

## Rarities in Numeral Systems

We have surveyed the numeral systems from over 4000 first-hand descriptive sources (estimated to represent some 2500 languages) from all over the world. Space here permits a discussion only on the outermost features such as e.g base<sup>1</sup>. We will only consider numbering systems which can be used in an open class of social situations to count an open class of objects. In particular, body-tally systems [32, 31, 30] are disregarded. Nowadays, these only exist in the Papua New Guinea highlands, but it has been neglected for a century to mention that there are indisputable attestations also from the Torres Straits [25] and mainland Australia(!) [27, 28]. 'Rare' will be used here in the sense of "present in few geographical areas" rather than "present in few languages".

Absence of numerals, and thus of base, is argued for Pirahã [17, 16]. Many more cases are mentioned in passing for Amazonia: Nadëb [50], Mocovi [24], Jabutí [3, p. 358], Canela-Krahô [23, p. 181], Krenák [49, p. 125], Chiquitano [1]. These are all of the type one-many or one-few-many, and in no case does it seem possible, or normed, to say few+one, one+one or few+few to designate an exact number (because e.g the word 'one' also means 'alone' or a word for 'twin' must be used which means something stronger than simply 'two'). A specific case for base-3 is given in Green [23] and there may be more cases. Base-4 is attested on four continents and there are a few more doubtful cases (whereas alleged cases like Huku, Nyali, Afudu, Welsh etc do not stand up to scrutiny). Bases 5, 10, and 20 are omnipresent. 25 as the next higher base for base-5 systems is only attested for Gumatj [26, 45]. This case is beyond all doubt genuine. However, *all* other claims of 5-25 systems lead nowhere. Three true base-6 systems from Frederik-Hendrik-Eiland are given in [15]. There are many attestations of bona-fide base-12 systems in the Plateau Area of Nigeria [44, 43, 35, 7, 6, 5, 29, 41, 47, 37, 46, 38, 36, 22, 20, 19, 2, 21], and Dhivehi of the Maldives may well have been another case [18]. The virtually unique cases of bases 15 [11, 51] and 24, 36 [48, 4] cannot be explained away as unsubstantiated. The next higher base after 20 in base-20 systems is more than rarely 40, 60 or 80 [13, 12, 39, 8, 9, 10, 14].

Other than base, the following are some remarkably sparse properties:

- Smaller-bigger order between additive units in numeral expressions  $> 100$ : Malagasy [40]. In our sample, the only parallel cases are alternative expressions in Classical Greek and Sanskrit.
- Unanalyzable forms for numerals up to 12: a bunch of base-12 languages e.g Jere and Janji. (Sharma's alleged 20 atoms for Kharia [42, p. 63] remain unsubstantiated). The pan-Germanic idiosyncratic formation around 12 is equally, if not more, rare.
- It is not crystal clear but there seems to be a decent case of a language with more ordinals than cardinals [33, 34, p. 100, p. 413].

---

<sup>1</sup>Definition used here is:  $n$  is a base iff the morpheme(s) for  $n$  are used in a proper majority of the expressions for numbers between  $n$  and the next higher base (or the end of the normed expressions). Proper majority between  $n$  and next higher base  $n'$  is to be interpreted as: at least one and strictly more than half of the numbers  $n < x \leq n'$ .

## Referenser

- [1] L. Adam and V. Henry. *Arte y Vocabulario de la Lengua Chiquita con algunos textos traducidos y explicados compuestos sobre manuscritos inéditos del XVIII siglo*, volume VI of *Bibliothèque Linguistique Américaine*. Librairie-Éditeur J. Maisonneuve, Paris, 1880.
- [2] Eleonore Adwiraah. *Grammatik des Gworok (Kagoro): Phonologie, Tonologie, Morphologie und Textanalyse*, volume 71 of *Europäische Hochschulschriften: Reihe XXI: Linguistik*. Peter Lang, Frankfurt am Main, 1987.
- [3] Alexandra Aikhenvald and R. M. W. Dixon. Other small families and isolates. In R. M. W. Dixon and A. Aikhenvald, editors, *The Amazonian Languages*, Cambridge Language Surveys, pages 341–383. Cambridge University Press, 1999.
- [4] M. Bokula and L. Ngandi. Numération cardinale dans les langues bantu du hautzaire. *Annales Équatoria*, 6:189–196, 1985.
- [5] Luc Bouquiaux. A propos de numération: L’emploi du système décimal et du système duodécimal dans la langue birom (nigéria septentrional). *Africana Linguistica*, I:7–10, 1962.
- [6] Luc Bouquiaux. A word list of aten (ganawuri). *Journal of West African Languages*, I(2):5–26, 1964.
- [7] Luc Bouquiaux. *La langue Birom (Nigeria Septentrional): phonologie, morphologie, syntaxe*. Bibliothèque de la Faculté de Philosophie et Lettres de l’Université de Liège – Fascicule CLXXXV. Société d’Édition les belles lettres”, Paris, 1970.
- [8] Nancy Bowers. Kapauku numeration: Reckoning, racism, scholarship and melanesian counting systems. *Journal of the Polynesian Society*, 86(1):105–116, 1977. There’s a lame reply in no 2.
- [9] G. Calame-Griaule. *Dictionnaire Dogon Dialecte Tørø: Langue et Civilisation*, volume IV of *Langues et Littératures de l’Afrique Noire*. Librairie C. Klincksieck, Paris, 1968.
- [10] Robert Carlson. *A Grammar of Supyire*, volume 14 of *Mouton Grammar Library*. Mouton de Gruyter, 1994.
- [11] B. Cheetham. Counting and number in huli. *Papua New Guinea Journal of Education*, 14:16–27, 1978.
- [12] Michael P. Closs. Native american number systems. In Michael P. Closs, editor, *Native American Mathematics*, pages 3–44. University of Texas Press, Austin, 1986.
- [13] E. Conzemius. Los indios payas de honduras estudio geográfico, histórico, etnográfico y lingüístico. *Journal de la Société des Américanistes*, XX:253–360, 1928.
- [14] Maurice Delafosse. La numération chez les nègres. *Africa, Journal of the International Institute of African Languages*, 1(3):387–390, 1928.

- [15] P. Drabbe. Bijzonderheden uit de talen van frederik-hendrik-eiland: Kimaghama, ndom en riantana. *Bijdragen tot Taal-, Land- en Volkenkunde*, 105:1–24, 1949.
- [16] Daniel L. Everett. The absense of numerals in pirahã. Presentation at the Workshop on Numerals, MPI, Leipzig, 29-30 of March, 2004, 2004.
- [17] Daniel L. Everett. Cultural constraints on grammar and cognition in pirahã: Another look at the design features of human language. *Current Anthropology*, 46(4):89–130, 2005.
- [18] Sonja Fritz. *The Dhivehi Language*, volume 191 of *Beiträge zur Südasiensforschung*. Ergon Verlag, Würzburg, 2002.
- [19] Ludwig Gerhardt. Abriß der nominalen klassen im koro, north central state, nigeria. *Africa und Übersee*, LVI(4):245–266, 1972/73.
- [20] Ludwig Gerhardt. *Beiträge zur Kenntnis der Sprachen des Nigerianischen Plateaus*. Afrikanistische Forschungen: Band IX. Verlag J. J. Augustin, Glückstadt, 1983.
- [21] Ludwig Gerhardt. The classification of eggon: Plateau or benue group? *Journal of West African Languages*, XIII(1):37–50, 1983. Eggon base 12 p. 47.
- [22] Ludwig Gerhardt. Some remarks on the numerical systems of the plateau languages. *Africa und Übersee*, 70:19–29, 1987.
- [23] Diana Green. Diferenças entre termos numéricos em algumas línguas indígenas do brasil. *Boletim do Museu Paraense Emílio Goeldi, Série Antropologia*, 13(2):179–207, 1997. Excellent previously not exposed data.
- [24] Verónica M. Grondona. *A Grammar of Mocovi*. PhD thesis, University of Pittsburgh, 1998.
- [25] Alfred C. Haddon. The ethnography of the western tribe of torres straits. *Journal of the Royal Anthropological Institute of Great Britain and Ireland*, XIX:297–437, 1890.
- [26] John Harris. Facts and fallacies of aboriginal number systems. In Susanne Hargrave, editor, *Language and Culture*, pages 153–182. Summer Institute of Linguistics, Darwin, 1982.
- [27] A. W. Howitt. Notes on australian message sticks and messengers. *Journal of the Royal Anthropological Institute of Great Britain and Ireland*, XVIII:314–333, 1889.
- [28] A. W. Howitt. *The Native Tribes of South-East Australia*. MacMillan, New York, 1904. On body-tally enumeration systems in connection with message sticks pp. 697-702.
- [29] Hermann Jungraithmayr. Die sprache der sura (maghavul) in nordnigerien. *Africa und Übersee*, XLVII:8–89, 204–220, 1963.

- [30] Donald C. Laycock. Observations on number systems and semantics. In Stephen A. Wurm, editor, *New Guinea area languages and language study vol 1: Papuan Languages and the New Guinea linguistic scene*, volume 38 of *Pacific Linguistics: Series C*, pages 219–233. Department of Linguistics, Research School of Pacific Studies, The Australian National University, 1975.
- [31] Glendon A. Lean. Counting systems of papua new guinea. 17 draft volumes left after Lean’s passing. Papua New Guinea University of Technology, Port Moresby, 1985-1986.
- [32] Glendon A. Lean. *Counting Systems of Papua New Guinea and Oceania*. PhD thesis, Papua New Guinea University of Technology, 1992.
- [33] E. H. Man. On the aboriginal inhabitants of the andaman islands (part i.). *Journal of the Royal Anthropological Institute of Great Britain and Ireland*, 12:69–116, 1883.
- [34] E. H. Man. On the aboriginal inhabitants of the andaman islands (part iii.). *Journal of the Royal Anthropological Institute of Great Britain and Ireland*, 12:327–434, 1883.
- [35] H. F. Mathews. Notes on the nungu tribe, nassawara province, northern nigeria, and the neighboring tribes which use the duodecimal system of numeration. *Harvard African Studies*, 1:83–93, 1917.
- [36] Shuji Matsushita. Decimal vs. duodecimal: An interaction between two systems of numeration. In *2nd Meeting of the AFLANG, October 1998, Tokyo*, 1998. Accessed Nov 29, 2004.
- [37] C. K. Meek. *Tribal Studies in Northern Nigeria*. Kegan Paul, Trench, Trübner & Co., London, 1931.
- [38] F. W. H. Migeod. Supposed duodecimal system in burum language. *Man*, 17(4):9–10, Jan 1917.
- [39] The Origin of the Sexagesimal System: The Interaction of Language and Writing. Marvin a. powell, jr. *Visible Language*, 6(1):5–18, 1972.
- [40] G. W. Parker. *Concise Grammar of the Malagasy Language*. Trübner & Co., London, 1883.
- [41] Uwe Seibert. *Das Ron von Daffo (Jos-Plateau, Zentralnigeria): morphologische, syntaktische und textlinguistische Strukturen einer westtschadischen Sprache*, volume 66 of *Europäische Hochschulschriften: Reihe XXVII: Asiatische und Afrikanische Studien*. Peter Lang, Frankfurt am Main, 1998.
- [42] D. D. Sharma. *Munda Sub-Stratum of Tibeto-Himalayan Languages*, volume VII of *Studies in Tibeto-Himalayan Languages*. Mittal Publications, New Delhi, India, 2003.
- [43] Kiyoshi Shimizu. Five wordlists with analyses from the northern jos group of plateau languages. *Africa und Übersee*, LXVII:253–271, 1979.

- [44] Kiyoshi Shimizu. Ten more wordlists with analyses from the northern jos group of plateau languages. *Africa und Übersee*, LXV:97–134, 1982.
- [45] Vivienne Sobek. Response to question about the gumatj base-5 numeral system. Personal Email Received 27 June 2005, 2005.
- [46] N. W. Thomas. Bases of numeration. *Man*, 17(96):145–147, Sept 1917.
- [47] N. W. Thomas. Duodecimal base of numeration. *Man*, 20:25–29, 1920.
- [48] H. van Geluwe. *Les Bali et les Peuplades Apparentées (Ndaka-Mbo-Beke-Lika-Budu-Nyari)*. Ethnographic Survey of Africa: Central Africa: Belgian Congo: Part V. International African Institute, London, 1960.
- [49] Čestmír Loukotka. Les indiens botocudo et leur langue. *Lingua Posnaniensis*, V:112–135, 1955.
- [50] E. M. Helen Weir. A negação e outros tópicos da gramática nadëb. Master’s thesis, Universidade Estadual de Campinas, 1984.
- [51] Edward P. Wolfers. The original counting systems of papua and new guinea. *The Arithmetic Teacher*, February:71–83, 1971.