Women are not dangerous things: Gender and categorization[*]

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1.   Introduction

Much work on noun class/gender[1] systems has focused on the role of semantics in the assignment of nouns to classes. Sometimes the semantics responsible for noun class assignment is rather straightforward and based on general, superordinate categories such as "human", "animate", "female", which are known to be foundational in developmental psychology. Sometimes, however, the kinds of semantic categories used to account for noun class composition are of a very culture-specific, complex nature (for an overview of the relevant literature, see Craig 1986; Corbett 1991:307-24).

Before appealing to complex semantic and cultural information involved in noun classification it is helpful to gauge the extent to which this information is available to speakers, and in particular to those trying to get a toehold in the system. Young language learners do not yet have access to much of the abstract and culture-specific information, and may have substantial difficulties learning a noun classification system based on such knowledge. To the extent that language change is driven by children acquiring language, we should expect to see that the kind of information to which children have access plays a significant role in the structure and development of a language.

In this paper, we examine a well-known case of exotic noun classification and argue that its development and operation can be accounted for on the basis of a small number of semantic features and the morphophonemic similarities of items and their type/token frequency, without recourse to complicated semantics. Enter Dyirbal, the main character of this study.

2. Data: Dyirbal noun classes

Dyirbal is a Pama-Nyungan language of Australia (Dixon 1972). It has four noun classes (genders), which are manifested in agreement with the demonstrative or 'noun marker'. Demonstratives also show case concord and differentiate between proximal, medial, and distal deixis. For medial deixis, the class markers are as follows:

Table 1: Dyirbal noun class markers, medial deixis

	Absolutive	Ergative	Dative	Genitive
Class I	*bayi*	*baŋgul*	*bagul*	*baŋul*
Class II	*balan*	*baŋgun*	*bagun*	*baŋun*
Class III	*balam*	*baŋgum*	*bagum*	---
Class IV	*bala*	*baŋgu*	*bagu*	*baŋu*

Moving on to the composition of noun classes, Dixon 1972 presents the following list of concepts associated with each class and suggests that such a heterogeneous list might indicate that the noun classification lacks any principled basis. However, he also notes that speakers have little variation in class assignment and immediately assign loan words to a class. The breakdown of concepts by classes is shown in Table 2.

Table 2: Distribution of concepts across noun classes in Dyirbal (Dixon 1972:307)

I (*bayi*)	II (*balan*)	III (*balam*)	IV (*bala*)
men	women		parts of the body
kangaroos	bandicoots		meat
possums	dog		
bats	platypus, echidna		
most snakes	some snakes		
most fishes	some fishes		
some birds	most birds		
most insects	firefly, scorpion, crickets		bees and honey[2]
	hairy mary grub		
	anything connected with fire or water		

moon	sun and stars		wind
storms, rainbow			yamsticks
boomerangs	shields		
some spears	some spears		some spears
	some trees	all trees with edible fruit	most trees
			grass, mud, stones
			most noises, language

This table shows a very complex, complicated system, which poses a serious challenge to any learnability model. Even if we set young learners aside, the storage and access of such a classification seem challenging even for an adult speaker. Therefore accounting for such a system is particularly important for our understanding of noun categorization in natural language. A plausible account should try to explain the principles underlying the system, and also make predictions for the classification of new words entering the lexicon. Dixon and several authors after him have proposed a purely semantic account of the Dyirbal noun class system, to which we turn in section 3.

3.   The semantic account of gender assignment in Dyirbal

The existing accounts of Dyirbal noun classes, proposed by Dixon (1972), Lakoff (1987), Mylne (1995), and Harvey (1997:19-24), all emphasize the conceptual underpinnings of the classification.

To account for the distribution of concepts across the four noun classes in Dyirbal (Table 2), Dixon suggests that class membership in Dyirbal is best explained through the interaction of some basic (core) concepts associated with the various classes and a set of overriding rules. The core concepts are (Dixon 1972:308):

(1)   Core semantic concepts in Dyirbal noun classification
        Class I: animacy, (human) masculinity
        Class II: (human) femininity; water; fire; fighting[3]
        Class III: edible plants (nonflesh food)[4]
        Class IV: everything else (residue)

Although in theory the association between core concepts and noun classes could be quite straightforward, in actuality nouns are assigned to classes subject to a set of conceptually based rules. These rules override the general principles of class assignment listed in (1); in other words, the principles in (1) represent the default conditions, whereas the overriding rules allow for a more fine-grained noun-to-class network, based on more specific conditions.

At this point, we will present the overriding rules followed by examples of their application.[5]

(2)   *Rule 1 (Myth-or-belief)*: If a noun has characteristic X (on the basis of which its class membership would be expected to be decided) but is, through belief or myth, associated with characteristic Y, then generally it will belong to the class corresponding to Y, not to X.

For example, most birds are in class II because they are thought to be spirits of dead women. However, willy wagtails, which as birds should be in class II, are instead in class I because they are believed to be mythical men. Several other birds are also assigned to class I based on such mythical connections. (Dixon 1972:308)

(3)   *Rule 2 (Domain-of-experience):* If there is a basic domain of experience associated with A, then it is natural for entities in that domain to be in the same category as A (Lakoff 1987:93).

To illustrate, plants tend to be in the elsewhere class in Dyirbal (class IV), but plants that have edible fruit are in class III with the fruit they yield.

(4)   *Rule 3 (Important-property):* If a subset of referents has some particular important property that the rest of the set does not have, then the members of that subset may be assigned to a different class from the rest of the set, to 'mark' that particular important property. In Dyirbal, the important property is often [+harmful].

For example, most types of fish are in class I; however, harmful ones (stone fish, toadfish) are in class II. Similarly, harmful (stinging) trees are in class II, with the harmful fish, but all other trees without edible fruit are in class IV.

Following Dixon's analysis, Lakoff (1987) proposes a description of the Dyirbal gender system based on the notion of a radial category. Within a radial category, a particular element that has most of the defining characteristics of that category serves as the prototype. Other elements are assimilated to the prototype on the basis of their perceived resemblance to the prototype, but they do not have to actually share the criterial features of that prototype. The more peripheral members are linked to the prototype, and these links can be motivated by certain principles. Taken together, the members of a category thus form a radial structure, with the most representative, or prototypical, members located at the center, and with less representative outliers clustered around this hub.

In the case of Dyirbal class II (containing 'women, fire, and dangerous things'), the core is human females (Lakoff 1987:100-1). The links to the core are achieved in the following manner: the sun is a female deity and is married to the moon (which is in class I, as a male). The sting of the hairy mary grub hurts like a sunburn; thus, it is linked to the sun. All items related to fire (fire, matches, and pipe) are linked to the sun as well. The firefly is linked to fire. Stars and light are associated with and linked to fire, and through it to the sun.

Birds are in the female class because they are spirits of dead women. (And some birds are in class I because they are spirits of dead men.) Crickets in myth are 'old ladies' and they are in the female class.

Since women are related via myth to the sun and the sun via domain-of-experience is related to fire, women and fire end up in one class. Since fire is dangerous, other dangerous things should be in the same class. This brings in water and fighting.

So far, we have applied the myth-or-belief rule and the domain-of-experience rule. Now comes the important-property rule (4): because something is 'harmful', it is placed in a separate class from all other members of its subset. Thus, most fish are in class I, but harmful fish are in class II. In other words, noun class distinctions can be used to underscore differences in some critical characteristic (see Zubin and Köpcke 1986 for a similar principle in the analysis of German gender assignment).

Mylne (1995) modifies Lakoff's account to make it more culture-specific, and sensitive to the semiotics of the traditional aboriginal society. However, despite these modifications the analysis remains largely semantically driven and expands the notion of the prototype. Thus, theoretically, it is not very different from Lakoff's account. And in another drive toward a more culture-specific account, Harvey (1997:24) proposes an ontology in which natural concepts such as [human], [force of nature],

[edible] are associated with particular environments (air, tree, water, ground), with further classifications built on such associations. While the details of his proposal may differ from the others discussed here, the spirit is very similar: pick a salient concept and build a radial category by various semiotic links to this concept.

If the rules described above applied satisfactorily and if the radial category account were comprehensive and had predictive power, then one could conclude the investigation of the Dyirbal noun classification. However, the rules do not apply in any systematic way and, as they are, seem to act more as after-the-fact generalizations than operational principles (see also endnote 14). The radial category account fails to motivate the links in an unambiguous and predictive manner. Most importantly, if links between members of a radial category require specific cultural knowledge and often have to be explained at length, it raises the crucial question of learnability: how does a young learner acquire all these links and relations? In our view, the opacity of links inside the presumed radial category suggests that an alternative account would be desirable.

Crucially, in their discussion of the Dyirbal genders, the previous authors rarely mention the actual lexical items occurring in Dyirbal—instead, they deal only with semantic concepts and the referents of the lexical items. In other words, they have not tried to find any connection between the form of the Dyirbal words appearing in a certain class before turning to the words' semantics. Given that learners are known to be very sensitive to formal cues from infancy (Saffran 1996, Newport and Aslin 2000, 2004; Hudson Kam and Newport 2005), and that young learners tend to regularize inconsistent input based on segmental information, it is important to give formal cues the credit they deserve before turning to complicated semantic cues. In addition, if formal cues were shown to fail then the categorizing power of conceptual structure could be validated even more forcefully than in the earlier accounts presented here.

In what follows we will attempt to explain Dyirbal noun classification differently, and our results will be compatible with the very general features that are found in gender systems all over the world. In a nutshell, we will portray Dyirbal as a much less exotic language as far as notional motivation for gender is concerned. In particular, we will argue for a combination of formal and semantic cues in Dyirbal gender assignment, bringing its gender classification much closer to the familiar systems around the globe. Before discussing these issues in section 5, we will address the diachrony of gender classification in Dyirbal.

4.   Where have Dyirbal noun classes come from?

4.1   Noun classification in related languages

In the Pama-Nyungan family the category of gender is extremely rare, although there are numerous instances of languages with classifiers. In fact, only the Pama-Nyungan languages spoken along the coastal strip from North Queensland in the north down to Banjalang in the south have gender; all languages in the area without gender systems possess classifier systems. Classifiers are specialized grammatical words which typically or obligatorily form a single constituent with a certain type of noun phrase, and apply to potentially open-ended classes. The choice of the classifier is determined by the semantic/pragmatic characteristics of the head noun or by the actual properties of its referent. From a grammatical viewpoint, classifiers differ from gender in that they are not manifest in agreement and are much more sensitive to the shape or function of the referent.

Yidiny (Dixon 1977), Wargamay (Dixon 1981), and Nyawaygi (Dixon 1983), all close to Dyirbal both geographically and genetically, do not show any evidence of gender, but do have classifier systems. For example, in Yidiny, the following classifiers are attested:

(5) Yidiny classifiers: main items (Dixon 1977; 1980)
mayi	'edible plant'
minya	'edible meat'
jugi	'tree'
yarruy	'bird'
munyimunyi	'ant'
bana	'liquid'
gugu	'any purposeful noise (incl. language)'
wirra	'any moveable object'

Another closely related language, Guugu-Yimidhirr, has classifiers (generic nouns, per Haviland 1979:102) for some, but not all, nouns:

(6) Guugu-Yimidhirr classifiers
mayi	'vegetable food'
minha	'edible meat'
mula	'honey, bee'
yugu	'tree, wood'
guudyu	'fish'
galga	'spear'

All of this suggests that classifier systems may be an areal feature, which might have been enhanced by contact with the prefixing languages of Arnhem Land (on trade contact in Australia, see Berndt and Berndt 1985:16-8); those languages also have developed classifier systems.

In the related languages with classifiers, these classifiers show material similarities, suggestive of very close genetic relationships among these languages (compare the forms in (5) and (6) above). The cognate classifiers do not reveal classes based on myth, belief or experiential domains but rather show standard classificatory systems based on the appearance, function or use of a particular referent.

Since all of the languages around Dyirbal have classifiers, it is likely that those languages with gender, such as Dyirbal and Banjalang (discussed below), developed their gender systems out of earlier classifier systems. Such a development is consistent with independently attested cases of genders developing on the basis of classifiers (Corbett 1991:310-312).

As mentioned above, although gender is rare in this part of Australia, Banjalang, another language related to Dyirbal, also has genders. In Banjalang, the composition of the genders depends on the individual dialect and is as follows:[6]

(7)   Banjalang genders (Crowley 1978:43-52)
        a.   Minjangbal dialect:
                Class I   male humans
                Class II   female humans
                Class III   animals and places
                Class IV   everything else

        b.   Casino dialect:
                Class I   male humans
                Class II   female humans
                Class III   trees
                Class IV   everything else

        c.   Gidabal dialect:
                Class I   masculine
                Class II   feminine
                Class III   trees
                Class IV   everything else

The similarities between the Dyirbal classes and the Banjalang classes are strong. In both languages, male humans and female humans are placed in separate classes. As is common with gender systems, both languages possess an elsewhere class, into which all nouns that do not fall into one of the other classes are placed. Although the semantic characteristics of the nouns that fall within the final group in Dyirbal and the Banjalang dialects is not identical, the classes of items covered are similar; while the Casino and Gidabal dialects of Banjalang place trees in class III, the corresponding class in Dyirbal contains edible, non-meat items and the trees that bear them. For our purposes, it is important to note that Banjalang noun classification is quite straightforward and does not seem to require complex semantic rules, such as those proposed for Dyirbal in (2)-(4) above.

4.2   The development of noun classification in Dyirbal

In addition to the evidence for classifier systems in languages closely related to Dyirbal, Dyirbal itself provides evidence of its former classifier system. Dixon and Koch (1996:44) note that the Dyirbal gender system is a relatively recent development, as confirmed by the relatively infrequent use of noun class markers in Dyirbal song poetry.

The first piece of internal evidence that Dyirbal's noun classes resulted from a former classifier system was noted by Dixon (1972). Recall that Dyirbal has four noun classes; these class markers have the endings *-l, -n, -m* and *-Ø*, respectively (Table 1), and these markers carry over to the other demonstratives. With the exception of the class III ending, *-m*, seen in *balam*, the origin of the Dyirbal noun class endings is unclear (Dixon 1972:352-3). However, the origin of the *-m* ending of *balam* is transparent (Dixon 1972:353-4): *balam* resulted from the merger (univerbation) of the demonstrative *bala* and *mayi*, the generic noun or classifier for non-flesh food. The other noun class endings may have originated in a similar manner, through the combination of the demonstrative and a relevant classifier which followed it.

The members of Dyirbal's four noun classes also provide indirect evidence of the classifiers that once existed in the language. The nouns in our sample fell into the semantic groups shown in (8):[7]

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(8)   Semantic groups associated with Dyirbal noun classes
        Class I: male humans, non-human animates
        Class II: female humans, birds, stinging things, inanimate
                         nouns related to fresh water or fire
        Class III: edible (non-meat) inanimates
        Class IV: everything else

As discussed above, the categories 'male humans' and 'female humans' are the core members of two of the four noun classes found in Banjalang. In addition, each of the additional semantic groups found in the Dyirbal noun classes corresponds to a classifier found in a closely related language.

Non-human animates. Although Banjalang does not place male humans and non-human animates into a single noun class, non-human animate nouns are a relevant group for gender classification in the Minjangbal dialect of Banjalang; while class III nouns in the Casino and Gidabal dialects of Banjalang contain trees, in the Minjangbal dialect class III contains animals and places.

In addition, the Yidiny classifier *minya* is used with "edible animals", including "many nouns referring to non-human animates, e.g. species of snakes, guanas, frogs, possums, bandicoots, kangaroos, grubs, fishes, birds, etc." (Dixon 1972:481) Only edible animals, fish and insects fall within the scope of the classifier. Thus, some, but not all, poisonous snakes are classified under *minya*. The garfish is classified as edible, while the stonefish and toadfish are not. Dixon (1972:481) notes that "[o]ne potential source of meat, the dog, could never be called *minya*; people in all parts of Australia felt a close relationship to the dog (sometimes including it within the kinship system) and certainly the Yidiny would never have considered eating a dog."

Recognizing that the original Dyirbal classifier was limited to edible meat items provides an insight into the composition of classes I and II that cannot be derived synchronically. Although class I is the default class for non-human animates, certain animates appear in class II; many of the animates placed in Dyirbal class II—including 'dog', 'stonefish', 'toadfish', 'cricket' and certain poisonous snakes—are similarly excluded from the scope of *minya*. The differences between the scope of *minya* and class I—for example, 'garfish' is included within the scope of *minya* but is found in Dyirbal class II—are due to the increasing opacity of the original basis for assignment to class I *vs.* class II, which led to a subsequent

reanalysis of class I as the default class for non-human animate nouns. Some nouns were presumably reassigned from class II to class I based on the new, perceived semantic basis for assignment, while other nouns were drawn from one class into another due to formal similarities to other forms, and while still other forms were able to resist reassignment due to formal features shared with other members of their class.

Birds. Most bird names are in class II, and Yidiny provides evidence for a 'bird' classifier that most likely underlies the separation of birds from other non-human animates. The Yidiny classifier *jarruy* is used with all birds other than the giant flightless cassowary; Dixon (1977:485) notes the classifier includes all other birds, including birds with distant mythic roles. Although a clear cognate of the Yidiny form is not in our sample, *jarrugan* 'scrub hen' appears to be derived from the Dyirbal cognate, possibly consisting of *jarru-* 'bird' and the feminine suffix *-gan*; we will examine the role of this suffix in detail in section 5. The existence of this classifier raises the question of which came first, the merger of the nouns that occurred with the [+bird] classifier and those that took the [+female] classifier, or the Dyirbal myth that birds are the spirits of dead women. Although this question may be unanswerable, it is clear that at some point in the development of Dyirbal, [+bird] ceased to be a relevant semantic label.

Stinging entities. A number of nouns indicating animate and inanimate things capable of inflicting a harmful sting are found in class II, including those nouns set forth in (9) and (10):

(9)   Animate nouns:

bima	'death adder'
jaŋgan	'stonefish'
juruŋun	'toadfish'
gumbiyan	'echidna'[8]
yunba	'water python'[9]

(10)   Inanimate nouns:

bumbilan	'stinging nettle'
jaŋali	'small stinging tree'
duŋan	'stinging tree'
giyarra	'big softwood stinging tree'

Yidiny similarly possesses a classifier for stinging animate and inanimate nouns. In the coastal dialects of Yidiny, *jama* is used with stinging trees, dangerous snakes, centipedes, and various other items, including medicine, due to its unpleasant taste; however, Dixon also notes that *jama* is most commonly used to refer to snakes, and sometimes seems to be used as a generic term for 'snake'. (Dixon 1977:494) The tablelands dialects use the classifier *wirra* rather than *jama*, but with the range of entities in the class is the same. Despite Dixon's claim that the classifiers *wirra* and *jama* referred "effectively to 'dangerous thing'" (Dixon 1977:494), we believe that the actual unifying characteristic is the ability to cause harmful stinging. The classifier appears to be used with a very limited subset of items that pose danger or are capable of causing harm, but the subset of items covered by *jama* all appear to be capable of stinging the Dyirbal in a harmful way.

Water and water-related items. The water-related items found in class II include the following nouns:

(11)   *bana*   'fresh water'
        barin/bariny   'whirlpool'
        binda   'waterfall'
        burba   'swamp'
        gamu   'water'
        malan   'river'
        nuba   'water bag, tree from which water bag is made'

Just as class III, which is limited to edible items, shows the importance of a [+edible] label, we propose that Dyirbal originally had a 'potable' classifier. We propose that members of that class merged with feminine nouns in class II. The evidence for such a class comes from the availability of similar classes in other Australian languages as well as from Dyirbal-internal facts.

Starting with external evidence, Murrinh-Patha, a Daly language of Australia, possesses just such a classifier: *kura*, which is used with "fresh water and associated concepts, as potable fluids, … and different collective terms for fresh water like 'rain' or 'river'." (Walsh 1993:109) Examples of nouns placed in the 'fresh water' class follow:

(12)   *kura ngipilinh*   'creek, river'
        kura yelyel   'rain'
        kura thurrulk   'beer (=foam water)'

Walsh speculates that Murrinh-Patha possesses this classifier due to the prominent place held by fresh water in Murrinh-Patha culture. Like Dyirbal, Murrinh-Patha possesses a classifier for non-meat edible items; thus, both languages show a semantic class for edible items, and we propose that both also possess, in the case of Murrinh-Patha, and possessed, in the case of Dyirbal, classifiers for fresh water, or potable, items.

Next, Yidiny provides additional evidence for the classifier that we propose for Dyirbal. Dixon (1977:481) states that the Yidiny classifier *bana* applies to "basically 'any drinkable liquid'", including the words for 'fresh water', 'river', 'swamp', 'tide', and 'beer', and notes that "the use of *bana* with *biriny* 'salt water' was something of an embarrassment" for his informants. The Dyirbal cognate of Yidiny *bana* is found in class II: *bana* 'fresh water'.[10]

The proposal that Dyirbal originally had a class of [+fresh water] items is further supported by the assignment of *banjin* 'salt water, sea' to class IV, which neither Dixon nor Lakoff discuss.[11] The assignment of 'salt water, sea' to class IV demonstrates either the break-down of the semantic-based system that Lakoff and Mylne wish to find in Dyirbal, or the existence of an earlier small class of [+fresh water] items, which never included *banjin* in the first place. Without evidence that *banjin* was ever assigned to class II, we find the latter explanation more convincing and parsimonious: it requires a simpler, more coherent semantic subclass and no reassignment of class for *banjin*.

Inanimate nouns related to the concept of fire. The fire-related words found in class II can also be traced to a separate classifier in the former system. The fire-related items found in class II include:

(13) *bugan*   'brush fire'
      buni   'fire'
      jidu   'tree species, and lighted torch made from the tree'
      jilin   'coals'
      jilman   'firestick'

Again, both Murrinh-Patha and Yidiny reveal that fire-related items are sufficiently distinct and relevant to form a semantic class serving as the basis for a classifier. As we propose for Dyirbal, Murrinh-Patha possesses a classifier for fire and things associated with fire, namely *thungku* (Walsh 1993). Examples of its use are shown in (14):

(14)   *thungku thay*   'firestick; firewood'
         thungku len   'hot coals'
         thungku methith 'matches'

Among Yidiny's classifiers is *buri*, which is used with "nouns referring to fire, sparks, charcoal, a light, etc." (Dixon 1977:481). These are precisely the nouns found in Dyirbal class II. The exclusion of 'sun' and 'lightning' from the scope of the Yidiny classifier makes the correspondence even more certain: 'sun' and 'lightning' are both class I nouns in Dyirbal. Again the Dyirbal cognate to the Yidiny classifier is found alive and well in class II: *buni* 'fire'.

Although only the semantic groups described above remain in Dyirbal at the time of Dixon (1972), the original classifier system likely contained many more classifiers that can no longer be identified as synchronic semantic classes. The number of classifiers in a typical classifier system is much higher than the usual number of genders found in a gender system. For example, Mandarin has over forty classifiers, although some of them are very rare (Erbaugh 1986); adult Japanese has several dozen classifiers (Matsumoto 1993), and Thai has over sixty (Hundius and Kölver 1983). Similarly, Dixon (1977) identifies 23 classifiers in Yidiny.

Gender systems can develop from classifier systems through the collapse of a larger number of classifiers into a smaller number of genders, with generic nouns such as 'woman', 'man, and 'animal' serving as class cores (Corbett 1991:311-312, 317). During the development of the Dyirbal classifier system into the present gender system, different classifiers merged to create each noun class. Although classifiers themselves are semantically based, the composition of the genders resulting from such a merger are not necessarily driven by the semantics of the classifiers; although one may expect classifiers for clearly semantically related concepts (such as 'edible' and 'potable') to merge, semantically unrelated classifiers may merge based on shared formal features or for no clear reason.

The correspondences between the classifier classes identified above and the resulting noun classes in Dyirbal are as follows:

(15)   Dyirbal classifier classes > Dyirbal noun classes
         Class I   [+male], [+edible animate]
         Class II   [+female], [+bird], [+fire], [+fresh water], [+stinging]
         Class III   [+edible non-animate]
         Class IV   everything else

The merger of several of the classes we have identified can be motivated straightforwardly based on the semantic characteristics involved. As we will discuss below, [+male] and [+female] appear to be the semantic cores of classes I and II, respectively, as in Banjalang, and the distinction between animate and inanimate nouns in Dyirbal is strong. All animate nouns fall within classes I and II; while classes I and II contain some inanimate nouns, no animate noun appears in class III or class IV. Accordingly, it appears that animacy was likely a driving factor in the development of the noun class system.

Focusing on *animate* nouns, a merger of the [+male] class with the [+edible animal] class led to the exclusion of those animate nouns that are not edible. Since only two classes, I and II, include animate nouns, this entailed that animates which were not [+edible animal] ended up in class II: any other animals that were not identified as 'edible', including dogs, flies, grasshoppers, spiders, and worms, were placed into class II. Similarly, animates capable of inflicting a harmful sting were not identified with human females, but were placed in class II due to their animacy. As non-edible animals, they could not be placed in the other animate class, class I; this left only class II available, and the entire set of [+stinging] items was drawn into class II.

However birds are a problem for this proposal: they are included within the scope of the [+edible animate] classifier, for example, in Yidiny, but they are in class II, rather than class I as expected. This may indicate that the merger of birds with human females occurred at an early stage during the collapse of the classifier system, possibly due to formal attraction or analogy, or the early identification of birds with the spirits of dead human females.

One possible attractor is the feminine suffix, -*gan*, which is found in a number of languages on the east coast of Australia (see Dixon 1972:12-13 for references), including Banjalang (Crowley 1978:37). As mentioned above, Dyirbal *jarrugan* 'scrub hen' appears to be derived from the Dyirbal generic noun or classifier corresponding to the Yidiny classifier *jarru*, possibly consisting of *jarru*- 'bird' and the feminine suffix –*gan*.

Identification of the ending *gan* with the feminine suffix *–gan* could easily have led to the form being attracted into the class for human females.

Other bird names in our sample contain formal features identified with class II. In assigning gender to a new noun, a speaker may classify it on the basis of formal similarity with familiar nouns (rather than semantics), especially if the initial or final segments of the noun resemble a pattern than a speaker recognizes as associated with a particular class. In addition to the salient suffix *–gan*, a crucial role in formal analogy belongs to stressed segments. The role of stressed segments in the division of nouns into classes is well-known from familiar Indo-European languages; for instance, Latin or French gender assignment can be successfully explained by appealing to stressed endings (Corbett 1991: Ch. 2, 3; Tucker et al. 1977; Lyster 2006). In Dyirbal, the stress is invariably on the first syllable, and we find strong evidence indicating that the initial syllable played a role in creating formal analogy that could facilitate class mergers.

For example, *yimalimal* 'welcome swallow' begins with *yi-*, which is strongly correlated with class II and is the initial syllable of *yibi* 'woman'; all animate nouns in our sample with the initial syllable *yi-* are placed in class II.[12] In addition, several bird names begin with *bi-*, which is also strongly correlated with class II membership, likely due to the association with the form *bibi*, which appears in various Pama-Nyungan languages with the meaning 'woman', 'mother' or '(female) breast' (O'Grady 1998). 'Whistle duck', 'large parrot', and 'white ibis' all begin with *bi-*. We will discuss each of these formal features in detail in section 5, but we would like to emphasize that the existence and salience of these features was probably the initial motivation for the classification of birds with human females.

Of the *inanimate* classes, the class of edible inanimate items was clearly the most salient, as attested by its status as the sole semantic class found in class III. As with the merger of names for birds and human females, we propose that the merger of fire- and water-related items with the other members of class II was due to existence of formal attractors and not any semantic identification between human females and fire or fresh water. For example, *bugan* 'brush fire' ends in *–gan*, which is identical to the feminine suffix *-gan*. Likewise, *binda* 'waterfall' begins with *bi-*, which we have also identified as a formal feature associated with class II (see section 5).

Formal features allow us to directly account for two of the prime examples for the "domain-of-experience" rule in (3): *garri* 'hairy mary grub' and *yarra* 'fishing line'. Although we would expect to find *garri* in class I, the default class for animate nouns, it appears in class II. Dixon

(1972:310) explains its classification as due to its semantic association with the sun, noting that "its sting is said to feel like sunburn". However, Dixon makes nothing of the exact correspondence between the forms *garri* 'sun' and *garri* 'hairy mary grub', or that this correspondence provides a more direct explanation for the class assignment. Put more directly, we propose that *garri* 'hairy mary grub' is not a class II noun because its sting is similar to the effect of spending too much time in the *garri* 'sun', but because its form is identical to *garri*.

In fact, recognizing that formal attraction led to the placement of both nouns in class II allows us to explain the assignment of *garram* 'garfish' to the same class. Although most fish are assigned to class I, a few fish, including garfish and stonefish, are assigned to class II, which Dixon and Lakoff attribute to the operation of the important-property rule, provided in (4); under their analysis, a subset of fish possess an important property ("harmfulness"), and this property is marked by placing these fish in a different class from other fish. However, while stonefish are, in fact, harmful, garfish are not; no Australian garfish species is known to be dangerous or harmful, although the members of one species are "described as 'pugnacious … but are incapable of inflicting anything like a serious wound'". (Mylne 1995:395) This and certain other assignments of non-human animates to class II led Mylne (1995) to question Dixon and Lakoff's determination that harmfulness underlies the assignment of these non-human animates to class II.

As noted above, we propose that the Dyirbal classifier class corresponding to Yidiny *minya* merged with the class of male humans to form class I. Under this scenario, 'garfish' was originally placed in class I as 'edible', while 'stonefish' and 'toadfish' were excluded from class I as not 'edible', just as 'garfish' is *minya* in Yidiny, while 'stonefish' and 'toadfish' are not. Accordingly, the assignment of 'garfish' to class II is similarly unexpected.

We propose that the assignment of *garram* 'garfish' to the same class as *garri* 'sun' and *garri* 'hairy mary grub' is due to the phonological shape of the left edge of each word. No other animate noun in our sample begins with *garr-*; all three—the sun being animate by myth—are assigned to class II.[13]

A similar argument can be made for the assignment of *yarra* 'fishing line'. Although, as an inanimate noun, we would expect to find *yarra* in class IV, it is found in class I. This unexpected classification is explained by Dixon as due to the semantic connection between men and fishing. However, the phonological similarity between the actual form for 'man', *yara*, and 'fishing line', *yarra*, more directly explains the class assignment.

These forms are identical except for the rhotic in each form. Although /r/ and /rr/ are phonemes in traditional Dyirbal, as shown by the minimal pair in question, the /r/ and /rr/ distinction appears to have been breaking down at the time of Dixon (1972), as shown by consistent dialectal differences in the presence of /r/ or /rr/ word-finally, as in the forms for 'navel', *jujur* in the Dyirbal and Mamu dialects but *jujurr* in the Giramay dialect, and 'urine', *jujar* in the Dyirbal and Mamu dialects but *jujarr* in the Giramay dialect. Thus, we propose that the rhotic distinction was not sufficiently salient to prevent the attraction of *yarra* 'fishing line' into class I on the basis of *yara* 'man'. This proposal receives support from the observation that the distinction between the two phonemes is almost lost in YD.[14]

The identification of formal features by speakers may either encourage the reassignment of a noun from its semantically expected class to the class with which the formal feature is associated (as in the case of *garri* 'hairy mary grub', *garram* 'garfish' and *yarra* 'fishing line'), or prevent the reassignment of a noun from a semantically unexpected class—but with which the formal feature is associated—to another, semantically expected class.[15] The result of either scenario is identical: a noun's class agrees with the formal feature that it carries.

If the origins that we propose for the noun class system are correct, the language documented by Dixon (1972) represents an intermediate stage in the expected development of the noun class system. The semantic criteria for certain classes have changed over time as speakers in general and child learners in particular were faced with the task of identifying the system's underlying principles, as shown by the shift from [+edible animal] to [+non-human animate] as a component of class I. The difficulty of identifying these semantic principles became even more troublesome once reclassifications began to occur on the basis of formal features. If given sufficient time, we would expect the number of exceptional classifications in the Dyirbal system to dwindle, and the vast majority of nouns to be classified simply and straightforwardly on the basis of a small number of core semantic classes and clear formal features.

5. Motivating Dyirbal noun classifications synchronically

In accounting for synchronic gender classification it is important to approach it from the standpoint of learnability. When faced with the task of determining which noun class to associate with each noun, a Dyirbal child is not able to draw on sophisticated semantic concepts and connections that either adults (seeking to justify the class associations that they have learned)[16] or linguists (seeking to find an underlying order in the

system) may come up with. A child has no inherent (or learned) association of women with dangerous things, as Lakoff argues, or as an "other" and "associated with the disruption of harmony of living", as Mylne (1995:387) proposes. Since many of the concepts that Lakoff and Mylne identify as underlying the Dyirbal noun class system are beyond the scope of young children's understanding, the systems posited by Lakoff and Mylne would be nearly impossible for children to learn. Unless we expect Dyirbal children to have memorized all class associations by rote until such time as they could understand the complex concepts and relations posited by the semantic accounts, the existing explanations of the Dyirbal gender system are untenable.

While complex mythological associations that require rote learning, abstract knowledge, and vast cultural experience are unlikely for a 2 year old, developmental psychology shows that children under the age of one are able to differentiate such basic categories as 'human', 'animate', 'male', 'female', 'mobile' (Gentner and Namy 1999, Namy and Gentner 2002; Kellman and Arterberry 1998; Mandler 2004, among many others). Remarkably, these categories match the basic semantic categories involved in gender assignment across languages (Corbett 1991:7-30, 82-89), and we can reasonably expect such a core to be present in our system. With nouns that fall outside of those semantic cores, one could expect a child to make errors and to reassign the nouns on the basis of some other salient cues, most likely the phonological form of a word. For example, children should learn quickly that males and most non-human animates belong in class I, females in class II, edible items in class III, and inanimate things in class IV. A child faced with the need to determine which class marker to use with *jirrga* 'eel-spear' and *baŋgay* 'spear' will place them in class IV with the other inanimate nouns that the child knows, rather than class I and II, respectively.

5.1 Semantic core

Turning to the composition of noun classes in Dyirbal, we find that classes I through III have a well-defined semantic core. This core is reinforced by the fact that nouns denoting the relevant concepts do not appear elsewhere, so the core is in a sense exclusive to the relevant class. Nouns referring to male humans appear only in class I, while nouns referring to female humans appear only in class II. Consumable, non-beverage items other than meat—a more accurate characterization than 'edible', which we use henceforth for the sake of brevity—appear only in class III. Examples are provided in (16).

(16)   a.   Class I: [+male]
            yara 'man'
            gaya 'mother's younger brother'
            wirru 'husband'

        b.   Class II: [+female]
            bulgu 'wife'
            jugumbil 'woman'
            gajin 'girl'

        c.   Class III: [+edible]
            jugur 'wild yam'
            gabi 'gabi fig'
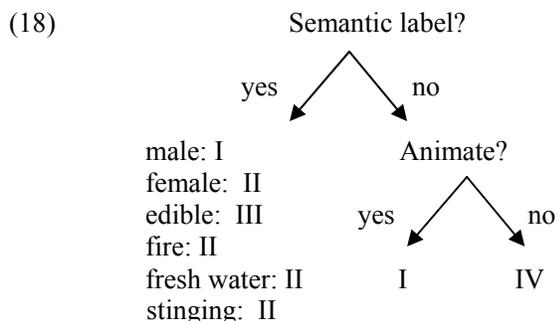   *wuju* 'vegetable/fruit food (generic)'

Loanwords from English are also drawn into the relevant classes on the basis of the same semantic criteria, as shown in (17):

(17)   a.   Class I
            bulijiman ~ buliman 'policeman'
            waybala 'white man'

        b.   Class II
            mijiji 'white woman'

        c.   Class III
            binarra 'peanut'
            gaygi 'cake'
            laymun 'lemon'

Thus, any [+male], [+female] or [+edible] nominal will be assigned to class I, class II and class III, respectively.[17] In addition, the majority of non-human animate beings, such as animals, fish and insects, appear in class I, and in fact comprise the majority of the class I nouns in our sample, while the vast majority of inanimate nouns are placed in class IV. Accordingly, class I appears to be the default class for non-human animate beings, while class IV is the default class for inanimate nouns.

While class III is a limited semantic class, only admitting edible items, and class IV is an elsewhere class, accepting nouns that are not assigned to any of the other three classes,[18] classes I and II contain a variety of nouns that do not fall within the semantic classes identified in (13). The three

smaller semantic classes that we identified in section 4, [+fire], [+fresh water] and [+stinging], account for the classification of certain inanimate nouns to class II. A decision tree for determining the assignment of Dyirbal nouns based on the above features is shown in (18).

(18)   Semantic label?

yes   no

male: I   Animate?
female: II
edible: III   yes   no
fire: II
fresh water: II   I   IV
stinging: II

While the previous accounts of the Dyirbal gender system sought a synchronic semantic basis for the assignment of every Dyirbal noun to its class, we propose that those nouns whose classification does not follow directly from (18) are classified on the basis of formal features or are remnants of the earlier classifier-based system which have successfully resisted reassignment due to their frequency of use.

5.2   *Beyond the core: In search of synchronic motivations*

Recall that classes I and II contain certain nouns whose class assignment is unexpected. In addition to names of humans, classes I and II contain non-human animate nouns, as well as various inanimate items, including the words for 'sun', 'moon', and 'rainbow'. Although class I appears to be the default class for non-human animate beings, certain non-human animate beings appear in class II, including most birds and certain fish. If class I is the default class for animates, any animates found in class II require an explanation. Similarly, we must explain any inanimate nouns placed in these classes.

As emphasized by Dixon (1972, 1984, 1996), the role of folklore in Dyirbal culture is undeniable, and we agree that folkloric associations are likely responsible for the class assignment of at least some nouns found in class I or II. The categorization of words denoting celestial objects (stars, planets) is likely due to folklore. As Dixon explains, the moon is the husband of the sun in Dyirbal folklore, and accordingly *gagara* 'moon' is placed in class I and *garri* 'sun' in class II. Similarly, *yamani* 'rainbow' is a man in Dyirbal mythology, and assigned to class I. In addition,

according to Dyirbal folklore, birds are the spirits of dead human females, and most bird names are in class II.[19] Similarly, crickets, which were excluded from the class of edible animals that formed class I, are assigned to class II because speakers liken them to 'old ladies'.[20]

Since the telling and retelling of folklore was such a part of Dyirbal society, from an early age children learned the mythological semantic label associated with these nouns, and this accounts for their gender assignment; it certainly helps in the learning of their gender that these words are few in number and presumably at least some of them are frequent. If certain words were not such an integral part of Dyirbal everyday conversation or story-telling, we would expect them to be susceptible to reassignment to class I, in the case of birds, or to class IV, in the case of inanimate nouns. In fact, these are precisely the reassignments that Schmidt (1985) documented in the language of the children and grandchildren of Dixon's Dyirbal consultants, as we will discuss in section 5.6.

The situation with the smaller semantic subclasses is similar. To the extent that a child is able to identify that nouns associated with water or fire or that are capable of harmful stinging are placed in class II, the association of these items with class II will remain. As we stated above, fresh water and fires both played a large role in Dyirbal daily life, and words relating to fresh water and fire do not appear in any other class. As a result, it is easy to believe that children received sufficient input to identify that fresh water- and fire-related items belong in class II.

Similarly, the class of 'stinging' items appears to remain a semantic class relevant to noun class assignment, but one that was breaking down at the time of Dixon 1972. The 'stinging' nouns in our sample include:
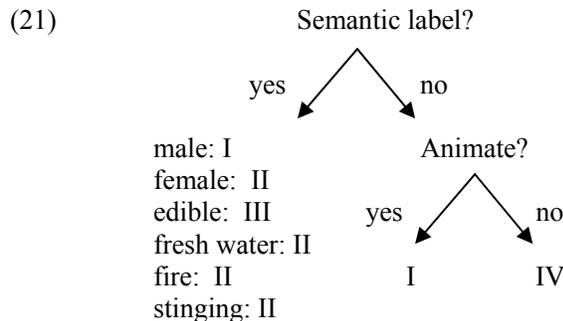
(19)   Animate nouns:
   bima   'death adder'
   gabul   'forest carpet snake'
   gadambal 'mangrove crab'
   gumbiyan 'echidna'
   jaŋgan   'stonefish'
   juruŋun 'toadfish'
   malayigarra 'scorpion'
   marrigal   'chicken snake'
   munilan 'chicken snake'
   yunba   'water python'

(20)   Inanimate nouns:
    bumbilan 'stinging nettle'
    jaŋali   'small stinging tree'
    duŋan   'stinging tree'
    giyarra   'big softwood stinging tree'

Although not all of the animates that we have identified as possible members of the [+stinging] class are poisonous, each is possible of causing a harmful stinging by biting, pinching or otherwise attacking a human. For example, although pythons are not poisonous, the water python is a particularly aggressive snake. Similarly, the mangrove crab can exceed 2 kg and possesses powerful claws.

We propose that the relevant semantic feature remains 'capable of inflicting a harmful sting' rather than simply 'dangerous' or 'harmful', as Dixon and Lakoff propose, as shown by assignment of harmful nouns to other classes. Many animals assigned to class I are capable of inflicting harm, including crocodiles, alligators, the brown snake (one of the most dangerous snakes in Australia), and the *bujimburran*, a stinking beetle that squirts fluid (and identified as a 'danger to eyesight') (Dixon 1984:148). Thus, due to the assignment of all stinging plants and the stinging animate nouns identified in (19) to class II, we posit that [+stinging] is a synchronic classification relevant for class assignment, albeit a weaker classification than the other classifications identified above. Just as [+fire] and [+fresh water] ceased to be semantic labels in Young People's Dyirbal (YD), Schmidt (1985) found that [+stinging] ceased to be a semantic label in YD; YD speakers reclassified members of the [+stinging] class to class I, in the case of animates, and class IV, in the case of inanimates (see also 5.6).

In sum, under the view proposed here, the semantic assignment of gender in Dyirbal was based on the following principles:

(21)   Semantic label?

            yes   no

    male: I
    female: II
    edible: III   Animate?
    fresh water: II   yes   no
    fire: II
    stinging: II   I   IV

Note that the semantic labels match some of the original classifiers that we hypothesized Dyirbal had; the range of these classifiers is also supported by the evidence from the classifier systems of related languages (see section 4). The development of larger gender classes resulted in the loss or bleaching of semantic motivation for smaller classes, and gradually resulted in a greater role of formal cues. Had Dyirbal stayed healthy as a language, and had not undergone attrition and gradual death under the encroachment of English, its four-class system may have developed further, with formal cues as criterial factors. Instead, the system underwent a significant reanalysis in Young People's Dyirbal, which we will discuss in section 5.6 below. Before turning to this new language, however, we would like to discuss the formal cues that were available in Traditional Dyirbal.

5.3   Beyond the core: Formal cues in gender assignment

The formal features responsible for class assignment affect only the animate nouns in our sample. That such a restriction would exist is not surprising given the distribution of nouns across the Dyirbal classes. Animate nouns appear only in classes I or II, and both of these classes consist primarily of animate nouns. Inanimate nouns, on the other hand, appear predominantly in class IV. Upon determining that a noun is animate, a child learner knows that the noun will appear in class I or II, and the attractive strength needed to pull a class I noun into class II will be less than that required to place an inanimate noun into class II. While formal features that affect all nouns may also be present in Dyirbal, we have not been able to identify any in our sample.

Yi-. An example of a formal feature that affects only animate nouns is *yi-*, the initial syllable of the Dyirbal word for 'woman', *yibi*. Our sample contains the following Dyirbal words beginning with *yi-*:

Table 4: Dyirbal nouns in *yi-*

Noun	Class	Gloss
yirrinyjila	I	'dragonfly'
yibi	II	'woman'
yigarra	II	'crayfish'
yimalimal	II	'welcome swallow'
yidir	IV	'grass'
yigan	IV	'sky'

yila	IV	'feather'
yilal	IV	'song style'
yilan	IV	'feather'
yimburr	IV	'bad smells'
yinyji	IV	'wing of net trap; spirit place'
yingar	IV	'basket'
yirri	IV	'rotting material'
yirribarra	IV	'nectar of forest red gum'

As Table 4 shows, four nouns in our sample are animate: *yirrinyjila* 'dragonfly', *yibi* 'woman', *yigarra* 'crayfish' and *yimalimal* 'welcome swallow'. While *yibi* and *yimalimal* are expected members of class II as due to a [+female] semantic label, *yigarra* should appear in class I, the default class for non-human animates. We propose that *yigarra* was drawn into class II due to the identification of the class with animate nouns beginning with *yi-*.

The reason for the resilience of *yirrinyjila* to the formal feature is clear: the form shows vacillation of its initial segment between *y-* and *w-*. While the Dyirbal dialect of Dyirbal shows *yirrinyjila*, the Mamu dialect form is *wirrinyjila*. The same alternation is seen in one of the Dyirbal words for 'firefly', but this time between the Dyirbal dialect and Nyawagy, a closely related language; the form in the Dyirbal dialect is *yugiyam*, while its cognate in Nyawagy is *wugiyam*. Thus, it appears that the original form of both 'dragonfly' and 'firefly' began with *w-*, and that the *y-* forms are due to a development within the Dyirbal dialect.

As Table 4 also shows, none of the inanimate nouns beginning with *yi-* are drawn into class IV; they are all in class IV, as otherwise expected. Since the source of the formal feature—the word for 'woman'—is animate, only nouns that are also animate are affected by the feature. As noted earlier, children from a very early age are able to distinguish 'animate' as a semantic category. Dyirbal shows a clear split of classification based on animacy, so it is not surprising that this split should also affect the operation of formal features.

Bi-. A related form for 'woman' provides another formal feature: *bi-*. A widespread word for 'woman', 'mother' and '(female) breast' in the Pama-Nyungan family is *bibi* (including Mbabaram *bib* 'breast', Muluridyi *bibi* 'breast', Nyganumarta *pipi* 'mother', Northern Nyungar *pipi* 'female breast', Kuku-Jalanji *pipi* 'breast', Kala Lagaw Ya *ipi* 'female, woman,

wife'). Although the form is not in our sample, it is widespread in the region and may be related to *yibi*, discussed above. If we examine all of the forms in our sample that begin with *bi-*, we find the forms listed in Table 5. The number and variety of nouns beginning with *bi-* is larger than those with *yi-*, so we have also included the motivation for the class assignment of each noun. As expected, all animate nouns appear in classes I and II, and inanimate nouns appear in class III, if edible, or class IV otherwise (with the exception of *bigin* 'shield').

Table 5: Dyirbal nouns in *bi-*

Noun	Class	Gloss	Motivation for assignment
bilŋgarriny	I	'little jew fish'	animate
binyjirriny	I	'small lizard'	animate
bilmbu	I/II	'widow/widower'	male/female
bimu(nyja)	I/II	'father's elder brother/sister (and reciprocal)'	male/female
bijuju	II	'whistle duck'	female
bigi	II	'pig'	bi- + animate
bigin	II	'shield'	---[21]
bilmbiran	II	'large parrot'	female
bima	II	'death adder'	bi- + animate
binda	II	'waterfall'	water
bingay	II	'white ibis'	female
biyilbiyil	II	'pee wee (magpie)'	female
binana	III	'banana'	edible
binarra	III	'peanut'	edible
bigay	IV	'handle of basket'	inanimate
biguny	IV	'(finger/toe) nail'	inanimate
bilayŋgirr	IV	'blanket'	inanimate
bilbara	IV	'main track'	inanimate
bilu	IV	'noise of a horn'	inanimate
birrgil	IV	'frost, wintertime'	inanimate
biyinyji	IV	'fence'	inanimate

The class assignment of most animate nouns follows straightforwardly from the semantic labels we have proposed, as shown in Tables 6 and 7.

Table 6: Expected Class I: [+male] and [+animate] nouns

Noun	Class	Gloss	Motivation for assignment
bilŋgarriny	I	'little jew fish'	animate
binyjiriny	I	'small lizard'	animate
bilmbu	I/II	'widow/widower'	male/female
bimu(nyja)	I/II	'father's elder brother/sister (and reciprocal)'	male/female
*bigi	II	'pig'	bi- + animate
*bima[22]	II	'death adder'	bi- + animate

Table 7: Expected Class II: [+female], [+water] and [+fire] nouns

Noun	Class	Gloss	Motivation for assignment
bilmbu	I/II	'widow/widower'	male/female
bimu(nyja)	I/II	'father's elder brother/sister (and reciprocal)'	male/female
bijuju	II	'whistle duck'	Female
bilmbiran	II	'large parrot'	Female
binda	II	'waterfall'	Water
bingay	II	'white ibis'	Female
biyilbiyil	II	'pee wee (magpie)'	Female

While the two starred items in Table 6 should be placed in class I as non-human animates, both are class II nouns. Dixon states that the assignment of *bima* 'death adder' is "probably" due to the snake's connection to *gurrburu* 'seven sisters', a constellation also found in class II, noting that the seven sisters are "believed to be a 'death adder in the sky'" (Dixon 1972:310). Dixon provides no explanation for the unexpected assignment of *bigi*; although *bigi* is a borrowing from English, it should nonetheless be

assigned according to the principles applicable to native Dyirbal words, as shown in (17).

As Table 6 shows, four animate forms in *bi-* should have been placed in class I, and the actual classifications are split, with *bilŋgarriny* 'little jew fish' and *binyjiriny* 'small lizard' in class I, while *bima* 'death adder' and *bigi* 'pig' appear in class II. The resilience of *bilŋgarriny* and *binyjiriny*, and the susceptibility of *bima* and *bigi*, to the formal feature is straightforward with the proper definition of the salient feature as being the initial syllable, not just the initial segment. The first syllable of the nouns in class II, *bima* and *bigi*, is *bi-*, while the first syllable of the nouns that were not transferred to class II is not *bi-*; both *bilŋgarriny* and *binyjiriny* begin with a closed syllable. Thus, it is the initial syllable and not merely the first two segments that constitutes the relevant formal feature. This is consistent with our proposal that stress (and therefore prominence) is behind the identification of certain formal features (see section 4). By identifying the operation of a formal feature, we are able to explain the assignment of all four nouns without the need for tenuous semantic connections.

Ma-. An additional formal feature associated with class II is the initial segment *ma-*. Our sample contains the following animate nouns beginning with *ma-*:

Table 8: Dyirbal animate nouns in *ma-*

Noun	Class	Gloss
mabi	I	'tree kangaroo'
mandija	I	'milky pine grub'
maral	I	'snail-like slug'
marbu	I	'louse'
maybaja	I	'alligator, crocodile'
maga	II	'rat'
malayigara	II	'scorpion'
maraba	II	'bird (generic)'
marigal	II	'chicken snake'
mawa	II	'shrimp'

Based solely on semantic labels, *maga* 'rat' and *mawa* 'shrimp' should be assigned to class I; we have posited a [+stinging] label for *malayigara*

'scorpion' and *marigal* 'chicken snake', and *maraba* 'bird' is classified according to its [+female] feature.

Again, the relevant formal feature appears to be the initial syllable *ma*; the initial syllable of both forms that unexpectedly remain in class I is bigger than *ma-*, showing that it is the composition of the entire syllable, rather than its initial segments, that acts as the formal feature. However, class I contains two forms whose initial syllable is *ma-*, but which resisted reclassification: *mabi* 'tree kangaroo' and *maral* 'snail-like slug'. 'Tree kangaroo' likely remained in class I due to the presence of other kangaroos, including *yunga* 'kangaroo' and *yuri* 'grey kangaroo', in class I. *Maral* similarly may have resisted reclassification due to its identification with the grubs and worms that are placed in class I. Unlike tree kangaroos and slugs, rats and shrimp may not fall as easily into a class of animate nouns identified solely with class I.

Gugu-. Another formal feature that we have identified is the initial disyllabic sequence *gugu-*. Our sample contains only three forms that begin with *gugu-*: *gugu* 'mopoke owl', *gugula* 'platypus', and *guguwuny* 'brown pigeon'. Of these three, *gugu* and *guguwuny* are birds, and accordingly placed in class II as [+female]. *Gugula*, on the other hand, has no semantic basis for assignment to class II, which Dixon was unable to explain. However, the presence of the initial disyllabic sequence *gugu-* in 'mopoke owl' and 'brown pigeon' likely was a sufficiently conspicuous feature of these class II nouns that 'platypus' was also drawn into the class.

While the majority of formal features that we have identified appear at the word's left edge, coinciding with the stressed syllable, at least one right-edge formal features also appears to exist. We have already hypothesized that suffixes may have played a role in the original merger of small classes (see section 4 above). The role of the feminine suffix *–gan* seems to continue synchronically as well. For example, the assignment of *jaŋgan* 'stone fish' to class II rather than class I, where the majority of fish species are assigned, may be due to the identification of *–gan* with class II in addition to the semantic label [+stinging], as proposed above. Table 9 shows all forms in our sample that end in *–gan*.

With the exception of *barrgan* 'wallaby', *burŋgan* 'termite species' and *nuŋgan* 'larger louse', all animate nouns ending in *-gan* appear in class II. While the feminine suffix is clearly present in *julbungan* and *yalŋgayngan*, and likely also present in *murgan*, class II contains other nouns in which *-gan* would most likely be perceived but only as a formal segment, without a semantic association with [+feminine]. For example, *bugan* 'brush fire' is unlikely to contain the suffix *-gan*; it is straightforwardly assigned to class II with the other 'fire' words, and the

presence of *–gan* may have been immaterial but may have also reinforced the class membership. Similarly, the assignment of *jarrugan* 'scrub hen' could be due to the belief that birds are spirits of dead women rather than the presence of *–gan*; however, this form nonetheless does end in *–gan*, implying class II membership.
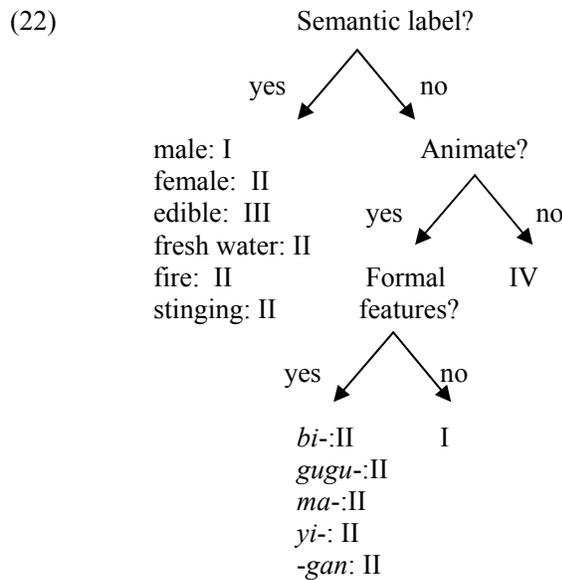
Table 9: Dyirbal forms ending in *–gan*

Noun	Class	Gloss
barrgan	I	'wallaby'
buruŋgan	I	'termite species'
nuŋgan	I	'larger louse'
bugan	II	'brush fire'
julbungan	II	'woman who entices her promised man'
yalŋgayngan	II	'single woman (beyond usual marrying age)'
jaŋgan	II	'stone fish'
murgan	II	(personal name)
jarrugan	II	'scrub hen'
babuligan	IV	'pub, publican'
balgan	IV	'bark of tree'
jungan	IV	'bull oak'
bugan	IV	'open forest'
girramaygan	IV	'tribal territory'
girramaygan	I/II	'members of tribe'

If our proposal that *–gan* shifted its association from implying a [+feminine] feature to simply indicating class II membership is correct, the failure of *bargan* 'wallaby', *buruŋgan* 'termite species' and *nuŋgan* 'larger louse' to be assigned to class II deserves an explanation. As animate nouns, these should have been placed in class II due to the existence of the formal feature. First, we propose 'termite species' and 'larger louse' resisted reassignment because they form a small group of closely related insects assigned to class I, all of which are covered by a single avoidance language term, *bayi dimaniny*. Second, the different treatment of *bargan* 'wallaby', which was not reclassified, and *jangan* 'stone fish', which was,

is likely due to the relative frequencies of the forms. High frequency forms commonly preserve irregularities that less frequent forms do not (Bybee 2002).[23]

In sum, the formal features that play a role in Dyirbal gender assignment fall into two groups: stressed segments (word-initial), which seem play the most prominent role, and at least one salient suffix.

To reiterate, formal features are operative only with respect to nouns that do not bear a semantic label; a noun with a semantic label is classified accordingly. However, formal features do prevent the default class assignment of animate nouns that do not carry semantic labels. Accordingly, the operation of formal features in noun class assignment may be easily represented using the decision tree in (21) by adding the possibility for assignment of animate nouns based on formal features prior to assignment to the relevant default class, as shown in (22).

(22)

Semantic label?

yes / \ no

male: I
female: II
edible: III   Animate?
fresh water: II   yes /   \ no
fire: II
stinging: II   Formal   IV
                         features?

              yes /   \ no

              bi-:II   I
              gugu-:II
              ma-:II
              yi-: II
              -gan: II

5.4   Preservation of original class assignments

In addition, we propose that a number of animate forms placed in class II are conservative retentions of the noun class assignments that resulted from the merger of the former Dyirbal classifiers. For example, as more fully described in section 4, we proposed that only 'edible' non-human animates were originally placed in class I, and that all non-edible animates

fell into class II. To the extent that such items were frequent, and accordingly their class membership was conspicuous to Dyirbal speakers, such items may have resisted later reclassification to class I despite the lack of a clear semantic reason for membership in class II.

Perhaps the best example of such a noun is *guda* 'dog', whose placement in class II is unexplained by Dixon (1972). As discussed in section 4, the dog held a special place in Australian culture and was not included among the 'edible' animals; as a result, it would have been excluded from the set of animals that we propose merged with male humans to form class I. Accordingly, we propose that from the beginning of Dyirbal's four class gender system, 'dog' was a member of class II along with female humans and the other animate nouns that did not designate edible animals. While the motivation for this assignment would have been unclear to later generations of speakers after class I was reanalyzed as the default class for animates rather than the class for edible animals, the frequency with which *guda* appeared in children's input insured that it would be learned as a class II noun. Not surprisingly, once the frequency of use decreased, *guda* was reclassified as a class I noun, even in the more fluent speakers of Dyirbal that Schmidt (1985) studied.

Although we have accounted for gender assignment of the majority of the Dyirbal nouns in our sample, some unexplained forms still remain. These forms may also be conservative retentions of classifications that occurred during the merger of Dyirbal's earlier classifier classes, particularly if such items may also have been sufficiently frequent to enable them to resist reclassification—for example, the presence of *jirga* 'eel-spear', *jumala* 'woomera', *waŋal* 'boomerang' and *warginy* 'boomerang' in class I may indicate the existence of a class of hunting implements that merged with human males and edible animals to form class I. However, we feel there currently is not sufficient evidence to posit the existence of any such additional classes of items. We will discuss the unexplained forms in the next subsection.

5.5   *Outstanding forms*

We now have accounted for the vast majority of nouns in the Dyirbal lexicon that we had available. There are still several nouns outstanding whose gender is still unpredictable:

Table 10: Unexplained classifications

Noun	Class	Gloss
burrubay	I	'boil'
gubaguba	I	'(type of stripy pearl shell)'
jirrga	I	'eel spear'
jumala	I	'woomera'
mayjala	I	'flash of lightning'
mayjanmayjan	II	'continuous flicks of lightning'
mugay	I	'grinding stone'
waŋal	I	'boomerang'
warrginy	I	'boomerang'
balma	II	'old scrub hen nest'
baŋgay	II	'spear'
bunara	II	'bow and arrow'
buluba	II	'fighting ground'
bulugi	II	'cattle'
bundiny	II	'grasshopper'
gabu	II	'cup, telephone mouthpiece or earpiece'
galabay	II	'beetle'
gawa	II	'cow'
jayari	II	'horse'
lambi	II	'lamp'
nyiyi	II	'noise of birds'
ŋama	II	'shield handle, trigger (on gun)'
warrayi	II	'bony bream'

Although we do not have a definitive account of gender assignment for these nouns we would like to offer some observations.

First, the unexplained class assignments in the sample may be either conservative retentions of the original classes that resulted from the merger of the classifier system or later class reassignments, made by young

language learners. However, frequency and formal features, rather than semantic content, are the likely motivators of any retention or reassignment.

Second, as Dixon (1977:310) notes,

> it seems likely that some [class memberships] are WITHOUT EXPLANATION (as would be the case in any natural language: some may have had an explanation in terms of an earlier stage of the language, but the class assignment has been retained and the explanation lost as the language has altered).

While we have been able to reach earlier stages of Dyirbal to explain certain class assignments that were not predicted by Dixon's classification system and to motivate certain 'myth-and-belief' assignments on a more solid basis, we have not been able to determine the explanation for all items. Nonetheless our successes demonstrate that the inquiry is worthwhile, and may shed light not only on the linguistic development of the language, but also the source of certain pieces of myth and folklore.

Third, there may be additional semantically motivated classes that are difficult to ascertain because of the small size of the sample. For instance, it is feasible that cows, horses, and pigs all formed a coherent small class of domesticated animals, which would explain the assignment of both *gawa* and *jayari* to class II, where *guda* 'dog', the other domesticated animal, is classified, which could have served as an attractor. At the current stage of our knowledge of Dyirbal vocabulary such proposals are doomed to be speculative. We prefer to leave some items unexplained rather than posit additional classes on the basis of limited data.

5.6 Gender assignment in Young People's Dyirbal

As mentioned above, Schmidt (1985) documented the language of the children and grandchildren of Dixon's Dyirbal informants and identified two groups of speakers: a more fluent group of speakers of traditional Dyirbal, and a less proficient group of speakers of a new variety of the language, Young People's Dyirbal. While the more fluent speakers preserve a majority of the features of traditional Dyirbal, YD has undergone a variety of changes that differentiate it from traditional Dyirbal. Most relevant for this paper is the simplification of the noun class system into a straightforward three-class system, as set forth in (23):

(23)   Noun classification in YD (Schmidt 1985:158)

	Category		Class
animate:	masculine	I
	feminine	II
inanimate		IV

Schmidt found that YD speakers classify nouns solely on the basis of the categories set forth in (23), and, as a result, reclassify all nouns whose former classification did not comply with the YD system. For example, YD speakers retain none of the mythological class assignments found in traditional Dyirbal, as shown in Table 11:

Table 11: Noun classification by Traditional Dyirbal and Young people's Dyirbal speakers (Schmidt 1985)

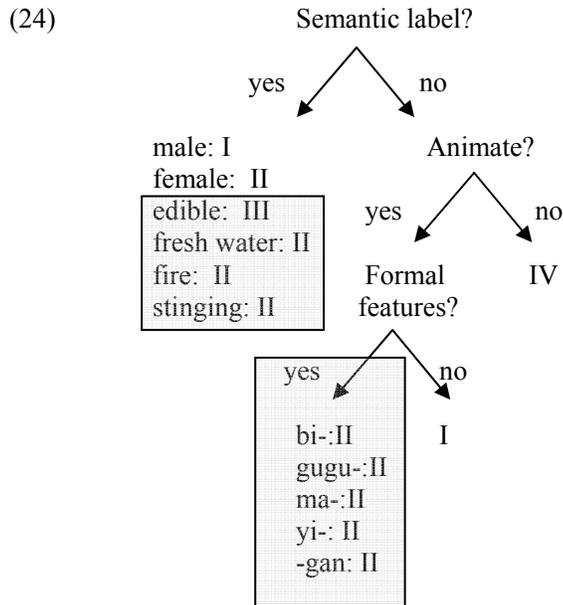|	Traditional Dyirbal	Young People's Dyirbal (YD)
'man'	I	I
'rainbow'	I	IV
'moon'	I	IV
'storm'	I	IV
'woman'	II	II
'bird'	II	I
'sun'	II	IV
'star'	II	IV

As Table 11 shows, in YD all inanimate nouns appear in class IV, despite any semantic associations that caused them to be placed in class I or II in traditional Dyirbal. Similarly, birds appear in class I with all other non-human animate beings. These developments, which occurred over a relatively short period of time, underscore the fragility of the hypothetical mythological associations in noun categorization.

In addition, YD speakers place the formerly [+fresh water] and [+fire] items in class IV, rather than class II. This reassignment is expected under our analysis, due to the loss of the more minor semantic labels.

For prior Dyirbal speakers these labels were both relevant and frequent, and as a result children quickly identified the semantic classes and their class assignment. YD speakers are much less likely to hear or

participate in conversations about fires than their ancestors who cooked and slept near fires for warmth. Sources of fresh water are likely no longer frequently mentioned, and water may not be the first beverage that comes to their mind when they are thirsty. Schmidt's YD speakers simply did not receive sufficient input to motivate the extra semantic labels on these inanimate items; as a result, they are placed in the default class for inanimate nouns.

Returning to the system that we proposed for noun classification in traditional Dyirbal in (22), we find that YD has preserved the core of the basic categorization that was present in the traditional system, while eliminating the formal features and removing the more ancillary semantic labels that were relevant to traditional Dyirbal speakers. These abandoned classification devices appear in shaded boxes in the decision tree set forth in (24); the remaining decision tree represents the classification system of the YD speakers.

(24)   Semantic label?

        yes   no

    male: I   Animate?
    female: II
    edible: III   yes   no
    fresh water: II
    fire: II   Formal   IV
    stinging: II   features?

                   yes   no

               bi-:II   I
               gugu-:II
               ma-:II
               yi-: II
               -gan: II

Thus, the development of the Young People's Dyirbal noun class system follows directly from the noun class system of traditional Dyirbal, with the loss of the more ancillary classification devices. The changes seen in the YD noun class system need not be attributed to the direct interference of English or the discontinuation of the traditional Dyirbal world view, as has been suggested; rather, while the abandoned pieces of

the tree were able to be maintained by Dixon's informants, their children and grandchildren did not receive sufficient input to infer the existence of these semantic categories and to identify these formal features.

6.   Conclusion

In this paper, we have reanalyzed Dyirbal noun classification, which has been previously analyzed in terms of radial categories that rely on complex conceptual associations. We have proposed that the assignment of Dyirbal nouns to genders is determined by a combination of rather straightforward semantic and formal features. Crucially, the relevant semantic features are quite similar to what is found in gender systems around the globe; they include the basic semantic labels "animate", "male", "female", and "edible". These features comprise the semantic core of Dyirbal classes I through III. The fourth class, which includes most of the inanimate nouns in the lexicon, constitutes the default gender for nouns that do not bear these labels.

We have also proposed a small subset of minor semantic labels, such as "water" or "fire", which identify semantic subclasses within larger classes. The Dyirbal noun classes arose from a reanalysis of an earlier classifier system; the original number of classifiers was larger than the number of resulting genders, and in several cases, several classifier sets merged within a single class. We hypothesize that this merger was facilitated by formal analogy between the members of different small classes. If this proposal is on the right track, it has as an important consequence that there is no synchronic conceptual association among all of the items in a given gender class; in particular, the smaller subsets within a class do not need to be radially related to the semantic core. The overall class membership is motivated only diachronically, and even then not necessarily on semantic grounds.

We have identified several formal cues that play a role in synchronic gender assignment in Dyirbal and may have also affected the merger of smaller classes in the history of the language. Most of these formal cues are initial syllables, which is the position of primary stress in Dyirbal; we have been able to connect at least some of these salient formal cues with words that represent core semantic notions. The reliance on prosodically prominent word segments is known to motivate gender assignment in many unrelated languages, including familiar Indo-European languages like French and Latin, so this finding also brings Dyirbal closer to well-known (and rather unsurprising) gender systems.

From the standpoint of learnability, the proposed account of Dyirbal genders is more plausible than one based on attenuated abstract semantic linking. Children show early acquisition of superordinate categories but are less likely to acquire more sophisticated and culture-specific semantic categorization at an early age (Mandler 2004). Children are also known to pay attention to statistical and phonetic cues in their language in the first year of life (Jusczyk et al., 1993, 1994; Saffran et al. 1996a, b; Karmiloff-Smith 1979; Levy 1983; Berman 1985; Smoczyńska 1985; Slobin 1973; Newport and Aslin 2000, 2004). Although adult speakers may offer intriguing generalizations concerning the motivations for gender assignment, there is no evidence that these are any more than after-the-fact rationalizations that speakers of any language often come up with, let alone what children use to assign gender.

In summary, the proposed account of Dyirbal gender does not require complex semantic rules and links; instead, it relies on core semantic categories and independently motivated features such as stressed syllables and salient suffixes. The changes in the gender system attested in Young People's Dyirbal directly follow from the explanation of traditional Dyirbal gender proposed herein. These changes are those that we would expect given the decreasing use of the language in the younger generation. In the end, Dyirbal is directly comparable to other noun classification systems, which often rely on a combination of formal and simple semantic cues (Corbett 1991: Ch. 2, 3).

The Dyirbal saga suggests the following cautionary note: linguistic explanations need to be judged not only by how well they account for the data, but also by how plausible they are with respect to the particular language's history and language learning.

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Notes

[1] Noun class and gender are different terms denoting the same concept (Corbett 1991:1); "class" and "gender" will be used interchangeably in this paper.

[2] While Dixon 1972 identified *girnyjal* 'honey' as belonging to class IV, Dixon 1984 identifies the noun as belonging to class III.

[3] In a different account, Mylne (1995) suggests that the main opposition is in terms of potency and benign/malign power. This still leaves the account driven by complicated semantics, a feature we are arguing against here.

[4] Such a narrowly defined class is rather surprising given the three other classes which are very inclusive. But note that in Australian traditional culture, 'children must learn from the earliest age to be able to classify plants (and indeed anything else they are liable to put into their mouths as babies)' (Mylne 1995: 390). See also Walsh (1993).

[5] Dixon (1972: 308-10) proposes the first two rules; rule three is proposed by Lakoff (1987: 93) on the basis of Dixon's analysis.

[6] There are two other Banjalang dialects where noun classification per se is not found, but which possess suffixes for nouns of particular semantic groupings which correspond to the noun classes of the other dialects (Crowley 1978: 47).

[7] Our sample contains 592 Dyirbal nominal forms culled from the following sources: Dixon 1972, 1982a, b, 1984, 1989, 1990, Dixon and Koch 1996, and Schmidt 1985. In the original lexicon, there are a number of items from the avoidance language (a highly formalized register used for communication across moieties, found in a number of Australian languages), which we did not include in our analysis because avoidance languages are often associated with their special phonology or grammar. In addition, we did not include items that appear only in Dyirbal song poetry. Thus here we treat only forms from Guwal, the everyday, non-avoidance language. A spreadsheet of the forms used in our sample is available upon request.

[8] The rationale for including echidnas in this class is that contact with their spines may result in harmful stinging.

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[9] Although water pythons are not poisonous they are very aggressive when approached.

[10] The original scope of the classifier in both Dyirbal and Yidiny was most likely [+fresh water] rather than [+potable], although, according to Dixon (1972:309), the Dyirbal's only beverages were water and honey-flavored water until they encountered white men, which meant there was no real difference between the [+fresh water] and [+potable] before that time. The developments in Dyirbal and Yidiny follow straightforwardly: Dyirbal speakers limited the scope of the class to [+fresh water] items, placing such new beverages as *milgi* 'milk' and *jiyi* 'tea' in class IV, while Yidiny speakers expanded the classifier's scope to include new beverages and all bodies of water. Thus, it is the merger of this classifier with the other classifier that formed class II that resulted in the placement of water-related nouns in that class.

[11] To our knowledge the form may have first appeared in Dixon 1996, so Dixon and Lakoff may have simply been unaware of its existence and classification.

[12] As we explain in section 5, although *yirrinyjila* 'dragonfly' begins with *yi-* in the Dyirbal dialect of Dyirbal, the form in the other dialects begins with *wi-*. As a result, in all other dialects the form does not contain the formal feature.

[13] The Dyirbal word *garambarri* 'young alligator' is the only other animate noun in our sample that begins with the sequence *ga-*, but due to its association with the class I nouns *gujagay* 'alligator' and *maybaja* 'alligator' we would not expect its classification to be affected by *garri* 'sun'.

[14] According to Schmidt (1985), the distinction between these phonemes has been fully lost in YD in words except where the distinction is necessary to prevent homophony, as in the case of *yara* 'man' and *yarra* 'fishing line'; otherwise, YD speakers wavered in their realizations of the /r/ and /rr/ phonemes. The weakening or collapse of rhotic distinctions has also been documented for other dying languages (see Schmidt 1985:193 for references and discussion).

[15] Which of these two forces is more powerful is an interesting question, but beyond the scope of this paper.

[16] Lakoff (1987:100-101) cites the following speech recorded by Schmidt (1985) from a semi-speaker of Dyirbal as evidence for a connection in the minds of Dyirbal speakers between fire and danger, on the one hand, and women, on the other: "buni [fire] is a lady…Woman is a destroyer. 'e destroys anything. A woman is a fire." However, it is impossible to determine whether the speaker possessed this belief prior to being asked, or if the speaker actually relies on the stated association to classify the items. If asked, even English speakers, who possess a minimal gender system, can posit semantic

reasons for ships being referred to with 'she' rather than 'it', while in actuality it is merely a matter of custom.

[6] The exceptionless character of these class assignments leads us to conclude with Dixon (1972) and Lakoff (1987), and against Mylne (1995), that masculine and feminine are core features of class I and II, respectively.

[18] Due to its elsewhere nature, class IV is by far the largest: of the 592 nouns that we have been able to establish, about 49% belong to class IV.

[19] The names of birds follow mythological associations much less reliably than the names of celestial objects or require more extensive knowledge of the avian world. In addition to birds like willy wagtails, which are placed in class I as mythical men, Dixon mentions that certain other birds (like hawks) go into Class I because they eat other birds. Rather than being classified as [+male], we suspect that such bird-eating birds may not bear the [+female] label due to their carnivorous conduct, and as a result are placed in the default class for animates.

[20] Again, the question of chronological order arises: were crickets viewed as 'old ladies' before they fell into class II, or did the connection between crickets and 'old ladies' come about later as an explanation for the class assignment?

[21] Although *bi-* has not attracted any other inanimate nouns into class II, this formal feature could be partly responsible for the assignment of *bigin* 'shield' to class II.

[22] While we identified *bima* 'death adder' as a potential member of the [+stinging] class, we treat it as if it is not a member of the class for the purposes of this section to show that it is doubly marked for assignment to class II.

[23] Although we do not have frequency numbers for the Dyirbal words in our sample, certain words would naturally be expected to be more frequent than others; for example, 'sun', 'moon', 'fire' and 'fresh water' are likely among the highest frequency items as they were part of Dyirbal daily life. Since wallabies were hunted by Dyirbal men as sources of food, we would expect 'wallaby' to be a high-frequency item, mentioned very frequently to, and in the presence of, Dyirbal children. Although stonefish are dangerous, and accordingly Dyirbal children needed to be warned about them, they were likely mentioned with much lower frequency, only to children who had reached an age where they may encounter them, and then only as part of a warning. Thus, we propose that the failure of *barrgan* to be reclassified from the default class for animates to class II despite the presence of the formal feature we have posited is explained by the high frequency of the item.