Biology of *Ancistrocerus gazella* (Hymenoptera: Vespoidea: Eumenidae) in New Zealand

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ABSTRACT

Ancistrocerus gazella (Panzer, 1798) is common in Central Otago, New Zealand. Details are provided of its typically tubular, generally multicelled nests in hollow stems, artificial trap nests, abandoned wood-boring insect galleries, cracks and holes in stone walls and old nail and bolt holes in cement, concrete and wood. After an egg is suspended by a slender thread from the roof of the cell near its inner end, 2-19 (mode = 8) lightly paralysed lepidopterous larvae are placed in the cell. The cell is then sealed with a plug of moulded mud. Host species so far identified are *Planotortrix octo* Dugdale, *Ctenopseustis obliquana* (Walker), *Epiphyas postvittana* Walker. *Eurythecta zelaea* Meyrick, *Harmologa amplexana* (Zeller), *H. sisyrana* Meyrick, *Harmologa* sp., *Crocidosema plebejana* Zeller, *Pyrgotis plagiatana* (Walker) (all Tortricidae), an unidentified species of Gelechiidae, *Epiphthora melanombra* Meyrick (Gelechiidae) and *Chloroclystis filata* Guenée (Geometridae).

Keywords: Hymenoptera, Eumenidae, *Ancistrocerus gazella,* biology, nests, host records, New Zealand.

INTRODUCTION

Ancistrocerus Westmael is a large, mostly Holarctic genus with a few species in South America and South Africa. The first segment of the metasoma lacks a petiole and is without a longitudinal furrow. The terminal segments of the male antennae are narrowed, with segment 13 being bent back in a hook against 11 and 12. Females nest in a wide diversity of cavities, and close the cells with moulded mud. Almost all prey on lepidopterous larvae.

A. gazella (Panzer, 1798) occurs naturally in England, Wales, Ireland and parts of continental Europe (Richards, 1980; Spradberry, 1973) and has very recently been introduced into North America and New Zealand (Berry 1989). Coloured black and yellow, *A. gazella* differs markedly in appearance and behaviour from other vespids in New Zealand. Females range in length from 11-15 mm and males from 7-9 mm. Good illustrations of a female are given in Berry (1989), with the distinctive male antenna being clearly illustrated in Giordani Soika (1984 (1986) fig. 28, p.120). All New Zealand specimens recorded by Berry (1989) were taken from the region of Auckland City, the earliest being in 1988.

I have since found *A. gazella* to be very common throughout Central Otago. It currently occurs between Hawea, Wanaka, Bendigo, Bannockburn, Cromwell, Alexandra, Omakau and Waipiata. In October-December 1993 and January-March 1994, I found it to be abundant at the last six localities. Mrs A. McKenzie (pers. comm.) first noticed it in 1989 in Cromwell, where local people refer to it as the "mason wasp" because it seals its cells with moulded mud. It is often very common around houses, where it nests in holes in mortar.

The following observations constitute the first records of the bionomics of this species in New Zealand. They may be the first set of published records in the world.

OBSERVATIONS

Foraging and Prey Records

A. gazella females were commonly seen foraging for lepidopterous larvae on a variety of plants (mostly shrubs) from October-December 1993 and January-March 1994. These records are summarised in Tables 1 and 2.

Nest Sites and Substrates

Between October 1993 and March 1994, detailed examinations were made of 76 nests at Bendigo, Bannockburn, Cromwell, Alexandra and Omakau. Of these, 38 were made in nail holes, bolt holes and ramset gun nail holes in cement between concrete blocks of outside walls of houses, 13 occurred in cracks between stones in outside walls of

Table 1: Summary of Lepidoptera species captured by *A. gazella*.

	Species	Total number recorded paralysed by *A. gazella*
Family Gelechiidae		
a.	sp. indet	58
b.	*Epiphthora melanombra* Meyrick, 1888 (?)	8
Family Tortricidae		
c.	*Ctenopseustis obliquana* (Walker 1863)	81
d.	*Planotortrix octo* Dugdale 1990	593
e.	*Epiphyas postvittana* Walker 1863	69
f.	*Eurythecta zelaea* Meyrick 1905	13
g.	*Harmologa amplexana* (Zeller, 1875)	56
h.	*H. sisyrana* Meyrick 1882	38
i.	*H.* undescribed sp.	9
j.	*Crocidosema plebejana* Zeller, 1847	452
k.	*Pyrgotis plagiatana* (Walker 1863)	12
Family Geometridae		
l.	*Chloroclystis filata* Guenée 1857	12

Table 2: Observations of nesting behaviour of *A. gazella* (letter codes for prey species as in Table 1).

Location & Date	No. ♀ *A. gazella* and prey species	Host Plant	Remarks
Cromwell Mar 1989	several, unknown	unknown	observed by Anne McKenzie nesting in holes in walls
Omakau 26 Nov 1993	5,d	*Rosa* spp. (Rosaceae)	taken to holes in mortar in house wall
Waipiata 26 Nov 1993	3,e 4,d	*Sambucus nigra* L. (Caprifoliaceae) *Prunus armeniaco* (L.) (Rosaceae)	taken to holes in mortar in outside wall of house
Alexandra 26 Nov 1993	4,c	*Atriplex halimus* L. (Chenopodiaceae)	taken to 4 mm diam. bolt holes in wall
Alexandra 27 Nov 1993	3,d	*Sanguisorba minor* Scop (Rosaceae)	taken to 4 mm diam. bolt holes in wall
Alexandra 27 Nov 1993	4,d	*Rosa* spp. (Rosaceae)	taken to hollow dead stems of *Arundo conspicua* Forst. f. Prodr. (Graminae)
Springvale 27 Nov 1993	3,e	*Malus* sp. (Rosaceae)	taken to 5 mm diam. holes in mortar
Alexandra 27 Nov 1993	1,d	*Cotoneaster lacteus* W.W.Sm. (Rosaceae)	taken to 4.5 mm diam. hole in mortar in concrete block garage
Alexandra 28 Nov 1993	6,d	*P. armeniaco* L.	holes in mortar in walls of homestead
Alexandra 28 Nov 1993	52,d	*C. lacteus*	taken to 4-5 mm diam. holes in walls of house
Bendigo 28 Nov 1993	2,d	*Prunus avium* L. (Rosaeae)	taken to 4.0 mm diam hole in house wall
Cromwell 14 Dec 1993	2,a	unknown	taken to 4 mm wide holes in mortar in wall
Bannockburn 14 Dec 1993	101,d	*S. nigra*	taken to 2.5-6.0 mm diam. holes in outside walls and to abandoned *Sirex noctilio* larval galleries in felled *Pinus radiata* trunks
Alexandra 28 Dec 1993	56,d	introduced garden shrubs	taken to 3-4 mm wide holes in outside wall
Bannockburn 28 Dec 1993	62,d 38,c 27,e	*S. nigra* *P. avium* *P. avium*	taken to holes in mortar in outside walls and to *Sirex* holes in wood
Alexandra 28 Dec 1993	5,g	*C. lacteus*	taken to 4 mm diam. holes in cement in external wall
Bannockburn 4 Jan 1994	103,d 4,c	*S. nigra* *P. armeniaco*	taken to *Sirex* holes and holes in walls
Alexandra 13 Jan 1994	16,d	*C. lacteus*	taken to 4-5 mm diam holes in house walls
Carrick Station 6km S of Bannockburn 14 Jan 1994	5,f	on any vegetation in area	taken to 3-4 mm diam. holes in mud in woolshed mud & stone wall
Alexandra 19 Jan 1994	8,g	ornamental shrubs in home garden	taken to 4-5 mm diam. holes in cement in outside wall

Table 2: —*Continued*

Location & Date	No. ♀ *A. gazella* and prey species	Host Plant	Remarks
Alexandra 4 Feb 1994	3,d	*Prunus* sp. (Rosaceae) *Hebe* sp. (Scrophulariaceae)	taken to 2.5-5.0 mm diam. holes in outside all
Bannockburn 4 Feb 1994	3,d	ornamental shrubs	taken to 4-6 mm diam. holes between bricks
Bannockburn 4 Feb 1994	123,j	*Malva sylvestris* L. (Malvaceae)	taken from wild flowers on hillside to 5-6 mm diam. *Sirex noctilio* holes in felled *Pinus radiata* trunks and to 3-5 mm diam. holes in walls of buildings
Alexandra 4 Feb 1994	4,h 2,i 2,c	introduced ornamental shrubs	taken from leaves to 3-5 mm diam. holes in cement in outside wall
Alexandra 4 Feb 1994	2,l	*Senecio quadridentatus* Labill. (Asteraceae)	taken from flowers to 4-5 mm diam. holes in cement in outside wall
Alexandra 5 Feb 1994	1,l	*S. quadridentatus*	taken from flowers to square groove in plywood 7.5 × 7.5 × 50.0 mm
Alexandra 5 Feb 1994	5,d	*P. avium*	taken to holes 5.0 mm wide, 18.0mm long, for drainage in aluminium window frame in house

buildings, 10 were made in holes, cracks and grooves in wood and plywood, 4 were made in holes drilled through glass, 3 were made in abandoned insect burrows in clay used as mortar in 19th century stone walls, 9 were made in abandoned *Sirex noctilio* larval galleries in felled *Pinus radiata* trunks and 3 were made in hollow stems of native grasses. Most nests were tubular and between 4-6 mm in diameter.

Nests and Life History

The following summary of nest structure and wasp biology is made from measuring 17 naturally-occurring nests (Table 3) and 17 artificial trap nests (Table 4). 160 artificial trap nests were made from 25 × 25 × 90 mm straight-grained hardwood blocks. A 75-77 mm long diameter hole was drilled in the centre of each block. On 19 January 1994 bundles of four trap nests were taped together and placed in the Alexandra Holiday Camp, on the wall of a garage facing a private house garden at 6 Spenser Street, Alexandra, at W. Grant's vineyard, Dunstan Road, Alexandra, and opposite the Post Office in Bannockburn. On 4 February 1994, 17 traps which were blocked at the entrance with mud were removed and split open, the contents and structure of the nests being as recorded in Table 4 and in Figs 5 and 6. By February 1994, all trap nests were occupied by *A. gazella*. Twenty three of these contained at least one cell filled entirely with *P. octo* pupae (see Fig. 7) although I was unable to record other contents of these nests.

Completed nests consisted of 1 to 8 cells. While one nest was made in an irregular cavity in mud beneath a stone in a wall (Table 3, nest 10), most nests were tubular and serial, occurring in tunnels 2.5-6.0 mm in diameter. Cells ranged from 5.9-42.0 mm in length. Partitions between the cells were made of moulded mud, inner partitions being 0.6-1.8 mm thick, with an external face smooth and concave, and an internal face convex and rough. The final plug of moulded mud was on average 1.9 mm thick.

In the end furthest from the mouth an egg 2.5 mm long, 0.9 mm wide, was laid,

Table 3: Naturally-occurring *A. gazella* nests (Abbreviations for stage of wasp: E = egg, L1-1st instar larva etc, C = Cocoon, A = adult. Letter codes for prey species as in Table 1).

Nest No.	Location & date	No. of Cells	Cell width, length (mm), stage of wasp, no. of prey				No. and species of prey
			Cell 1	Cell 2	Cell 3	Cell 4	
1	Cromwell 12 Dec 1993	4	4.0, 8.0 E, 8	4.0, 7.8 E, 8	4.0, 8.0 L1, 9	4.0, 10.2 L2, 8	33a
2	Cromwell 12 Dec 1993	3	4.0, 10.0 E, 8	4.0, 11.5 E, 8	4.0, 12.5 L1, 8		24a
3	Alexandra 28 Dec 1993	1	6.0, 15.0 C, -				
4	Alexandra 28 Dec 1993	1	4.0, 18.0 C, -				
5	Bannockburn 4 Jan 1994	3	4.0, 12.8 E, 12	4.2, 8.4 E, 7	4.7, 15.7 L1, 8		12d, 15c, 15c
6	Bannockburn 4 Jan 1994	2	4.5, 7.5 A♂	4.5, 8.0 A♀			
7	" "	2	5.0, 6.5 C, -	5.0, 7.8 C, -			
8	" "	2	5.0, 7.5 C, -	5.0, 8.6 C, -			
9	" "	3	6.5, 6.2 C, -	6.5, 7.1 C, -	6.5, 6.2 C, -		
10	Bannockburn 14 Jan 1994	1	23.0, 38.0 E, 8-				8f
11	Alexandra 4 Feb 1994	1	6.0, 15.0 E, 8-				8g
12	" "	1	2.5, 14.2 E, 8-				8c
13	" "	1	4.0, 20.0 E,2-				121
14	" "	3	3.0, 7.1 E, 5	3.0, 10.6 E,8	3.0, 12.3 L1, 7		13h, 7i
15	" "	1	5.0, 9.4 E, 9				5d, 4c
16	Bannockburn 4 Feb 1994	2	4.5, 7.9 E, 12	4.5, 8.5 E, 15			5d, 27j
17	Cromwell 4 Feb 1994	2	5.0, 7.3 E, 7	5.0, 8.5 E, 8			15b

suspended from the roof of the cell by a thread 0.8-0.9 mm long. The cell was then stocked with from 3 to 19 lightly paralysed caterpillars which twitched considerably. A mud partition (or seal) was then made. The egg took 3 days to hatch and the larva fed for 12 days before spinning its cocoon. There were two generations per year, the second generation undergoing prepupal diapause until the following spring. All *A. gazella* prepupae in trap nests had entered diapause by 8 March 1994. Adults were observed for six months, from October until March. Cocoons of the first generation were found in December and January. Some cocoons of the 2nd generation spun on 4 February contained pupae when opened on 16 February 1994.

Parasitism

A two-celled nest in an abandoned *Sirex noctilio* larval gallery in *Pinus radiata* examined

Table 4: Trap Nests. (Letter codes for prey species as in Table 1. Abbreviations for stage of wasp as in Table 3)

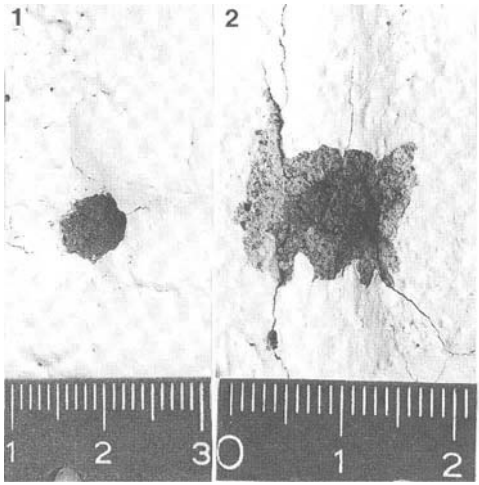
Nest No.	Locality & Date	No. Cells	Cell lengths in mm (from innermost)	No. Prey	No. & Species of Prey	Stage of Wasp
1	Alexandra Holiday Camp 4 Feb 1994	4	14.2, 17.0, 16.0, 22.0	10, 9, 10, 11	23d, 11e, 6g	L1, E, E, E
2	"	2	23.5, 47.3	7, 8	11d, 4e	E, E
3	6 Spenser St Alexandra 4 Feb 1994	6	10.0, 13.0, 8.0, 7.0, 9.0, 15.6	7, 9, 5, 6, 6, 2	3c, 12d, 10e, 6g, 3k	L3, L2, L2, L1, E, E
4	"	5	11.8, 14.4, 10.0, 9.0, 24.0	—	—	L5, L5, L5, L5, L5
5	"	6	24.4, 6.0, 7.1, 7.2, 17.2, 20.0	7, 8, 7, 5, 8, 8	5c, 11d, 11e, 5g, 4k, 7l	L2, L2, L1, L1, E, E
6	"	5	10.3, 8.2, 9.0, 15.0, 28.4	—	—	L5, L5, L5, L5, L5
7	Bannockburn 4 Feb 1994	7	12.1, 11.1, 8.1, 8.0, 8.1, 7.2, 18.0	8, 10, 3, 12, 7, 8, 8	9d, 3d, 2g, 2h, 3j, 2k	L2, L1, L1, E, E, E, E
8	"	2	27.0, 49.0	10, 8	18j	E, E
9	"	7	11.9, 8.1, 7.9, 7.2, 8.0, 7.5, 13.3	52 (total)	7d, 3e, 3g, 1h, 36j, 2k	L2, L2, L1 L1, E, E
10	"	3	12.2, 12.9, 42.0	17, 19, 18	8d, 4e, 2g, 2h, 37j, 1k	L2, E, E
11	"	6	10.1, 9.3, 10.0, 12.0, 10.9, 10.0	10, 4, 12, 8, 8, 7	9d, 3e, 4g, 3h, 40j	L3, L2, L1, L1, E, E
12	"	5	18.0, 12.0, 12.5, 15.5, 20.2	8, 7, 10, 11, 14	8d, 2e, 3g, 3h, 34j	L2, L2, L1 L1, E
13	"	3	12.1, 13.2, 39.8	6, 8, 8	22j	L3, L2, L2
14	"	7	11.1, 8.5, 6.5, 8.0, 6.9, 9.9, 11.8	8, 8, 7, 8, 9, 8, 8	9d, 4e, 1g, 2h, 43j	L2, L2, L2, L1, E, E, E
15	"	6	13.1, 10.5, 8.0, 11.2, 10.1, 10.1	4, 8, 12, 11, 15, 17	8d, 6e, 3g, 2h, 46j, 2k	L5, L4, L3, L2, L1, E, E
16	"	8	11.9, 6.5, 6.6, 5.9, 6.8, 8.4, 10.6, 7.1	4, 3, 17, 4, 2, 5, 8, 4	47j	L5, L4, L3, L3, L2, L2, L1, E
17	"	1	10.6	14	4e, 10j	E

at Bannockburn (Table 3, nest 8) contained two cocoons, both parasitised by *Melittobia acasta* (Walker) (Eulophidae). This is a common polyphagous parasitoid of a wide variety of aculeate Hymenoptera. Other hosts recorded in New Zealand are listed in Valentine & Walker (1991).

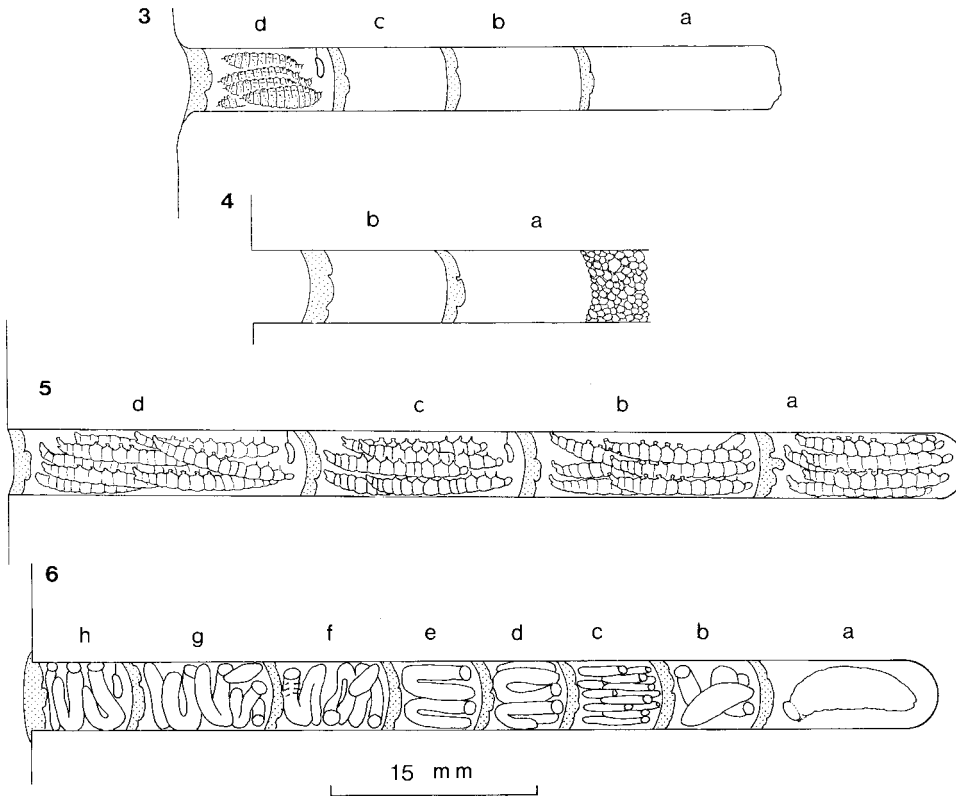
Fourteen adults (6♂, 8♀) of a species of Bethylidae were found in nests provisioned with *Harmologa amplexana* and *Planotortrix octo* at Alexandra on 11 March 1994. No stages of *A. gazella* were present in cells containing Bethylidae, all of which held some untouched prey caterpillars in addition to adult bethylids. Prey were probably already parasitized by Bethylidae when captured by *A. gazella*.

REMARKS

While most people in Alexandra and Omakau stated that 1993 was the first year in



Figs 1 & 2: Mud closures in entrances to *A. gazella* nests 1 and 2 in cement between concrete blocks of outside wall of house at 95 Inniscourt Street, Cromwell. Scale in mm.



Figs 3-6: *A. gazella* nests in L.s.: 3, nest 1 at 95 Inniscourt Street, Cromwell. First cell shown with *A. gazella* egg and prey; 4, L.s. nest 1 in abandoned *Sirex noctilio* burrow in felled *Pinus radiata* trunk at Bannockburn; 5, artificial trap nest 1 from Alexandra Holiday Camp, Alexandra; 6, artificial trap nest 10 from Bannockburn. Letters refer to individual cells.

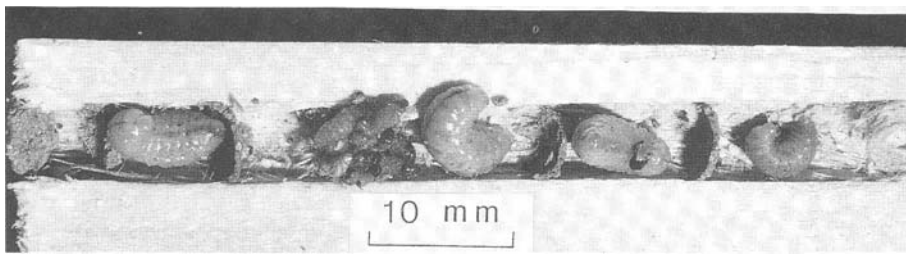


Fig. 7: Artificial trap nest from Bannockburn. Four cells contain *A. gazella* final instar larvae, one cell contains *P. octo* pupae only.

which they had noticed *A. gazella,* Mrs A. McKenzie stated (pers. comm.) that both she and her brother had observed this species since 1989 in Cromwell. Various people in Cromwell referred to it as the "mason wasp" and sent accurately-identified specimens to the Otago Museum, in response to requests in the author's weekly nature column published on 6 and 13 December 1993, in the Otago Daily Times. To be present in such large numbers as were observed throughout Cromwell, Alexandra and Bannockburn, where well over 100 individuals were observed simultaneously frequenting a single bush, it seems likely that *A. gazella* has been established in Central Otago for some time.

The large number of tortricid pupae in nests examined on 28 February 1994 is puzzling. It is probable that lightly-paralysed advanced final instar larvae were able to pupate.

It would appear that *A. gazella is* concentrating on a narrow range of species and that in Central Otago a large proportion of its prey consists of Tortricidae captured on the leaves of introduced Rosaceae. Many prey records comprise leafrollers, both native and introduced, which might suggest that *A. gazella* is of benefit to orchardists. It is significant that only one species of Geometridae was recorded from nests, given that suitably-sized larvae of a large number of geometrid species were present in the habitats in which *A. gazella* was observed to hunt.

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