

NOTES ON *Cardiastethus consors* B. White AND *Cardiastethus poweri*

B. White (HETEROPTERA: Anthocoridae).

By J. H. STYLES,
Forest Research Institute, Rotorua.

SYNOPSIS

Specimens of *Cardiastethus consors* B. White and *Cardiastethus poweri* B. White were obtained from samples of *Pinus radiata* needle litter, collected from a number of forest areas or private woodlots in the North and South Islands of New Zealand. Eggs were obtained and nymphs reared through to the adult stage on a diet of Copeognatha and Thysanoptera nymphs, Lepidopterous eggs and caterpillars including *Selidosema suavis* (Butler), *Declana floccosa* Walk., *Oxycañus* sp. and *Melanchra mutans* (Walk.). Incubation in *C. consors* takes up to twenty one days and the nymphal period, of five instars, up to ninety-five days. The instar development of *C. poweri* would appear to be shorter under laboratory conditions. There are two to three generations each year.

INTRODUCTION

Species of *Cardiastethus* have been found in several parts of the world, all in islands or island-groups remarkable for the peculiarities of their fauna (White, 1879). A number of species is also recorded from Australia and Tasmania (Gross, 1954-1955). *C. fasciventris* Garbiglietti is recorded from the British Isles from a number of host plants which include Scots pine (*Pinus sylvestris* L.) and spruce (*Picea* spp.) (Southwood and Leston, 1959).

Three species of New Zealand *Cardiastethus* have been described by F. B. White (White, 1878-1879), *C. consors* B. White and *C. poweri* B. White which have the veins of the membrane free and *C. brownianus* B. White which has the third and fourth veins of the membrane combined to form a small cell. The last species was not collected from any needle litter samples.

The general characteristics of the two species under observation translated by Hutton (Hutton 1898) from the Latin descriptions of F. B. White are as follows:

Cardiastethus consors B. White, Ent. Mon. Mag., Vol. 16, p.143. Brownish-yellow with long pale hairs, marked with reddish-brown; external part of the cuneus rosy. Only the outer vein of the membrane is distinct. Length 3 mm. Hab. Auckland.

Cardiastethus poweri B. White, Ent. Mon. Mag., Vol. 16, p.143. Dark reddish-brown, with long grey hairs; marked with paler. All the veins of the membrane are very indistinct. Length 1-2 mm. Hab. Auckland.

One additional identification feature of *C. consors* not mentioned by White is the row of short denticles situated on the inner margins of the tibia on the first and second pair of legs (Gross, 1954). The denticles on the first pair of legs are bare, while those on the second pair are sparsely surrounded by fine hairs. The denticles are not present on the tibia of *C. poweri*.

Adult anthrocorids may be found under loose bark of trees, in leaf litter at the junction of branches with the stem of the tree or in litter on the ground. The eggs are placed in bark crevices and in the grooves of pine needles or bracken stalks. The nymphs are very active and move about on plant foliage or amongst litter on the ground in search of food. There are five instars in the nymphal development, the fourth showing well developed wing pads. There are two to three generations each year.

In New Zealand one species of *Cardiastethus* occurs among decaying Agarics and other fungi, where its nymph is also found (Myers, 1922). *C. consors* has been recorded on *P. radiata* as a probable predator on psocids (Rawlings, 1953).

The present paper describes the development in the laboratory of *C. consors* and *C. poweri*.

LOCALITIES FROM WHICH SPECIMENS OF *C. consors* AND
C. poweri WERE OBTAINED

During the period September 1960 to February 1961, specimens of *C. consors* and *C. poweri* were extracted in the laboratory from samples of *P. radiata* branch and ground needle litter collected from State Forest areas and private woodlots in New Zealand to study the insect microfauna of these habitats.

C. consors (Fig. 1)—

| | Adults | Nymphs |
|---|--------|--------|
| Glenbervie Forest, Compt. 20, Auckland Conservancy | 2 | 3 |
| Whakarewarewa Forest, Compt. 7, Rotorua Conservancy | 38 | 10 |
| Kaingaroa Forest, Compt. 82, Rotorua Conservancy | 1 | 7 |
| Kaingaroa Forest, Compt. 377, Rotorua Conservancy | 5 | 0 |
| Kaingaroa Forest, Compt. 540, Rotorua Conservancy | 9 | 0 |
| Rotoehu Forest, Compt. 29, Rotorua Conservancy | 1 | 0 |
| N.Z. Forest Products, Compt. 28s, private forest near Taupo | 1 | 1 |

No specimens were extracted from litter samples from Waiuku State Forest, Compt. 48, Auckland Conservancy; Anzac Park, Palmerston North and "Treelands", Himatangi, private woodlot near Palmerston North, or from forests in the South Island.

C. poweri (Fig. 2)—

| | Adults | Nymphs |
|---|--------|--------|
| Golden Downs Forest, Compt. 16, Nelson Conservancy | 1 | 1 |
| Balmoral Forest, Compt. 27M, Canterbury Conservancy | 2 | 5 |
| Conical Hill Forest, Compt. 1C, Southland Conservancy | 1 | 1 |
| Tapanui Forest, Compt. 15E, Southland Conservancy | 3 | 10 |

No specimens were extracted from litter samples from Golden Downs State Forest, Compt. 64, or from forests in the North Island.

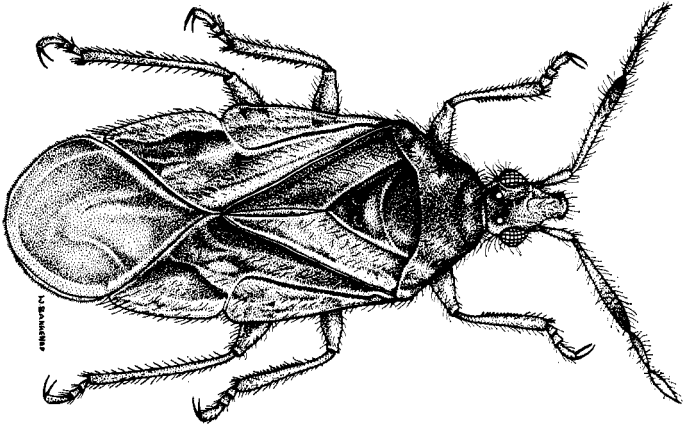


Fig. 1—*Cardiaastethus consors* B. White. Adult female.

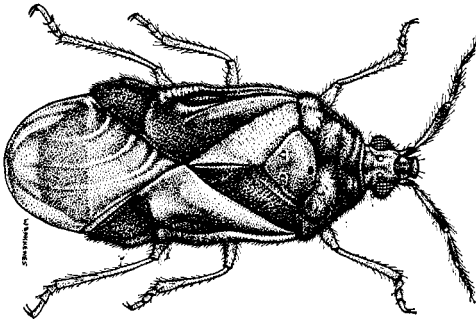


Fig. 2—*Cardiaastethus poweri* B. White. Adult female.

TECHNIQUES

For rearing *Cardiastethus*, Lepidopterous eggs and larvae, Copeognatha and Thysanoptera nymphs and soil Collembola were obtained both by collecting in the field or rearing in the laboratory and kept in cold storage until required. First instar anthocorid nymphs are only capable of successfully penetrating Lepidopterous eggs with a thin chorion or attacking and feeding on first instar larvae.

In the laboratory the anthocorids were reared successfully in 1" x 2" transparent pill boxes at a controlled temperature of 60-65°F and a humidity of 80-85 per cent. This type of box enabled observations to be carried out without disturbing the contents. Each box contained a small piece of pine bark underneath which the anthocorids could conceal themselves. At a later stage small $\frac{1}{2}$ " squares of cellulose wadding were used instead of the pieces of pine bark as it was found easier to locate eggs or early instar cast nymphal skins on this material. Short pine shoots, preferably with small needles, or cut pine needles were placed in the containers together with a number of anthocorids and food material. Short lengths of bracken stalks provided suitable egg laying sites. It was found that although the anthocorids were sensitive to movement if disturbed, both adults and nymphs were active during the daytime, although juvenile nymphs usually concealed themselves.

A plentiful supply of food material is essential and was renewed if necessary every twenty-four hours. Lepidopterous larval frass was removed in order to keep the containers clean for observation. It was found that care had to be taken to ensure that newly hatched nymphs were not placed on recently flushed pine needles, otherwise they became attached to the resinous area of the needle and died. To prevent the flow of resin, the cut surfaces of shoots were covered with a small piece of cellulose wadding.

Records were maintained throughout the observation period giving details of predation and insects successfully or unsuccessfully attacked. Cast nymphal skins were removed together with any sucked food material. Anthocorid

eggs were also removed and put in separate containers for incubation. Except when shedding their head capsules and larval skins, 4th and 5th instar Geometrid larvae, e.g. *Selidosema*, were capable of shaking off any anthocorids which attacked them.

NOTES ON THE BIOLOGY OF *Cardiastethus consors*

The egg (Fig. 3) which is about .26mm. wide and .75mm. long is pink when first laid with a glossy surface; the pink colour however changes to dark red within twenty-four hours. One end of the egg is rounded while the other has a granular surface fringed with a white area. During the incubation period, from 15-21 days, darker areas are visible through the chorion as the embryo develops. On hatching the nymph breaks out of the egg by pushing off the granular cover, which usually remains attached to the chorion.

The newly hatched nymph is dark red in colour and changes to reddish-brown as development proceeds. There are five stadia with a total length from 92-95 days, from the time the egg is laid to the time the young female anthocorid reaches maturity and is capable of laying eggs.

The average length of each stadium is as follows:—

1st, 12 days (9-15); 2nd, 6 days (6-14); 3rd, 7 days (7-13); 4th, 9 days (8-11); 5th, 18 days (15-19); total, 52 days (45-72).

Figures in brackets denote minimum and maximum number of days.

It was found that the young female anthocorids take from two to three weeks to reach sexual maturity. One female will lay from 2 to 15 eggs.

NOTES ON THE BIOLOGY OF *Cardiastethus poweri*

The egg is about .21mm. wide and .74mm. long and differs from that of *C. consors* by having a more prominent white fringe area to the granular cover. The pink colour of the newly laid egg changes to dark red within twenty-four hours. The incubation period from six to eleven days under laboratory conditions is considerably shorter than that of *C. consors*.

Owing to the small number of specimens extracted from the needle litter samples, complete details of the nymphal development are not available; the length of the nymphal period however is from 26-35 days and would therefore appear to be shorter than that of *C. consors*. One female will lay from 1 to 4 eggs.

PREDATION BY ADULTS AND NYMPHS OF *Cardiastethus*

| Food Material | <i>C. consors</i> | <i>C. poweri</i> |
|--|-------------------|------------------|
| Lepidoptera | | |
| <i>Selidosema suavis</i> (Butler), eggs | + | + |
| 1st-2nd instar larvae | + | + |
| 3rd instar larvae | + | |
| <i>S. panagrata</i> (Walk.), eggs | + | |
| 1st-3rd instar larvae | + | |
| <i>S. dejectaria</i> (Walk.), 3rd instar larvae | + | |
| <i>Declana floccosa</i> Walk., eggs | + | |
| 1st-3rd instar larvae | + | |
| <i>Chloroclystis semialbata</i> (Walk.), mature larvae | + | |
| <i>Melanchra mutans</i> (Walk.), 1st-3rd instar larvae | + | |
| <i>Melanchra</i> sp., eggs | + | + |
| " sp., 1st instar larvae | | + |
| <i>Oxycanus</i> sp., eggs | | |
| " sp., 1st-2nd instar larvae | + | + |
| <i>Tortrix</i> sp., 1st-2nd instar larvae | | |
| <i>Scoriodyta</i> sp., larvae | | |
| Thysanoptera | | |
| <i>Heliothrips haemorrhoidalis</i> Bouché, nymphs | + | + |
| Copeognatha | | |
| Unidentified spp., young nymphs | + | + |
| Collembola | | |
| <i>Onychiurus</i> sp., adults | + | + |

+ Denotes predation observed.

C. poweri is no doubt capable of attacking a wide range of food material but, as indicated, few specimens were obtained for study.

The method of attacking a healthy Lepidopterous larva is for the anthocorid to pierce the last abdominal segments of the larva with its stylets; the larva quickly becomes paralysed and then the body fluid is sucked out. This process

may take from five to ten minutes, according to the size of the larva being attacked. With large hosts a number of anthocorids may be observed feeding together on one larva. Small caterpillars are attacked and sucked before they have time to emerge from the egg.

The adults of both species of *Cardiastethus* will also suck their own eggs and 3rd-5th instar nymphs will attack 1st-2nd instar nymphs. Normally the food material of both species of *Cardiastethus* would be small insects to be found in leaf litter.

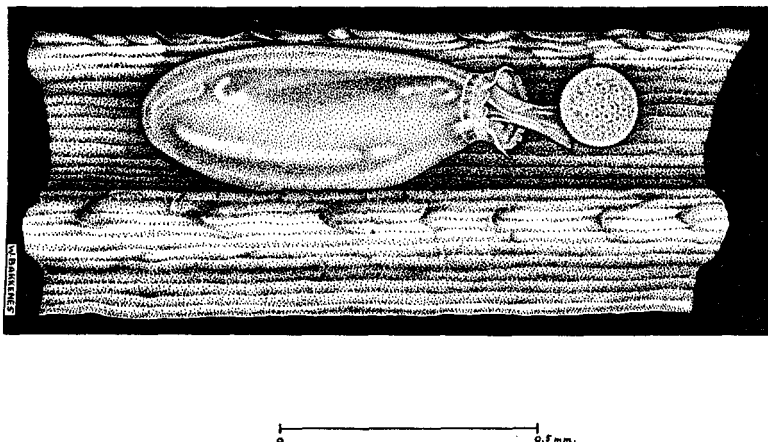


Fig. 3—*Cardiastethus consors* B. White. Hatched egg.

ACKNOWLEDGMENTS

The author wishes to thank those who have helped in the preparation of this paper, Forest Biology Observers of the Forest Research Institute who sent in samples of *P. radiata* needle litter for examination and Mr. W. Bakkeness for illustrations of the egg and adults of *Cardiastethus*.

REFERENCES

- GROSS, G. F., 1954-1955. A revision of the flower bugs (Heteroptera Anthocoridae) of the Australian and adjacent Pacific Regions—Parts I and II. *Records of the South Australia Museum*. Vol. XI, No. 2: 129-164 and No. 4: 409-422.

- HUTTON, F. W., 1898. Synopsis of the Hemiptera of New Zealand which have been described previous to 1896. *Trans. Proc. N.Z. Inst.*, 30: 167-187.
- MYERS, J. G., 1922. The Order Hemiptera in New Zealand. With special reference to its biological and economic aspects. *N.Z. J. Sci. Tech.*, 5: 1-12.
- RAWLINGS, G. B., 1953. Insects of *Pinus radiata* forests in New Zealand. *For. Res. Notes*. Vol. 1, No. 8: 1-19.
- SOUTHWOOD, T. R. E. and LESTON, D., 1959. Land and Water Bugs of the British Isles, Frederick Warne, London, 436 pp.
- WHITE, F. BUCHANAN, 1878. List of the Hemiptera of New Zealand. *Ent. Mon. Mag.*, 15: esp.p. 159.
1879. Description of new Anthocoridae. *Ent. Mon. Mag.* 16: 142-148.