

# Hadza: IOL 2024

Hadza was the 2nd problem of the individual contest of the 21st IOL held in Brasilia, Brazil. It was my fourth solo problem selected for the IOL and, including collaborations, my seventh problem selected. Unfortunately, I was busy with job applications for the summer of 2024, so I was unable to commit to attending the IOL in person, marking it as the first event I had not attended since I first competed in 2015. In my absence, the problem grading was led by Elysia Warner and the presentation by Jan Petr.

Hadza, also known as *Animal Kingdom* (among the Problem Committee) or *Safari* (in my drafts), is a semantics problem with a side salad of morphology and phonology. The phrases involved feature a wide variety of different animals and plants hunted and harvested by the Hadzabe. The problem was, therefore, intended as a window into a small aspect of Hadza culture, though there were many interesting aspects that I was unable to fit into an IOL format. It's one of my favourite problems I've written, and changed very little between its first and final incarnations. The final version is given below – enjoy!

## 1 The problem (EN)

Here are some word combinations in Hadza and their English translations. (The original problem features images of most of the animals involved, but not this version.)

- |                                      |   |
|--------------------------------------|---|
| 1. <b>chutisa zzokwanako</b>         | <i>the giraffe's neck</i>                         |
| 2. <b>athuitcha slimibii</b>         | <i>the men's axes (for collecting honey)</i>      |
| 3. <b>panjubeema popho</b>           | <i>the male impala's I. transvaalensis tubers</i> |
| 4. <b>do'aikuitcha sisimibii</b>     | <i>the lions' V. macrorhyncha tuber</i>           |
| 5. <b>uphukwabiitcha zzokwanabii</b> | <i>the male giraffes' legs</i>                    |
| 6. <b>chutikoma beggau</b>           | <i>the male elephant's neck</i>                   |
| 7. <b>uthumekoeta dlakwebee</b>      | <i>the girls' spear</i>                           |
| 8. <b>makokoma erati</b>             | <i>the boy's short, wide cooking pot</i>          |
| 9. <b>midlabiisa neeko</b>           | <i>the baboon's bones</i>                         |
| 10. <b>dungubiima hazzake</b>        | <i>the male thief's male zebras</i>               |
| 11. <b>athobeema sleme</b>           | <i>the man's axes (for splitting firewood)</i>    |
| 12. <b>uphukwakosa beggauko</b>      | <i>the elephant's leg</i>                         |

- |                                   |  |
|-----------------------------------|--|
| 13. <b>shumusa nqeko</b>          | <i>the female leopard's V. pseudolablab vine</i> |
| 14. <b>gogogogoma uhuyiti</b>     | <i>the male stranger's flamingo</i>              |
| 15. <b>uthumesa dlakweko</b>      | <i>the girl's long spear</i>                     |
| 16. <b>do'aisa sesemeko</b>       | <i>the female lion's V. macrorhyncha vine</i>    |
| 17. <b>midlaitcha niibii</b>      | <i>the male baboons' bone</i>                    |
| 18. <b>garibiieta akhiwitibee</b> | <i>the women's trucks</i>                        |

(a) Determine the correct correspondences:

- |                     |                                     |
|---------------------|-------------------------------------|
| 19. <b>wiriko</b>   | A. <i>tails (e.g., of leopards)</i> |
| 20. <b>roobee</b>   | B. <i>thin twig</i>                 |
| 21. <b>mu'a</b>     | C. <i>horns (e.g., of dik-diks)</i> |
| 22. <b>zzahubii</b> | D. <i>short, thick root</i>         |

(b) Translate into English:

23. **gariko**
24. **makubii**
25. **hazzakeko**
26. **dongobee**
27. **zzahoko**
28. **nqibii**

(c) Translate into Hadza:

29. *the flamingo's leg*
30. *the zebra's V. pseudolablab tuber*
31. *the male impala's horns*
32. *the female strangers' thick stick*
33. *the boys' tall cooking pot*
34. *the impala's long, thin roots*

△ Hadza is a language isolate. It is spoken by approx. 1000 people around Lake Eyasi in Tanzania. **ch, dl, gg, khw, kw, nj, nq, ph, sh, sl, tch, th, w, y, zz** are consonants. ' is the so-called glottal stop (a brief blocking of the flow of air in the throat). Consecutive identical vowels are pronounced separately (with intervening ').

*Ipomoea (I.) transvaalensis*, *Vatovaea (V.) pseudolablab* and *Vigna (V.) macrorhyncha* are vine plants with edible thickened underground stems called tubers (which are like potatoes). Any differences between these plants are not relevant to the solution of this problem.

—Samuel Ahmed

## 2 The genesis

In the second semester of my research master's in Leiden, I took a compulsory course called *Samples of Linguistic Structure*, in which we learnt about the features of 6 different languages. The aim of the course was to gain an appreciation for what the different languages of the world look like, especially since there's such a strong department of language documentation and description in Leiden. This was perfect for a student like myself, taking courses in fieldwork and documentation and interested in typological curiosities. (It was less directly useful for the few Indo-Europeanists in my cohort, and rather out of the usual scheme of things for the students focusing on cognitive/neuro-

/acquisition.)

In the end, the course was not as diverse as it could have been – we looked at four languages spoken in Tanzania, one from South America and one from China. The four languages spoken in Tanzania were, however, in three different genealogical groups; one Bantu, two Cushitic and one isolate. The assignment for the isolate, Hadza, involved taking a small portion of a transcribed text (approx. 4–4.5 minutes of audio) and, using a dictionary and sketch grammar, parsing and glossing it to the best of our abilities.

And if that sounds like an IOL team task, it might as well have been. It was hugely fun and, even better, I still had access to all the materials afterwards. This included a sketch grammar by Richard Griscom (who was leading this part of the course) and Andrew Harvey (Griscom & Harvey 2024), and Kirk Miller’s unpublished lexicons (Miller et al. 2017a).

After the 20th IOL in Bansko, I ended up looking through Griscom and Harvey’s sketch grammar for the kernel of an interesting problem and came across the tidbit that Hadza genders often lined up with semantic qualities, with a link to Edenmyr’s (2004) article. That article included most of the basis of what ended up in the template of the problem, with the exact lexical items verified/provided by Miller’s lexicon. I won’t share most of these files, since they explicitly say not to without permission, but many of the relevant parts are mentioned in publicly available work by Edenmyr and Miller (Edenmyr 2004, Miller 2008).

### 3 The language

Hadza is spoken around Lake Eyasi in Tanzania. Its speakers are renowned for their traditional hunter-gatherer lifestyle, though this way of life is getting harder over time (Miller 2008). The language, known by its speakers as Hadzane (Griscom & Harvey 2024), is known for being one of three languages in East Africa with click consonants.

These click consonants are present throughout the problem – they make up a large portion of the consonants listed in the phonetic note at the footer of the problem. They come in three places of articulation, with an associated letter of the alphabet; dental (**c**, **ch**, **cc**, **nc**), alveolar (**q**, **qh**, **qq**, **nq**) and lateral (**x**, **xh**, **xx**, **nx**). The variations represent the unaspirated oral, aspirated oral, glottalised nasal and nasal clicks respectively. Hadza also has a series of ejective affricates, mostly represented by doubled consonants (e.g. **zz**, **jj**, **gg**, but also **dl**). In the end, the precise phonetic character of the consonants does not affect the solution of the problem, hence why they were simply listed in the footer without further elaboration.

## 4 The game

What makes the Hadza problem tick, then?

The centrepiece of the problem is the semantic characterisations of masculine and feminine gender – we see grammatical gender being used explicitly to refer to the gender of animals and humans, but also metaphorically to distinguish between long/thin and short/wide inanimate objects. The ‘game’ is that these two uses overlap when discussing animals’ bodyparts; a giraffe’s (long) neck will be masculine, while an elephant’s (short) neck will be feminine. The double duty of using animals to show the ‘literal’ gender and using their bodyparts to show the metaphorical use is what makes the composition of the puzzle feel satisfying, at least from the author’s perspective (your mileage may vary).

## 5 The template

By necessity, linguistic problems are an oversimplification of real linguistic data. Most language is far too messy to work as a logical puzzle that can be solved by a single person within an hour, and most grammatical features require much more data to actually determine how they (usually) function in a system.

Part of the process of creating a problem like this is then to make such an oversimplification. In any case, you want the problem to be a good reflection of the language as it is actually spoken, and you want the data to be as realistic and verifiable as possible. However, the final result will always leave things out and create rigidity where a language has none.

The way I do this (and I imagine most other authors do) is by constructing a template to build the problem material out of. This template is its own mini sub-grammar of the language, with its own sub-lexicon, and it can be used to generate a large, but finite, number of forms in a language. The most important part is, then, ensuring that the template is as accurate as possible to the source material you’re working with. In that vein, it is now good practice in the PC to find an expert in the language and run the data past them to see if it looks alright.

For this problem, I contacted Andrew Harvey and Richard Griscom, who had run the Hadza course I attended in Leiden. They were very enthusiastic about the project and gave their okay to the first version of the problem. The template is thus based on course materials supplied by them (Griscom & Harvey 2024, Miller et al. 2017a) and (Edenmyr 2004).

The broad template of the Hadza problem is given below. Notes on each part are

included in the following subsections.

- Phrase structure: **Possessee-Suffix Possessor**
- Nouns:
  - 5 feminine-default animals: **dongo-ko** ‘zebra’, **popho-ko** ‘impala’, **nee-ko** ‘baboon’, **beggau-ko** ‘elephant’, **zzokwana-ko** ‘giraffe’
  - 3 masculine-default animals: **seseme** ‘lion’, **nqe** ‘leopard’, **gogogogo** ‘flamingo’
  - 6 humans: **akhwiti-ko** ‘woman’, **dlakwe-ko** ‘girl’, **sleme** ‘man’, **erati** ‘boy’, **hazzake(-ko)** ‘thief’, **uhuyiti(-ko)** ‘stranger’
  - 5 body parts: **chuti(-ko)** ‘neck’, **uphukwa(-ko)** ‘leg’, **midla** ‘bone’<sup>1</sup>, **roo(-ko)** ‘horn’, **zzaho(-ko)** ‘tail’
  - 3 plants: **panju-ko** ‘*Ipomoea transvaalensis* tuber’, **shumu(-ko)** ‘*Vatovaea pseudolablab* vine/tuber’, **do’ai(-ko)** ‘*Vigna macrorhyncha* vine/tuber’
  - 6 other objects: **atho(-ko)** ‘axe’, **uthume(-ko)** ‘spear’, **mako(-ko)** ‘cooking pot’, **gari(-ko)** ‘truck’, **mu’a(-ko)** ‘twig/stick’, **wiri(-ko)** ‘root’
- Semantics: For humans, grammatical gender is literal. For animals, one gender is default, the other is marked. For objects and body parts, feminine objects are prototypically short/wide/thick, e.g. tubers, short cooking pot, thick roots, while masculine objects are prototypically long/thin, e.g. vines, long spear, truck, twig.
- Morphology:
  - Gender suffixes
    - \*  $\emptyset$  masculine singular
    - \* **-ko** feminine singular
    - \* **-bii** masculine plural
    - \* **-bee** feminine plural
  - Possessor suffixes (appears after gender suffix on possessed noun)
    - \* **-ma** masculine singular possessor
    - \* **-sa** feminine singular possessor
    - \* **-itcha** masculine plural possessor
    - \* **-eta** feminine plural possessor
- Phonology:
  - Vowel harmony: Before suffixes with **i** (**-bii** and **-itcha**), **e/o** → **i/u**. This applies regressively through the whole word, including suffixes, until it is blocked by **a**.

- Haplology: **-bii-itcha** is reduced to **-biitcha**. (The same is also true for **-bee-eta**, but this is not tested.)

## 5.1 Phrase structure

The structure of possessives in Hadza is **Possessee-suffix Possessor**, where the suffix corresponds to the gender of the Possessor. This can be seen in (1–2), which gives some examples from Griscom and Harvey’s sketch grammar and the problem.

- (1) a. **mana-ko = ma**                      **kharimo-∅**  
           meat-F.SG = 3.M.SG.POSS    animal  
           ‘(the) meat of an animal’    (Griscom & Harvey 2024: 20200123\_MAA\_43)
- b. **mua-∅ = ma**                      **sleme-∅**  
           stick-M.SG = 3.M.SG.POSS    man-M.SG  
           ‘the man’s stick’
- (2) **chuti-ko = ma**                      **beggau-∅**  
       neck-F.SG = 3.M.SG.POSS    elephant-M.SG  
       ‘the male elephant’s neck’ (#6)

p.48

## 5.2 Lexicon

The following table gives the page reference in Miller et al. (2017a) of each noun used in the problem, along with any additional notes.

<b>dongo-ko</b>	(f) ‘zebra’, (m) ‘zebra buck’, (mpl) <b>dungu-bii</b> pp.129–130
<b>popho-ko</b>	(f) ‘impala’, (m) ‘impala buck’, (mpl) <b>puphu-bii</b> p.348. Also <b>phopho-ko</b> .
<b>nee-ko</b>	(f) ‘baboon’, (m) ‘male baboon’, (mpl) <b>nii-bii</b> p.314
<b>beggau-ko</b>	(f) ‘elephant’, (m) ‘bull elephant’, (mpl) <b>beggau-bii</b> p.86. Also <b>beggahu-ko</b> .
<b>zzokwana-ko</b>	‘giraffe’, f/m = natural gender p.556. mpl <b>zzokwana-bii</b> p.462
<b>seseme</b>	lit. ‘eater’; (m) ‘lion’, “ <b>sesemeko</b> is used”, (mpl) <b>sisimi-bii</b> p.414
<b>nqe</b>	(m) ‘leopard’ pp.387–388, (f) ‘female leopard’ (Griscom & Harvey 2024: 12). $\triangle$ mpl <b>nqe-bii</b> not <b>nqi-bii</b> . <sup>2</sup>
<b>gogogogo</b>	‘flamingo’ pp.156–157. No reported f or pl. Mimetic name, very common on the lake at certain seasons.

<sup>1</sup>**midla** ‘bone’ can also have a feminine form for a particularly large or thick bone (e.g. belonging to an elephant or giraffe), but this was not included as part of the problem. This word was included because it ended in an **-a**, which was needed to show that the masculine plural possessive suffix is **-itcha**, not **-tcha** or **-uitcha**.

<b>akhwiti-ko</b>	‘female, human or animal; girl, woman, any age’ p.17. Gloss ‘woman’ from Griscom & Harvey (2024)
<b>dlakwe-ko</b>	‘young woman, from circumcision to marriage, cf. <b>erati</b> ’ p.134. Gloss ‘girl’ from Griscom & Harvey (2024)
<b>sleme</b>	‘man’, pl. <b>slimi-bii</b> p.437
<b>erati</b>	‘young man, grown but not married, cf. <b>dlakwe-ko</b> ’, pl. <b>erati-bii</b> p.38. Gloss ‘boy’ from Griscom & Harvey (2024)
<b>hazzake(-ko)</b>	‘thief, esp. non-habitual’, m/f forms given. pp.198, 548. Agent noun derived from verb <b>zzake</b> ‘to steal’.
<b>uhuyiti(-ko)</b>	‘stranger’, msg/fsg/fpl forms given p.70
<b>chuti-ko</b>	(f) ‘neck (for antelope, people, most birds)’, (m) ‘especially long neck (giraffe, flamingo)’ p.107
<b>uphukwa</b>	(m) ‘legs/long legs (as water birds, antelope)’, (f) ‘stout legs, as elephant, hippo’ p.20. Also <b>aphukwa</b> , f can refer to just feet.
<b>midla</b>	‘bone’ p.286. (fsg, no pl) ‘big bones, i.e. of elephant or giraffe’
<b>roo(-ko)</b>	(m) ‘long horns (gazelle, oryx, kudu)’, (f) ‘shorter horns (rhino, goat, dikdik, wildebeest, buffalo, giraffe)’, (mpl) <b>roo-bii</b> ~ <b>ruu-bii</b> p.397
<b>zzaho(-ko)</b>	(m) ‘long thin tail (vervet monkey, baboon, lion, mongoose, rat, sheep, cat, cheetah, leopard, cow)’, (f) ‘short tail (giraffe, wildebeest, eland, buffalo, elephant, horse)’, (mpl) <b>zzahu-bii</b> p.548
<b>panju-ko</b>	‘wild yam <i>Ipomoea transvaalensis</i> ’ (f) for tuber and vine, (m) refers to a different tree <i>Adenium obesum</i> p.342
<b>shumu(-ko)</b>	(m) ‘leguminous vine <i>Vatovaea pseudolablab</i> ’, (f) ‘tuber of this vine’ p.431. Shaped like sweet potato with rough bark. Cooked for food or chewed raw for water.
<b>do’ai(-ko)</b>	(m) ‘leguminous vine <i>Vigna macrorhyncha</i> ’, (f) ‘the edible tuber (of said vine)’ pp.128–129. Tuber looks like a sweet <i>Solanum</i> -type potato. Eaten raw (consistency of carrot) or softened by roasting.
<b>atho(-ko)</b>	(m) ‘small axe designed for getting honey’, (f) ‘large axe for splitting firewood’ p.28. <b>atho</b> has hole for blade in handle, <b>athoko</b> has hole for handle in blade. See Figure 1 for an example of an <b>atho</b> .
<b>uthume-ko</b>	(f) ‘spear (in general)’, (m) ‘long spear’, (mpl) <b>uthumi-bii</b> p.75
<b>mako</b>	(m) ‘cooking pot (default or tall)’, (f) ‘short & wide cooking pot’, (mpl) <b>maku-bii</b> p.274
<b>gari-ko</b>	(f) ‘car’, (m) ‘truck’ p.150
<b>mu’a</b>	(m) ‘thin stick, twig, switch’, (f) ‘stick, thicker than <b>mu’a</b> , e.g. walking stick/club’ p.292

**wiri(-ko)** (m) ‘root, long and thin/default’, (f) ‘root, short and thick’ p.506. Also combines with diminutive and augmentative to give **wiri-nakwete** ‘short and thin’, **wirizu’ako** ‘long and thick’.



Figure 1: **atho** for collecting honey – note that the blade is (relatively) narrow. Image property of British Museum.

([https://www.britishmuseum.org/collection/object/E\\_Af1970-12-41](https://www.britishmuseum.org/collection/object/E_Af1970-12-41))

## 5.3 Morphology

The gender suffixes are given in the lexicon entries for each noun separately, though they are also given by Edenmyr (2004) and Griscom & Harvey (2024: 12). The possessive clitics are given by Griscom & Harvey (2024: 15–16) and Miller et al. (2017b: 3). The syntax of such examples is made clear with the examples seen earlier in (1).

## 5.4 Phonology

### 5.4.1 Vowel harmony

Vowel harmony before the masculine plural suffix **-bii** is very well attested in individual lexicon entries for most words where it occurs (see Section 5.2 for where the mpl form is explicitly stated).

Miller et al. (2017b: 3) also writes: “The =**ina** and =**itcha** forms trigger vowel harmony in the stem, incl. fsg **-ko** → **-ku** and fpl **-bee** → **-bi**, thus conflating the gender of plural nouns.” The latter fact does not show up in the final version of the problem, though the conflation of female and male plural suffixes did appear in an earlier version.

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<sup>2</sup>...Oops. I remember meaning to remove **nqibii** from the problem, but it must have gotten lost on the way. At least Miller reports that someone else reported **nqi-pii**, even if he thinks it was most likely a mistranscription of a raised **e**.



## 5.4.2 Haplology

I can't find a reference for the haplology rule right now, though I also can't find any evidence against it in the literature. The only references I can find right now are in the glossing assignment I did as part of the course I took at university, given in (3), and both of these are examples of **-eee-** → **-ee**, not **\*iii**. The quote given above about the suffixes undergoing vowel harmony also seems to suggest haplology of **iii**: “fpl **-bee** → **-bi**” (Miller et al. 2017b: 3); i.e. **-bee = itcha** → **-bi = itcha** (**\*-bii = itcha**). If I find a better source for the haplology of **i**, I'll add it to this section.

- (3) a. **ê**      **the**              **akhana-be = ena**              **akwaza**      **the**  
EXCL 2SG.PRON name-F.PL = 2SG.POSS who 2SG.PRON  
'Ahah, what is your name?'  
'Ee wewe jina lako ni nani?'
- b. **akhwiti-be = eta**              **haza-bee**  
woman-F.PL = F.PL.POSS Hadza-F.PL  
'the women of the Hadzabe'  
'wanawake wa Kihadzabe'

## 6 Miscellanea

### 6.1 Other animal terminology

There was no way to involve it in the problem, but animals (and hunting them) are even more involved in Hadza life and language than represented. One reflection of this is the phenomenon of “exclamatory” words used when pointing out dead animals, and the alternative names used for sighting an animal during a hunt.

The exclamatory words function grammatically like imperative verbs, taking inflection for how many people the speaker is addressing and taking direct object marking for the gender and number of the animals in question. Some examples are given in 4.

- (4) a. **hanta-ii**  
zebra.lo-F.SG.OBJ  
'[Look, a dead zebra!]' (Miller et al. 2017a: 198)
- b. **dlonkô-eta-si**  
impala.lo-F.PL.OBJ-PL.addressee  
'[Look (y'all), a dead impala!]' (Miller et al. 2017a: 198)

Most of the animals given in this problem have similar exclamatory verbs: **hantâ** (for **dongoko** 'zebra'), **dlonkô** (for **pophoko** 'impala'), **hawâ** (for **zzokwanako** 'giraffe'),

**henqê** (for **nqe** ‘leopard’), **hubû** (for **seseme** ‘lion’), **kapurâ** (for **beggauko** ‘elephant’), **nqokhô** (for **neeko** ‘baboon’).

Some also have alternative names used for sighting/while hunting: ‘zebra’ can be **bashu**, **dabasho**, **gidabashu**; ‘giraffe’ can be **kar(r)o** (female), **katire** (male), **khupe** (male); ‘baboon’ can be **robe** or **rabe** (male); ‘impala’ can be **sôpi/sûpi(-ko)**.

## 6.2 Further info about Hadza noun classification

In general, the problem intended to show how there is a tendency for long and thin objects to have masculine gender, while short and thick objects have feminine gender. Edenmyr (2004) gives many more examples of how gender categorisation is influenced by semantics, some of which are given in Table 1.

Masculine	Feminine
carnivorous mammals	grass-eaters
snakes & long/thin insects	spiders & termites
twigs, berries fruit	most plant species
diseases	hair
moon/night	sun/day
bow <b>khoo</b>	rifle <b>khooko</b>
deep baobab cave <b>mereka</b>	shallow baobab cave <b>merkako</b>

Table 1: Some other trends in Hadza gender categorisation

## References

- Edenmyr, Niklas. 2004. The semantics of Hadza gender assignment: a few notes from the field. *Africa & Asia* 4. 3–19.
- Griscom, Richard & Andrew Harvey. 2024. A sketch of Hadza grammar. Unpublished manuscript.
- Miller, Kirk. 2008. *Hadza grammar notes*. [https://www.academia.edu/36533859/Hadza\\_grammar\\_notes](https://www.academia.edu/36533859/Hadza_grammar_notes).
- Miller, Kirk, Mariam Anyawire, G. G. Bala & Bonny Sands. 2017a. *A Hadza lexicon II: lexical dictionary*.
- Miller, Kirk, Mariam Anyawire, G. G. Bala & Bonny Sands. 2017b. *A Hadza lexicon III: grammatical dictionary*.