

A new host of the groundnut seed beetle, *Caryedon serratus* (Ol.) in Israel

M. Calderon*

Abstract

Caryedon serratus (Ol.), well known as a serious pest in stored groundnuts, was first reported in Israel, in 1962, as *Caryedon gonagra* (F.). Its hosts then were seeds of two desert *Acacia* species. Since then this bruchid has been reported in more host plants, the most recent one being seeds of the ornamental tree, *Bauhinia variegata* (Caesalpinaceae). A short account of its life cycle in the different host plants is given.

Introduction

One of the first comprehensive studies of the groundnut seed beetle (*Caryedon gonagra* (F.), a previous synonym of *C. serratus*), was done by Davey (1958), and observations on its biology were reported by Pevett (1966).

Caryedon serratus was first reported in Israel by Calderon (1959) as *Caryedon fuscus* (Goeze) which was identified by Southgate and Pope (1958) as *C. gonagra* (Fabricus). However, in 1966, the above types were found by Decelle to be synonyms of *Caryedon serratus* (Ol.), which is today the accepted name for the groundnut seed beetle.

This species was extensively studied for many years by P.F. Pevett, and important information on its origin, distribution and hosts (Pevett 1967) and notes on its biology (Pevett 1966) were reported. The distribution of this species (discussed in detail in Davey 1958) indicates that its origin was Asia, and that it breeds in the seeds of *Tamarindus indica* (Cesalpinaceae) and other legumes. Through international trade *C. serratus* spread and was established in Africa, also in unshelled groundnuts, in which it became a primary pest. It should be noted, however, that this species was never found in groundnuts in Israel. On the other hand, *C. serratus* was found on other host plants in this country, and in 1976, was identified and described by B.J. Southgate as *Caryedon serratus* (Ol.) subsp. *palaesticus*. (Southgate 1976). It is probable that the species we found in *B. variegata*, may also belong to the above mentioned subspecies. However, according to its identification, obtained from Prof. J. Decelle in 1990 (per. comm.) it is referred to in this paper as *C. serratus* (Ol.).

Host recorded in Israel

Acacia tortilis complex (Mimosaceae)

C. serratus (Ol.) was first recorded and described in Israel as *Caryedon fuscus* (Goeze) in 1959 (Caryedon 1959). It was found developing in pods of *Acacia tortilis* complex, later identified as *Acacia tortilis* (Forsk.) Hayne subsp. *tortilis*

* The Agricultural Research Organization, Department of Stored Products, The Volcani Center, P.O. Box 6, Bet Dagan, Israel.

(Hayne) Brenan, and *A. tortilis* (Forsk.) Hayne subsp. *radiana* (Savi) Brenan (Halevi 1974). The *Caryedon* specimen and the acacia pods were collected in the arid south of Israel and the Dead Sea depression.

An account of the behaviour of *C. serratus* as a pest of the above mentioned *Acaciae* was given by E. Donahaye et al. in 1966. It should be noted that *Acaciae spirocarpa*, given in the above mentioned paper was wrongly identified and the correct denomination should be *Acacia t. radiana*.

The specimens were collected in the seed pods of the above desert *Acaciae* in the arid south of the country. The pods were heavily attacked by *C. serratus* and by other bruchids belonging to the genus *Bruchidius*. The ripe seed pods which had fallen on the ground were so heavily damaged that this may represent a limiting factor to the spread of these acacia species in that area.

The adults lay their eggs on the seed pods developing on the trees or on dry pods still found on the sandy ground. The developed larvae, within the pods, pupate in oval silk cocoons, which are found stuck on the dry pods or loose on the ground. The mature larvae may remain in cocoons for long periods of time, depending on the ambient conditions. Adults emerge, mate and lay eggs when the environment is favourable. The time from the forming of the cocoon cell, until the emergence of the adults, may take from three to seven months. The extended period during which the insects remain in the pupal cocoons indicated that this species spends the winter months in a state of dormancy. It is estimated that the insect develops during the year about two overlapping generations.

The authors provide a list of *Hymenoptera* and *Diptera* parasites found in the dry pods collected from the ground, which, however, may be associated with other bruchid species.

Prosopis farcta (Banks et Sol.) MacBride (Mimosaceae)

This thorny shrub is commonly found in uncultivated fields of heavier soil, in many parts of the country and it is considered an undesirable weed. Its pods are oblong egg-shaped and their integument thick and spongy. The plant is not higher than 2 m.

C. serratus developing in the seeds of *P. farcta* were found and studied by Belinsky (1976). The distribution of *C. serratus* in this country, its development and reproductive biology in seeds of this new host were studied in laboratory conditions by Belinsky and Kugler (1978). In this work *C. serratus* was referred to as *C. serratus* subsp. *palaesinicus* as identified by B.J. Southgate 1976.

Adults start emerging toward spring and lay eggs on fruits from the previous year still found on the plants. Larvae penetrate into the fruit and try to reach the seeds in which they develop, moult and remain until the end of the fourth instar and then leave the seed and the fruit and pupate in their typical silk cocoons. Some larvae pupate inside the pod near its surface but in general the mature larvae pupate inside the pod near its surface but in general the mature larvae leave the fruit to pupate. The second generation lay eggs on the new green pods that are just ripening and the development of larvae continues. The authors estimate that there are at least three generations throughout the year and the larvae or the prepupae

pass the winter in a dormant state. Laboratory trials carried out by the authors showed that at 25°C and 50% r.h. females laid significantly more eggs than at 30°C and 70% r.h. The longevity of females was significantly greater than males under both conditions. Belinsky and Kugler (1978) investigated also the host preference of this species for *Prosopis farcta* or *Arachis hypogea* (groundnuts). This topic is discussed later in the paper.

The new host *Bauhinia variegata* (Caesalpinaceae)

Several species of the genus *Bauhinia* have been recorded as hosts of the groundnut seed beetle (Davey 1958; Yvon de Luca 1962; Prevett 1967); however, *B. variegata* is not amongst them. *B. variegata* is a beautiful ornamental tree which may be found in gardens in many parts of Israel. According to the New York Botanical Garden Encyclopedia (1981) this *Bauhinia* is native of India, South East Asia and China, and today is a favourite ornamental tree in Florida, Hawaii and other warm regions. It is a medium-sized, stiff-branched tree with heart shaped leaves and beautiful white flower clusters. Seed pods become dark brown when ripe and are up to 20–30 cm long. *C. serratus*, breeding on pods and seeds of this tree, was found a few years ago and in 1990 was sent for final identification to Prof. J. Decelle. During the last two years the following notes on its biology were observed:

The tree starts flowering at the end of April and the beginning of May, and the green pods commence forming and elongating. During June the fruits are ripening, their colour becomes yellowish-brown to dark brown. Ripe pods are collected under laboratory conditions in jars. During August the larvae pupating in the oval silk cocoons can be seen at the bottom of the jar, and towards the end of August the first adults emerge. It is estimated therefore that the development of the first generation takes, in nature, about 2 months.

The adults continue laying eggs on the pods kept in jars, and young larvae penetrate the pods and develop in the seeds, causing extensive damage. Adults of the second generation (under laboratory conditions) appear in large numbers during November and December with plenty of pupal cocoons stuck on the pods or on the bottom of the jar. Adults in the jars were seen during all of December and January. It is supposed, therefore, that this insect develops at least two generations during the year, while the larvae or the pupae of the second (or the third) generation spend the winter in dormancy, either in dry pods which have fallen on the ground or in other debris, until the forming of new pods on the trees. This assumption, however, is not yet proved.

Discussion

C. serratus is important in Israel because it is known as a destructive pest of stored groundnuts in Africa and in other parts of the world. Groundnuts (*Arachis hypogea*) are grown locally on quite a large scale and a considerable part of the harvest is exported. The groundnut storage places are not far from areas in which the natural hosts of *C. serratus* (especially in the case of *B. variegata*) are found. Therefore, Calderon et al. (1967) investigated the possibility of *C. serratus* developing in local groundnuts, when transferred from its natural host *Acacia tortilis*. The results obtained showed clearly that *C. serratus* is capable of developing in the locally stored groundnuts. This point was more thoroughly studied by Belinsky and Kugler (1978). They examined the host preference and the development of this species when reared in *P. farcta* versus in groundnuts. Results showed that the beetles developed much

more successfully on their natural host, *P. farcta*, than in groundnuts, and when given a choice the females would oviposit only on *P. farcta*. The authors deduction is that although this species can develop on groundnuts it will not become a pest of groundnuts in Israel in places where *P. farcta* grows.

C. serratus adults grown in *B. variegata* pods were also transferred in jars containing shelled and unshelled groundnuts. Adults oviposited in August and developed at least two generations until winter under laboratory conditions, while live adults, pupal cocoons and perforated groundnuts are seen in the jars at the beginning of February. However, no preference tests were carried out in this case.

It should be noted again that *C. serratus* found in the first two hosts were identified by B.J. Southgate as *C. serratus* subsp. *palaestinus*. It is very probable that our specimens from *B. variegata* belong also to the same subspecies. The preference of this species for its natural host, and its relatively less successful development in groundnuts, may be due to characteristics pertaining to the new subspecies. However, the fact that the insects can develop freely in groundnuts indicates the possibility that it may become a pest of stored groundnuts in Israel if established in a groundnut storage place at a considerable distance from its natural host.

References

- Belinsky, A. 1976. A survey of entomofauna of *Prosopis farcta* (Mimosaceae) in Israel, with special reference to *Caryedon serratus* (Coleoptera, Bruchidae), M.Sc. thesis, Tel Aviv University, 82 pp.
- Belinsky, A. and Kugler, J. 1978. Observations on the biology and host preference of *Caryedon serratus palaestinus* (Coleoptera, Bruchidae) in Israel.
- Calderon, M. 1959. The Bruchidae of Israel. Ph.D. thesis, the Hebrew University of Jerusalem. (in Hebrew with English summary).
- Calderon, M., Donahaye, E. and Navarro, S. 1967. The life cycle of the Groundnut Seed Beetle, *Caryedon serratus* (Ol.) in Israel. Israel Journal of Agricultural Research, 17, 145–148.
- Davey, P.M. 1958. The Groundnut Bruchid *Caryedon gonagra* (F.) Bulletin of Entomological Research, 49, 385–404.
- Decelle, J. 1966. *Bruchus serratus* Ol. 1790, espece-type du genre *Caryedon* Schoenherr, 1823. Revue of Zoology and Botany in Africa, 74, 1–2.
- Donahaye, E., Navarro, S. and Calderon, M. 1966. Observations on the life cycle of *Caryedon gonagra* (F.) on its natural host in Israel, *Acacia spirocarpa*, Tropical Science, 8, 85–89.
- Halevy, G. 1974. Effect of gazelles and seed beetles (Bruchidae) on germination and establishment of *Acacia* species. Israel Journal of Botany, 23, 120–126.
- Prevett, P.F. 1966. Observation on biology in the genus *Caryedon* Schonherr (Coleoptera, Bruchidae) in Northern Nigeria, with a list of associated parasitic Hymenoptera. Proceedings of the Royal Entomological Society of London (A), 41, 9–16.
- Prevett, P.F. 1967. Notes on the biology, food plants and distribution of Nigerian Bruchidae (Coleoptera), with particular reference to the northern region. Bulletin of the Entomological Society of Nigeria, vol 1, 3–6.
- Prevett, P.F. 1967. The field occurrence of *Caryedon serratus* (Ol.), the Groundnut Seed Beetle (Coleoptera, Bruchidae), in Uganda. Journal of Stored Products Research, vol. 3, 267–268.
- Southgate, B.J. 1976. A new subspecies of *Caryedon* (Coleoptera: Bruchidae), from the Middle East. Israel Journal of Zoology, 25: 194–198.
- Yvon de Luca 1962. Contribution aux Bruchidae (Coleopteres) d'Algerie. Leurs hotes—leurs parasites—leurs stations. Memoires de la Societe d'Histoire Naturelle de l'Afrique du Nord, No. 7, 115 pp.