Restricted Numeral Systems and the Hunter-Gatherer Connection

Harald Hammarström
MPI Nijmegen

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Numerals are

- **spoken**
- **normed expressions** that are used to denote the
- **exact number** of objects for an
- **open class of objects** in an
- **open class of social situations** with
- **the whole speech community** in question

Restricted Numeral Systems: Definition

A numeral system is *restricted* iff

1. Monomorphemic numerals exist only up to 2 or 3 AND

2. Higher quantities are expressed orally only

   a) inexactly or

   b) up to ca 10 with additions of 1, 2 and 3 (possibly including ad hoc use of 'hand' for 5).

- Example: !Kũ (Juu, Botswana-Namibia) of Vedder (1910-1911):

$$
\begin{array}{ll}
1 & |\bar{\text{e}} \\
2 & \text{dsã} \\
3 & \text{!gao} \\
\text{viel} & \text{!gao}
\end{array}
$$

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Restricted Numeral Systems: Notes

- A numeral system with normed usage of hand + feet for 5, 10, 20 will never be called a "restricted" numeral system.

- People with restricted numeral systems may use one or more of the following strategies to cope with higher quantities:

  1. Do without exact counting above 3 and live happily anyway
  2. Use hands, fingers and feet for tallying in an ad-hoc way
  3. Use hands, fingers and feet in a normed way (but without corresponding oral expressions)
  4. Use numerals from another language
  5. Keep track of things by tallying or individuizing

History of Research

- Probably the earliest descriptions of restricted numeral system come from the Americas:

  Taino of Hispaniola (Arawakan): (Very unclear)

  > Ramón Pané 1571 [1498] Relación acerca de las antigüedades de los indios

  Tupinambá (Tupian): (Rather Unclear)

  > Joseph de Anchieta 1595 [1556] Arte de Grammatica da Lingoa mais usada na costa do Brasil

  > Jean de Lery 1578 Histoire d'vn voyage fait en la terre du Bresil, avtrement dite Amerique

- Probably the first scholars to mention restricted numeral systems in contrast to others are

  Re Tupinamba Locke 1689 An essay concerning human understanding

  Re Thracians – probably erroneous and Leibniz 1697 Unvorgreifliche Danken

- 19th-20th century scholars frequently flash the label "primitive" but do little to understand the nature and distribution of restricted numeral systems

# Worldwide Presence of Restricted Systems

- Out of 6 880 languages in the world for which there is published data on numerals

- 1 093 languages are attested with a restricted system

Note:

- There are no bona fide cases of languages with "almost restricted" numeral systems, say, numerals up to, e.g., 5, 6, 10, 13.

- Not all restricted numeral systems are necessarily alike:
  - Most end at 2, many end at 3
  - Ca 15 cases where the 2-word is claimed to mean 'a few' (Papua, Amazon)
  - 2 cases with very good evidence that both the 1-word and 2-word are fuzzy: Pirahã and Ninam (Yanomami, Brazil)

Whence Restricted Numeral Systems?

- A limit at 2-3 coincides with the cognitively established **subitizing limit** =

    the number of objects one immediately sees how many they are, without grouping or counting.

- George Mandler and Billie J. Shebo 1982 Subitizing: An analysis of its component processes, p 8:
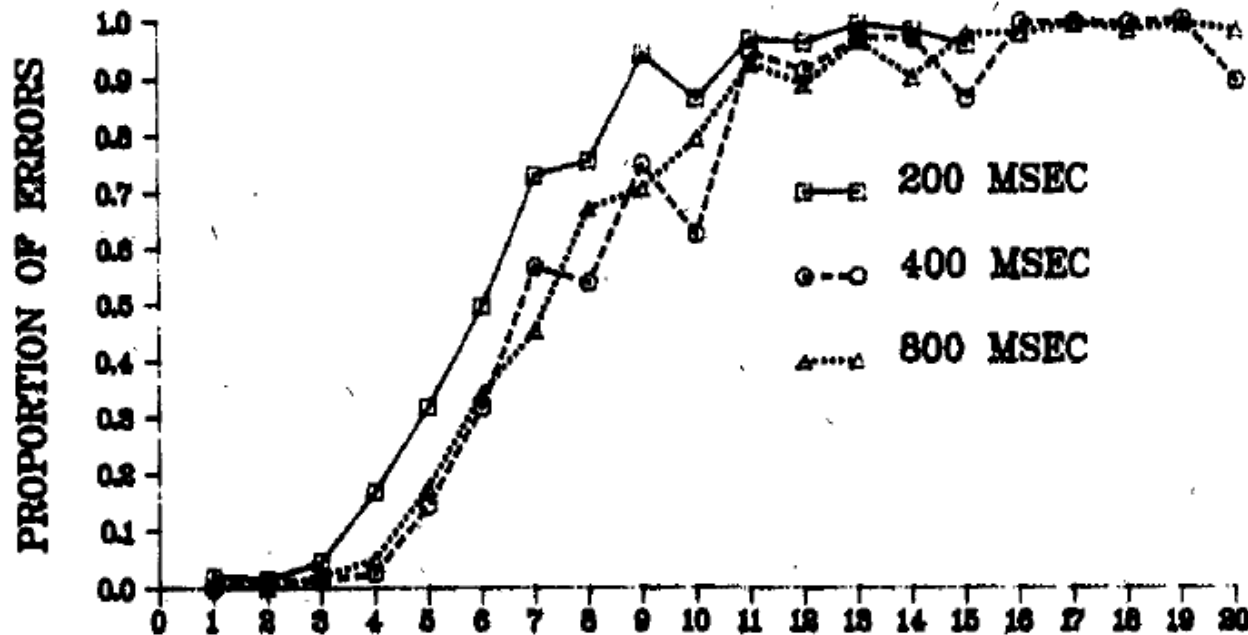
Geographical Distribution
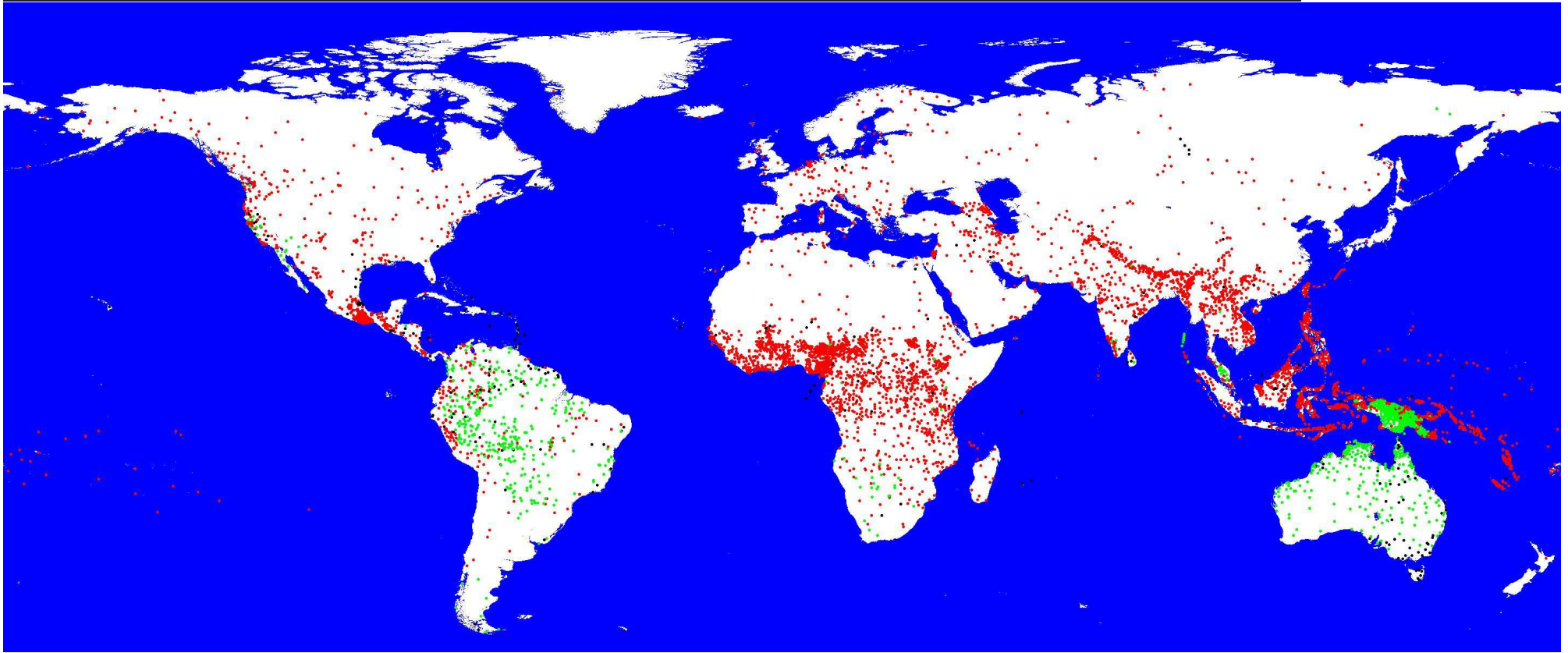
Restricted Systems and Hunter-Gatherers

A language is a Hunter-Gatherer (HG) language iff

> its speakers subsist more than 50% on plants and animals whose reproduction is not controlled by humans

- Amendment 1: If a language
  - with known HG-status ethnographically
  - borrows numerals 3+ or 4+

=> then it had an original restricted numeral system

- Amendment 2: If a language *family*
  - with known HG-status ethnographically
  - can reconstruct numerals up to exactly 2 or exactly 3 (inclusive)

=> then it had an original restricted numeral system

- Amendment 3: If a language
  - is not directly attested with a restricted system in vocabularies
  - but there ethnographic evidence that they are "unable to count beyond 3"

=> then it has a restricted numeral system

- Maes, Josef. (1947) Belgisch-Kongo, p 722

  Der Ituri-urwäld Pygmäe kann kaum bis drei zählen.

- Hose, Charles & William McDougall. (1912) The pagan tribes of Borneo, V2 p 193:

  The most striking evidence of the low cultural standing of the Punan is the fact that he cannot count beyond three (the words are 'ja', 'dua', 'telo') ; all larger numbers are for him merely many 'pina'.

- Shortt, John. (1865) An Account of Some Rude Tribes, the Supposed Aborigines of Southern India, p 380:

  [Re Yenadies of Strihurreecottah] One or two of the boys, with the exception of a few errors, could count up to a hundred. Most of them, even with the assistance of their fingers, could not add numbers together; some could not tell how much three and two were, and the brightest among them could not add two figures to make twelve.

Worldwide HG Survey: Numbers

To count independent cases of restricted systems:

- If the phylogenetic history of the numeral system of a family is known, this gives which occurrences are independent

- Otherwise, look at every restricted system with independent *forms*

	Restricted	Restricted-Amendment	Non-Restricted
HG	85	35	76
NON-HG	7	1	124

- The poorly populated cell is non-HG & Restricted system

    If a language has a restricted system, then the speakers are likely HG

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Restricted → HG Covariation

- Several language families have some AGR and some HG member languages where the HG languages have restricted systems and the AGR members have non-restricted systems: Austroasiatic (Minor Mlabri, Hill Korwa), Cushitic, Morehead and Upper Maro, Pygmies (Ubangi, Bantu, Central Sudanic), Austronesian (Negritos, Tasaday, To Ala, Punan, Sera-Sissano, Waropen, Kuni), Chibchan, Khoe-Kwadi

- Shrinking must be inferred in the cases such as:

  – Kuni (Austronesian/Oceanic, Papua New Guinea):

  Sound Changes
  10
  10 R
  Kuni
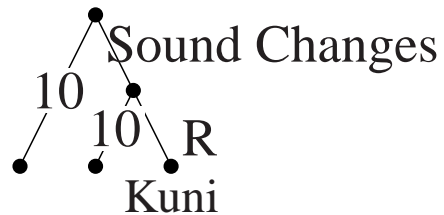
  – Minor Mlabri (Austroasiatic/Khmuic, Thailand): Old Khmuic numeral morphemes are preserved in ritual formulae

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Why Restricted Systems?

Why all AGR languages, as well as some HG languages, invent non-restricted systems is not well-understood:

- HG societies typically have many uses for exact counting, e.g.:
  - Valiente-Noailles, Carlos. (1993) The Kua: Life and Soul of the Central Kalahari Bushmen, p 87:

    She ... wait for the moment of birth ... calculate the nine month period ... counting the moons
  - Number of days to a festivity
  - Lots of evidence for non-verbal counting

- There is no simple explanation involving *trade*
  - Trade is omnipresent in HG societies around the world
    * Thurnwald, Richard. 1932 Economics in primitive communities. OUP.
    * Micha, Franz Josef. (1958) Der Handel der Zentralaustralischen Eingeborenen. Annali Lateranensi XXII. 41-228.
  - Expressions for exact numbers are **not** a pre-requisite for trade, e.g., a Spanish-Panare trade pidgin has a restricted system where 'vente' means 'many'

    Riley, Carroll L. (1952) Trade Spanish of the Piñaguero Panare. Studies in Linguistics 10(1). 6-11.

Restricted Systems in Khoisan

Sandawe (AGR) : Not restricted (5-10-100)

Hadza (HG) : Restricted plus Datooga + Swahili loans

Kx'a :

    Ju (HG) : Restricted

    Amkhoe (HG) : Restricted

Tuu :

    !Ui (HG) : Attested languages restricted (possible exception //Xegwi?)

    Lower Nosop (HG) : Restricted

    Taa (HG) : Restricted

Khoe-Kwadi : See next slide

Khoe-Kwadi

Kwadi (PAS) : Not restricted

Khoe :

    Khoekhoe :

        North :

            Hai//om (HG) : Not restricted / Borrowings from Nama?

            Nama (AGR) : Not restricted

            Bergdama (HG) : Restricted

        South (AGR) : Not restricted

    Non-Khoekhoe :

        Ts'ixa (HG) : Restricted

        Ost-Kxoe :

            Shua (HG) : Some lects restricted, some not

            Tshwa (HG) : Restricted

        West-Kxoe :

        Khwe-//Ani :

            Khwe (HG) : Restricted

            //Ani (HG) : probably not restricted

        Naro-Ana :

            Naro (HG) : Originally restricted

            //Gana (HG) : Restricted

            /Gwi (HG) : Restricted

Khoe-Kwadi 1-4

	Capelo/Ivens 1886 Westphal (nd) Kwadi	Nienaber 1962:37 Nama 1626	Hagman 1977 Nama	Heine 1999:37 ‖Ani	Vossen 2013:216 Cara	|Xaise	Danisi	Wilhelm 1955:26 Khwe
1	|wí	istwee	/gui	/úí	/úí	/úí	/úí	/gúichā
2	|ám	istum	/gam	/ám̀	/ám̀	/ám̀	/ám̀	/găm
3	dátùa < Bantu	istgwunny	!nona	n!óànà	//óbé	ngónà	//óbé	!nōănă
4	né < Bantu	hackey	haka	fìàtsâ	hàtsá	//óbé	-	-

- 1-4 reconstructs to proto-Khoe:

  => no inference from numerals that proto-Khoe was HG

- 1-2 only shared between proto-Khoe and Kwadi:

  ? => proto-Khoe-Kwadi was HG, or

  ? => Kwadi went through a HG stage between the split from proto-Khoe-Kwadi and the present

The End

Thank You for Listening!

* ————————————————————————References

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