Offenbar wieder orientiert, flog sie wenig später ab und kehrte kurze Zeit später mit einer neuen Beute, diesmal einer Imago von *Issus coleoptratus*, zurück (Abb. 4). In für Bembicinae typischer Weise öffnete das Weibchen ihr Nest, ohne die mit beiden Mittelbeinen gehaltene Beute abzulegen und schlüpfte mit Beute ein. Nach kurzer Zeit kam sie ohne Beute wieder zum Vorschein (Abb. 5), verschloss das Nest sorgfältig (Abb. 6) und flog ab, um nur wenige Minuten später mit der nächsten Beute zurückzukehren. Dieses wiederholte sich nun in der nächsten Viertelstunde regelmäßig. Nur etwa 3 Minuten benötigte das Weibchen für einen Jagdausflug. Alle im Weiteren eingetragenen Beutetiere waren Imagines von *Issus coleoptratus*.

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Observations on flower visits of *Anthoglossa* cf. *callander* (COCKERELL, 1915) and *A. nigrocincta* (COCKERELL, 1914) in Western Australia (Hymenoptera, Colletidae, Paracolletinae)

BERNHARD JACOBI

Summary

The flower visits of two species of the genus *Anthoglossa* were observed and photographed in a total of five localities. The presumed oligolecty of both species is confirmed. The pollen loads in both species were apparently bound by an unknown agent. The bigger species is able to fly on cool overcast days even in drizzle. The orange colour of this species' males agrees very well with inflorescences of the main observed pollen-source, a *Grevillea* species. This may be another of the rare cases of male crypsis in bees.

Zusammenfassung

Der Blütenbesuch zweier Arten der Gattung *Anthoglossa*, *A.* cf. *callander* und *A. nigrocinctus*, wurden an insgesamt fünf Fundorten in West-Australien beobachtet, beschrieben und in Fotos dokumentiert. Die vermutete Oligolektie beider Arten konnte bestätigt werden. Die Pollenladungen beider Arten erschienen als durch ein unbekanntes Bindemittel zusammengehalten. Die größere Art verhält sich ausgesprochen Pelzbienen-artig und ist auch bei Nieselregen aktiv. Bei dieser Art stimmt die orange Färbung der Männchen auffallend mit der der bevorzugten *Grevillea*-Blütenstände überein. Es handelt sich dabei möglicherweise um einen der seltenen Fälle von Crypsis bei Bienen.

Introduction

While until recently (HOUSTON 2000, MICHENER 2000) the reported species were included in the genus *Paracolletes*, ALMEIDA (2008b) raised all subgenera included in this unsatisfactory taxon to generic rank, including *Anthoglossa*, a decision followed in this paper. In an elegant study ALMEIDA & DANFORTH (2009) resolved the phylogenetic structure of Colletidae, which resulted in the revalidation of Paracolletinae as a subfamily. *Anthoglossa* turned out to be the most basal clade inside Paracolletinae, being a sister group to all other taxa in this subfamily.

As no specimens have been collected some doubt remains as to the specific identity of the species first named in the title. Though very similar to *A. callander* (see COCKERELL 1915) the observed population may actually belong to an as yet unnamed species listed as *A.* sp. F111/M111 in HOUSTON (2000).

COCKERELL (1914a, 1914b) was led by the marked differences to describe the sexes of the second observed species as separate species; the male was described as *Paracolletes (A.) nigrocinctus* and the female sex as *P.* (*A.) tenuicinctus*. Both descriptions were published in 1914 simultaneously in the same volume, but the male's description preceded the females´ in pagination: male p.6, female p.42, so according to the International Rules of Taxonomy, the male's name stuck, while the females' was relegated to synonymy.

Grevillea species (Proteaceae) transfer pollen from anthers to pistil in flowers pre-opening. The bent pistil straightens upon opening of individual florets and presents the pollen to pollinators.

Eremaea species (Myrtaceae) have poricidally dehiscent anthers, benefitting buzz-pollinators.

Verticordia species (Myrtaceae) present pollen with unusually high amount of oily pollenkit, requiring special adaptations to utilize it (HOUSTON et al. 1993).

Results

A. Geographical information

locality	date, time	locality, geogr. designation	coordinate S	coordinate E	*Anthoglossa* species
A.	02-10-2008	Mullewa-Wubin Rd	29°53'55.01 "29°54'02.20"	116°30'58.23 "116°31'08.21"	cf. *callander* (F111/M111)
B.	02-10-2008	Mullewa-Wubin Rd X Maya South West Rd	"29°53'30.66"	"116°30'30.21"	cf. *callander* (F111/M111)
C.	03-10-2008	Roadside between Dongara and Moora	~30°	~115°	*nigrocincta*
D.	05-10-2008	Boolanooling Reserve, Copestakes Rd X Willams Rd	32°06'36.07	117°45'05.46	*nigrocincta*
E.	05-10-2008	Old Beverley Rd	32°05'47.26	117°50'07.85	*nigrocincta*

Quotation-marks: coordinates from Google Earth; X = intersection

Results

B. Ecological and behavioural observations

1. *Anthoglossa* cf. *callander* (COCKERELL, 1915)

This species was encountered at two locations, A. and B. (see table):

The species´ females were observed collecting pollen and nectar on *Grevillea excelsior* plants growing on the roadside of the Mullewa-Wubin Highway (A) on a windy day with complete cloud-cover and occasional light rain (October 2nd, 2008). It was quite unexpected to find bees active under these conditions.

The more ore less horizontal bright orange-yellow flower spikes of *G. excelsior* exhibit a bird-pollination syndrome with erect pistils erect on top. The viscid nectar is secreted in copious amounts (Fig.2). Probably Honeyeater species (Meliphagidae) are among the natural pollinators. Individuals of the Singing Honeyeater *Lichenostomus virescens* were observed nearby.

The female bees were observed hovering above the flower spikes scraping the sticky beaded pistils with fore and middle tarsi (Fig.1). Apparently they removed pollen already stuck there and possibly some of a sticky secretion as well. Females were also regularly observed to land below the flower spikes and lick up the syrupy nectar with their short tongues (Fig.2). The pollen loads carried by the females in their scopae appeared as bound by some unknown agent (Fig.3).

The species' males were constantly flying fast around the *G. excelsior* plants looking for sitting females. If they detected one, they hovered about 5 cm behind for a second (Fig.4) then dive-bombed and tried to grab it, which always failed. No mating was observed in one hour of continuous observation by four observers. Only occasionally a male would sit on a plant to rest or preen (Fig.5). Both sexes were extremely alert and did only rarely sit for more than a second. This made them very hard to photograph.

A few kilometres to the north on the same Highway (B.) a single female was encountered collecting roseate pollen from *Grevillea paradoxa* (Fig.6), a Proteaceae looking "paradoxically" similar to a Bottle Brush *Callistemmon* sp. (Myrtaceae).

2. *Anthoglossa nigrocincta* (COCKERELL, 1914)

In the field the specific identity of the beautiful red males and the grey females of the second species *Anthoglossa nigrocincta* was not realized (see introduction).

This species was encountered at three locations, C., D. and E. (see table):

At C. several females were observed and photographed collecting pollen on *Eremaea* cf. *beaufortioides* (Fig.7). Collecting females *A. nigrocincta* made a piping noise at short intervals probably to shake pollen from the poricidal anthers (sonicating, buzz collecting). On several photos pollen grains are visible in the air close to the collecting bee. The substantial pollen loads appeared compact as if moistened. The bright orange flowers were attractive to an undescribed striped species of *Euhesma (Euhesma*), too.

At D. males were seen patrolling pink *Verticordia* cf. *picta* (a Featherflower, Myrtaceae) in rapid flight without landing. The weather was partly overcast and windy, the location being an island of near natural vegetation now protected (formerly grazed) on a hill in the midst of agricultural land.

Fig. 1: Hovering female *Anthoglossa* cf. *callander* harvesting pollen from pistils of *Grevillea excelsior*. Locality A (Photo: ROBERT LUTTRELL).

Fig. 2: Female *Anthoglossa* cf. *callander* licking up nectar from *Grevillea excelsior* flower. Locality A (Photo: BERNHARD JACOBI).

Fig. 3: Female *Anthoglossa* cf. *callander* collecting brood provisions from *Grevillea excelsior* inflorescence, showing scopae with pollen loads. Locality A (Photo: BERNHARD JACOBI).

Fig. 4: Male *Anthophora* cf. *callander* hovering behind a conspecific female collecting pollen from *Grevillea excelsior* flowers. Locality A (Photo: MARC NEWMAN).

Fig. 5: Male *Anthoglossa* cf. *callander* resting for some seconds on a plant. Locality A (Photo: PAUL ZBOROWSKI).

Fig. 6: Hovering female *Anthoglossa* cf. *callander* harvesting the roseate pollen from pistils of *Grevillea paradoxa*. Locality B (Photo: PAUL ZBOROWSKI).

Fig. 7: Female *Anthoglossa nigrocincta* collecting pollen by sonicating the poricidal anthers of *Eremaea* cf. *beaufortioides*. Locality C (Photo: BERNHARD JACOBI).

Fig. 8: Female *Anthoglossa nigrocincta* taking nectar from a *Verticordia* species. Locality D (Photo: BERNHARD JACOBI).

Fig. 9: Male *Anthoglossa nigrocincta* taking nectar from a *Verticordia* species. Locality E (Photo: BERNHARD JACOBI).

A female (later identified as belonging to this species from a photograph, Fig. 8) was observed visiting a yellow *Verticordia* sp. (*chrysantha*?). A black-and-red undescribed species of *Euhesma* (*Euhesma*) and a small probable *Braunsapis* sp. were seen and photographed additionally on the same flowers.

At E. a male was photographed (Fig.9) taking nectar with its surprisingly long and acute tongue on a yellow *Verticordia* sp. (*chrysantha*?).

Discussion

A. Probable oligolecty confirmed in both species

For his *Anthoglossa* F111/M111 HOUSTON (2000) lists (besides *G. excelsior* and *G. paradoxa*) three more *Grevillea* and one *Hakea* species (all Proteaceae) and states that this species might be oligolectic on Proteaceae, which fits our observations.

For *Anthoglossa nigrocincta* HOUSTON (2000) lists 5 *Melaleuca* and 5 *Verticordia* species (*chrysantha* and *plumosa* among them) along with single species of seven more

genera of Myrtaceae. A single female was recorded from another plant family (*Jacksonia* sp., Papilionaceae) probably visited for nectar only. Thus HOUSTON suspects this species to be a Myrtaceae oligolectic (p.6), which again fits our observations.

B. Coherent pollen loads observed in both observed species

Moist-transport of pollen probably serves to avoid losses during aerial transport and/or sonication (like in *A. nigrocinta*).

Moist-transport of pollen on hind legs has been observed in Stenotritidae, Apidae (Apini, Meliponini, Bombini, Eucerini) and in Melittidae (Melittini, Macropini). The trait has obviously evolved several times independently in bees. Compared to dry-collecting it probably is a derived (apomorphic) feature.

ALMEIDA (2008a) in a reconstruction of the evolutionary sequence of adaptations in Colletidae nesting behaviour assumed a secondary reversal from semi-liquid provisions thought to be plesiomorphic in the family to firm brood provisions in Paracolletinae.

In other subfamilies of Colletidae nectar and pollen is mixed either in the crop (Euryglossinae, Hylaeinae) or inside the brood cells (Colletidae) to produce semi-liquid to liquid brood provisions.

In both species reported here the pollen loads in the scopae gave the impression of being coherent by some unknown agent.

In the case of *A.* cf. *callander* the possibilities are: pollenkit, secretion of flower pistils, nectar or a mix of several of these substances.

In *A. nigrocincta* possibilities are nectar, pollen-kit or both. Anthers of *Verticordia* species are known to present oily pollen, which is utilized by specialized *Euhesma* (*Euhesma*) species (HOUSTON et al. 1993). Female *A. nigrocincta* have been observed on *Verticordia* flowers, but with empty scopae (Fig.8), only taking liquids.

With their rather short tongues, it would certainly be difficult for *Anthoglosa* females to transfer nectar from mouth to hindlegs in hovering flight as LT-bees like Apini, Bombini a.o. do. So probably the pollen in scopae of *Anthoglossa* cf. *callander* is held compact by the sticky nature of the pollen itself.

The pollen of *Eremaea* collected by *Anthoglossa nigrocincta* on the other hand has to be low in pollen-kit, to be shaken out of the poricidal anthers easily. In this case the addition of a binding liquid by the bee seems possible. The relatively long tongue in the species, referred to in the generic name Anthoglossa = flower-tongue, could hypothetically be involved transferring a liquid (nectar, floral oil?) to the scopae to stabilize pollen loads.

Interestingly HOUSTON (1989) states for females of the *Leioproctus conospermi*-group (Paracolletinae): "The tibial pollen mass of a fully laden female extends well beyond the extremities of the scopal setae (Figure 3e) and must be bound by some adhesive." (p.291)

The genus *Conospermum* is a member of Proteaceae, too, so the pollen might be as rich in pollen-kit like *Grevillea*. This might be an adaptive trait for sticking to bird's bills and feathers which are covered by a minute layer of fatty oils from the parson's nose gland.

C. Possible endothermy in *A.* cf. *callander*

At first we mistook these rather big bees for an *Amegilla* species, as they looked and behaved like Red Singers, *A. rhodoscymna*. Their stocky furry appearance in combination with swift flight at unfavourable weather conditions prompted the error.

The voluminous thorax probably accommodates big flight muscles and additionally is covered with short but dense hair of shorn appearance.

So the species is suggested to be facultatively endothermic like the Western Australian endemic Dawson's burrowing bee *Amegilla dawsoni*, which is active in winter (ALCOCK 1997).

D. Why so many unsuccessful mating attempts at flowers?

In ground-nesting bees the majority of copulations happen near nests with recently emerged females. Even if the probability to find a receptive female on flowers is extremely low, males apparently never miss a chance. A parallel case was described by JACOBI (1997) for *Anthophora plumipes* (Apidae, Apinae, Anthophorini).

Probably there are costs for the females, which are hindered in collecting provisions, but these may be more than compensated by the reduction of bird-induced mortality resulting from the reduction of the average duration of each flower stop and

simultaneously by increasing the frequency of flower-to-flower flights and the number of flower-stops for collection of a full load.

E. Possible crypsis of male *A. callander* on *Grevillea excelsior* flower spikes

COCKERELL (1915) describes *A. callander* as having "bright orange hair on the thorax". In the male the integument is orange-red all over, except two black spots on either side of metasomal tergum 2. The males access the nectary glands of Grevillea from beneath the oblique or even horizontal flower spikes. This combined with their orange colour reduces conspicuity to bird predators. Should the male bees occasionally spend times of inactivity tucked into the underside of *Grevillea excelsior* inflorescences (which was not observed but seems possible), they would be camouflaged.

The first case of camouflage in male bees from the same subfamily has been discovered by HOUSTON (1989). The males of the *Leioproctus conospermi*-group, especially so in *L. pappus* and *L. tomentosus* have white pilosity and even white eyes, concealing them well when resting on the white-downy Smokebush plants, *Conospermum* sp., the single pollen source of their females.

Except for the short and broad tongue in *A. cf. callander* both species show a syndrome of apomorphic traits otherwise rather expected in LT-bees and interesting in view of the basal position of *Anthoglossa* in Paracolletinae as shown by ALMEIDA & DANFORTH (2009).

Summary of results

Anthoglossa species	method of pollen harvest	progressed endothermy	oligolecty	pollen loads looking coherent
cf. *callander* F111/M111	scraping from pistils while hovering	deducted from obs.	probable (Proteaceae)	observed (pollenkit?)
nigrocinta	sonication while walking	not suspected	probable (Myrtaceae)	observed (some additive?)

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Wiederbesiedlung alter Hornissen-Brutzellen durch Bauchsammlerbienen (Hymenoptera: Vespidae, Megachilidae)

GERD REDER

Einleitung

In einer Feldhütte außerhalb der Ortschaft Hamm bei Worms/Rheinhessen (TK 6216, Landkreis Alzey-Worms) fand mein Enkel TIMO KLINGSPORN mehrere am Boden liegende und großteils zerstörte Brutwaben von *Vespa crabro* LINNÉ. Der Fund liegt