



Stingless honeybee (sugarbag) naming, identification and conceptualization in Arnhem Land – a lexicographic approach

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Abstract

The stingless honeybees of Arnhem Land (sugarbag) are a culturally important, but hard-to-identify group of insects. As a result, the dictionary definitions of these creatures in a range of Australian languages tend to lack precise scientific identifications, while also containing inaccurate or contradictory ethnobiological information. This paper attempts to address this problem by investigating honeybee terms and their semantics in ten languages of western and central Arnhem Land. Biological specimens were collected in the presence of knowledgeable speakers of three languages, and identified by a taxonomist. Interviews with speakers of the remaining seven languages allowed the assigning of identifications to bee names in these languages. While the names and identifications of bee names in the languages Kune and Rembarnga are presented here with a high degree of certainty, the proposed name correspondences, ethnospecies categories and scientific identifications for the remaining languages are tentative. Issues such as cross-linguistic patterns in naming, and inter-speaker and inter-language variation in the conceptualization of named categories are discussed. The paper concludes with a discussion on the lexicographic challenges of writing scientifically accurate and culturally sensitive definitions of invertebrate names.

Keywords: *Austroplebeia*, *Tetragonula*, ethnobiology, Indigenous Australia, invertebrates

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1. Introduction

Honeybees are an important group of organisms in Australian Indigenous cultures, valued primarily as a source of sweet food – ‘sugarbag’ in Aboriginal English. They also provide the wax used in the manufacture of various tools and instruments, and figure prominently in myths and songs. The great significance of honeybees to Indigenous people is reflected in the large number of words, in field linguists’ dictionaries, indicating honeybee types and products, along with parts of a beehive and other organisms associated with honeybees (Si and Turpin, 2015). While these dictionary entries typically contain a wealth of cultural and ethnobiological knowledge, they tend to lack scientific identifications, for the honeybees, down to species level. This is unsurprising, as stingless honeybee species are notoriously difficult to distinguish from each other, and the proper identification of these insects requires a high level of specialist taxonomic expertise. This paper is a preliminary attempt to assign scientific identifications to honeybee names in a number of Australian Indigenous languages. It also deals with lexicographic issues relating to the description of invertebrates in general, and Australian honeybees in particular. Previous attempts at writing dictionary entries for closely-related or similar-looking groups of invertebrates are compared, and the difficulties involved in composing culturally and linguistically faithful entries for such organisms are discussed.

Most of the languages examined here are spoken in and around the town of Maningrida in Arnhem Land. Figure 1 shows the geographic distribution of traditional languages in north-central Arnhem Land. The languages of north-central Arnhem Land are genetically diverse, representing both non-Pama-Nyungan and Pama-Nyungan language phyla. The non-Pama-Nyungan Gunwinyguan family includes the Bininj Kunwok dialect chain (Kuninjku and Kune), Kun-barlang and Rembarrnga. The Maningrida language family (Green 2003) includes Burarra/Gun-nartpa, Ndjébbana, Gurr-goni and Na-Kara. The third non-Pama-Nyungan family spoken in the region is Iwaidjan and includes Mawng and Iwaidja (Evans 2003a; Green 2003). The Iwaidjan languages are not discussed in this paper. The easternmost languages in north-central Arnhem Land are from the Pama-Nyungan group of languages that occupies the north-eastern corner of Arnhem Land. They include the various Djinaṅ and Wurlaki dialects, Yan-nhaṅu, Ganalpiṅu, Gupapuyṅu and Djambarrpuyṅu. Djinaṅ and Gupapuyṅu are discussed in this paper. Additionally, some languages from Cape York are also discussed. The advantage of focusing on Maningrida, with its high level of multilingualism (estimates of the number of languages spoken there range from around 8 to 12, depending on factors such as vitality and immigration/emigration) is that correspondence lists can be created for words from the ethnobiological domain across several languages. In theory, scientific identification of organisms such as honeybees could be carried out through systematic biological sampling in the company of the speakers of just one or two languages, and the IDs thus obtained could subsequently be

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3 assigned to words in other languages via the correspondence lists. Extensive lists for plants and
4 animals were created for some Maningrida languages by Carolyn Coleman (unpublished), but
5 the honeybee names contained in these lists often lack scientific IDs. This paper will also attempt
6 to address some of the inconsistencies and gaps in the Coleman correspondence lists.
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9 The method described above does not yield definitive scientific identifications, and the best way
10 to arrive at totally reliable IDs remains the collection of biological specimens in the field with a
11 native speaker guide for each language of interest, followed by lab-based investigations by a
12 competent taxonomist. Before such labour- and time-intensive fieldwork can be carried out,
13 however, the data provided below could serve as a useful indication of the categorization and
14 naming of honeybees in several Australian Indigenous languages. A cross-linguistic comparison
15 is presented, with particular emphasis on the explicit criteria used by consultants for the
16 identification of various honeybee types in the field. For some languages, honeybee names have
17 been recorded by more than one field linguist, and/or from multiple speakers; such situations
18 provide a valuable opportunity to examine any inter-speaker variability in the naming and
19 classification of bees.
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25 **2. Methodology**

26 *2.1 Biological Samples*

27 Author Si collected biological samples in the company of Kune and Rembarrnga speakers over
28 three field trips in 2014-2015. The hives were located either in Maningrida or around
29 Buluhkaduru outstation to the south east. When a hive was first located, photographs were taken
30 of the hive entrance to document the presence or absence of an entrance tube¹. Around 20
31 foragers per hive were captured in clear zip-lock bags as they exited the hive; the specimens
32 were preserved by placing them in a freezer overnight, followed by air-drying for several days.
33 Dr. Anne Dollin of AussieBee, Sydney, kindly provided the scientific IDs for the dry samples.
34 For about half the samples, it was possible to open up the hive and examine the contents.
35 Photographs of the arrangement of brood, pollen and honey, as well as the morphology of the
36 brood comb, also provided useful information that helped in the identification process.
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41 In 2015, three Gun-nartpa consultants provided information during an expedition to harvest a
42 hive from a large *Eucalyptus tetradonta* specimen, documented at Gochan Jiny-jirra by Carew
43 and Si. Although a hive was present, it was immature and held only a small amount of honey.
44 While the outcome was disappointing, this activity was useful in terms of exploring the different
45 diagnostics applied to labelling the kind of honey, which has been identified as a species of
46 *Tetragonula*, most probably *Tetragonula mellipes*.
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50 *2.2 Language Data*

51 Knowledgeable consultants from various language communities were asked for honeybee-related
52 vocabulary, along with ethnobiological information and folklore pertaining to these insects.
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56 ¹ See Halcroft *et al.* (2003) for descriptions of the nests and behaviour of Australian stingless honeybees
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3 Consultants who spoke more than one language were encouraged to provide equivalent lexemes
4 for honeybee names in both/all their languages. Carew recorded information about honeybees
5 from Gun-nartpa consultants on several occasions at Gochan Jiny-jirra outstation throughout the
6 period 1993-1994 and more recently in 2015. The earlier consultations were primarily with two
7 men – EB, a senior Yirrichinga clan leader and TN, a younger Jowunga man and a close affinal
8 relative to EB. Published and unpublished dictionaries of relevant languages – Green *et al.*
9 (2007) for Ndjébbana, Glasgow (1994) for Burarra; Carew (unpublished) for Gun-nartpa (an
10 inland dialect closely related to the coastal Burarra language)², Green and Nimbadja (2015) for
11 Gurr-goni, Saulwick (2003) for Rembarrnga, Greatorex (2015) for Gupapuyŋu – were consulted
12 to resolve disagreements between consultants, and to recover any missing lexemes that had
13 escaped their memory. Data for Djinang/Wurlaki were obtained from the dictionary database
14 compiled by Bruce Waters and kindly provided by AuSIL (Waters, 2011; cf. Waters, 1983),
15 along with interviews with knowledgeable consultants resident in Maningrida. The Dalabon data
16 were obtained first from Evans *et al.* (2004), and later partially checked by Nicholas Evans in the
17 field with a senior consultant.
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24 While the languages of Arnhem Land are phonologically similar, they are written in a range of
25 different orthographies. These different orthographic representations are maintained in this
26 paper. When discussing shared lexical stock across the Arnhem Land region, shared terms are
27 spelt according to the conventions of the language under discussion and shown with language
28 affiliation. For example: Djinang *djurduk* ~ Gun-nartpa *jorduk* ~ Kune *djordok* ‘type of honey’.
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31 **3. A Note on Bees and Honey in Myth and Ceremony**

32 Bees, their honey and their hives are the focus of a major Ancestral story involving the travels of
33 a honey ancestor throughout north-eastern and central Arnhem Land, associated with Duwa
34 moiety clans and their estates. The route of the Ancestral being intersects the paths of other
35 spirits, and the myth complex takes various local expressions (Clunies Ross, 1978; Elliott, 2015).
36 Aspects of spiritual significance form part of the conceptual underpinnings of bee and honey
37 lexicography throughout the region. For example, there is a consistent alignment of the ‘long
38 nose’ type of bee with the Duwa moiety and the ‘short/no-nose/cheeky’ types of bees with the
39 Yirridja moiety (refer to Table 3). A similar phenomenon has been reported in north
40 Queensland, where honeybee ethnospecies, possibly corresponding to *Tetragonula carbonaria*
41 and *Austroplebeia australis* are the totems for contrasting moieties and/or sections (McConvell
42 in press). The ceremonial context for expressions of myth in Arnhem Land has secret/sacred
43 dimensions and thus some terms are restricted to certain domains of use, while others terms are
44 suitable for public, everyday discourse. Such mythological aspects of the meanings of honey
45 terms do influence interspeaker, dialectal and regional variation in the use of terms (cf.
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52 ² The Gun-nartpa/Burarra dictionary database administered by Carew builds upon the earlier work of Kathy and
53 David Glasgow. A published dictionary (Glasgow, 1994) drew from the Glasgows’ earlier dataset. With the support
54 of the Australian Society for Indigenous Languages, the Glasgows added to this dictionary until 2010, and it was
55 published in electronic form in 2011 (Glasgow & Glasgow, 2011). Since 2012 the database has been maintained by
56 Carew, who has added material from her Gun-nartpa fieldnotes and text corpus.
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discussion in Section 5.1 about views on particular terms), but are not discussed in depth in this paper.

4. Bee Naming and Identification

Honeybee names from ten languages were mapped onto a total of four biological species, belonging to the genera *Tetragonula* (previously *Trigona*) and *Austroplebeia* (Tables 1, 2 and 3). Scientific IDs corresponding to the Kune and Rembarrnga terms can be considered definitive (Table 1). IDs for honeybee names in the other languages have been assigned on the basis of information gathered in consultant interviews or from dictionary entries (Table 3; see Methodology), and should be considered tentative. Also to be considered tentative are some of the name correspondences proposed for the eight languages in Table 3. Although eight ethnospecies are proposed in Table 3 (rows 1-8), some of them, such as ethnospecies 4 and 5, are based on weak matches in consultants' descriptions of bees named in two or more languages, while one, namely ethnospecies 7, is based on a single name from one language. Ethnospecies 1-3, however, are supported by data (matching names and/or descriptions) from all eight languages, and may be regarded with confidence. Finally, it is proposed that the six ethnospecies shown in Table 1 for Kune and Rembarrnga correspond to the first six ethnospecies of Table 3, for the remaining eight languages. Each of the ten languages is discussed below; note that the disproportionately longer discussions for Kune, Rembarrnga and Burarra/Gun-nartpa reflect the authors' greater familiarity with these languages.

4.1 Kune and Rembarrnga

These two languages are discussed together, as they are both spoken in Buluhkaduru and Bolkdjam outstations, which are located next to each other to the south-east of Maningrida. Kune is spoken by all members of these communities, including young adults and children. Few fluent speakers of Rembarrnga remain today, although a number of adults are able to understand it, and even speak it to a limited degree. The presence of Kune-Rembarrnga bilingual speakers in the above-named outstations provided an excellent opportunity to document a reliable correspondence list of honeybee names in the two languages, along with confirmed scientific identifications. Here, it is worth noting a curious fact about the word for 'honeybee', *i.e.* the individual insect, in Kune: the word is *bod-no*, and the 3Sg.possessed suffix *-no* indicates that the bee 'belongs' to the hive or the honey it makes (lit. 'its fly/bee'), and not the other way around. This is also the case in Dalabon (the word is also *bod-no*), and is restricted to honeybees among animal names (see Evans 2003b:197 for more details).

Four bilingual speakers of Kune and Rembarrnga, when interviewed separately, provided near-identical criteria for distinguishing the six honeybee types named in these languages. The criteria, in brief, are also presented in Table 1. In most cases, the primary defining feature of each honeybee category is the physical location of the hive or the morphology of the wax entrance tube to the hive, commonly referred to as the 'nose' of the hive (Figs. 2 and 3). Although the length of the 'nose' for each type is quite variable, and the criteria appear to be

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3 very subjective, Kune and Rembarrnga speakers will usually make an immediate and confident
4 declaration of the name of the hive, even without having seen the bees that ‘belong’ to it. The
5 ‘long nose’ *yurdu* (Rem: *yurdupal*) has a tube that ranges from a few millimetres to about 2.5
6 cm, while the ‘short nose’ *man-yalk* (Rem: *jonggo*) only has raised ring of wax around the
7 opening to the hive. The ‘very long nose’ *lorlbban* (Rem: *jordok*) can have a tube that measures
8 as long as 17-18 cm. The rock bee *na-badyalk* (Rem: *gawurrwa*) also makes tubes of
9 approximately 2-2.5 cm, while the ground dwelling bee is usually found in termite mounds, and
10 lacks an entrance tube. Identification of the ‘no nose’ bee *rdiwarrah* (Rem: *rdippu*) can also be
11 facilitated by the knowledge that this type tends to occur higher up on a tree. Lacking an entrance
12 tube completely, this bee spreads droplets of sticky resin around the otherwise featureless
13 entrance to its hive. Only occasionally was the appearance of the bees spontaneously mentioned,
14 and when consultants did talk about the bees, it was mostly in general terms pertaining to their
15 relative size. *Rdiwarrah* was singled out as being a particularly aggressive bee, but the
16 observations that the hives were usually found in the high branches of tall trees, and lacked any
17 entrance tube, were also considered to be salient.
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24 Table 1 indicates that the species *Austroplebeia magna* is referred to by two names in Kune and
25 Rembarrnga, depending on the length of the entrance tube to the hive. Like the related species *A.*
26 *cincta*, which is found in North Queensland, *A. magna* worker bees add additional wax to the
27 distal end of the entrance tube when the hive is being harassed by green tree ants (*Oecophylla*
28 *smaragdina*) (Dollin 2013). This can result in the creation of extremely long entrance tubes. In
29 the case of one hive sampled at Buluhkaduru, the entrance tube was at least 15 cm long, and
30 clear signs of green tree ant activity could be seen in the immediate vicinity of the hive.
31 Incidentally, the ants associated with such long entrance tubes of the bee called *lorlbban* in Kune
32 are called *berdworrkorkl* (<-berd ‘penis’), in contrast to the usual names for green tree ants, which
33 are *na-worrkorkl* and *bodbarng*.
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38 A noteworthy pattern evident from Table 1 is the similarity between the names for the ‘short
39 nose’ *man-yalk* and the rock bee *na-badyalk* (from *-bad* ‘rock’). Some Kune speakers report that
40 the two terms are synonymous, but this is inconsistent with the fact that the rock bees can have
41 substantial entrance tubes of up to 3 cm, whereas *man-yalk* does not. One Kune speaker stated
42 that *na-badyalk* is the same as the ground-dwelling *modjarnh*. From a scientific point of view,
43 the synonymy of the two (and potentially three) terms can be explained by the fact that *man-yalk*,
44 *na-badyalk* and *modjarnh* all label the same biological species, *T. mellipes*. The picture is
45 slightly complicated by the existence of another rock-dwelling bee, *A. essingtoni*, in the same
46 locality as *T. mellipes* (around Korlobidahdah outstation, in the rock country south of
47 Maningrida).
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51 One tentative conclusion can be drawn, and one hypothesis proposed, from the preceding
52 discussion, about Kune conceptions of *T. mellipes* and *A. essingtoni*. The conclusion is that even
53 though Kune speakers are aware of the similarities between the rock, ground and tree-dwelling
54 instances of *T. mellipes*, the differences in nesting location are given priority, and the three
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3 variants are accordingly named. Even the fact that tree-dwelling *T. mellipes* construct a very
4 short entrance tube, while rock-dwelling hives have a longer tube, appears to be of no
5 consequence, as the Kune names *man-yalk* and *na-badyalk* reflect an underlying unity. In
6 contrast, the presence or absence of tube, and relative differences in its length are of crucial
7 importance in differentiating between tree-dwelling sugarbag types, as evidenced by the two
8 completely different names for *A. magna*. It can be hypothesized that instead of using a single
9 criterion (e.g. tube length) to correctly identify a type of sugarbag, Kune speakers employ a
10 range of variables, including presence/absence of tube, tube length, location on tree, location of
11 nest site (if not on a tree).
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15 Rembarrnga honeybee names were previously documented by Saulwick (2003) during the
16 compilation of a Rembarrnga-English dictionary, and it is interesting to compare his definitions
17 with the ‘identifying features’ recorded by Author Si (Table 1). Following are the seven
18 honeybee names recorded by Saulwick (2003), along with relevant excerpts from the definitions:
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22	<i>birrgurda</i>	small black and yellow bees... large hive; middle of the tree; ‘selfish bees’
23	<i>yurduppall</i>	bees with long stings... any kind of bee hive with honey in middle-sized branches
24		at the top of the tree. (<i>Austroplebeia</i> sp. (? <i>essingtoni</i>); <i>Trigona</i> (<i>Plebeia</i>) sp.). A
25		large hive; may occur right along the branch in several sections; occurs in middle-
26		sized and larger branches.
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28	<i>yurduyurdu</i>	a bee’s hive with honey in thin branches at the top of a tree. (<i>Austroplebeia</i> sp.
29		(? <i>essingtoni</i>); <i>Trigona</i> (<i>Plebeia</i>) sp.).
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31	<i>jonggo</i>	small native honey bees, hairy and black in colour. (<i>Trigona mellipes</i>). Lives in
32		trees or rocks usually in the rock country. The small nest [is] in skinny horizontal
33		outer branches of a tree. This has a long entrance tunnel built up so that it stands
34		out like a little pipe from the branch.
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36	<i>jordok</i>	bees with long stings
37	<i>gawurrwa</i>	wild honey from a rock country beehive. (<i>Austroplebeia</i> sp. (? <i>essingtoni</i>);
38		<i>Trigona</i> (<i>Plebeia</i>) sp.). This is found in stony ground or in cracks between the
39		rocks in the escarpment country. It has a long entrance tunnel of soft sticky wax.
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41	<i>len</i>	any kind of honey found in the ground, also in the roots of trees. (<i>Trigona</i>
42		(<i>Tetragonula</i>) <i>hockingsii</i>)... Found in clay embankments, ant bed and the holes of
43		stringybark trees which have been eaten by termites...
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47 The definitions of the final two ethnospecies, *gawurrwa* and *len*, match the features presented in
48 Table 1, and are unproblematic. Similarly, the characterization of *birrgurda* as ‘selfish bees’ (i.e.
49 bees that do not easily give up their honey, and harass people who try to obtain it) matches the
50 description given by speakers of all ten Arnhem Land languages discussed in this paper.
51 *Yurduyurdu* is presumably a variant of the Kune name *yurdu*, which according to Si’s
52 consultants, is also a synonym of *yurduppall*. A puzzling statement made in the definition of
53 *yurduppall* is that these are ‘bees with long stings’. From a biological point of view, this is
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incorrect, because all four honeybee species discussed in this paper are stingless bees. The ethnospecies *jordok* is also said to have ‘long stings’ in Saulwick’s definition, and it is likely that this is a misunderstanding that has arisen due to issues with the contact language used during fieldwork. Most probably, the consultant(s) wanted to say that these bees had long entrance tubes – if so, this would match Si’s identifying features for *yurduppall* and *jordok*, which can both be distinguished by the presence of entrance tubes (although the tube is much longer for *jordok*). Finally, the discrepancy between Saulwick’s *jonggo* (‘this has a long entrance tunnel’) and Si’s characterization of these bees as having a ‘very short nose’ is harder to explain. It is possible that this is an example of inter-dialectal or inter-individual variation. Saulwick’s identification of *jonggo* as *T. mellipes* matches the identification obtained by Si, and this bee is known to produce conspicuous entrance tunnels, as can be seen in Figure 3. One way of interpreting the difference in Saulwick’s and Si’s descriptions of *jonggo* could be that the consultants of the latter author used the above name to specifically mean *T. mellipes* nests in trees that have recently been established, and have yet to construct a long entrance tube. This could explain why Dalabon speakers stated that the corresponding ethnospecies *yalk* does not have much honey, and why Kun-barlang speakers characterized *man-yalk* as living in skinny branches (*i.e.* due to the small size of the hive) (Table 3). Saulwick’s consultants may have been accustomed to extracting honey from more mature *T. mellipes* hives in trees, and therefore nominated the entrance tube as a salient feature.

4.2 Ndjébbana and Kun-barlang

These two languages are discussed together because the data were collected through a joint interview with two senior consultants who spoke both languages fluently. The speakers agreed that four emic categories were identical in the two languages (rows 1-4 of Table 2), but Ndjébbana has two additional names with no known counterparts in Kun-barlang. Like many other plant and animal names in Ndjébbana, ethnospecies 1 and 2 have names that appear to be complete verb phrases. While the first, *dilana ka-ndaburrúwanga*, can be translated as ‘it swarms around the eyes’, the second, *ngárrabba-kkáddaworna*, appears untranslatable in any satisfactory way, and may be a reference to the ritual significance of this creature. *Bóbbidj*, an alternative name for ethnospecies 2 is shared with Burarra, Kun-barlang, and Gurr-goni, while the name for ethnospecies 6, *man-birned*, appears superficially to be a loan from Bininj Kun-wok.

4.3 Burarra/Gun-nartpa

The Burarra/Gun-nartpa language – known by its speakers as Gu-jingarliya ‘of the tongue’ – encompasses a number of speech communities based on country to the east of Maningrida. The most salient parameter for the purposes of this paper is the distinction between the speakers of inland floodplain dialects and the various coastal groups. The inland group identify with both the language term Gun-nartpa and the regional identity label Mu-golarra ‘black speargrass’ (an icon of the inland floodplains), and it is their dialect that is the focus of the following discussion.

Table 2 presents a summary of Gun-nartpa bee ethnospecies. The scientific identifications are based on comparison with data from Kune and Rembarrnga presented in Table 1. Both the Gun-

nartpa and the coastal Anbarra Burarra use the polysemous honey term *woma*. The term *woma* appears frequently in the discussions of the Jambich song cycle from the coastal Anbarra Burarra, where the focus is on the flow of plentiful honey and the interrelationship between honey and the trees that are its habitat and also bear the flowers that are the food for the bees (Clunies Ross, 1978). *Woma* thus has wide currency as the name for the ‘best’ honey, which belongs to the Jowunga moiety³. In this sense, *woma* is a synonym to the other terms used to label the ethnospecies shown in row 2 of Table 2.

Table 2 identifies 4 ethnospecies, although the classification is tentative for 3 and 4 (note that there does not appear to be an equivalent ethnospecies 4). Ethnospecies 1-3 align with 3 biological species of stingless bee, *Austroplebeia magna*, *Tetragonula hockingsi* and *Tetragonula mellipes*. *Austroplebeia essingtoni*, an inconspicuous bee that nests in spindly, dead trees and rock crevices, is tentatively included in Table 2 as aligning with ethnospecies 4, even though field data matched the Rembarrnga name *jorduk* with *A. magna*. This is discussed further below. Important diagnostics for the Gun-nartpa in differentiating different types of honey are the presence of an entrance tube, the nesting location (in tree, in termite mound, in the ground) and the quality of the honey found in the hive. For bees that nest in trees, the height above the ground and the size of the tree hollow (which in turn relates to the amount of honey present) are also salient. Gun-nartpa consultants also differentiate between types of hive using the English terms ‘boy one’ and ‘girl one’. This is a way of noting the presence or absence of the entrance tube (called *mun-japi* which also means ‘foreskin’) and is a way of distinguishing the two most important species – *A. magna* and *T. hockingsi*.

In discussions in 1994, consultant TN consistently differentiated three types of honey. The most salient types for him were *woma*, the Jowunga honey, where there is usually an entrance tube, and *diwarraman*, the Yirrichinga honey, with bees that bite and nests that lack entrance tubes. TN also identified *mojarn*, the honey that lives in termite mounds, and also Jowunga. EB independently provided the same classification as TN, asserting that there are three types of sugarbag, two that are Jowunga and one Yirrichinga. He identified the most important Jowunga type with a number of synonyms – all names that refer to the same honey: *woma~yurdupal~yurdu~boppich~yarrpany~bambir* (henceforth this ethnospecies is referred to as *yurdupal*). This is the best honey, made by large bees nesting in large trees with big tree hollows. Types of tree that are typical locations are *gongarra* ‘woollybutt’, *ngumula* ‘stringybark’ and *burichparr* ‘large melaleuca’. While the presence of an entrance tube is a significant diagnostic, Gun-nartpa consultants have not identified distinct ethnospecies based on

³ Patrimoiety names are shared throughout north-central Arnhem Land, notwithstanding some minor variations. The terms are written according to the spelling conventions of each group. Kuninjku/Kune/Kunbarlang - Duwa and Yirridja: Ndjébbana -Djówanga and Yirridjanga; Na-Kara - Djowanga and Yirridjanga; Gurr-goni -Djowunga and Yirritjinga; Burarra/Gun-nartpa - Jowunga and Yirrichinga; Djinang/Wurlaki - Djuwingi and Yirritjingi.

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3 the length of the entrance tube (see Table 1). Despite this, the diagnostics for the *yurdupal*
4 ethnospecies indicate that this aligns with biological species *A. magna*.
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7 As in Kune, the Gun-nartpa use *diwarraman~diwarra* for the biological species *T. hockingsi*,
8 Yirrichinga bees with hives that lack entrance tubes. The 1993-94 consultants, provided other
9 well defined characteristics of *diwarraman* – the bees bite and there is a large amount of
10 *galanyan* ‘cerumen’, prized for making weapons, tools and performance regalia. As noted for the
11 equivalent ethnospecies in Table 1, the height of the hive is also significant. In 1993-94,
12 consultant TN commented that *diwarraman* is found in large trees and not smaller paperbarks,
13 unlike *yurdupal*. The salience of high nesting locations for *diwarraman* bees was supported
14 during the 2015 consultation. The early stages of harvesting in 2015 involved locating the hive
15 entrance, which was high in the tree and lacked an entrance tube. At this stage there was
16 speculation about whether the bees were *yurdupal~yurdu* or *diwarraman*. While *yurdupal* was
17 more desirable, the harvesting team at this stage concluded that the hive was *diwarraman*. After
18 felling the tree and opening the hive, the hive was seen to be immature (*gun-guna waya* ‘recent’).
19 At that point there was speculation that the nest was *gun-menambula*, a species aligned with
20 biological species *T. mellipes* on the basis of descriptions of them as ground dwelling bees.
21 Identification of the bees from this nest confirmed them as a species of *Tetragonula* and most
22 likely to be *T. mellipes*. However, from the perspective of Gun-nartpa diagnostics, these bees
23 were nesting in location more typically associated with *diwarraman*, yet failed to match the other
24 diagnostics for that type of honeybee (cheeky bees, lots of cerumen).
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31 The Gun-nartpa identify at least one, potentially two ethnospecies which are observed nesting in
32 the ground, in termite mounds and in the base of trees (*T. mellipes*). An important factor in the
33 Gun-nartpa diagnostics of the ethnospecies *gun-menambula ~ mojar*n is that inland Gun-nartpa
34 country lacks significant rock outcrops or escarpment. Ethnospecies 6 in Table 1 (Kune *na-*
35 *badyalk*, Rembarrnga *gawurrwa*) is not salient for the Gun-nartpa, given the absence of this
36 distinct nesting location. The open woodland and floodplain country, however, abounds in
37 magnetic termite mounds (*Amitermes meridionalis*) and this variety in termite nest habitats may
38 be reflected in the choice of name for honey. In 1994, *mojar*n was offered as the name for bees
39 that nest in the ground and in termite mounds. It is regarded as inferior honey – one Gun-nartpa
40 consultant (TN) commented that *mojar*n is honey inside *morliya* ‘termite mound’, and that is
41 ‘too sweet, sometimes don't eat - makes you thirsty’. In 2015, three Gun-nartpa consultants
42 contrasted *mojar*n to another type, *gun-menambula*, which had not been mentioned in the 1993-
43 94 consultations. On the basis of this one occasion it is possible that the salient difference
44 between *mojar*n and *gun-menambula* is nesting location, with the latter described as *gun-mujel*
45 ‘of the ground’ (< *jel* ‘ground’⁴). Visual inspection of a *gun-menambula* hive showed that this
46 was located in a termite nest that lay at ground level. The term *gun-menambula* is derived from
47 the root *menama* ‘knee’. This derivation is possibly driven by a shape metaphor, given the
48 slightly rounded kneecap shape of the nests of some termites. More investigation is required to
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56 ⁴ cf. Gurr-goni *git-gi-djel* for ethnospecies 4.
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discern whether *mojarn* and *gun-menambula* are alternative terms that refer to the same ethnospecies or whether there are salient differences in the nesting locations that are reflected in terminology.

Further investigations of the 2015 nest harvest showed that there was only a small amount of honey in a narrow cavity. At the conclusion, consultant CB stated that this honey was *jorduk*, describing it as a kind of honey that is found in small, dead trees with narrow hollows ('a little hole'). The term also occurs in Djinang (as *djurduk*), and Waters (1983) records this with the primary meaning of 'brackish water' along with noting that it is a type of honey. This range of meaning suggests that *jorduk*, for the Djinang and the Gun-nartpa holds connotations of inferiority when used in relation to honey. While the bee was in fact a *Tetragonula* sp., this suggests that *jorduk* could also possibly be aligned with *Austroplebeia essingtoni*, an inconspicuous bee that nests in such locations and yields only small amounts of honey (Dollin, 2016).

It is notable that Gun-nartpa consultant CB used *jorduk* quite differently to the same term in neighboring languages. The term *jordok* occurs in Rembarrnga also (see Table 1.) where it aligns with the biological species *A. magna* and has 'big bees' and a 'long nose'. For the Rembarrnga, *yurdupal* and *jordok* name the same biological bee species, and are distinguished on the basis of the length of the entrance tube. For Gun-nartpa, consultant CB used the term *jorduk* to contrast a small immature hive with the anticipated *diwarraman*, which would be expected to hold honey in a large hollow within the tree. This indicates that for the Gun-nartpa, the nesting location, the presence of honey and the size of the hive cavity are more important than the length of the entrance tube in differentiating different ethnospecies, although there are indeterminacies in how such contrasts are made by different consultants.

The geographic range of the clans that speak Gun-nartpa represents a linguistic crossroads in the region, cross-cutting the marked differences in cultural orientation between the western cultural block (Kuninjku, Ndjébbana, Na-kara, Kun-barlang, Gurr-goni) and the east (Burarra, Djinang/Wurlaki and other Yolngu languages) (Armstrong, 1967; Elwell, 1982; Hiatt, 1965). Many Gun-nartpa people share lineages and have close ceremonial ties with members of the Gurr-goni, Rembarrnga/Kune and Dalabon speaking groups, and there is long term patterned intermarriage between Gun-nartpa people and Djinang/Wurlaki to the east. Despite these social connections, the Gun-nartpa speak the same language as the Burarra clans on the coast and to the east of the Blyth River, yet at the same time, despite some intermarriage, many disavow a close social connection with the coastal groups (Carew, 2016). It is not surprising to find that there are a number of terms that are shared between the Gun-nartpa and neighbouring inland groups. In addition, some lexical differences between the Gun-nartpa and Burarra reflect the differences in social networks, and intersecting with these social factors are some differences in the coastal and inland habitats where nests are located. These variations are complicated by the differences in criteria that people apply when explaining their use of honey terms, as discussed above in relation to the term *woma* 'honey'.

For example, a Burarra term, *ngu-rowuna* ‘coastal variety of sugarbag, ie. honey’, is recorded in the printed Burarra dictionary (Glasgow, 1994:612). The example sentence for this entry indicates a differentiation between coastal and inland types in ethnotaxonomy, drawing a contrast with *woma* ‘honeybee, sugarbag’ as an inland species.: ...*ngu-rowuna gochilawa gun-guyinda, rrapa woma jorrnyjurra gu-bona*. ‘*Ngu-rowuna* sugarbag is from the coastal area, and *woma* sugarbag went inland.’ (Glasgow, 1994:612). This is yet another type of differentiation that focuses on macrohabitat, in which *woma* is used as a generic in opposition to more specific types of honey.

Further differentiations are also possible, when considering the different habitats that occur on the coast and inland. In 2015, Gun-nartpa consultant CB spoke of his memories of harvesting honey in the Gochan Jiny-jirra region during his childhood. He used the generic term *woma* while also indicating that there are many different kinds of honeybee and attributing these differences to their different moieties and to the places they are found. In the following excerpt, CB refers to the honey that occurs in mangroves (*mu-lacha gu-guyinda* ‘among mangroves’) and thick vegetation near creeks (*gu-wurrpa* ‘in thick vegetation’) that was harvested by senior family members on country within a day’s walk from their home-base at Gochan Jiny-jirra (*gun-gurrepa* ‘a place within walking distance’). CB refers to these mangrove-lined estuary and coastal habitats as *gochilawa* ‘low ground’. He contrasts these habitats to *jorrnyjurra* ‘high ground’, the common way of referring to inland country.

Ngu-nana ngaypa, ngu-nana ngu-delipa ngu-ni, nguburr-nana, an-ngaypa jungurda, ngaypa bama ng-galiyarra, ngunabirri-ganyja, woma, ngu-barra. Wurpa lika gun-nerranga gun-nerranga woma gun-guna gu-ninyarra, Jowunga, Yirrichinga. Gun-nerranga jorrnyjurra rrapa gun-nerranga gochilawa rrapa, gochilawa michpa, mu-lacha gu-guyinda, gu-wurrpa. Gun-gurrepa gu-bona woma.

I saw this, I saw it when I was young, my father’s father and my father took me for honey, and I ate it. However there are different kinds of honey that exist, both Jowunga and Yirrichinga. Some are on the high ground and there are some that belong to the low ground. Low ground, such as among mangroves and in thick vegetation. Honey went to those nearby places.

CB’s account highlights the importance of nesting location as a diagnostic for the type of honeybee. In Gun-nartpa, differentiations made on the basis of habitat can be referred to with descriptive nominals derived from the habitat lexemes. For example, ground honey is commonly referred to with the term *gun-gujel*, ‘one from the ground’ a denominal noun based on the word *jel* ‘ground’. Similar descriptive terminology exists in Gurr-goni (see xx). As indicated by CB’s

description above, there are salient differences in habitat between the inland and the coast, and it is likely that some terms once used by Gun-nartpa forebears have now fallen out of use.⁵

4.4 Djinang/Wurlaki and Gupapuyŋu

Determining ethnospecies correspondences among honeybee names in these three related languages was a relatively straightforward matter, because of some shared vocabulary and the unambiguous descriptions offered by consultants. Some of the Djinang names were multimorphemic and analysable, and this facilitated the task of assigning these names to the appropriate ethnospecies, e.g. *ngurr-dambi djarwarri* (nose-short *djarwarri*). The lexeme with the least certain status among the Djinang names is *dambung* (short one), tentatively assigned to ethnospecies 4. *Dambung* has been placed in this ethnospecies solely on the basis of its having a short entrance tube, but this reasoning may be problematic, as discussed further in Sections 6.1 and 6.2.

4.5 Dalabon

Dalabon has a number of sugarbag names in common with Kune and Rembarŋga, probably due to its close genetic relationship with these languages. Thus, *diwarrah*, *yurdu/yurdubbal*, *modjarngh*, *yalk* and *lorlbban* can be assumed to correspond perfectly to ethnospecies 1-5 of Table 1. In addition, the rock bee is labelled with a different lexeme, namely *nawaran*. Incidentally, this is also the Dalabon name for the Oenpelli python *Morelia oenpelliensis*, and the similarity in names might indicate a metonymic relationship between the bee and the snake, as both are found in sandstone habitats. The Dalabon dictionary (Evans *et al.*, 2004) also contains some other lexemes whose precise identification remains a mystery. The sugarbag type *morli*, although not explicitly defined, could merely be a life-stage term rather than an ethnospecies. Specifically, it could indicate a hive that has regenerated after an initial harvest, a possibility that is hinted at by the following example sentence:

Kung kanunh, bale-bon, bula-ngun bulah-dong, bokorrehkun bulah-dong nunh dubmi-dubmi yalalhng-bon yila-nan kanunh birdi-no ka-burlhmu, ngeyh-no, kenh birdi-no, kanh yila-nan ka-ngeyh-di nunh yayalng-bon yilah-nan ngalemak nunda kung ka-doni kah-dorrin yalah-yin, yilalng-yawoyh-dong yilah-ngun, kanunh morli yalah-yin Dalabon-walung

That honey, when they go along, when they eat it and they chop the hive, now when we go along and see the wax coming up, the honey, I mean the wax, when we see that there's honey there well we come up and take a look to see if the hive has been dying back from being chopped, if not we chop it again and eat the honey, that's the sort of honey we call *morli* in Dalabon.

⁵ Also noteworthy is the similarity of idiom used by Glasgow's unnamed coastal consultant who describes *woma* 'honey' as 'going' inland from coastal habitats, to that of CB, who uses the same verb (*gu-bona* 'it went') to describe the presence of honey in various habitats.

Another bee type, named *belinjdan bulubbulu* or simply *burlubburlu*, is not described wholly in terms of its intrinsic characteristics, but rather in terms of its affiliation with two other ethnospecies.

Belinjdan bulubbulu modjarn wanjkih, diwarra wanjkih, bod-no barnghbarng

Belinjdan bulubbulu is like ground sugarbag, like *diwarra* (sugarbag), and its bee is cheeky.

On a recent field trip, it was again stated by senior consultant Maggie Tukumba that there were three similar sugarbags ‘*all the same, brothers*’, and all of Yirridjdja moiety. These were: *modjarnh* (the smallest), *belinjdan bulubbulu* (middle-sized) and *diwarrah* (the largest) (Nicholas Evans, pers. comm.) Out of all the languages investigated in this study, Dalabon speakers were the only people to group these bees together, and the significance of this grouping has yet to be determined. Two further inconsistencies with regard to *belinjdan bulubbulu* are that this bee is characterised as a ‘brother’ to the other two, and belonging to the Yirridjdja moiety, whereas *belinjdan* appears to be a female subsection term of the Duwa moiety. Finally, although the ethnospecies *yurdubbal* is assigned to the Yirridjdja moiety in Evans *et al.* (2004), further investigation during the field trip confirmed that it is indeed a synonym of *yurdu*, and properly belongs to the Duwa moiety as is the case in the other languages.

4.6 Gurr-goni

The Gurr-goni ethnospecies 1-3 are unproblematic with the names of the former two being similar to other languages, and the third having an unambiguous description. This is the only language to have a word for honey that is found in hollow logs, even though speakers of other languages also frequently mentioned finding honey in such a location. Like some other coastal communities (Burarra, Ndjébbana, Gupapuyŋu), Gurr-goni has a term for ‘mangrove honey’, as exemplified by the following:

Wami gu-garrapu gubu-bukubini, Bart A-djerre guwu-bukubini, arrapu **gut-gu-wurrpu** wami gu-wurrpu a-yorri, gu-goni mu-djalawarritj.

They soaked up honey with grass or bark at that place Bart A-djerre, *and there was mangrove honey in the mangroves, this saltwater one.* (Green & Nimbadja, 2015:55)

4.7 Na-kara

The Na-kara dictionary (Eather and Kalamirnda 2005) lists four sugarbag types, but provides no descriptions or scientific identifications for any of them. Two additional terms were recorded in native speaker interviews. The assignment of *wuna-ngayarda* and *na-kubbarliya* to ethnospecies 1 was based on interviews (although note that two native speakers provided these two very different names for the ‘cheeky’ honeybee of the Yirridjdja moiety). The name *wuna-djawa-kuna* is from the Na-kara dictionary, and was assigned to ethnospecies 2 after a process of elimination. After all the other honeybee names had been assigned to appropriate ethnospecies on the basis of

various criteria, it was noted that the ethnospecies 2 slot was vacant for Na-kara. *Wuna-djawa-kuna* was also left unassigned due to a complete lack of descriptive information for this ethnospecies. As all other languages investigated in this study have a name for this ethnospecies – and as it is an important totemic ethnospecies – it seemed appropriate to suggest that *wuna-djawa-kuna* might be the Na-kara word for ethnospecies 2. *Ngunidjdjáwkkuna* and *nbúrda* were designated ‘ground’ and ‘rock’ sugarbag respectively on the basis of information gathered in interviews, whereas *burrburr* was assigned to ethnospecies 4 solely on the basis of formal similarities with one of the Ndjébbana terms for this ethnospecies.

5. Patterns in the Naming and Classification of Honeybees

An obvious pattern in the words presented in Tables 1 and 2 is the naming of two bee types (Rows 1 and 2 in each Table) by a small set of related terms across many languages. Thus, *T. hockingsi* is called by the name *rdiwarrah* or a similar term in four languages, or *birrkurda* in four languages. The two terms are synonymous in Rembarrnga. One of the types of bees identified as *A. magna* is also known by one of two names in a few languages: *yurdu* (or a related lexeme) in four languages, and *bobbidj* in five languages. Both terms are acceptable in Kune, as spoken in Buluhkaduru outstation, but the former is preferred. Note that *A. magna* is also the ID for another honeybee ethnospecies (*i.e.* an emic category), which will be discussed further in the following section. The above pattern is absent from the names of the other honeybee types, and this perhaps gives an indication of the greater cultural significance of *rdiwarrah/birrkurda* and *yurdu/bobbidj* compared to the other bees. *Rdiwarrah/birrkurda* and *yurdu/bobbidj* are two important totemic honeybee categories across all of Arnhem Land, and possibly beyond. It is beyond the scope of the current paper to adequately explore the question of whether the prevalence of the *rdiwarrah/birrkurda* and *yurdu/bobbidj* terms in many languages represents common historical descent or the borrowing of words among languages. However, the fact that many languages have two or three synonyms for the same honeybee type strongly suggests that at least some of the words are likely to be borrowings, perhaps by virtue of their being mentioned in the important Mewal songline of the Marrangu Djinang people of north-central Arnhem Land (Elliott, 2015; Si, in press; see also <https://call.batchelor.edu.au/project/mewal/>).

Tables 1, 2 and 3 show that a significant amount of variation exists in not only the names of honeybee types within a particular language, but also in the identifying features recorded from consultants by linguists working on different languages. The following sections briefly summarize three phenomena in turn, drawing on the observations presented above – synonyms in individual languages, inter-speaker/inter-dialectal variation and cross-linguistic variation in the characterization of honeybee categories.

5.1 Synonyms

The existence of synonyms for a honeybee type in a particular language is most likely a sign of borrowing due to language/dialect contact, as in the case of the terms *modjarnh* and *nabiwo* ‘ground sugarbag’ in the Kune spoken at Buluhkaduru. Note that such synonyms, which are

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3 completely different in form, can be distinguished from dialectal/patrillectal variants which are
4 also quite common in Arnhem Land: *e.g.* *belinjđjan bu(r)lubbu(r)lu* and *belinjđjahđjah* for
5 Dalabon, or *nganawálwala*, and *nawálwala* for Ndjébbana. In the case of Kune, author Si
6 worked with several consultants who were keen on instructing the author in the ‘proper way’ of
7 speaking Kune, and would unhesitatingly correct the author if he used an inappropriate word
8 from a neighbouring dialect. Although *na-biwo* is the word in the Kuninjku dialect of Bininj
9 Gun-wok for ground honey (Garde, n.d.) it appears to be an accepted synonym in Kune as well.
10 The particular ancestral history and affinal relations of the people currently residing at
11 Buluhkaduru outstation are probably responsible for the adoption of *na-biwo* into the local
12 dialect, and this remains a topic for further investigation.
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17 The two Kun-barlang terms recorded for *A. magna*, namely *kardderre* and *boppidj*, could both
18 potentially be considered loanwords, as both terms have been recorded in other languages by
19 various authors. As mentioned above, *boppidj* appears in many languages of Arnhem Land,
20 while *kardderre* has been recorded as a word from the Gundjeihmi dialect of Bininj Gun-wok
21 (Garde, n.d.). A more extreme example is to be found in the two Burarra/Gun-nartpa names for
22 *T. hockingsi*, both of which are shared with a few other languages. Such instances highlight the
23 difficulties inherent in determining the historical trajectories of such words, and in particular, the
24 direction of borrowing.
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29 The final example in this section deals with differing attitudes towards certain honeybee names
30 among speakers of different languages. The word *birrkurda*, which is found in four languages,
31 appears to have a special status in at least one language. Author Si first encountered this word
32 when interviewing a Rembarrnga speaker, and was told that *birrkurda* was one of the everyday
33 names for *T. hockingsi*. During a later interview with a Gupapuyŋu speaker, however, Si was
34 told that this was a word from the ceremonial register in that language, and was not to be used in
35 everyday situations. The synonyms *niwođa* and *ŋanitj* were to be used in such instances.
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39 5.2 Inter-speaker/Inter-dialectal Variation

40 The complicated patterns of language contact in Arnhem Land, coupled with norms of
41 intermarriage that vary from community to community, have given rise to a mass of inter-
42 speaker and inter-dialectal variation, even in the seemingly straightforward domain of honeybee
43 nomenclature. Gun-nartpa consultants sometimes identified terms as belonging to a neighbouring
44 language, in particular Kuninjku, although such assessments were not consistent for all speakers.
45 For example, in 1993-94 one knowledgeable senior man EB (deceased in 2001), to whom other
46 Gun-nartpa consultants deferred on this topic, attributed some terms to Kuninjku. This was the
47 case with the term *bopich*, which is commonly used by Gun-nartpa people to refer to hives that
48 are located in trees and that have a long entrance tube. According to consultant EB this is a
49 Kuninjku term, despite its common use among the Gun-nartpa, and other neighboring groups to
50 the west and south (Rembarrnga, Gurr-goni, Kun-barlang). For EB, the ‘correct’ Gun-nartpa
51 term for this type of honey is *yurdupal*. In 1993-94, Gun-nartpa consultants were consistent in
52 their use of *yurdupal*, rather than *yurdu*, the Kune equivalent that was frequently used in 2015.
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3 Similarly, *diwarraman* was used consistently in the earlier consultations, while the Kune variant
4 *rdiwarra* was also alternately used in 2015.
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7 During the 1993-94 consultations on these honey terms (and for ethnotaxonomic terms in
8 general), younger consultants were less likely to assert that certain words belonged to certain
9 languages and more likely to explain the existence of different names for the same kind of honey
10 as being simply alternatives. This may reflect the consolidation of certain terms borrowed from
11 neighboring languages as part of the Gun-nartpa lexicon over time and with generational change.
12 Some evidence for this claim comes from Gun-nartpa people's own accounts of when they came
13 into contact with other language groups. According to Gun-nartpa consultants, Gun-nartpa and
14 Kuninjku intermarriage first commenced in the 1950s. By contrast, Gun-nartpa people trace their
15 shared lineages with Rembarrnga/Kune, Djinang/Wurlaki and Gurr-goni people back to the pre-
16 second world war period (Carew, 2016). The different time depths of contact have a social
17 reality for many Gun-nartpa people. Such meta-commentaries on the language affiliations of
18 'dialect synonyms' and shared terms may suggest that, in this instance, attributing a term to
19 Kuninjku marks its alterity, even though it may be commonly used by a range of language
20 groups within a region. For instance, Carew was directed to record *bopich* as a Kuninjku term by
21 the senior consultant EB in 1993-94, despite it also occurring in Rembarrnga, Kun-barlang and
22 Gurr-goni.
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29 While certain honey terms are shared between the Gun-nartpa and neighbouring language
30 groups, these are sometimes not commented on in terms of belonging to another language. This
31 is true of the 'Kuninjku' term *bopich* for younger speakers, who accept it as an unproblematic
32 Gun-nartpa term. Notably, throughout our discussions the most knowledgeable consultant, EB,
33 did not identify terms shared with Rembarrnga and Gurr-goni as belonging to 'another'
34 language. Similarly, TN provided the term *yarrpany*, shared with Wurlaki and Gupapuyngu as an
35 alternative to *yurdupal*, without commenting on it being shared with these languages. The
36 dialects Wurlaki and Djinang are from adjacent clan estates and are socially differentiated on the
37 basis of moiety Yirrichinga and Jowunga respectively. The Djinang (Marrangu subgroup) are
38 owners of the regional ancestral honey spirit, named Djarwarri, and the term *djarwarri* is also
39 used for honey in everyday contexts, along with a normative view that this a Jowunga (or Duwa
40 moiety) term. Thus, the Wurlaki term *yarrpany* is marked as a Yirrichinga (Yirrittja moiety)
41 alternative name for the same honey – it is a Wurlaki shibboleth. It is not known whether this
42 moiety-based distinction in terminology is relevant to the Gun-nartpa.
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49 Shared terms often involve semantic shift across languages and align with differences in
50 ethnotaxonomic criteria. For example, the term *djurduk* was recorded for Djinang by Waters,
51 who lists two senses: 1. 'brackish water' and 2. 'a type of honey'. This polysemy suggests that
52 *djurduk*, within the honey domain, carries connotations of inferior honey, and this connotation
53 appears to be the primary meaning of the term in Gun-nartpa. The term also occurs in
54 Rembarrnga, aligned with a Kune/Rembarrnga ethnospecies of *A. magna* (see Table 1) where the
55 bees build a long entrance tube, often when the hive is harassed by green ants. CB provided the
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3 term *jorduk* for the immature hive of *T. ?mellipes* harvested at Gochan Jiny-jirra in 2015. While
4 CB explained his choice of *jorduk* on the basis of the small cavity and lack of honey in *T.*
5 *mellipes*, the harvesting expedition was plagued by large amounts of green ants, whose nests
6 were disturbed. This factor aligns it with the Kune ethnospecies *lorbbanh/djordok*, although it is
7 not clear that CB considered this as a factor alongside the hive characteristics.
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10 The term *jorduk* also provides another example of shared vocabulary within a regional pool,
11 rather than a marked borrowing (as is the case with *bopich/bobbidj*). At the Gochan Jiny-jirra
12 harvesting discussed in Section 4.3, Si mentioned to CB that the name *jorduk* was recorded from
13 another language and Carew suggested Dalabon as a possible source. CB asserted, however,
14 ‘*jorduk*, I call *jorduk* too, round this area’. His following comment reflects the point made
15 earlier, that long term language contact between Gun-nartpa, Djinang/Wurlaki, Dalabon and
16 Rembarrnga has resulted in shared terms that are ‘owned’ by speakers of all these languages and
17 where there is no known history of borrowing: ...*Dalabon - well ngayurrpa we bin get that name*
18 *from there, gala marn.gi, long time, gala marn.gi.* ‘As for Dalabon, well (maybe) we got that
19 name from there, but I don’t have any knowledge about that, it’s too long ago.’
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25 Incomplete cultural knowledge of ethnospecies that are considered less important may be a
26 contributing factor towards inter-individual variation in responses. The most telling indication of
27 the greater cultural importance of the bees labelled by *rdiwarrah/birrkuda* and *yurdu/bobbidj* is
28 to be found in consultants’ responses to the question of the moiety of different bees. Practically
29 all consultants stated confidently that *rdiwarrah/birrkuda* belonged to the Yirridja/Yirringa
30 moiety, and that *yurdu/bobbidj* belonged to the Duwa/Djowanga moiety (Tables 1 and 2). The
31 only exception here is the Dalabon word *yurdubbal*, which, in Evans *et al.* (2004), is assigned
32 Yirridja moiety. When asked about the moiety of the other bees (rows 3-8 of Table 2),
33 consultants were far more hesitant, either giving inconsistent responses, or simply stating that
34 they did not know. An occasional response was that only *rdiwarrah/birrkuda* was Yirridja,
35 whereas all the other bee types were Duwa. While these responses are not shown in Tables 1 and
36 2, the frequent lack of any moiety information for a particular honeybee label for many of the
37 other honeybee ethnospecies, or conflicting moiety assignment across languages, is a direct
38 result of the above phenomenon.
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44 5.3 Cross-linguistic Differences in the Conceptualization of Honeybee Categories

45 The data presented for ten languages of Arnhem Land indicate that there are a total of eight
46 potential emic categories (*i.e.* ethnospecies of honeybee, represented by rows 1-8 of Table 2)
47 which can be conceptualized and named by speakers of these languages. In practice, however, no
48 language seems to recognize more than six ethnospecies. A perusal of the descriptions of
49 honeybee ethnospecies offered by the speakers of the ten languages discussed here reveals that
50 there are key differences in the categories recognized by different languages, and in the manner
51 in which certain categories are defined cross-linguistically. The features mentioned by speakers
52 include (macro)habitat (*e.g.* coast, islands, rock escarpment), microhabitat (branches, trunk, base
53 of tree, ground, antbed, fallen hollow log), nest morphology (presence and shape of entrance
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3 tube) and behaviour (aggressiveness). One obvious cross-linguistic difference lies in the
4 recognition of (macro)habitat-based categories in some languages. Arnhem Land encompasses a
5 great many habitat types, and the territories of most, if not all, language groups will be lacking in
6 one or more habitat type that may be found on the territory of a nearby community. Therefore, it
7 is to be expected that labels such as ‘mangrove/coastal honeybee’ and ‘rock honeybee’ are absent
8 from the lexicons of communities that live respectively inland (such as Kune, Rembarrnga and
9 Dalabon) or in the coastal lowlands (such as Burarra, Kun-barlang and Gupapuyṅu).

13 Three bee ethnospecies were found to be named in all the Arnhem Land languages investigated
14 in this study; these are presented in the first three rows of Tables 1 and 2, and comprise the
15 prototypical Yiriddja bee frequently labelled *rdiwarrah/birrkuda* (ethnospecies 1), the
16 prototypical Duwa bee frequently labelled *yurdu/bobbidj* (ethnospecies 2), and bees that nest in
17 the ground, at the base of trees or in antbeds, and are given various names. Unlike the majority of
18 the ground ethnospecies, ethnospecies 1 and 2 can be conceptualized in different ways cross-
19 linguistically, with speakers prioritizing one potential set of identifying features over the others.
20 As described in Section 4.3, Gun-nartpa is the only language of the ones surveyed here to have
21 possibly two ethnospecies associated with termite mounds. Broadly, the languages presented
22 above can be divided into two groups, based on speakers’ pronouncements regarding the salient
23 features of ethnospecies 1 and 2: the first group comprises Kune-Rembarrnga-Dalabon-Burara-
24 Djinang-Gupapuyṅu, while the second includes Ndjébbana-Kun-barlang-Gurr-goni. The basis
25 for this division is as follows. Speakers of the languages in the first group tended to mention the
26 aggressiveness of the bees for ethnospecies 1, and the presence of a noticeable entrance tube to
27 the hive for ethnospecies 2. In contrast, speakers of the languages in the second group tended to
28 favour microhabitat-based features (*i.e.* location of the hive on a tree) with which to
29 conceptualize the bee ethnospecies. This phenomenon can also be observed to some extent in
30 ethnospecies 4 of Table 3.

38 Interestingly, speakers of the Paman language Wik-Mungkan from Cape York also name five
39 sugarbag ethnospecies (McKnight 1973). Although criteria such as ‘the formation of wax, the
40 amount of honey, the size and habits of the bees,’ (p. 201) are supposed to be relevant to the
41 identification of the five types, McKnight states that the shape and size of the entrance tube were
42 possibly the most important variables. This is largely reminiscent of the Kune/Rembarrnga
43 categories presented in Table 1. In decreasing order of length, McKnight lists the following
44 ethnospecies: *mai kuyan*⁶, *mai polpa*, *mai mola*, *mai wa:ta* and *mai atta*, with the latter lacking a
45 tube altogether. The entrance tube of *mai kuyan* (known as the *kunch* ‘penis’) is said to reach up
46 to three inches in length, (~7.5 cm; almost five times as long as that of *mai polpa*), and it is likely
47 that the ethnospecies *mai kuyan* denotes one or more species of the genus *Austroplebeia* which
48 can make very long entrance tubes when harassed by green ants (Dollin 2013). In north
49 Queensland, these are likely to be *A. cassiae*, *A. australis* and possibly the rarer species *A. cincta*.
50 *Mai atta* is probably *Tetragonula hockingsi* (and therefore equivalent to ethnospecies 1 of Tables
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56 ⁶ This is spelled as ‘*mai kuyin*’ in McKnight (1981).
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1-3), which is also common in Cape York, and lacks an entrance tube. The information provided in the McKnight (1973) paper do not allow further assignment of scientific identifications to the remaining Wik-Mungkan ethnospecies with any certainty. As in Arnhem Land, certain kinds of honey are associated with ritual and taboo – *may kuyan*, in particular, is considered especially potent due to its phallic nature and its involvement in mythology and initiation rituals.

6. Sources of Error

6.1 Incomplete Data

It is likely that at least some honeybee names from the eight languages presented in Table 3 remain to be documented, and that some of the Table's blank cells could be filled by future investigations with appropriately knowledgeable consultants. This is particularly true of ethnospecies such as 'sugarbag found in hollow logs' (Row 7), and it is surprising that only Gurr-goni should have a name for this category. On the other hand, ethnospecies 4 (see the following section for a discussion of some issues relating to this category) is named in all languages except Burarra, Gurr-goni and Gupapuyŋu, and it is possible that undocumented names exist for this ethnospecies in these languages.

6.2 Potentially Spurious Ethnospecies

As mentioned at the start of this paper, some of the ethnospecies and scientific identifications shown in Table 3 are tentative, as they are based on weak matches in consultants' descriptions of named bees and/or name correspondences for lexemes that have yet to be assigned a definitive biological identification. Ethnospecies 4 and 5 are problematic in this respect. The Dalabon and Kun-barlang names of ethnospecies 4 both contain the morpheme *yalk*, and this matches exactly the Kune ethnospecies *man-yalk* (Table 1), which has been reliably identified as *T. mellipes*. However, the Dalabon, Djinang and Na-kara lexemes have been placed in this ethnospecies category because the consultants stated, when prompted in an interview, that the corresponding bees built hives with very short entrance tubes. Whether the Dalabon, Djinang and Na-kara bees really do correspond to the Kune *man-yalk* (and the species *T. mellipes*) remains to be verified through targeted biological collection in the field with the appropriate language consultants.

Similarly, in ethnospecies 5, the Burarra term *gurdarri* is problematic because the only reason for placing it in the same category as the Dalabon *lorlbban*, and identifying it as *A. magna*, is a single consultant's assertion that it builds a very long entrance tube. The identification of the Dalabon *lorlbban* as *A. magna* could also be incorrect in the absence of any description of this bee in Evans *at al.* (2004). However, it has been assigned to this category because of the perfect name-match with Kune ethnospecies 5 (Table 1).

Multilingual consultants could have overgeneralised the similarity of two or more bee ethnospecies in the languages they spoke. While the authors tried to verify the purported similarity of ethnospecies from different languages by asking additional questions about the

biology of the bees involved, there could be instances of inappropriate matching between ethnospecies from the lesser-known languages.

7. Lexicographic Issues

The composition of dictionary entries for invertebrate species is particularly challenging for three main reasons: 1) the species (and ethnospecies) diversity of a named group of organisms may be very high, and it can be very difficult for a linguist with no biological training – or for a biologist with inadequate taxonomic expertise – to select criteria that unambiguously single out a named category 2) even if the lexicographer is able to arrive at a unique description for a named category, and contrast it with similar, named categories, this description may be at odds with native-speaker conceptions of those organisms and 3) very often, the invertebrate species that form the referent of a word may simply not be sighted by the field linguist during his/her visit to the language community. Naturally, these problems may also arise when trying to write definitions for larger species such as plants, birds or mammals. We maintain, however, that the magnitude of the difficulties involved in writing invertebrate definitions is much greater, because of the greater number and quality of published and online resources available for the identification of vertebrates and flowering plants (see Lahe-Deklin and Si 2014 for a comparison), and the greater familiarity of these larger organisms to the average linguist⁷.

Reasons 1) and 3), listed above, often conspire to force the lexicographer to write a minimal definition for an invertebrate lexeme. Hence, in Dixon's (1991) survey of culturally important words in the Yidiny language of north Queensland, the members of the 'worms' category (p. 171; itself a highly ambiguous term from a scientific point of view), are given definitions that native speakers and biologists alike might find uninformative:

<i>wugun</i>	a big, dark coloured swamp worm, often used for bait
<i>junggumU</i>	a brown ground worm
<i>burrma</i>	a big black rock worm
<i>jirrgal</i>	a little grass worm
<i>burngu</i>	a big blue worm
<i>duwan.ga</i>	a large worm

Similar issues can be seen in Dixon's treatment of other invertebrate groups such as grasshoppers and locusts. An additional problem presents itself here: the two English insect words are used in separate definitions, but with no indication of how the author himself might conceive of the distinction between 'locust' and 'grasshopper'. Some examples include:

<i>jinjalum</i>	a slatey-coloured grasshopper
<i>bundim</i>	a grasshopper sp.
<i>balmbiny</i>	a grasshopper sp.

⁷ Many groups of scientifically recognized marine and terrestrial invertebrates – Polychaeta, Onychophora, Isopoda, Tunicata – may be completely unknown to field linguists, in spite of being diverse and common.

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3	<i>nyilngarran</i>	large, brown locust
4	<i>yindin</i>	a very small, brown locust
5	<i>wirri</i>	a brown and white locust
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8 The definitions give the impression that it should be a straightforward matter to distinguish
9 between ‘grasshopper’ and ‘locust’, but it is unlikely that English speakers would be able to
10 reliably and consistently tell the two apart, especially when confronted with a single specimen,
11 instead of the swarms that are usually associated with the latter term. There are, of course,
12 numerous invertebrate lexemes in Dixon’s volume which contain not only scientific
13 identifications, but also pertinent cultural information. Such definitions are a valuable resource
14 not only for linguists and (ethno)biologists, but also for future generations of Yidiny speakers
15 who might wish to relearn the language of their ancestors. Nevertheless, a general trend that is
16 evident from a comparison of invertebrate definitions and the definitions for larger organisms
17 such as birds or mammals is a much greater level of precision and detail in the latter group.
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21 Lexicographers may struggle to invent unique definitions for suites of closely-related and
22 similar-looking organisms, eventually resorting to the use of imprecise terminology in the
23 defining language. In addition to the ‘grasshopper’ and ‘locust’ issue mentioned above, Dixon
24 also employs numerous English adjectives in his definitions that suggest to the reader, perhaps
25 incorrectly, that two named organisms differ from each other in a particular way. Thus,
26 locusts/grasshoppers may be described as ‘little’, ‘small’, ‘very small’, ‘big’ and ‘large’, and it is
27 unclear if a strict hierarchy of sizes is implied. One way of avoiding the uncertainty inherent in
28 such terminology is to explicitly ask native speakers to arrange a group of related organisms in,
29 for example, an increasing order of size, and to state the results of such an exercise in the
30 definition (along the lines of, say, ‘X is the second largest locust’). Dixon does sometimes
31 comment on the relative difference in size between two organisms, as in the following example:
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33	<i>ganyala</i>	large black scrub locust ...
34	<i>jujanyV</i>	a black locust, a little smaller than <i>ganyala</i>
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39 Following such a strategy indiscriminately can result in other unexpected problems, chief among
40 which is a mismatch between the lexicographer’s categories and the mental representations of
41 the native speaker (Reason 2) above). As discussed in section 5.3, closely-related organisms can
42 be distinguished by native speakers using a range of criteria, as in the case of the sugarbag names
43 in Kune and Rembarrnga (Section 4.1). Making a six-way distinction between the sugarbag types
44 using only one variable such as ‘entrance tube length’ or ‘hive location’ would likely result in
45 definitions that do not accurately represent native conceptions of the organisms in questions.
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50 Some of the features that consultants provide, when asked to describe an ethnospecies, appear to
51 be what cognitive psychologists call ‘characteristic features’ (e.g. the size of the hive for the
52 sugarbag *yurduppal*), and not ‘defining features’ (e.g. the location of the hive for the ground
53 sugarbag *len*) (Keil and Batterman 1984). To use a familiar English example *dog*, the fact that
54 dogs bark is a characteristic feature, but it does not seem entirely appropriate to define *dog* as ‘an
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3 animal that barks'. One would instead expect the definition of *dog* to begin with a more salient
4 feature, such as 'a companion animal'. A complication in the identification of an appropriate
5 defining feature is the observation that a single predictive feature may not exist for some
6 categories (Brooks *et al.* 2007). As a preamble to their own experimental study, Brooks *et al.*
7 state:
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10 ... what happens when people who have paid little attention to the basis of the
11 categorization of naturally occurring objects are asked an explicit question about
12 identification, such as 'how do you know an animal is a dog?' We intend to show that
13 they have to develop an explicit answer, probably for the first time, and that this answer
14 often is only loosely constrained by the criteria they actually used in their previous
15 identifications. (p. 2)
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19 It is probably fair to say that most native speaker consultants in field elicitation situations would
20 have 'paid little attention to the basis of categorization', in spite of being able to name and
21 categorize countless biological organisms effortlessly and consistently. The situation is identical
22 to that of English speakers who know instinctively that an animal is a dog. The well-intentioned
23 answers that language consultants provide in response to direct questioning may not all be the
24 'defining features' that should be given prominence in a dictionary entry. Much of what a native
25 speaker reports in relation to a question such as 'How do you know that this is *yurdu*?' will
26 consist of 'characteristic features', or what a linguist might call 'encyclopaedic information'. In
27 such situations, a lexicographer needs to play the role of not only linguist and amateur zoologist,
28 but also that of cognitive psychologist, trying to uncover in the native speaker's responses his/her
29 understanding of the original question.
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Table 1. Bee names in Kune and Rembarrnga. Six ethnospecies are listed in rows 1-6.

	Kune	Rembarrnga	Identifying features	Scientific ID
1.	<i>rdiwarrah</i>	<i>rdippu,</i> <i>birrkurda,</i> <i>birrkurdkurd</i>	no 'nose'; aggressive, small bees, high up; Yirridja	<i>Tetragonula hockingsi</i>
2.	<i>yurdu, bobbidj</i>	<i>yurduppal</i>	long 'nose'; big bees, Duwa	<i>Austroplebeia magna</i> (prev. <i>A.symeii</i>) ⁸
3.	<i>modjarnh, nabiwo</i>	<i>len</i>	lives in ground, tree stumps, termite mounds; small bees	<i>Tetragonula mellipes</i> (and others?)
4.	<i>man-yalk</i>	<i>jonggo</i>	short 'nose'; small bees	<i>Tetragonula mellipes</i>
5.	<i>lorlbbanh</i>	<i>jordok</i>	very long 'nose'; big bees	<i>Austroplebeia magna</i> (prev. <i>A.symeii</i>)
6.	<i>na-badyalk</i>	<i>gawurrwa</i>	lives in rock	<i>Austroplebeia essingtoni;</i> <i>Tetragonula mellipes</i>

⁸ Recently revised by Dollin et al (2015) (see also Dollin (2016)).

Table 2. Bee names in Gun-nartpa. Ethnospecies are proposed and aligned with biological species.

	Gun-nartpa term	Identifying features	Other notes	Scientific ID
1.	<i>diwarraman</i> , <i>diwarra</i>	no entrance tube; aggressive bees, high up; small amount of cerumen/resin and some royal jelly, honey is 'cheeky', Yirrichinga moiety	2015 consultants alternated between these two terms	<i>Tetragonula</i> <i>hockingsi</i>
2.	<i>woma</i> , <i>yurdupal</i> , <i>yurdu</i> , <i>bopich</i> , <i>yarrpany</i> , <i>bambir</i>	Entrance tube present; big bees, Jowunga moiety (~ Duwa), lots of honey, the best honey	The best Jowunga honey is called <i>woma</i> ; this term also functions as a generic. In 1993-94 senior speakers claim <i>yurdupal</i> as the correct Gun-nartpa term; 2015 consultants alternated between <i>yurdu</i> and <i>yurdupal</i>	<i>Austroplebeia</i> <i>magna</i>
3	<i>mojarn</i>	Nests in ground, tree stumps, termite mounds; small bees, inferior honey makes you thirsty; Jowunga moiety	Opposed to <i>yurdupal</i> (and its synonyms) and <i>diwarraman</i> in 1993-94	<i>Tetragonula</i> <i>mellipes</i>
	<i>gun-menambula</i>	Nests in the ground	Not mentioned in 1993-94 but contrasted with <i>yurdupal</i> and <i>diwarraman</i> in 2015.	
4	<i>jorduk</i>	Nests in small dead trees and trees with small cavities, not much honey	Contrasted with species 1-3 by one consultant in 2015.	? <i>Austroplebeia</i> <i>essingtoni</i>

Table 3. Bee names in eight Arnhem Land languages. Eight putative ethnospecies are listed in rows 1-8. Row 9 lists a handful of names which cannot be associated with the 8 ethnospecies due to conflicting information.

	Burarra/ Gun-nartpa	Dalabon	Ndjébbana	Djinang/ Wurlaki	Kun-barlang	Gurr-goni	Na-kara	Gupapuyngu	ID (provisional)
1.	<i>birrkuda</i> ¹ , <i>diwarraman</i> ² [Y, found in big trees ² , 'cheeky one' ^{1,2} , best wax for making implements ²]	<i>diwarrah</i> ⁴ , <i>belinjdan</i> <i>bu(r)lubbu(r)lu</i> ⁴ , <i>belinjdhahdjah</i> ⁶ [Y, type of sugarbag with 'cheeky honey'* ⁶ , tree sugarbag, honey in the hollow cavity of a broken branch, large hive with wide entrance, honey in the middle of the tree, has 'selfish bees'; cf. <i>diwadiwarrah</i> 'glassfish']	<i>káddeyana</i> ^{1,5} , <i>dílana ka-</i> <i>ndaburrúwang</i> <i>a</i> ¹ [Y, found inland, high up in stringybark trees in hollow tree trunks* ⁵ / broken branch cavities* ⁶ , the bees bite and 'swarm around one's eyes' ¹]	<i>ɲanitj</i> ¹ , (<i>ɲorrdambi</i>) <i>birrkuda</i> ¹ , <i>ɲorrdambi</i> <i>djarwarri</i> ¹ [Y, 'cheeky' sugarbag, short 'nose']	<i>kubburlak</i> ¹ <i>kubbulak</i> ^{6,7} [Y, found high up in trees ¹ , 'cheeky' bees ¹ , honey in a tree hollow ⁷]	<i>rdiwarraman</i> ⁸ [Y, honey from high up]	<i>wuna-</i> <i>ngayarda</i> ¹ , <i>na-</i> <i>kubbarliya</i> ^{1,9} [Y, 'cheeky' sugarbag]	<i>niwuda</i> ^{1,10} <i>birrkuda</i> ^{1,10} , <i>ɲanitj</i> ^{1,10} [Y, 'busy' hive on tree stump or branches ¹ , 'cheeky' bees ^{1,10} with darker wax ¹ , mostly found on the mainland ¹]	<i>Tetragonula</i> <i>hockingsi</i>
2.	<i>yurrupal</i> ^{1,2} , <i>bopich</i> ² , <i>yarrparn</i> ² , <i>bambir</i> ² [found in stringybark, paperbark, woollybutt trees ² , has an entrance tube ^{1,2} , wax is no good ²]	<i>yurduh</i> ⁴ , <i>yurdubbal</i> ⁴ [D, Y*, long 'nose' sugarbag found in trees, lots of honey]	<i>bóbbidj</i> ⁵ , <i>ngárrabba-</i> <i>kkáddaworna</i> ^{1,5} ⁶ [D, high up in stringybark and woollybutt trees ⁵ , honey in medium branches in the top of the tree ⁶]	<i>djarwarri</i> ¹ in Djinang, <i>yarrpany</i> ¹ in Wulaki, <i>marrdambuj</i> ¹ , <i>ɲorri</i> <i>marrgololɔŋ</i> ¹ [D, 'quiet' bees, medium to long 'nose']	<i>kardderre</i> ^{1,6} , <i>bobbidj</i> ^{1,6} [D, long 'nose' ¹ , lives in trees ⁶ , honey in banches ⁷ , big honey in trees ⁷]	<i>bopitj</i> ⁸ [D, honey from high up]	poss. <i>wuna-</i> <i>djawa-kuna</i> ⁹ [no description]	<i>yarrpany</i> ^{1,10} [D, 'slow- moving' bees with lighter- coloured wax ¹ , found on trees on islands, but mostly on the mainland ¹ , long 'nose' ^{1,10} with 'creamy']	<i>Austroplebeia</i> <i>magna</i> (prev. <i>A. symei</i>)

								honey ¹	
3.	<i>mojarn</i> ² [honey inside antbed] <i>gun-menambula</i> ² [ground honey]	<i>modjarngh</i> ⁴ , <i>modjarnh</i> ⁴ [ground sugarbag (also in antbeds, boles of termite-eaten stringybark trees)]	<i>barlúya</i> ^{1,5} , <i>nbarlúyara</i> ⁶ [D, honey from the ground ^{1,5,6}]	<i>nambidi</i> <i>djarwarri</i> <i>wendebi/</i> <i>wendemirri</i> ¹ [D, honey in the ground or in antbeds]	<i>narrambareng</i> ^{1,6,7} [honey from ground, antbeds, tree stumps, rocks ^{1,6,7}]	<i>git-gi-djel</i> ⁸ [honey from the ground at the base of a tree]	<i>ngunidjdjávkk-una</i> ¹ [ground sugarbag]	<i>bangitj</i> ^{1,10} [ground sugarbag ^{1,10}]	<i>Tetragonula mellipes</i> (and others?)
4.		<i>yalk</i> ⁴ [D, small, not much honey]	<i>nalyángkurrk</i> ^{1,5,6} , <i>búrrburr</i> ^{1,5,6} [D, honey in woollybutt trees, honey in skinny outer branches respectively* ⁶ , honey high up in branches* ⁵ , short 'nose' ¹]	poss. <i>dambuy</i> ¹ [very short 'nose']	<i>man-yalk</i> ^{1,6} [short 'nose' ¹ , lives in skinny branches ^{6,7}]		<i>burrburr</i> ⁹ [no description]	?	<i>Tetragonula mellipes</i>
5.	<i>jorduk</i> ² [honey found in skinny branches, narrow hollows], poss. <i>gurdarri</i> ¹ [long entrance tube]	<i>lorlbban</i> ⁴ , <i>dedjbornko</i> ⁴ [D, no description, poss. 'very long nose' (cf. Table 1)]							<i>Austroplebeia magna</i> (prev. <i>A. symei</i>)
6.		<i>nawaran</i> ⁴ [hive with long 'nose' found in rock, can be either D or Y; also name for Oenpelli python]	<i>manbírned</i> ⁶ [D, high in the escarpment country ⁶ (rock bees)]				<i>nbúrda</i> ^{1,9} [sugarbag found in rocks ¹]		<i>Austroplebeia essingtoni</i> ; <i>Tetragonula mellipes</i>
7.						<i>djordorr</i> ⁸ [D, honey from hollow logs]			?

8.	<i>ngorawana</i> ¹ <i>ngu-rowuna</i> ³ [coastal variety of honeybee ³]		<i>nganawálwala</i> ⁶ , <i>nawálwala</i> ⁶ [D, honey in mangroves]		<i>gut-gu-wurru</i> ⁸ [Y, mangrove honey]			<i>milniri</i> ¹ [smallest bee, lives in coastal paperbark trees, also found on islands ¹]	? Possibly also <i>Tetragonula mellipes</i>
9.			<i>karónmanja</i> ^{5,6} [D, honey in branches – biggest* ⁶ , honey in the roots of eucalyptus trees* ⁵]		<i>burnerrng</i> ¹ , <i>bunerr</i> ⁷ [D, honey in tree trunk* ¹ , honey in small horizontal branches of a tree* ⁷]				?

Superscripts indicate data source. 1: Author Si's field notes, 2: Carew (unpublished) Gun-nartpa/Burarra dictionary and field notes, 3: Glasgow (1994), 4: Evans *et al.* (2004), 5: Green *et al.* (2007), 6: Coleman (unpublished) Comparative word lists, 7: Coleman and O'Keefe (2010), 8: Green and Nimbadja (2015), 9: Eather and Kalamirnda (2005), 10: Greatorrex (2015). Text inside square brackets indicates salient features of the honey(bee)/hive; source not mentioned if unambiguous. D: Duwa/Djówanga moiety, Y: Yirridjja/Yirringa moiety (see footnote 3); * indicates inconsistency between sources or within a source.

Figure captions

Fig 1. Map showing approximate locations of the Arnhem Land languages investigated in this paper. Outline maps sourced from the University of Melbourne Library homepage (http://library.unimelb.edu.au/collections/map_collection/map_collection_outline_maps).

Fig 2. Sugarbag nest entrances photographed at Buluhkaduru, Arnhem Land. a.-c. *lorlbban*; a. and c. entrance tube of the same nest photographed in 2013 and 2014; b. close up of the distal end of the 2013 tube, showing a green ant; d. *rdiwarrah* in a high branch; e. *yurdu*.

Fig 3. Sugarbag nest entrances photographed around Maningrida and Korlobidahdah. a. *na-bardyalk*, nest of *Austroplebeia essingtoni*, b. *na-bardyalk*, nest of *Tetragonula mellipes*, c. *man-yalk*.

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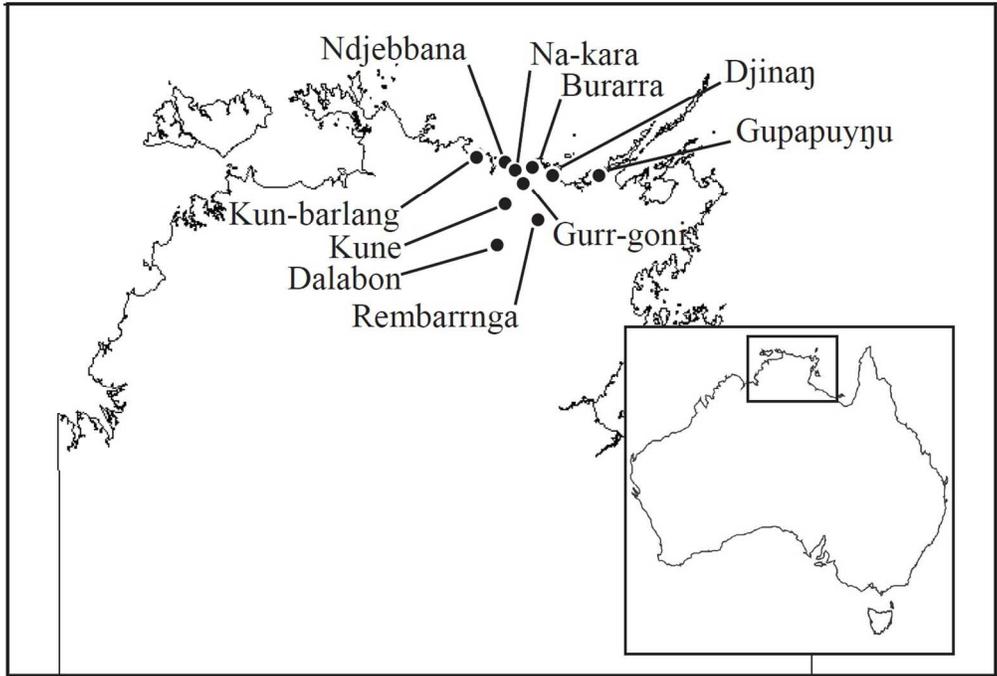


Fig 1. Map showing approximate locations of the Arnhem Land languages investigated in this paper. Outline maps sourced from the University of Melbourne Library homepage (http://library.unimelb.edu.au/collections/map_collection/map_collection_outline_maps).

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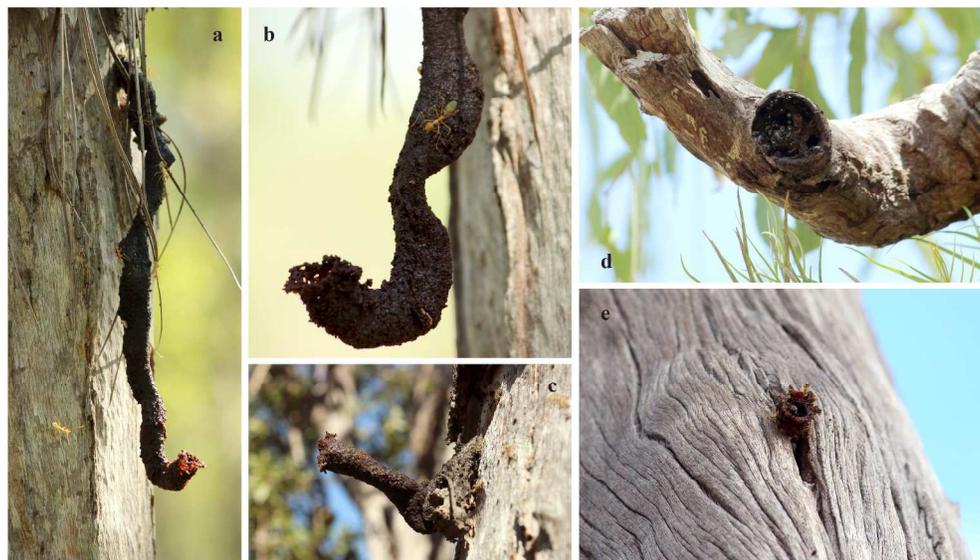


Fig 2. Sugarbag nest entrances photographed at Buluhkaduru, Arnhem Land. a.-c. lorlbban; a. and c. entrance tube of the same nest photographed in 2013 and 2014; b. close up of the distal end of the 2013 tube, showing a green ant; d. rdiwarrah in a high branch; e. yurdu.

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Fig. 3. Sugarbag nest entrances photographed around Maningrida and Korlobidahdah. a. na bardyalk, nest of *Austroplebeia essingtoni*, b. na-bardyalk, nest of *Tetragonula mellipes*, c. man-yalk.

662x469mm (96 x 96 DPI)

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