Diversity in the numeral systems of Australian hunter-gatherers

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Abstract

While the numeral systems of Australian languages are small, they are not uniform in all respects. In this paper we shed light on the extent of diversity in small numeral systems by systematically surveying 121 languages from Pama-Nyungan and non-Pama-Nyungan families.
Outline

1. Introduction

2. Features of Australian numeral systems
   - Extent of system
   - Internal structure
   - Secondary meanings of numerals
   - Etymologies of numerals

3. Conclusions
Stereotypes of Australian numeral systems

- One, two, (three), many (Dixon 1980: 107–108)
- Often excluded from discussion (e.g., Hanke 2010: 64)
- Or claimed that they aren’t numeral systems at all

http://xkcd.com/764/
This is timely, given the current interest in cultural constraints on language (e.g., Evans & Levinson 2009).
Data sources

- Bowern’s Pama-Nyungan comparative lexical database;
- Supplemented by information from grammars and fieldnotes (where available);
- Numerals and quantifiers extracted;
- Partial data omitted, leaving:
- 121 doculects/varieties:
  - Ten Pama-Nyungan subgroups
  - Six non-Pama-Nyungan families
Survey languages
The forms for basic numerals; subsequent analysis provided data regarding:

- The extent of the numeral system (that is, how high the numbers go);
- How (and whether) numerals are combined to form higher numerals;
- Etymologies of numeral forms (and whether any are likely loans);
- Whether there is information about the use of numerals for vague counting.

(Whether there are ancillary counting systems.)
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Extent of system

- No systems in the survey extend above 20, so they are all “restricted” (Comrie 2005)
- But, upper limits vary:
Combining numerals

### General observation
- 75 of the 121 surveyed languages combine smaller numerals to create larger ones.

### Common patterns
- 1, 2, 3, 2:2, 2:2:1
- 1, 2, 2:1, 2:2, 2:2:1
- 10 = 2:5 or 5:2 or 5:5
Do small number systems have bases?

**Terminology (Hanke 2010: 68–69)**

- **additive base** (Greenberg’s (1978) *augend*):
  \[ 16 = 6 + 10 \]

- **multiplicative base** (Greenberg’s (1978) *multiplicand*):
  \[ 40 = 4 \times 10 \]

- **additive-multiplicative base** (Greenberg’s (1978) *base*):
  \[ 68 = (6 \times 10) + 8 \]
Do small number systems have bases?

Bases in the Australian survey

- 2:1 for ‘three’ must be $2 + 1$
  $\rightarrow$ 2 is an additive base

- 2:2 for ‘four’ could be $2 + 2$
  $\rightarrow$ 2 is an additive base
  Or, 2:2 for ‘four’ could be $2 \times 2$
  $\rightarrow$ 2 is a multiplicative base

- Is 2:2:1 for ‘five’ formed through addition alone or through both multiplication and addition?
Variation in numeral composition

Multiple ways of forming numerals

- Warumungu: $3 = \text{‘three’ or } 2 + 1$
- Wiradjuri: $4 = \text{‘four’ or } 2:2$
- Gooniyandi: $5 = 2:2:1, 3 + 2, \text{or ‘hand’}$
- Gamilaraay: $6 = 2 \times 3 \text{ or } 1 + 5$
Are Australian numerals really numerals?

Hale (1975); Dixon (1980)

- Australian languages don’t have numerals, they have quantifiers which can denote more or less specific quantities.

Evidence includes:

- Jaru *murrkun* ‘three, few’
- Yan-nhaŋu (Yolŋu)
  - *walip* ‘one’
  - *märrma* ‘two’
  - *lurrkun* ‘three, a few, a little, some, several’
  - *goku walip* [hand one] ‘five, a handful, a bunch’

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Our survey

- 29 languages allow vague readings
- 34 languages do not allow vague readings
- 58 languages had no conclusive information
Languages with and without vague numerals
Are numerals and vague quantifiers related?

Some languages show an etymological (but not synchronic) relationship between numerals and vague quantifiers:

Garrwa (Furby & Furby 1977)
- ‘three’: kujarra yalku \((2 + 1)\)
- ‘four’: kujarra kujarra \((2 + 2)\)
- ‘a few’: kujajarra

Other languages have distinct numerals and quantifiers throughout (e.g. Bardi).
Some families have reconstructible numerals:

* Nyulnyulan

- one: *warinyji
- two: *kujarra (Loan into Proto-Nyulnyulan)
- three: *yirrjara
- four: *kujarrakujarra
- (five): (*nimarla) < Hand
Reconstructibility of numerals

- Numerals in Pama-Nyungan are difficult to reconstruct beyond the lower subgroups.
- There are many opaque forms for ‘one’ in different subgroups: 
  *waŋka-, *kurnu, *kayanu, *wanytyu, *watyin, *kunytyi, 
  *kurrika, *kuma, *kutyu, . . .
Composition (i.e., other numerals):
- Wangkumara \textit{parrkukurnu} ‘3’ = 2+1
- Diyari \textit{parrkulu} ‘3’ via compound reduction

Loans: e.g., *\textit{kutyarra} ‘2’ into Proto-Nyulnyulan

Semantic shift:
- Diyari \textit{mandu} ‘2’ < ‘pair’
- ‘one’ as collective (i.e. ‘together’) vs ‘one’ as \textit{individuative} (i.e. ‘alone’)

Etymological sources of numerals
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What about other hunter-gatherer languages?

Small numeral systems
- Australian systems are larger than Amazonian hunter-gatherer systems, but smaller than the average agriculturalist ones in Amazonia
- California & Great Basin: Both hunter-gatherer and agriculturalist languages have larger systems

Etymological sources
- Combination of numerals: found in all case study areas (though with differences in the details)
- Hand: found in all case study areas
- Kinship/sibling terms: only Amazonia (Epps 2006)
Conclusions

Australian numeral systems are uniformly small, which makes it difficult to answer the traditional questions of numeral typology, but there are parameters along which they differ.

- May numerals be combined, and if so, how?
- May numerals be used for inexact quantities?
- To what level are numerals reconstructible?
- What are the etymological sources for numerals?

We would like to encourage numeral typologists not to lay aside data from small systems, and for linguists working on languages with such systems to explore them.

One, two, three, many is by no means the end of the story.
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References


