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LIFE HISTORIES OF *COCCINELLA SEPTEMPUNCTATA BRUCKI, PROPYLEA JAPONICA* AND *SCYMNUS HOFFMANNI* (*COL., COCCINELLIDAE*) IN JAPAN

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There are seven species of coccinellids known predators of aphids infesting on field crops in Japan. In Fukuoka Prefecture, three of them, *Coccinella septempunctata brucki, Propylea japonica* and *Scymnus hoffmanni* are known to occur, appearing from spring to autumn. Present study was carried out in the field to clarify the life histories of tree species of aphidophagous coccinellids.

KEY-WORDS: life history, *Coccinellidae*, Japan.

Coccinella septempunctata, Propylea japonica and *Scymnus hoffmani* are familiar species and important predators of aphids in Japan. *C. septempunctata* aestivated from late June to early August, and the adults of the 2nd generation emerged in October. In winter these adults hibernated in clusters of grass and under fallen leaves, and become active on warm winter days when the maximum temperature exceeded 10°C.

P. japonica and *S. hoffmanni* emerged from hibernation in April, did not aestivate, and were active from spring to autumn 3 generations. Hukushima and Komada (1971) reported that *P. japonica* has 7 generations in a year. According to Kawauchi (1985) *P. japonica* diapauses and *S. hoffmanni* hibernates in winter.

This study is on the life cycle of these 3 species of Coccinellids, and their overwintering and aestivation sites.

MATERIALS AND METHODS

All of the surveys were done in fields around Chikushino and Kurume, in the eastern part of Fukuoka Prefecture, Kyusyu district, Japan. At Chikushino the populations change of aphids and Coccinellids was investigated weekly on 12 kinds of organically grown crops from February to November, in 1978 and 1980. Three species of aphidophagous Coccinellids were found. Coccinellid numbers were monitered not only in the crops but also in the grass around the field.

RESULTS AND DISCUSSION

COCCINELLA SEPTEMPUNCTATA BRUCKI

Adults of the first generation were found on *Brassica campestris napus, Triticum eaestivum, Solanum melongena* from late May to mid-June. The adults aestivated at the

base of Japanese pampas grass, *Miscanthus sinensis,* from July to August in the Fukuoka district. Maeta (1965) reported that the adults aestivate in weeds growing under orchard trees in southern Japan, and Sakurai *et al.* (1981), and Sakuratani (1985) that they aestivate at the base of pampas grass, in central Japan. That is adults aestivate in several localities, but not in either Hokkaido or the northern part of Tohoku district. Okuda and Hodek (1994) reported that the Sapporo population has a long-day photo-periodic response adequate for the induction of winter diapause.

The adults that emerged from aestivation oviposited in late August, and the 2nd generation of adults emerged from late September to October. The adults were found on *Solidago altissima* in November (fig. 1).

Adults hibernated in clusters of grass and under fallen leaves from December to March. They were not in diapause at this time, as they were found exposed on the grass and fallen leaves on warm winter days when the maximum temperature exceeded 10°C.

Sakuratani *et al.* (1991) reported that in winter some adults emerged from pupae attached to stones or wood discarded in sunny places close to the Yodo River on the Osaka Plain.

PROPYLEA JAPONICA

The overwintered adults of *P. japonica* emerged from hibernation on warm days from mid March to April. They move to *Pisum sativum* L. var. *arvense* and *Rosa multiflora,* and later to wheat, potatoes and broad beans. In the Gifu prefecture they leave their hibernation quarters on warm days during mid April to May, and rest on the branches and twigs of maple trees (Hukushima & Komazaki, 1971).

The adults were found on the farm from April to late November, when many adults were found on *Solidago altissima.* Many adults of *P. japonica* were observed on the farm in May to June. Larvae appeared first in mid May on wheat where some of the adults remained.

Conspicuous peaks in number of adults were seen in June and July and between late August and September. The population of larvae decreased during early June and early July. They were observed on egg-plants (*Solanum melongena*), cucumbers (*Cucumis sativus*), pumpkins (*Cucurbita moschata* var. *toonas*) and taros (*Colocasia antiquorum* var. *esculenta*) from late July to October. In November the larvae disappeared from the crops, but were observed on wild grasses. The first pupae were observed in late May, and the last in late October. As fig. 2 (A, B, D, E and F) shows, many pupae were seen in late May, early to middle June and late July.

P. japonica does not aestivate and has 2 or 3 generations in a year. Fig. 2 E and F shows that many eggs were oviposited in August and September.

SCYMNUS HOFFMANNI

Fig. 3 shows the seasonal fluctuations in number of *S. hoffmanni.* The eggs were too small to find in the field. Adults diapause in winter. They are first found eating aphids on the wheat and potato. The feeding activity of adults continues from April to late November. The population density is highest from June to August.

The larvae first appeared on wheat on May 3, and pupae as early as June 2 on the leaves of potatoes and on June 4 on wheat. Larvae were observed feeding on aphids on taros, egg-plants, cucumbers and pumpkins in mid-July to August, and pupae were on these plants from late July to late September. Larvae and pupae were not found on crops from mid-June to early July.

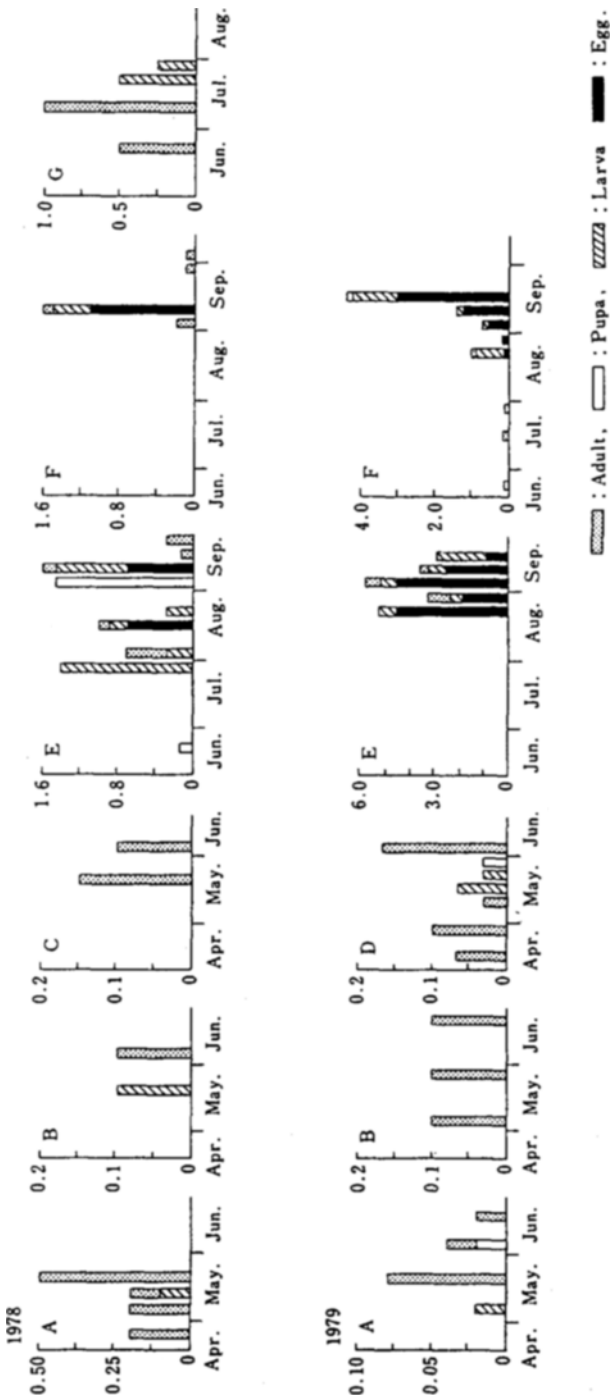

Fig. 1. Number of *C. septempunctata* per plant observed on each crop in Chikushino in 1978 and 1979. A: *T. aestivum*; B: *S. tuberosum*; C: *B. campestris napus*; D: *V. faba* f. *anacarna*; E: *S. melongena*; F: *C. antiquorum* var. *esculenta*.

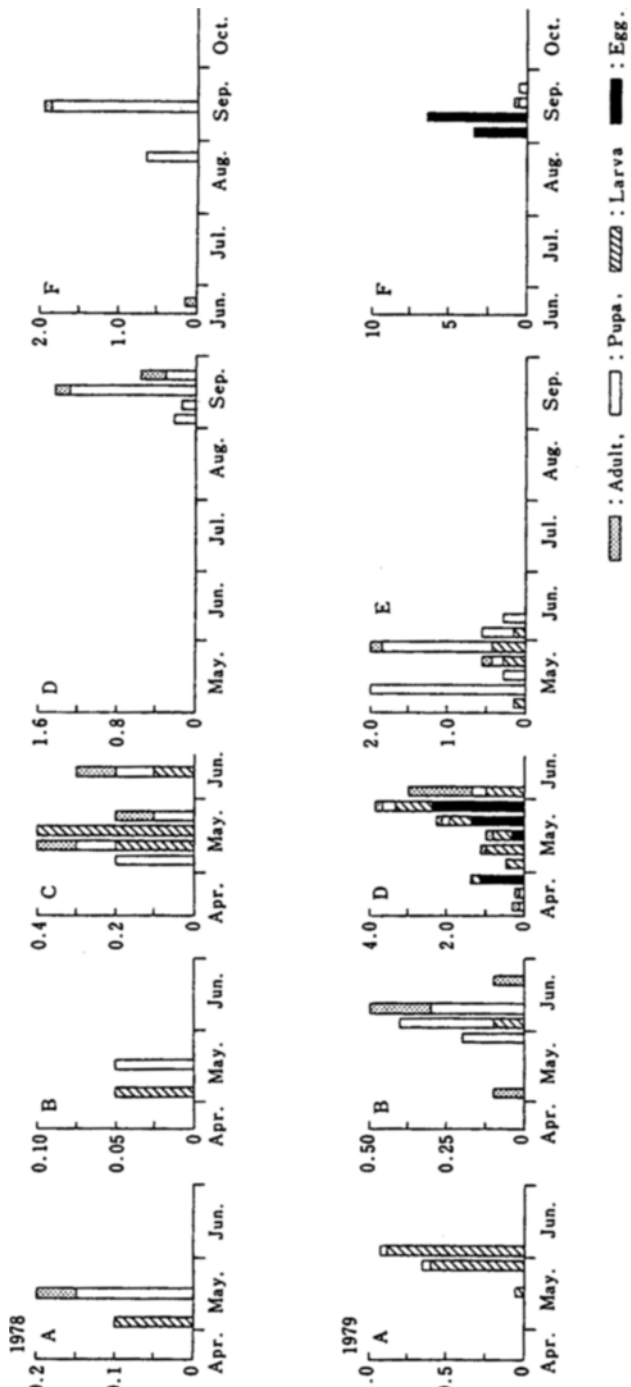

Fig. 2. Number of *P. japonica* per plant observed on each crop in Chikushino in 1978 and 1979. A: *T. aestivum*; B: *S. tuberosum*; C: *B. campestris*; D: *V. faba* f. *anacarpa*; E: *S. melongena*; F: *C. antiquorum* var. *esculenta*; G: *C. moschata* var. *toonas*.

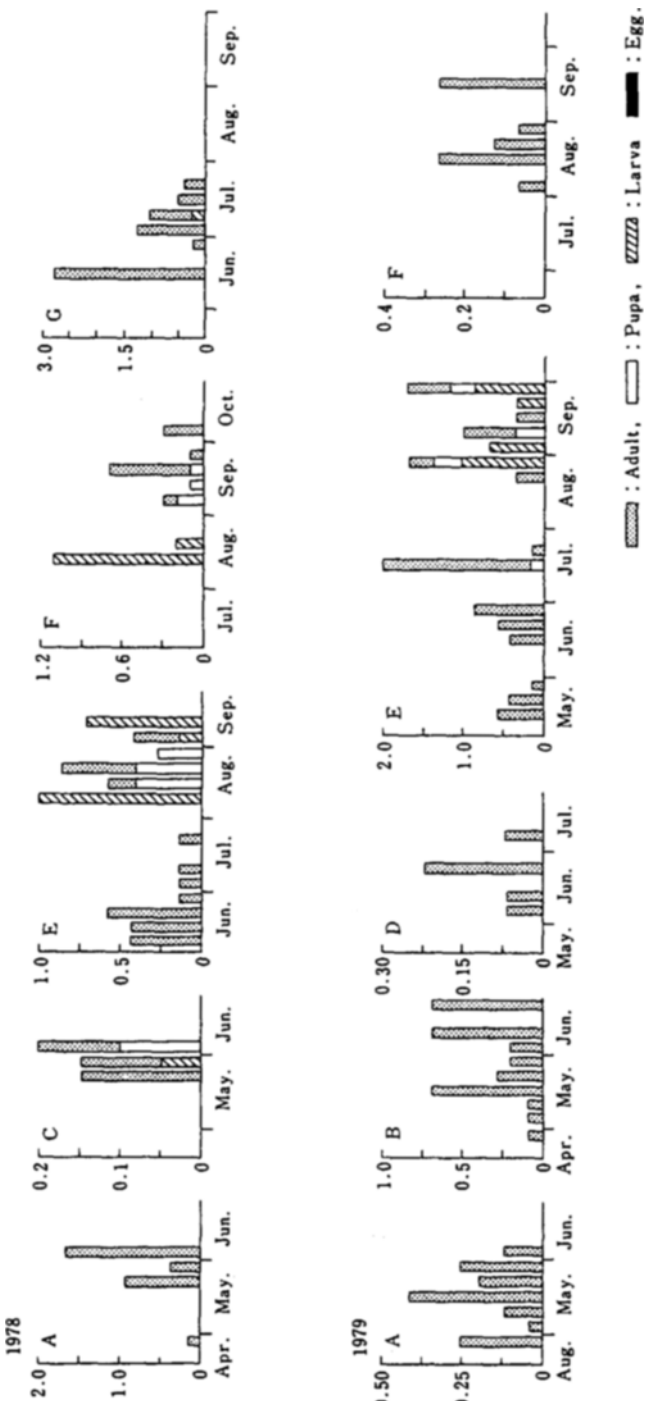

Fig. 3. Number of *S. hoffmanni* per plant observed on each crop in Chikushino in 1978 and 1979. A: *T. aestivum*; B: *S. tuberosum*; C: *B. campestris napus*; D: *V. faba* f. *anacarna*; E: *S. melongena*; F: *C. antiquorum* var. *esculenta*; G: *C. moschata* var. *toonas*.

It is possible that *S. hoffmanni* has 3 or more generations in a year and they do not diapause. Adults hibernated in the cluster of grass and fallen leaves from December to March.

CONCLUSION

Active seasons for the three most important species of coccinellids the predators of aphids in Japan, can be summarised as follows. Adults and larvae of *C. septempunctata* were the first to appear, and remained active until late autumn, i.e., this species had the longest activity period. Most *C. septempunctata* of the 1st generation aestivated, and oviposited after aestivation. The 2nd generation adults appeared in autumn. It was made clear that this life cycle belongs to type 2A of Hagen (1962).

P. japonica and *S. hoffmanni* were active continuously from spring to autumn. Takeda *et al.* (1964) reported that *P. japonica* is first found on azalea (*Rhododendron indicumin*), in spring and them on rose, on which the population increases, and finally on acacia (*Astragalus sinicus*) in summer. In the aestivation season (July to August) for *C. septempunctata, P. japonica* and *S. hoffmanni* feed on aphids on egg-plants, cucumber, pumpkins and taros. *P. japonica* and *S. hoffmanni* are not regarded as important natural enemy as they are small and less voracious. However as they only need a few aphids for their development they may be affective at controling low population densities of aphids.

RÉSUMÉ

Cycles de développement au Japon de *Coccinella septempunctata brucki, Propylea japonica* et *Scymnus hoffmani* (Col. : Coccinellidae)

Il existe 7 espèces de coccinellides prédatrices de pucerons présentes dans les cultures de plein champ du Japon. Dans la préfecture de Fukuoka, trois espèces, *Coccinella septempunctata brucki, Propylea japonica* et *Scymnus hoffmani* sont présentes du printemps à l'automne. La présente étude porte sur le cycle biologique de ces trois espèces.

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