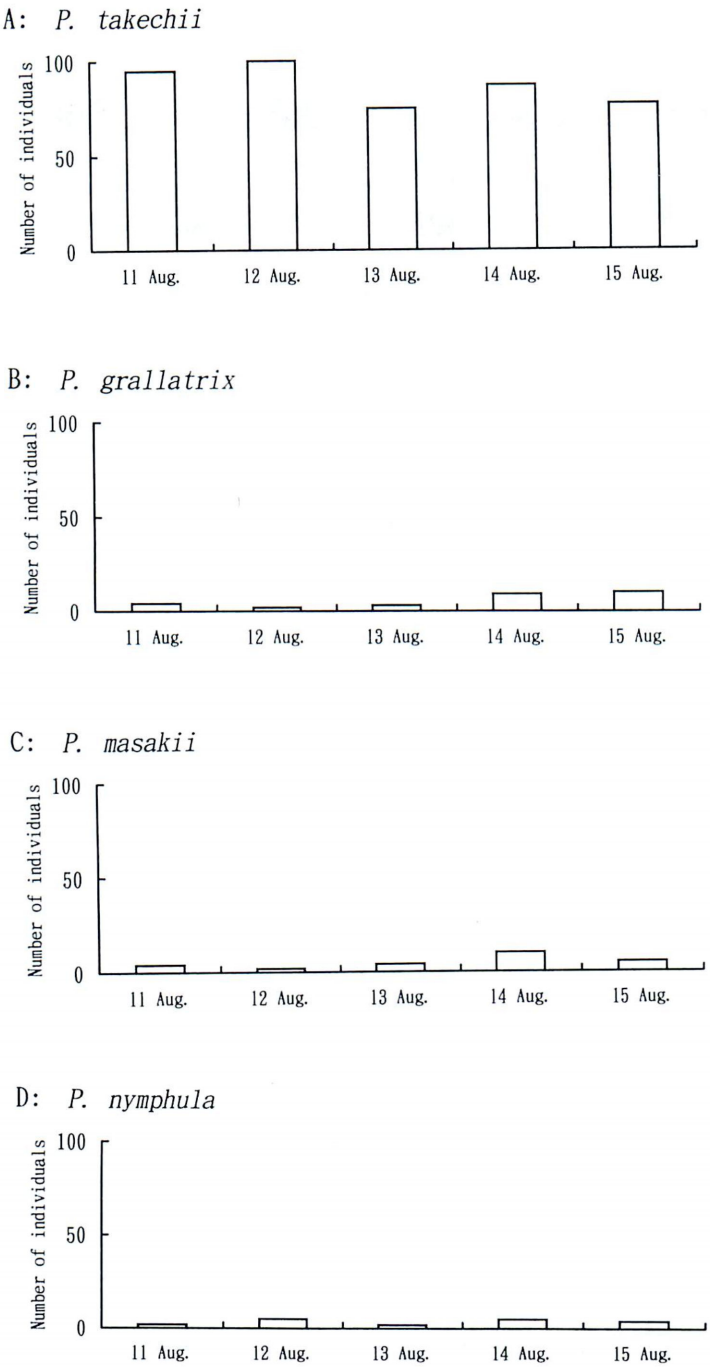

Fig. 3. Numbers of individuals of cerambycid beetles captured on flowers over five days at daily intervals.

the flowers (Table 1). Both in traps and flower catches, *P. takechii* and *P. grallatrix* were included in the dominant members, suggesting that medium-sized lepturine species form the nucleus of the cerambycid beetle community on the flowers in this region. It has been reported that the capture of small- and medium-sized lepturine species showed double-peak patterns during daytime, suggesting their avoidance of high temperature and/or heavy sunshine (WATANABE, 1976; KUBOKI, 1978). In the present study, beetle capture on flowers exhibited a single peak, and low temperature and high humidity were recorded during all the study period. It can be said that these meteorological factors rather favored the activities of cerambycid beetles on flowers.

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要　　約

榊原陽一・岩田隆太郎・小林博隆・山根明臣：群馬県水上町における3時間ごと6日間の訪花性カミキリムシの捕獲消長．—— 群馬県水上町田代林道のブナ林において，花上のカミキリムシ群集の調査を行った．1993年8月10日から8月16日までの6日間，ヤマブキショウマ20株とシシウド1株に訪花しているカミキリムシを3時間ごとに捕獲し，11種577個体を得た．捕獲されたカミキリムシはすべて，ヒメハナカミキリ属を中心とするハナカミキリ亜科のもので，とくにアサマヒメハナカミキリが多数を占めた (475; 82.3%)．各種の捕獲個体数の日ごとの変動はごく小さかった．また，夜間の捕獲個体数は激減し，日によってはまったく得られない時間帯もあった．

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