The Grammar of Individuation and Counting

Suzi Lima
THE GRAMMAR OF INDIVIDUATION AND COUNTING

A Dissertation Presented

by

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Department of Linguistics
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This dissertation is dedicated with love to my parents Raimundo and Sirlei and to the dear Yudja people whose friendship and support brought me here.

Esta dissertação é dedicada com amor aos meus pais, Raimundo e Sirlei, e também para o querido povo Yudja cuja amizade e apoio me trouxeram até aqui.
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This dissertation investigates the linguistic expression of individuation, counting, quantifying and measuring in Yudja (Juruna family), a Tupi language spoken in Brazil. Based on elicitation data and experimental studies with children and adults, three main topics are explored: (i) the semantic properties of numeral constructions and their compatibility with notional count and notional mass nouns; (ii) the semantics of container phrases and their interaction with numerals, and finally (iii) the semantics of nominal quantifiers. Relying on the principles of mereotopology (Casati and Varzi 1999, Varzi 2007), the main claim of this dissertation is that in Yudja all nouns can be used as count nouns. That is, in Yudja maximal self-connected concrete portions of a kind can be considered as atoms and can be counted. This claim is based on three fundamental properties of Yudja that were confirmed by experimental studies with children and adults. First, data obtained in context-based elicitation sessions show that all notional count and all notional mass nouns can be directly combined with numerals. Second, the results of quantity judgments studies with Yudja children and adults suggest that all nouns can be directly combined with count-quantifiers and that count-quantifiers are necessarily
interpreted as referring to the number of concrete portions. Third, the results of comprehension and production tasks with Yudja children and adults show that container phrases are interpreted as locatives and do not necessarily determine the individuation unit. These properties together suggest that all nouns in Yudja are interpreted as count nouns.
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CHAPTER 1
INTRODUCTION

This dissertation investigates the linguistic expression of individuation and counting in Yudja (Juruna family), a Tupi language spoken in Brazil. Based on elicitation data and experimental studies with children and adults, three main topics are explored: (i) the semantic properties of numeral constructions and their compatibility with notional count and notional mass nouns (Chapters 2 and 3); (ii) the semantics of container phrases and their interaction with numerals (Chapter 4), and finally (iii) the semantics of nominal quantifiers (Chapter 5). This introductory chapter will present a general overview of the questions that motivate the discussion in this dissertation (Section 1.1), and also an overview of the three main topics analyzed in the dissertation (Section 1.2). Moreover, this introductory chapter presents an overview of the literature on the Yudja people and language (Section 1.3), an overview of the technical background assumptions (Section 1.4), an overview of the fieldwork methodology (Section 1.5) and a discussion about cultural aspects of counting and measuring (Section 1.6), as these will be the main topics discussed in this dissertation.

1.1 The count/mass distinction across languages: background

Linguists and philosophers have extensively discussed how languages encode the distinction between so-called ‘count nouns’ (e.g. dog) and so-called ‘mass nouns’ (e.g. blood) (see Quine 1960, Burge 1972, 1979, Pelletier 1975, 2009, 2012, Bunt 1979, 1985,
Across many languages, these classes of nouns have distinct morphological and syntactic properties. The exact properties that distinguish ‘mass’ from ‘count’ nouns can vary from language to language. Chierchia (1998a, 1998b, 2010) has established three different categories of languages: number-marking languages, classifier languages and number-neutral languages. In the so-called number-marking languages, only count nouns can be pluralized:

(1a) This dog/girl is happy
(1b) These dogs/girls are happy

(2a) That blood is RH Positive
(2b) ?? Those bloods are RH Positive

(3a) That gold weighs two ounces
(3b) ?? Those golds weigh two ounces

(Chierchia 2010; 109 – examples (19a) to 19d)

In the examples above, dog and girl, but not blood and gold can be pluralized because the former but not the latter have clearly individuated entities in their extensions. In addition, the determiner system is sensitive to the mass/count distinction in English:
The determiners *the* and *some* can combine with any noun, either count (4a and 4b) or mass (4c). Determiners such as *a* and *every* are restricted to singular count nouns (5a). Finally, determiners such as *most* and *all* are restricted to plural and mass nouns (6b and 6c, respectively).

Not only English but also other number-marking languages, such as the Romance languages¹, use these two morphosyntactic criteria – pluralization of count nouns and distribution of quantifiers – to distinguish these two classes of nouns. Additionally, a critical property to distinguish count from mass nouns in English are the numeral constructions. In constructions with numeral and mass nouns, a container or a measure phrase is required (‘three quarts of blood’ (measure); ‘three tubes of blood’ (container); *‘three blood(s)’). Without such a container or measure phrase, the sentence is either ungrammatical, or else reinterpreted so that the mass noun shifts its interpretation (‘we drank three beers’, meaning ‘three bottles of beer’; cf. Gleason 1965, Pelletier 1975, Frisson and Frazier 2005, Wiese and Maling 2005, Lima 2012).

The second type of language described in Chierchia’s count/mass typology is the classifier languages. Classifier languages are characterized by (i) bare arguments, that is,

---

¹ There is an extensive literature on the count-mass distinction in Brazilian Portuguese. Consult Paraguassu-Martins and Müller (2007) and references therein.
nouns that are not associated with any functional material, occurring without articles, number inflection, case, etc.; (ii) the absence of pluralization and (iii) the requirement of a classifier. A classifier is understood here as “a word that denotes something like a measure, a container, or shape based words that express something like ‘unit’” (Chierchia 2010; 107):

Mandarin Chinese

(7a) San *(ge) nanhai (7b) Yi *(ben) shu
three CL boy one CL book

‘Three boys’ ‘One book’

(Chierchia 2010; 107 – examples 15a and 15b)

Examples (7a) and (7b) show that nouns in Chinese require a classifier, including nouns that have well-individuated atoms in their extensions, such as nanhai ‘boy’ and shu ‘book’. Note, however, that the distribution of classifiers is not unrestricted in this language. Cheng and Sybesma (1999) argue in favor of count-classifiers and mass-classifiers (henceforth massifiers) in Chinese. For instance, the classifier ge does not combine with mass nouns or, if it does, it forces a count interpretation²:

Mandarin Chinese

(8) ?? San ge xue
three CL blood

2 There is a debate about whether some classifiers are associated only to count nouns and others only to mass nouns in Chinese. See Li (2010).
‘Three portions of blood’
(Chierchia 2010; 107 – example 14)

Cheng and Sybesma (1999) show that some modifiers and adjectives are restricted to one class of classifiers. For instance, a modifier marker *de* can intervene between [massifier+N], but not between [count-classifier+N]:

Mandarin Chinese

(9a) San bang (de) rou
three CL.pound DE meat

‘Three pounds of meat’

(9b) Ba tou (*de) niu
eight CL.head DE cow

‘Eight cows’
(Cheng and Sybesma 1999; 516 – example 12a and 13a, respectively)

Another aspect of the distribution of classifiers in Chinese is the fact that some adjectives modify massifiers but not count-classifiers:

Mandarin Chinese

(10a) Yi da zhang zhi
one big CL.sheet paper

(10b) *Yi da zhi gou
one big CL.dog
‘One large sheet of paper’
(Cheng and Sybesma 1999; 516 – examples 14a and 15a)

This set of examples show that even though pluralization and distribution of
determiners do not discriminate count nouns from and mass nouns in Chinese, other
criteria can be used to establish this distinction.

The third type of language described in the literature (Wilhelm 2008), the
number-neutral languages, share some properties with classifier languages. To start with,
these languages, like classifier languages, are characterized by bare arguments:

Dëne Suline
(11a) K’ásba nághilnígh
      chicken PERF-1SG-buy O
      ‘I bought a chicken’

(11b) Li dëneyuaze theál
      dog boy-DIM PERF-bite/chew O
      ‘The dog bit the little boy’
(Wilhelm 2008; 45 - examples 4a (11a) and 4e (11b))

In these examples, the nouns in argument position (subject or object) are bare.
That is to say, k’ásba ‘chicken’ (in 11a), li ‘dog’ and dëneyuaze ‘boy’ (in 11b) do not
bear definiteness, case or number inflection. The second characteristic that number-neutral languages share with classifier languages is the absence of plural morphology:

Dëne Suliné

(12a) Larry lághe ejëre nághélnígh

Larry one bovine PERF-buy O

‘Larry bought one cow’

(12b) Larry ejëre nádághélnígh

Larry bovine DIST-PERF-buy O

‘Larry bought several cows/ cattle’

(Wilhelm 2008; 45 - examples 5a and 5b)

In the examples above, ejëre ‘bovine’ has the same morphological form in its singular (‘cow’ (12a)) and plural (‘cows’ (12b)) uses, where, crucially, no morphology is added. What distinguishes count and mass nouns in these languages is the fact that count nouns can directly combine with numerals while mass nouns cannot. That is the first property that distinguishes classifier languages from number-neutral languages. Differently from classifier languages, number-neutral languages have no classifier systems (therefore, no numeral classifiers in constructions with mass nouns and numerals). Instead, as in number-marking languages, in number-neutral languages a numeral cannot combine with a mass noun without an intervening container or measure phrases (13c):
1.2 The Yudja language and the count-mass distinction

The examples from English, Chinese and Dene Suline have shown that the grammatical properties that distinguish count from mass nouns vary across languages. Nevertheless, two key features in the count-mass distinction typology are the distribution of numerals and quantifiers. In most languages described in the literature numerals and mass nouns cannot be combined directly, as we observed above for English, Mandarin and Dene Suline. In these languages, a classifier or a measure phrase must intervene. Another common feature observed cross-linguistically is that only count nouns can be combined with count-quantifiers such as ‘many’ in English (many boys/ * many water). This restriction is also observable cross-linguistically, even in languages where the count/mass distinction is expressed in different ways beyond the typology presented...
above\(^3\). Gillon (2010), for example, argues that in spite of the apparent absence of a count/mass distinction in Innu-Aimun, the distribution of the plural morpheme in constructions with quantifiers provides evidence for grammatical differences between count and mass nouns. In Innu-Aimun (Gillon 2010; 22), all nouns can occur with any class of quantifier, but only count nouns and some mass nouns can be pluralized in constructions with the quantifier \textit{mîtshet} ‘many/much’:

\begin{center}
\textbf{Innu-Aimun}
\end{center}

\begin{align*}
(14a) & \quad \text{Mítshet} & \quad \text{utenâu} & \quad (14b) & \quad \text{mítshet} & \quad \text{utenâu-a} \\
& \quad \text{lots/many} & \quad \text{town} & \quad & \quad \text{lots/many} & \quad \text{town-INAN.PL}
\end{align*}

\begin{align*}
& \quad \text{‘Many towns’} & \quad & \quad \text{‘Many towns’}
\end{align*}

\textit{(Gillon 2010; 21-22 [examples: 30b and 32c])}

\begin{align*}
(15) & \quad \text{pimî} & \quad (16) & \quad \text{pimî-a} \\
& \quad \text{oil} & \quad & \quad \text{oil-INAN.PL}
\end{align*}

\begin{align*}
& \quad \text{‘Oil’} & \quad \quad \text{‘Oil(s)’}
\end{align*}

\begin{align*}
(17) & \quad \text{mítshet} & \quad \text{pimî} & \quad (18) & \quad * \text{mítshet} & \quad \text{pimî-a} \\
& \quad \text{lots/many} & \quad \text{oil} & \quad & \quad \text{lots/many} & \quad \text{oil-INAN.PL}
\end{align*}

\begin{align*}
& \quad \text{‘Lots of oil’} & \quad \quad \text{(intended: lots of bottles of oil)}
\end{align*}

\textit{(Gillon 2010; 12 [examples: 1c, 1d, 31d, 33c])}

\(^3\) A few of those languages are: Blackfoot (Wiltschko 2010), Dene Sulîné (Wilhelm 2008), Inuu-aimun (Gillon 2010), Karitiana (Müller, Storto and Coutinho-Silva 2006), Ojibwe (Mathieu 2012), St'at'imcets (Davis and Matthewson 1999) and Kuikuro (Franchetto, Santos and Lima 2013)
The key point of this dissertation is to describe and analyze the distribution of notional count and notional mass nouns in constructions with numerals and quantifiers in the Yudja language (see 1.3. for details about the group and their language). What makes Yudja interesting from a typological perspective is that differently from other languages described in the literature so far, in this language notional count and notional mass nouns can be directly combined with numerals and count-quantifiers. An overview of the aspects of the Yudja language that will be discussed in this dissertation is presented as follows.

Numerals and atomicity (Chapters 2 and 3) First, as it will be shown in detail in Chapters 2 and 3, differently of most languages described so far, in Yudja all nouns can be directly combined with numerals, including notional mass nouns (20):

(19)  Txabīu piṣa dju wī  
Three canoe bring

‘(Someone) brought three canoes’

# ‘Someone brought canoes three times’

(20)  Txabīu apeta dju wī  
Three blood bring

‘(Someone) brought three (quantities of) blood’

# ‘Someone brought (portions of) blood three times’
Based on elicitation sessions with Yudja speakers I will show that notional mass nouns can be combined directly with numerals independently of the existence of a standardized unit associated with a particular substance. For example, in English, when one says in a bar ‘three beers, please’, a particular unit of individuation of the beer is implicit (bottles or cups). Conversely, if an English speaker sees three spots of beer on the floor this person will not say ‘there are three beers on the floor’. Thus, mass nouns can be directly combined with numerals only when standardized units are involved. In Yudja, however, we will see that this is not the case: notional mass nouns can be directly combined with numerals even when standardized units are not involved. Indeed, I will show that the distribution of numerals with notional count and notional mass is the same.

**Locative container phrases (Chapter 4)** Second, while in most non-classifier languages container or measure phrases are required in constructions with numerals, in Yudja they are optional. When they do occur, container nouns are always followed by the postposition *he* ‘in’ (*saku he* ‘sacs in’, *sedukaha ipakï he* ‘syringes in’, *papera akalikali he* ‘boxes in’, *karaxu he* ‘spoon in’, *kaneku he* ‘cups in’, *duyãhã he* ‘package in’, *wã’ê he* ‘pan in’, *xãã he* ‘bowl in’). For example:

(21) **Txabïu asa wĩ he [saku he] au**

Three flour bank in bag in have

‘There are three bags of flour in the river’s bank’

Based on the results of experimental studies with children and adults, I will show
that potential candidates to the role of container or measure phrases in Yudja (saku he ‘in bags’ in (21)) have the syntax of locatives and are interpreted as such. In other words, I will show that the absence of container/measure phrases (and the use of locative phrases instead) is correlated with the possibility to combine numerals with mass nouns.

**Count-quantifiers** (Chapter 5) Third, in Yudja all nouns can be combined with the count-quantifier itxîbî ‘many’. In these sentences, count-quantifiers are interpreted as quantifying over individuals or portions of stuff:

(22) Itxîbî pîza dju wî
    Many canoe bring
    ‘(Someone) brought many canoes’

(23) Itxîbî uda apeta dju wî
    Many someone blood bring
    ‘(Someone) brought many (clearly individuated quantities of) blood’

Based on the distribution of notional mass nouns in constructions with numerals and count-quantifiers, the main claim that I will make in this dissertation is that in Yudja there are no expressions that select only notional count nouns such as pîza ‘canoe’. Instead, all nouns can be combined with count-quantifiers and all nouns can be directly combined with numerals (including notional mass nouns) because, as I will claim, all nouns allow count denotations (expressing number-neutral properties of concrete portions
of stuff). This claim makes two predictions about this language. First, when count-quantifiers combine with notional mass nouns such as y’a ‘water’ they should only produce what we will call ‘number’ interpretations (many portions of water) and not ‘volume’ interpretations (a big portion of water). Second, if all nouns have the same denotation, we expect that speakers will not treat these nouns differently in quantity judgment tasks. Both of these predictions are confirmed by the results of quantity judgment studies (Chapters 3 and 5) with Yudja adults and children. In the rest of this introduction I present an overview of the literature about the Yudja language.

1.3 The Yudja people and language

Yudja (Juruna family; Tupi stock – cf. Rodrigues, 1986), also known in the literature as Juruna, is an endangered and understudied language spoken by approximately 300 people in the Xingu Indigenous Territory in Brazil, divided in 6 villages (Kretire Antigo, Mupadá, Paksamba, Pequizal, Piaraçu and Tuba Tuba). Despite the small number of speakers, Yudja is not an endangered language if we consider that all children and adults speak it fluently in their villages (Lima and Santos 2008), and that children are schooled in Yudja. Along with Yudja, two other languages belong to the Juruna family: Xipaya (spoken by two elderly persons and described by C. Rodrigues (1990, 1995), and Manitsawá (extinct) (Rodrigues 1986). The Tupi stock is presented in the graph below:

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4 Even though the Yudja people are generally known as Juruna, I will adopt the denomination Yudja because this is the self-denomination of the group. Furthermore, they expressed their preference for this denomination explicitly in different circumstances.
Figure 1.1: The Tupi stock

The first studies that documented the Yudja language consist of word lists and verbal paradigms (Stein 1942, Collins 1962, Coudreau 1977 *apud* Fargetti 2001) and a preliminary report of Yudja’s phonological features (Louro 1978). The first and most detailed description of the Yudja language was done by Cristina Fargetti, who analyzed the phonology of the Yudja language (Fargetti 1992) and produced a descriptive grammar that discussed aspects of the morphology and syntax of the language (Fargetti 2001). Since then, Fargetti has continued working with the Yudja people; she wrote a number of papers about a variety of aspects of the Yudja language and culture (Fargetti 2002a,
2002b, 2002c, 2003, 2006, 2007, 2008, 2010, 2012), including typological studies about the Juruna family with Carmen Rodrigues, who documented the Xipaya language, which also belongs to the Juruna family (Fargetti and C. Rodrigues, 2005a, 2005b, 2007, 2008, 2009, 2011), among many other publications. Many anthropological aspects of the Yudja people were documented and analyzed by Stolze-Lima (1995, 1996, 1998, 2005), among many other publications. I have been working with Yudja communities since 2005, when I started to develop linguistic projects and engaged in educational projects and training of indigenous researchers. In previous work, I have described and I have analyzed the argument structure of Yudja (Lima 2007b, 2008), pluractionality (Lima 2006, 2007a, 2007b, 2007c, 2007d), nominal and verbal cumulativity, and the count-mass distinction (Lima 2010, 2012). In collaboration with Yudja schoolteachers, I have produced an online dictionary of verbs (bilingual: Yudja/Portuguese) to be published by Museu do Índio/FUNAI/Brazil. In this dissertation I will use the Yudja orthography created by Cristina Fargetti (Fargetti 2001; 53), which is still used by the Yudja people nowadays. The Yudja orthography and its IPA transcription are presented below:

Table 1.1: Yudja orthography (correspondence IPA and orthographic symbols)

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Tania Stolze Lima uses ‘Lima’ as her last name in citations. In this dissertation I will refer to her work using Stolze-Lima in order to avoid confusion with my own work.
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**Vowels**

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(Fargetti 2001; 53)
1.4 Background assumptions and notional conventions

1.4.1 Syntactic assumptions

This dissertation is placed loosely within the Principle and Parameters framework (cf. Chomsky 1981) and Distributive Morphology framework (cf. Marantz 1995, Embick and Noyer 2007). I assume that syntactic phrases can be structured by binary branching and the nucleus of these projections can be lexical or functional. From the Distributive Morphology framework, I adopt the working hypothesis that all lexical items are formed by combining category neutral roots with category-defining functional heads. In the distributive morphology framework, roots surface in the syntax as lexical categories (nouns, verbs, adjectives, etc) only after being categorized. Therefore, lexical categories are always syntactically complex and are formed by combining abstract morphemes and lexical roots (specific aspects of this proposal and the implications for the working hypothesis are discussed Chapter 3).

1.4.2 Semantic assumptions

This work is situated in the tradition of formal, truth-conditional semantics (Heim and Kratzer 1998, Chierchia and McConnel-Ginet 2000). In this perspective, the interpretation of sentences is type-driven, and makes use of semantic rules – terminal node, non-branching node, functional application and predicate modification (cf. Heim

1.5 Fieldwork methodology

In this dissertation a variety of data collection methods were used. This work relied heavily on the Yudja speakers linguistic intuitions, in small elicitation sessions but also in experimental studies. Experimental studies were done for two main reasons. First, in order to make a stronger case for the analysis presented in this dissertation, we wanted to show that a particular phenomenon is attested across a large and diverse number of speakers (given that we interviewed speakers of different genders and age groups). Second, as all studies were done with children and adults, we wanted to present a preliminary discussion about the acquisition of a particular topic (interpretation of nouns; distribution of numerals; interpretation of container phrases; quantifiers).

Three methods of data collection were used: elicitation, studies and interviews. I also consulted previous materials (description and narratives) produced by linguists (such as Fargetti 1992, 2001) and anthropologists who studied counting in this society (Ferreira 1991, 1994, 1997, 2001, 2002). Data elicited by other researchers is always identified as such. Unless I indicate otherwise, the data from Yudja come from my own fieldwork.

Before I discuss the methodology of elicitation, I must emphasize that each phase of this project was always discussed with the whole communities before the research began. At the beginning of each field trip, my research project was discussed in a whole-community meeting, as were the counterparts of my work for the community. The
community also received a description of the project in Brazilian Portuguese. Prior to each interview, speakers read (in Brazilian Portuguese) and listened to (first in Brazilian Portuguese and then in Yudja, provided a translation that was prepared and enunciated by a Yudja teacher) a consent form. These measures were taken to ensure that the process of linguistic fieldwork was as transparent and as collaborative as possible for the communities.

1.5.1 Elicitation

Elicitation sessions were conducted with one to two speakers per session. They included three main types of tasks. Overall, every questionnaire was elicited with more than one speaker, and in a few cases the same questionnaire was elicited twice in different field trips in order to check consistency of speakers’ answers.

1.5.1.1 Elicitation method 1: scenarios

Matthewson (2004) argues in favor of the use of scenarios in data elicitation sessions because semantic data are fundamentally context-dependent. In the elicitation sessions conducted in the Yudja communities, scenarios were presented orally (in Brazilian Portuguese or in Yudja) and drawings/photos were used as support in most cases (in order to avoid a misleading interpretation of the scenarios being tested). After presenting the scenario, the task could be concluded in two different ways: 1) a target sentence in Yudja was presented and it was asked whether that sentence could be used in
that scenario; 2) the participant was asked to provide a sentence that described that scenario. The use of scenarios allows the fieldworker to test a specific hypothesis given a single sentence that is tested in different scenarios previously designed. The reverse methodology was also used: first we presented a sentence in Yudja, and then the participant was asked to provide a scenario where that sentence could be used. The advantage of asking the participants to provide scenarios that could be described by a particular sentence is an important tool in elicitation sessions for two reasons: 1) first, because it creates a different dynamic in the fieldwork session making it less repetitive (as each sentence will be associated with a different scenario); 2) second, because the consultants are more knowledgeable in providing real life scenarios unknown to the fieldworker, who does not live in an indigenous community. This process enriches the description of a particular phenomenon in an endangered language.

1.5.1.2 Elicitation method 2: drawings (comprehension tasks)

A sentence was presented to the participants who were then asked to draw a situation that the sentence describes. This method was used to elicit data on the interpretation of quantifiers in Yudja (since asking for translations is misleading, even when both researcher and consultant are bilinguals (cf. Matthewson 2004)).

1.5.1.3 Elicitation method 3: create a sentence (production task)
In order to get sentences that are close to spontaneous speech, I provided words in Yudja and I asked the consultants to create a sentence with them. After creating a sentence with the words provided, they were asked to provide a scenario in which they could use it, or hear a native speaker of the language saying it. The participants were encouraged to use visual stimuli (drawing) to present their scenarios. This task is helpful because it encourages the consultants to present contextually relevant scenarios, and it makes the elicitation process more interactive in comparison to more traditional techniques. The sentences created in this task were later used to build experimental studies, and also to test hypotheses using designed scenarios and different syntactic orders. This method was used to elicit data on the interpretation of container words and numerals.

1.5.2 Experimental studies

Studies were made with Yudja children and adults in order to investigate on a larger scale the consistency of the intuitions tested in elicitation sessions with a smaller group of speakers. Children were tested in order to describe the acquisition path and the interpretation of: 1) count and mass nouns in quantity judgment studies (Chapter 3); 2) container phrases in comprehension and production tasks (Chapter 4) and 3) quantifiers and adjectives in quantity judgment tasks (Chapter 5).

1.5.3 Interviews
Nine interviews were realized with members of the Yudja community that occupy different positions inside their territory (pajés (spiritual leaders), leaders, nurses, teachers, and crafters), in order to better understand cultural aspects of counting and measuring in Yudja. A bilingual schoolteacher assisted me during the interviews and interacted with the interviewees. Given the main theme of this dissertation, I focused on aspects of counting and measuring quantities and individuals (but not time or distance). In the next section, I provide cultural evidence that motivated the description and analysis of the topics discussed in this dissertation.

1.6 Notes about the social circumstances of counting and measuring in Yudja

Anthropological studies in Yudja communities have shown that numerals and counting play an important role in giving, receiving and sharing goods, i.e., reciprocity/exchange relations (cf. Ferreira 1991, 1994, 1997, 2002).

In order to show the particularities of counting and measuring in these communities, I will present below the summary of a series of interviews with Yudja speakers. It will become clear that the choice of analyzing container nouns is motivated by the fact that while constructions with numerals are highly productive in daily activities to refer to portions and number of objects by adults and children, the description of volume (liters, kilos or pounds) is not. This aspect of counting in Yudja can be explained by the absence in the language for measure words. Therefore, I intend to show that the use of numerals to describe time and distance and the assimilation of the idea of measuring volume is based on borrowed words from Brazilian Portuguese as a result of
interactions with non-Yudja people. Below I present the highlights of the interviews with some members of the Yudja communities that corroborate these observations.

1.6.1 Interviews: counting and measuring in Yudja

In order to discuss cultural aspects of counting and measuring in Yudja, six members of the Yudja community were interviewed: Doriu Juruna, indigenous nurse of the Tuba Tuba village; (male, 45 years old); Nunhã Juruna, who lives in the Tuba Tuba village (female, 43 years old); Lafussia Juruna, who lives in the Tuba Tuba village (male, 53 years old); Taikapo Juruna ('Pini'), the pajê (male, spiritual leader) of the Tuba Tuba village (male, 49 years old); Tarinu Juruna, one of the two first indigenous professors of the Tuba Tuba village (male, 51 years old) and Txinini Juruna, the leader of the Tuba Tuba village (male, 60 years old). All the interviews were conducted in Yudja with the help of the following language consultants: Chadaha Juruna (male, 27 years old), a local school teacher, accompanied Nunhã's and Doriu's interview; Tawaiku Juruna (male, 26 years old), a local nurse who accompanied most of the interviews, except the interview with Tarinu and Yabaiwa Juruna (male, 27 years old), young leader, local school teacher and coordinator of education in the Tuba Tuba village, accompanied Tarinu's interview, his father.

The interviews included questions about the use of numerals more generally (in counting time, space, distance) and also on the use of container nouns. I present below the main aspects of these interviews.

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6 The interviewees signed a consent form authorizing their names to appear in the reports of the interviews.
Measuring time The interviewees explained that measuring time depends on natural elements such as the position of the sun for indicating the time during the day and the position of stars to indicate different ‘months’ during the year. Measuring time using a numerical system is not part of the traditional culture, and it is a relatively recent loan from the ‘white’ culture. For this reason, Yudja speakers use day and month names borrowed from Portuguese. One of the interviewees, Tarinu, explained that while on a trip, the Yudja people traditionally keep track of days spent travelling by making a node on a string every time the sun is in a certain position.

Measuring space Spatial distances are traditionally measured using wood sticks (one or more wood sticks). However, the interviewees explained that the Yudja people have since incorporated the ‘white’ metric system (centimeters) by borrowing measure words from Portuguese. The measurement of distance between places was also independent of counting with numerals. Instead, they would choose a place as a symbol in their trajectory (when going from their villages to another place). Alternatively, they could measure the amount of time that it takes to get to a place by observing the sky and the sun.

Sharing goods Sharing is an important aspect of the Yudja culture. The owners of a given plantation invite friends and family to their plantation in order to share goods; the quantities vary according to how much was produced in a given plantation and also depend on personal relations. The Yudja people share produce and meat from hunting and fishing between family and members of the community, spiritual leaders and spirits.
When sharing goods, they consider what the family or member of the community needs and they provide this amount to the person, if they have it. Quantity comparison is one strategy to share goods and be fair. In order to compare, the Yudja people use the number of objects (fruits, fish, etc), or the number of containers filled with a substance (e.g., the number of canoes filled with caxiri (Yudja’s traditional drink), the number of bowls filled with flour, etc). I will return to the issue of quantity comparison in Chapters 2, 3 and 4.

Cooking Nunhã observed that while cooking, the Yudja people do not count the numbers of bowls or pans used. Instead, they observe the texture of the food and they evaluate if they need to add some ingredient (water, for example). Nunhã exemplifies how she gives directions to another woman in this kind of scenario with the following sentences:

(26a) Meme hinaku yukidí karahu he nanũ̂ yahã ameku
one only salt spoon in full PRED put
‘Drop one full spoon of salt’

(26b) Meme hinaku asa wa’ẽ xi yahã he pitxa
one only flour pan small PRED in fish
iwĩ yahã he lameku
cook PRED in put
‘Put one pan of flour in (the container that contains) the cooked fish’

(26c) Yauda iya xaa he itutu (wa’ẽ he)
two water bowl in put.RED (pan in)

‘Put two bowls of water (in the pan)’

Note that in all examples above, container nouns (xãã ‘bowl’, wa’ẽ ‘pan’, karaxu ‘spoon’) are followed by a postposition (he ‘in’). Thus, one could wonder whether these containers are just indicating the location of a particular quantity of a substance or whether they determine the counting units. I return to this topic in Chapter 4 where I discuss the possible interpretations of these phrases based on experimental studies with children and adults.

_Ceramics and other artifacts_ Nunhã observed that in the past women used to use pieces of _inaja_ (maripa palm) in order to measure a pre-existent bowl before starting to make a new one. Tarinu added that historically they produced artifacts (arc, arc’s rope, _borduna_ (indigenous ‘weapon’)) based on people’s height.

_When do we need counting with numerals?_ Overall Pini, the _pajê_ (spiritual leader) of the Yudja community, observed that counting using numerals is only required to refer to precise quantities (number of objects, plantation goods, clothes, containers). Pini also mentioned that they usually count quantities (number of objects or portions), not volume. Interestingly, Lafussia made a similar comment. He said that counting is useful when referring to goods that they are sharing or have shared. When the Yudja people can count the produce itself, which is the case with fruits, they count the individual fruits. When
they need to count things that are difficult to individuate, they use container words (such as xàà ‘bowl’).

In sum, the interviews introduce an important aspect of counting in Yudja that will be present throughout this dissertation (cf. Chapter 2 to 4): the Yudja people prefer to count portions/individuals by the number of clearly individuated portions when they cannot use natural elements (sun, stars) for measurement, but they rarely use volume standards. For example, in the community (such as in a situation of sharing goods) if they share substances, they compare quantities by the number of different containers being used, not by the amount of a substance x in each container. Thus, volume is rarely a relevant strategy for measurement among the Yudja people; if they need to measure substances based on volume, the measure words are borrowed from Portuguese and they are probably interacting with a ‘white’ person. The examples below illustrate the distribution of these borrowed words in Yudja:

litro ‘liter’

(27a) Una yauda litro y’a awi
   1S two liter water drink
   ‘I drank two liters of water’

(27b) Dez litro na motor u’â awa
   Ten litro 1S motor oil buy/take
   ‘I bought 10 liters of gasoline (motor’s oil)’
As illustrated in (27) and (28) the Yudja people can refer to measurement units by using words borrowed from Brazilian Portuguese. The word *litro* ‘liter’ is used in Yudja
in its non-pluralized form and they keep the syntax of use of these words in Brazilian Portuguese (numeral + measure word). Also note that in a few cases they also use the numeral in Brazilian Portuguese (27b and 28a to 28c). For non-liquid substances, the unit of measurement (*kilo* ‘kilo’) is implicit, as illustrated in the examples in (28). These examples were elicited in a workshop that I organized in a Yudja village, during which I had to buy local produce. Because the Yudja people knew that I was familiar with the metric system, they used it during our transactions. However, they would not use those sentences if they where exchanging goods between themselves. Rather, they would refer to the actual objects (fruits, for examples) or the number of containers filled with a particular substance as mentioned previously.

### 1.7 Numerals in Yudja

To conclude this introduction, I will present an overview of the numerical system of the Yudja language. Fargetti (2001) has shown that the Yudja numeral system goes up to 20 and if they refer to higher quantities, they start counting again (therefore counting in groups of 20). Duriu and Nunhã observed that nowadays younger members of the community tend to use the ‘white’ numerical system, that is, Brazilian Portuguese numerals. Words that are used to refer to numbers from one to four are morphologically simple; they do not refer to body parts:

**Yudja**

(29a) Meme    (29b) Yauda    (29c) Txabïu    (29d) Duwadjuse
Numerals from five to ten are formed by the combination of the word for hand and number words from one to four. Number words from six to nine have two possible morphological forms (see (31a) and (31b) for the number word ‘six’) that are used in free variation:

Yudja

(30) Five

Sewa pauna ne

hand side

‘Five’

(31a) Six (form 1)  (31b) Six (form 2)

Se-wa pauna meme  Se-wa pauna be meme kara

1PL-hand side one 1PL-hand side DAT one pass

‘Six’ (lit.: hand size (plus) one)  ‘Six’ (lit.: pass one (finger) to our hand)

The number words for eleven to twenty are formed by the combination of the word for foot and number words from one to five, as illustrated below:

Yudja

(32) Sixteen  Se-bïdaha pauna be meme kara
In Chapters 3 and 4 I present a series of studies with children and adults that involve numerals in Yudja. The reader will note that in these studies I used the numerals *yauda* ‘two’ and *txabîu* ‘three’. The motivation to use these two number words comes from the fact that they are less morphologically complex in comparison to other numerals in Yudja and also because they are used by all speakers, including children that master the meaning of these numerals by 3 years of age. Thus, it is common to hear the numerals *yauda* and *txabîu* being used in the communities, but numerals above these are in competition with Brazilian Portuguese numerals and so we concentrate in the use of numerals that are productive in the language and that have no morphological variations.

In the next Chapter (Chapter 2) I start to present a more detailed description of the distribution of numerals in Yudja in constructions with notional count and notional mass nouns.
CHAPTER 2

BASIC NOMINAL PROPERTIES OF YUDJA

In Chapter 1 we have seen that in most languages described so far in the literature, numerals can be directly combined with count nouns (‘three canoes’/ ‘three girls’/ ‘three dogs’) but they cannot be directly combined with mass nouns (*‘three honey’/ ‘the bottles of/liters of honey’). This has been taken as a signature property of the distinction between count and mass nouns crosslinguistically (cf. Chierchia 2010).

The goal of this chapter is to investigate the properties of constructions with numerals in Yudja as in this language all nouns can be directly combined with both notional count and notional mass nouns. Based on elicitation data that manipulated contexts and visual stimuli, I argue that coercion (universal packager) is not enough to explain why numerals can be directly combined with mass nouns in this language (Sections 2.2 and 2.3). Crucially, I will also show that Yudja does not have classifiers (just like most of the Tupi languages) that could intervene between notional mass nouns and numerals (Section 2.4).
2.1 Basic properties of the Yudja language

2.1.1 Bare arguments

Yudja is a bare noun language, i.e., nouns are unspecified for number (singular, plural) and unspecified for definiteness (definite or indefinite). Therefore, nouns can be interpreted as singular or plural, definite or indefinite, depending on the context:

(01) Ali ba’i ixu
child paca eat
‘The child(ren) eat(s)/ate the/a/some paca(s)’
Lit.: an undefined number of children eat(s)/ate an undefined number of pacas.

Bare nouns in Yudja are not only used in episodic sentences, but they can also be used with kind-referring nouns and generic predicates (cf. Chapter 3):

(02a) Kaniã urahu yahã Xingu he apî’i mama
animal big REL Xingu in jaguar
‘The biggest animal of Xingu is the jaguar’

(02b) Takum iduhau anu
mutum disappear ASP
‘Mutum (a Brazilian bird) is extinct’
(02c) Ka’apa apeta a anu
insect blood like ASP

‘Insects like blood’

2.1.2 Plurals

Yudja has an optional plural morpheme -i restricted to [+ human] nouns (Fargetti 2001). If a [+ human] noun refers to pluralities, the preference is to use the noun modified by -i (see (03b) and (03c)). However, a non-pluralized [+ human] noun can also refer to pluralities as we can see in (03a) below:

(03a) Senahï kota ixu
man snake eat
‘A/the/some man/men eat(s)/ate a/the/some snake(s)’
Lit.: an undefined number of men eat(s)/ate an unspecified number of snakes

(03b) Senahï-i kota ixu
man-PL snake eat
‘(The) men eat/ate a/the/some snake(s)’
Lit.: a plural set of men eat/ate an unspecified number of snakes

(03c) Kota senahï-i ixu
snake man-PL eat

‘A/the/some snake(s) eat(s)/ate the/some men’

Lit.: an unspecified number of snakes eat(s)/ate an unspecified number of men

Example (03a) is ambiguous between an interpretation where a single man or more than one man ate a/the snake(s). In (03b) and (03c), the plural morpheme -i excludes the possibility of the interpretation ‘one single man’. Note that the plural morpheme –i cannot be associated with [-human] nouns such as kota ‘snake’:

(03d) * Kota-i senahi ixu
   snake-pl man eat

(03e) * Senahi kota-i ixu
   man snake-PL eat

As a consequence of this fact, the plural morpheme cannot be combined with nouns that denote substances (04b):

Yukidi ‘salt’ (substance, non-liquid)

(04a) Yauda Maria yukidi dju wi
   two Maria salt bring

   ‘Maria brought two (portions of) salt’
The facts presented show that only [+human] nouns can be pluralized in Yudja. Therefore, it is not the case that the distribution of the plural morpheme depends on a distinction between (notional) count nouns and (notional) mass nouns.

2.1.3 Numerals

As mentioned in Chapter 1, in most languages for which the mass-count distinction has been discussed so far, a classifier, or a measure or container phrase, like pound or bowl as in three pounds/bowls of sugar is required for felicitous combination of a numerical expression with a mass noun (cf. Chierchia 1998b, 2010). If a measure/container phrase or classifier is not available, a sentence that includes a numeral
and a (notional) mass noun is either ungrammatical or requires reinterpretation (‘coercion’ or ‘type-shifting’), as illustrated below:

Dene Suliné (number neutral language)

(06a)  * Solághe  ber  (06b)  Solághe  nedádhi  bër
       five      meat      five     pound     meat

      ‘Five pounds of meat’

(Wilhelm 2008; 47 - example (9b))    (Wilhelm 2008; 47 - example (10a))

English (Number-marking language)

(07a)   *Thirty three waters

(07b)   Thirty three bottles of/liters of water

(based on Chierchia 2010)

Mandarin (Classifier language)

(08a)  * San     rou
       three    meat

(08b)  San     bang     rou
       three    CL     meat

      ‘Three pounds of meat’

(Chierchia 2010; 104 – example 5)

In Yudja, however, all nouns can be directly combined with numerals without intervening classifiers or measure phrases:
Ba'ï ‘paca’ (animal)

(09a) Txabïu ba’ï wânä
three paca ran

‘Three pacas ran’

Ali ‘child’ (human)

(09b) Txabïu ali wânä
three child ran

‘Three children ran’

Pïkaha ‘chair’ (artifact)

(09c) Txabïu Maria pïkaha ïwä
three Maria chair buy

‘Maria bought three chairs’

Yukïdï ‘salt’ (substance; granulated)

(09d) Maria txabïu yukïdï apa
Maria three salt drop/fall

‘Maria dropped three (portions of) salt’

Apeta ‘blood’ (substance; bodily fluid)

(09e) Txabïu uda apeta wï
three someone blood bring
‘Someone brought three (portions of) blood’

$Y’a$ ‘water’ (substance; liquid)

(09f) Maria yauda y’a dju wi

Maria two water bring

‘Maria brought two (portions of) water’

Before we move to the actual hypothesis being tested in this chapter – the coercion hypothesis – three observations about the data presented above must be made.

First, container nouns – such as those referring to bottles, bowls, bags, spoons, etc – can occur in constructions with numerals and (notional) mass nouns such as $yukidî$ ‘salt’, $apeta$ ‘blood’ and $y’a$ ‘water’ (9d.i, 9e.i, 9f.i), but they are optional:

$Yukidî$ ‘salt’ (substance; granulated)

(9d.i) Maria txabîu yukidî xââ he apa

Maria three salt bowl in drop/fall

‘Maria dropped three bowls of salt’

Lit.: Maria dropped three (portions of) salt in bowls

$Apeta$ ‘blood’ (substance; body fluid)

(9e.i) Txabîu uda apeta xââ he wi

three someone blood bowl in bring

---

7 An analysis about the container phrases in Yudja is provided in Chapter 4.
‘Someone brought three bowls of blood’

Lit.: Someone brought three (portions of) blood in bowls

$Y’a$ ‘water’ (substance; liquid)

(9f.i) Maria yauda y’a karaha he dju wi

Maria two water bottle in bring

‘Maria brought two bottles of water’

Lit.: Maria brought two (portions of water) in bottles

Second, numerals can occur discontinuous to the noun they are associated with. That is, numerals can occur in different positions of the sentence in this language (compare the examples 9c and 9d, and 9d.i/9f.i with 9e.i). Even though I will not pursue a syntactic analysis for these constructions in this dissertation, two crucial notes must be made.

First, different variations of the same sentence where the only difference is the position of the numeral (if the numeral is adjacent or not to the noun it modifies) can be used to describe the same context. That is, the variations of the sentence (9f) (repeated below) can be used to describe the same context:

CONTEXT: Maria brought two portions of water from her house to the school:

(09f.ii) Maria yauda y’a dju wi

Maria two water bring
Second, and related to the first note, if numerals are not modified by the morpheme –*ha* they can only modify nouns, not verbs (09f.iii). Conversely, numerals marked by the morpheme –*ha* can only modify verbs, not nouns (09f.iv):

(09f.iii) Yauda Maria y’a dju wï
Two Maria water bring

‘Maria brought two (portions of) water’

# Maria brought water twice’

(09f.iv) Yauda-ha Maria y’a dju wï
Two-ADV Maria water bring

‘Maria brought water twice’

# ‘Maria brought two (portions of) water’

In this chapter (as in the other chapters of this dissertation) I will focus on the interpretation of numerals that are not modified by the –*ha* morpheme. Thus, I will focus on the interpretation of numerals when they are associated with nouns, not verbs.
Given that numerals can be directly combined with (notional) mass nouns in Yudja, one could ask whether numeral constructions in Yudja are not simply an example of coercion. In the next section (2.2) I exclude this possibility by showing that even in scenarios where coercion is not possible, Yudja speakers can combine numerals and nouns that denote substances directly.

2.2 The coercion hypothesis

Coercion or ‘recategorization’, in Corbett’s (2000) terms, is a technical term for shifts from count to mass nouns and mass nouns to count nouns. To exemplify these shifts, consider the count noun chicken. The standard interpretation of chicken is a count interpretation, a set or species of animals as in (10):

\[
(10) \text{ ‘There are four chickens over there’}
\]

The fact that some nouns, such as chicken, are considered ‘naturally’ able to be count does not exclude the possibility of a mass interpretation:

(11) There is chicken in the soup

Enriched interpretation: ‘There is chicken \textit{meat} in the soup’
In (11), one can easily understand that *chicken* refers to ‘meat’, as the substance, not the ‘animal’ as in (10). Conversely, if some nouns are considered mass, that does not exclude the possibility that they may be used as count nouns:

(12) The best wines are from Chile

   Enriched interpretation: ‘sorts of wine’

   (Wiese and Maling 2005; 5 – example (3a))

(13) Two beers and a coffee, please

   Enriched interpretation: ‘portions of beer, portions of coffee’

   (Wiese and Maling 2005; 5 – example (3b))

In (12) the substance ‘wine’ can have an enriched interpretation that yields sorts of substances. In (13) the interpretation of substances such as ‘beer’ and ‘coffee’ yields portions. Examples (11)-(13) represent the three different processes described in the literature under the name of ‘coercion’, which we will explore in this section. In (11), the process of shifting involved is the ‘universal grinder’ (Pelletier 1975). The universal grinder transforms objects into substances. In (12), the mapping involved is the ‘universal sorter’ (Bunt 1985), which derives sorts from substances. Finally, in (13), the shift is the so-called ‘universal packer/packager’ (Gleason 1965, Pelletier 1975). This function takes
a substance and returns portions associated to it. Wiese and Maling (2005) visualize these three operations in the following figure:

Figure 2.1: Conceptual enrichment in mass/count coercion

(Wiese and Maling 2005; 6)

A central question is how free are these shifts: are they unrestricted or are there criteria to determine if a shift is possible or not?

Doetjes (1997; 22) argues that count-mass shifts have a regular pattern and that mass-count shifts are unpredictable. Consider the universal grinder as a kind of count to mass noun shift. According to Doetjes, this shift is possible in appropriate contexts for all nouns that describe physical objects. Gleason (1965) (apud Pelletier 1975 6-7) introduced the idea that coercion is context-dependent:

“Are there limitations to this shifting [between count and mass senses]? (...) it is soon found that many of the ones with both uses are very much more frequent in one than in the other. The less frequent use occurs only rather unusual circumstances. Water as a mass noun is common and widespread; as a count noun is nearly restricted to waiters. Perhaps some of the other words would also
show both uses if sufficiently unusual situations were conceived. This seems to be the case. For example, book and shelf are both fairly typical count nouns. With the present vogue for speaking—animal stories, we can imagine one featuring a mother termite concerned over the child Jonny is very choosy about his food. He will eat book, but he won’t touch shelf. This is far-fetched, of course. But it does suggest that every noun, given the right context, can occur in either type of usage, count or mass”

Gleason (1965) (apud Pelletier 1975; 6-7)

The quote cited by Gleason involves the use of the count nouns book and shelf as mass nouns. Both book and shelf are count nouns that denote physical objects therefore, can undergo this shift. Abstract nouns such as characteristic, mile or aspect (Doetjes 1997; 22), on the other hand, cannot easily undergo this shift.

The shift of mass nouns into count nouns or into names for kinds requires a different explanation. As described by Doetjes (1997), some cases of kind-referring interpretations for mass nouns do not imply coercion. Consider (14) and (15):

Dutch

(14) Ze verkopen dit hout al jaren

They sell this wood since years

‘They have been selling this (type of) wood for years’

(Doetjes 1997; 22 – example (10))

Portuguese

(15) Eles vendem essa madeira há anos

They sell this wood there is years

8The examples in this dissertation are followed by the identification of their original source except when the examples were created and/or elicited by me.
‘They have been selling this wood for years’

In (14) and (15) above, we cannot consider wood (hout in Dutch or madeira in Portuguese) as a count use of a mass noun because it cannot be pluralized, as shown below. Recall from Chapter 1 that pluralization is a central property of count nouns in number-marking languages:

Dutch

(16) Ze verkopen verschillende duurzame *houten/houtsoorten

They sell different durable woods/kinds of woods

‘They sell different kinds of durable wood’

(Doetjes 1997; 23 – example (11))

Portuguese

(17) Eles vendem diferentes ? madeiras/ tipos de madeiras duráveis

They sell different ? woods/ kinds of woods

‘They sell different kinds of durable wood’

The examples above show that wood cannot undergo coercion because it cannot be pluralized. Unlike wood/hout/madeira, the noun wine/ vinho/ wijn can be pluralized; thus it can be coerced (see 19 and 20):

Portuguese
(18) Vinho uruguaio é ótimo, mas o vinho chileno é melhor
wine uruguyan is great but the wine Chilean is better

‘Uruguayan wine is great, but Chilean wine is better’

Portuguese

(19) Vinhos uruguais são ótimos, mas os
wine-PL uruguaian.PL are great-PL but the.PL
vinhos Chileno-s são (os) melhor-es
wines chilean-PL are (the) best-PL

‘Uruguaian wines are great, but Chilean wines are (the) best’

Portuguese

(20) Maria experimentou diferentes vinhos
Maria tasted different wine.PL

‘Maria tasted different wines’

Unlike madeira (wood), vinho (wine) must have undergone coercion in (19) and
(20), because the noun is pluralized. The same can be observed in Dutch (21):

Dutch

(21) Marie heeft verschillende wijnen geproefd
Marie has different wines tasted

‘Marie tasted different wines’
The examples in Dutch, Brazilian Portuguese, and English presented in this section were used to show that grammatical properties of languages (such as the plural morpheme) can be used to distinguish coerced and non-coerced uses of nouns in some languages. However, not every language provides a grammatical property that distinguishes coerced from non-coerced uses of nouns. For that reason, other coercion diagnostics must be used to test for coerced and non-coerced uses of nouns cross-linguistically.

A critical type of coercion in our discussion of the Yudja data is the universal packager. Like the availability of the universal sorter, the availability of the universal packager is culture-dependent and restricted to standard uses, in this case to standard serving units or conventionalized containers in a given context/culture. What will count as a standard counting unit will depend on the context. For instance, we can say in a restaurant ‘three beers, please’ because this is related to a standard serving of beer. The literature (cf. Gleason (1965) *apud* Pelletier (1975) Frisson and Frazier (2005), Wiese and Maling (2005)) says that these shifts are more commonly accomplished in the domain of food and drink. As presented in Gleason’s (1965) quotation, containers associated with ‘restaurant talk’ are easily conventionalized in a large number of languages and cultures, possibly because of frequency of use. However, even nouns that are less frequently used as count nouns can be directly combined with numerals if the context provides a conventionalized use of a noun. The following example exemplifies this fact:

(Doetjes 1997; 23 – example (12))
(. . .) During this preliminary manipulation the bloods were exposed to the air and lost COT. Consequently, the reaction of the bloods at the beginning of incubation was somewhat more alkaline than normal blood. In four bloods measured, the plasma pH before incubation was 7.92, 7.87, 7.88, and 7.78 (. . .)


This excerpt extracted from a scientific paper shows that even a noun like blood can be directly combined with numerals and have a count use if the context establishes a standard use of the noun (in this case, samples of blood). If this requirement fails, then coercion is not possible, as illustrated below:

CONTEXT: a police inspector enters a house where a murder has been committed and discovers three very clearly individuated puddles of blood on the floor (Angelika Kratzer p.c.)

(22) # There are three bloods on the floor.

In example (22), clearly individuated portions are salient in the context. However, these nouns are not associated with a ‘conventional container’ in this particular context. Therefore, a unit associated with these nouns is needed in order to make the sentence felicitous (23’):

(23) # There are three bloods on the floor
(23’) There are three puddles of blood on the floor’
The existence of coercion in languages like Dutch, English and Portuguese is a serious empirical challenge for the claim that, in Yudja, notional mass nouns can be directly combined with numerals without an intervening container construction or numeral classifier. One could argue that the apparently free elasticity of nouns in Yudja is due to coercion if we consider that coercion (universal packager) always presents the same requirements across languages: clearly individuated portions of a substance and standardized serving units. As plural or other grammatical properties cannot be used to distinguish coerced and non-coerced uses of nouns in Yudja, when testing the coercion hypothesis, the field worker has to create scenarios that manipulate the two other properties that characterize the universal packager: clearly individuated portions and standardized serving units or conventionalized containers in a context/culture. This strategy was used in the questionnaire presented in the next section in order to test the coercion hypothesis in Yudja.

2.3 A questionnaire on coercion: numerals and the universal packager

Materials and procedure

In this questionnaire I was testing whether coercion is involved in constructions where numerals are directly combined with nouns that denote substances. Two Yudja speakers (20-to-30-year-old adult male consultants) had to answer a questionnaire composed of 40 items: 20 items presented a context where clearly individualized portions of a substance and a standard container were provided (henceforth ‘conventional
context’), and 20 items presented a context where clearly individuated portions were still available, but standard containers were not (henceforth ‘unconventional context’). In this task, 20 different nouns were used, covering four different semantic groups: liquid substances such as milk, water, honey, oil, fat/grease, or yakuha [traditional drink]; non-liquid substances such as salt, sugar, rice, cotton, wood, meat, fish, flour, or beans; bodily fluids such as blood, nasal secretion, or saliva; and ‘nature’ substances (sand and rain). Below I exemplify the two types of scenarios used to test the coercion hypothesis:

**Conventional context:**

<table>
<thead>
<tr>
<th>Target question, option 1 (In Brazilian Portuguese): Como eu digo em Yudja ‘Tamariku trouxe três tubos de sangue?’</th>
<th>Target question, option 2 (In Yudja): É correto dizer Tamariku txabïu apeta dju wï?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tamariku, enfermeiro em Tuba Tuba, trouxe 3 potes de sangue do Diauarum.</td>
<td>Tamariku, a nurse in Tuba Tuba, brought three containers of blood from Diauarum.</td>
</tr>
<tr>
<td>How do I say in Yudja ‘Tamariku brought three tubes of blood?’</td>
<td>Is it correct to say ‘Tamariku brought three blood(s)?’</td>
</tr>
</tbody>
</table>

**Unconventional context:**

João cortou seu dedo e três gotas caíram no chão. Uma perto da escola, outra perto do rio e uma perto de sua casa.

João cut his finger and three drops of blood fell on the ground: one near the school, another near the river and another near his house.
**Target question, option 1 (In Brazilian Portuguese):**

Como eu digo em Yudja ‘Três gotas de sangue caíram no chão?’

*How do I say in Yudja ‘Three drops of blood fell on the ground?’*

**Target question, option 2 (In Yudja):**

É correto dizer txabìu apeta lapa?

*Is it correct to say ‘three blood(s) fell?’*

The goal of the questionnaire refers back to the hypothesis presented in Section 2.2 that I repeat here. In languages where coercion (universal packager) is required when a mass noun is combined with a numeral without classifiers or container constructions, coercion depends on clearly individuated portions of the noun and on culturally standardized containers. In a language such as Yudja where nouns that denote substances can be combined with numerals without container constructions or classifiers, the question is whether coercion is involved in these processes and if it is, to what extent. To answer this question, the critical items in this questionnaire were scenarios that included unconventionalized containers; the ‘unconventional contexts’ illustrated above tested contexts where coercion is not possible in English, Dutch, or Portuguese. Thus, if coercion does play a role in Yudja, speakers would consistently refuse scenarios where a (notional) mass noun is combined with a numeral and a conventional container is not available. If coercion does not play a role in Yudja, nouns will be combined with numerals even when conventional containers are not available, which is not a possibility for most languages cross-linguistically.
In this questionnaire, the consultants first heard the context and then the target question. In one version (Brazilian Portuguese) the consultants had to provide a sentence in Yudja that could describe the scenario. In another version (Yudja), the consultants had to say whether a particular sentence in Yudja could match the scenario provided. Each consultant saw half of the target questions in Brazilian Portuguese and half in Yudja, and they saw different items for each language (for example, speaker 1 saw items 1 to 10 in Yudja and speaker 2 saw items 1 to 10 in Brazilian Portuguese). The results for this task are presented below.

Results

In both conventional and unconventional contexts, both speakers agreed that the same 16 out of 20 nouns can be directly combined with numerals without intervening container/measure phrases or classifiers\(^9\). This was observed both when the target question was asked in Yudja and when the consultants were asked to describe in Yudja a scenario that was presented in Brazilian Portuguese. Below, I present the sentences provided by the consultants in each context tested along with their respective contexts. I present two examples for each of the semantic categories (liquid substances, non-liquid substances, body fluids and ‘nature’ substances) used in this task\(^10\):

**Semantic category 1: liquid substances** (identical results for: *awîla* ‘honey’, *y’a ‘water’, *ũ’ã ‘oil*, *ikaha ‘fat/grease’, and *yakuha* ‘traditional drink’)

\(^9\) See Section 2.4 for the four other nouns that present different properties in comparison to the notional mass nouns discussed in this section.

\(^10\) Additional examples for each category are presented in Appendix 2.
Awïla ‘honey’

CONVENTIONAL CONTEXT: Someone brought two containers full of honey.

(24a) Yauda awïla dju wï
Two honey bring
‘(Someone) brought two (bowls of) honey’

UNCONVENTIONAL CONTEXT: Someone was carrying a container full of honey. On the way, one drop fell near the school and another near the health unit.

(24b) Yauda awïla pe–pe–pe
 two honey drip.RED
‘Two (drops of) honey dripped (in different events)’¹¹

Y’a ‘water’

CONVENTIONAL CONTEXT: A woman brought three containers of water to the school.

(25a) Txabïu idja y’a dju wï
three woman water bring
‘A woman brought three (containers of) water’

¹¹ I emphasize ‘different events’ not because of the numerals, but because of the reduplicated verb. The sentence would also be grammatical if the verb was not reduplicated as attested in a subsequent fieldwork trip where I used this questionnaire again using the sentences provided by these consultants, but with non-reduplicated verbs (for the cases where a reduplicated verb was used). For an analysis of reduplication in Yudja and verbal quantification, consult Lima 2006, 2007a, 2007b, 2007c, 2008).
CONVENTIONAL CONTEXT 2: A woman brought three containers with water. The containers fell at the same moment and made a single big puddle on the floor.

(25b) Txabù y’a ipide l-apa
three water on the floor l-fall
Three (containers of) water fell on the floor’

UNCONVENTIONAL CONTEXT: Someone brought a container of water and let a drop fall near the school, another drop near the hospital and a last drop near the river (all drops are different in size and form):

(25c) Txabù y’a ipide pe~pe~pe
three water on the floor drip~RED
‘Three (drops of) water dripped on the floor (in different events)’


Awatxi’i ‘rice’

CONVENTIONAL CONTEXT 1: Maria brought two bowls full of rice:
(26a) Maria yauda awatxi’i dju wî
Maria two rice bring
‘Maria brought two (bowls of) rice’

CONVENTIONAL CONTEXT 2: Someone dropped two bowls and they formed one heap on the floor:

(26b) Yauda awatxi’i l-apa
Two rice I-fall
‘I dropped two (bowls of) rice (on the floor)’

UNCONVENTIONAL CONTEXT: Maria was serving rice for the children and while she was doing that two small portions of rice fell over the chair:

(26c) Yauda awatxi’i pktaha txade l-apa
two rice chair above INT-drop
‘Two (small portions of) rice fell over the chair’

Asa ‘flour’

CONVENTIONAL CONTEXT: Maria brought two bowls with flour:

(27a) Maria yauda asa dju wî
Maria two flour bring
‘Maria brought two (bowls of) flour’

**CONVENTIONAL CONTEXT 2:** Children had two bowls of flour in the table. They decided to play with flour and make an ‘X’ with it.

(27b) Yauda ali asa maku ebikarahu
two child flour make cross
‘Children made a cross with two (containers of) flour’

**UNCONVENTIONAL CONTEXT:** Someone was walking with a bowl full of flour. On the way, two small portions of flour fell: one near the school and another near the health unit.

(27c) Yauda asa apa~pa
two flour drop~RED
‘Someone dropped two (portions of) flour (in different events)’

As expected, ‘liquid substances’ nouns and ‘non-liquid substances’ nouns can be combined directly with a numeral if a conventional container is provided in the context (awïla ‘honey’ (24a/24b); y’a ‘water’ (25a/25b); awatxi’i ‘rice’ (26a/26b); asa ‘flour’ (27a)). Crucially, numerals can also be directly combined with nouns in Yudja when unconventional units of counting are implied (awïla ‘honey’ (24c); y’a ‘water’ (25c); awatxi’i ‘rice’ (26c); asa ‘flour’ (27b/27c)). The third category of nouns tested - ‘bodily
fluid’ nouns like *apeta* ‘blood’ and *ikuritxa* ‘saliva’ - have no conventionalized containers associated to them in this culture, therefore the distinction between conventionalized and unconventionalized container is neutralized here. Despite that, even these nouns can be directly combined with numerals (*apeta* ‘blood’ (28); *ikuritxa* ‘saliva’ (29)). Thus, all these data can be used to argue against the coercion hypothesis:

**Semantic category 3: body fluids** (identical results: *apeta* ‘blood’ and *ikuritxa* ‘saliva’)

*Apete ‘blood’*

**CONVENTIONAL CONTEXT:** A nurse from Diauarum brought 3 tubes of blood to the Tuba Tuba village.

(28a) Txabïu uda apeta dju wï

three someone blood bring

‘Someone brought three (tubes of) blood’

**UNCONVENTIONAL CONTEXT:** João cut his finger and 3 drops of blood fell on the floor: one near the river, one near the house and another near the school.

(28b) Txabïu apeta pe–pe–pe

three blood drip–RED

Literal: ‘Three (drops of) blood dripped (in different events)’
*ikuritxa* ‘saliva’

**CONTEXT:** The dog let one drop of saliva fall near the hospital and another near the school.

(29a) **Apï yauda ikuritxa pe–pe–pe**

  dog two saliva drip–RED

  ‘The dog dripped two (drops of) saliva (in different events)’

**CONTEXT:** There are two clear individuated drops of saliva on the floor.

(29b) **Yauda kuritxa anu**

  Two saliva ASP

  ‘There are two (drops of) saliva over there’

Now consider the fourth category of nouns used in this task (*nature* nouns):

**Semantic category 4: ‘nature’ substances** *(identical results for *amana* ‘rain’ and *eta* ‘sand’)*

*Amana* ‘rain’

**CONTEXT:** there are three villages that are next to each other: Diauarum, Tuba Tuba and Paksamba. A person in Tuba Tuba looked to the left and saw that it was raining in
Diauarum. The same person looked to the right and saw that it was raining in Paksamba.

In this context, the person can say:

(30) Yauda amana ala
two rain fall

‘Two rain(s) fell’

Eta ‘sand’

**CONVENTIONAL CONTEXT:** the children went to the beach to play. When they returned they brought three containers filled with sand:

(31a) Txabîu ali eta awa–wa
three child sand get.RED

‘The children got three (containers with) sand (from the beach)’

**CONVENTIONAL CONTEXT:** children lifted up three portions of sand:

(31b) Ali txabîu eta ilâu
child three sand lift

‘Child(ren) lifted up three (portions of) sand’
UNCONVENTIONAL CONTEXT: the children brought one bowl full of sand from the beach. While they walked, they dropped a little bit of sand near the school, and a little bit near the hospital (in the drawing the portions were different in size and form):

(31c) Yauda ali eta apa-pa
two child sand drop~RED

Literal: ‘Children dropped two (portions of) sand(s) (in different events)’

The nouns eta ‘sand’ and amana ‘rain’ (just like apeata ‘blood’ and ikuritxa ‘saliva’) have no possible standard container associated with them. Yudja consultants made this comment and that is standard in other cultures too; there are no conventional containers associated with eta ‘sand’; the same holds for amana ‘rain’, which is not a substance that people usually carry in containers. In that sense, a bowl, which is a standard container for most substances in the Yudja culture, is not a standard container for neither eta ‘sand’ nor amana ‘rain’, just because no container is associated with these nouns. Nonetheless, these nouns can be directly combined with numerals. As a consequence, examples (30) and (31) (for amana ‘rain’ and eta ‘sand’, respectively) — as well as the other data presented in this section — are not cases of coercion.

Note that this questionnaire was elicited again after one year with the same speakers. During the second elicitation, I made two main changes in some of the target sentences using the same contexts. First, in sentences where the verb was reduplicated, I tested whether the verb could be non-reduplicated (29). Second, in sentences where numerals and mass nouns were discontinuous, I tested whether they could be adjacent
(27b). Both the sentences elicited in the first year and the sentences elicited in the second year were accepted by the consultants suggesting that verb reduplication and the position of the numeral in the sentence do not affect the interpretation of numerals in constructions with nouns that denote substances.

In sum, contra the coercion hypothesis, Yudja speakers accepted the combination of numerals directly with (notional) mass nouns in both conventionalized and unconventionalized contexts. The crucial data for this analysis are the examples derived from unconventionalized contexts (which are incompatible with coercion in other languages, as we saw in the section 2.2) since they show that conventionalized containers are not required in numeral constructions with (notional) mass nouns in Yudja and thus (notional) count nouns and (notional) mass nouns have the same distribution in constructions with numerals.

While the Yudja language differs from typical classifier languages in not having classifiers, it also shares certain properties with typical classifier languages (cf. Chapter 1), such as bare arguments and optionality of plural morphology. One could therefore ask whether Yudja has any morpheme that could be analyzed as a classifier. This is a hypothesis explored in the next section (2.4).

2.4. Classifiers in Yudja?

In this section I will show that some nouns do require a morpheme in order to describe a particular part/whole relation. So far, in elicitation sessions, I found four morphemes in Yudja that yield this relation: *atxa* ‘round piece’, *akuata* ‘long piece’, *itxa*
'liquid’ and *itxukī* ‘granulated’. From all materials elicited in Yudja, it was observed that only four nouns in Yudja require these morphemes in order to describe a particular part/whole relation, as illustrated below:

(32a)  
*Ahuanama*  
‘breast’

(32a.i)  
*Ahuanama itxa*  
‘(liquid portion of) milk’

(32b)  
*Kania*  
‘animal’

(32b.i)  
*Kania atxa*  
‘(piece of) meat’

(32c)  
*Epa*  
‘tree’

(32c.i)  
*Epa atxa/akuata/itxukī*  
‘(piece of) wood’

(32d)  
*I’ā*  
‘nose’

(32d.i)  
*I’ākua itxa*  
‘nasal liquid secretion’

These morphemes always occur after the noun they are associated with and they do not occur discontinuous to the nominal root they modify:

*Itxa* ‘liquid portion’

(33a)  
*Yauda ahuanama itxa lapa*  

(33b)  
*Itxa*  
*Yauda ahuanama lapa*

---

12 In nouns such as *pitxa* ‘fish’ and *ikuritxa* ‘saliva’, it is not clear whether the morpheme *atxa/itxa* is phonologically incorporated in the word or whether this is a morpho-phonological ‘coincidence’. In interviews, Yudja speakers could not attribute a meaning to the roots *pi-* and *ikuri-* as they did for *ahuanama, epa* and *kania.*
The semantic specialization observed for these four morphemes — as referring to granulate, liquids, round and non-round pieces — is similar to the semantic specialization of classifiers in classifier languages, such Yucatec Maya:

Yucatec Maya

‘un-tz’iit  hā’as  ‘one 1-dimensional banana (i.e. the fruit)’
‘un-wáal  hā’as  ‘one two-dimensional banana (i.e. the leaf)’
‘un-kúul  hā’as  ‘one planted banana (i.e. the plant/tree)’
‘un-kúuch  hā’as  ‘one load banana (i.e. the bunch)’
‘un-p’iit  hā’as  ‘one bit banana (i.e. a bit of the fruit)’
In the examples above the same root noun meaning, *há’as* ‘banana’, can refer to different units of individuation depending on which classifier is associated with it. In Yucatec Maya, the same classifier can be combined with different root noun meanings in order to derive the same interpretation (that is, reference to the same unit, individuation):

(37) **Yucatec Maya**

\[
\begin{array}{ll}
\text{un-tz’iit} & \text{há’as} & \text{‘one 1-dimensional banana (i.e. a banana)’} \\
\text{un-tz’iit} & \text{che’} & \text{‘one 1-dimensional wood (i.e. a stick)’} \\
\text{un-tz’iit} & \text{nal} & \text{‘one 1-dimensional corn (i.e. a ear)’} \\
\end{array}
\]

(Lucy 2000; 329)

Lucy (2000; 329) claims that these classifiers “have independent referential value and combine with other material of the noun phrase to help identify referents, indicate the perspective from which they should be interpreted (…)”. Under this view, the root noun meaning “(…) indicates the referent’s identity (its type and quality)” while the classifier “indicates its individuation status (its individuation or quantity)” (Lucy 2000; 330). Lucy (Lucy 1992 *apud* Lucy 2000) argues that lexical nouns in Yucatec Maya do not provide the unit for individuation and it is therefore up to the classifiers to provide such information.

A possible hypothesis one could explore is that Yudja used to be a classifier language and that these four morphemes are a vestige of an obsolete classifier system that
is no longer in use. From a typological point of view the question about the existence of classifiers in Yudja is particularly relevant given that most of the Tupi languages do not have classifiers (Costa 2010, Storto and Costa in press). The Karo language (Ramarama-Puruborá family, Tupi stock) has a small system (Gabas Jr. 1999, Costa 2010), while Munduruku (Munduruku family, Tupi stock) is claimed to have a more developed one. Aikhenvald (2000; 12; 2012; 297) describes one hundred and twenty Munduruku classifier morphemes that can be used with verbs, demonstratives, adjectives and nouns, and claims that they “characterize the referent in terms of its shape”, as illustrated below:

(38) Munduruku (Munduruku family; Tupi stock)

\[-ba\] ‘long and rigid objects’
\[ako-ba\] ‘banana fruit’
\[xepxep-pa\] \[ako-ba\]
\[two-CL\] banana-CL: LONG.RIGID ‘two bananas’

Specialists of the Munduruku language – such as Gomes (2006, 2009) – claim that these morphemes are not classifiers \textit{per se} but nouns that “act as classifiers”\textsuperscript{13}. Such nouns are not restricted to Munduruku. As shown by Costa (2010) and Storto and Costa (in press), other Tupi languages (such as Karitiana) do not have classifiers, but instead nouns that can be composed with other nouns adding to them a categorization that is typical of classifiers, such as form and dimension. Costa (2010) argues that we can find

\textsuperscript{13} Aikhenvald argues that these morphemes are classifiers, but classifiers derived from nouns. For example: \[-ba\] ‘arm’ in Munduruku got grammaticalized as a classifier to indicate a long, rigid object (Aikhenvald 2012; 297). \textit{A} ‘head’ is the reference for round objects (Aikhenvald 2000; 444).
cognates between the classifiers in Karo and the ‘classifier’ nouns in languages like Munduruku, Mekéns, Karitiana and Gavião:

Table 2.1: Cognates in Karo, Munduruku, Mekéns, Karitiana and Gavião (Costa 2010)

<table>
<thead>
<tr>
<th>Karo</th>
<th>Munduruku</th>
<th>Mekéns</th>
<th>Karitiana</th>
<th>Gavião</th>
</tr>
</thead>
<tbody>
<tr>
<td>peʔ</td>
<td>-dup/-tup</td>
<td>ʔa</td>
<td>-sap</td>
<td>Sep</td>
</tr>
<tr>
<td>‘flat’</td>
<td>‘flattened object’</td>
<td>‘leaf’</td>
<td>‘leaf’</td>
<td>‘flattened object’</td>
</tr>
<tr>
<td>?aʔ</td>
<td>-ʔa</td>
<td>aniip</td>
<td>- ‘o’</td>
<td>káp/aá</td>
</tr>
<tr>
<td>‘round’</td>
<td>‘round object’</td>
<td>‘head’</td>
<td>‘fruit’</td>
<td>‘round object/fruit’</td>
</tr>
<tr>
<td>?ii</td>
<td>-di/-ti</td>
<td>iki</td>
<td>-se</td>
<td>ci</td>
</tr>
<tr>
<td>‘river’</td>
<td>‘liquid’</td>
<td>‘water’</td>
<td>‘liquid’</td>
<td>‘liquid’</td>
</tr>
</tbody>
</table>

Thus, while there is a debate in the literature of the Tupi languages about the syntactic status of these morphemes (whether they are nouns that form compounds or classifiers), there is an agreement that these morphemes, when combined with other nouns, have an interpretation similar to classifiers in classifier languages.

In the rest of this section I will explore the distribution of the four morphemes that are potential candidates as classifiers in Yudja (atxa ‘round piece’, akuata ‘long piece’, itxa ‘liquid’ and itxukĩ ‘granulated’). Based on a questionnaire that was answered by two Yudja speakers (20-to-30-year-old male adults) I intend to explore the distribution of these morphemes with (notional) mass nouns and (notional) count nouns and their
interpretation when combined with other nouns beyond the nouns that they usually combine with (32). Below I present the materials used and the results.

**Materials**

In this questionnaire I was testing whether the morphemes *atxa* ‘round piece’, *akuata* ‘long piece’, *itxa* ‘liquid’ and *itxukĩ* ‘granulated’ can be used with other nouns in the Yudja language beyond the four nouns described in (32). In this task, two Yudja consultants (20-to-30-year-old adult male consultants) were presented with a noun from Table 2.2 along with one of the morphemes in study (*atxa, itxa, itxukĩ, akuata*). Then they had to say whether these nouns could be combined with these morphemes:

**Table 2.2: Classifier questionnaire: nouns tested**

<table>
<thead>
<tr>
<th>Type of the noun</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Humans</td>
<td><em>ali</em> ‘child’; <em>senahi</em> ‘man’</td>
</tr>
<tr>
<td>Animals</td>
<td><em>ba‘i</em> ‘paca’; <em>amia</em> ‘monkey’; <em>api</em> ‘dog’</td>
</tr>
<tr>
<td>Objects</td>
<td><em>pikaha</em> ‘chair’; <em>abeata</em> ‘clothes’; <em>wâ‘e</em> ‘pan/ceramics’</td>
</tr>
<tr>
<td>Liquid substances</td>
<td><em>iya</em> ‘water’; <em>apeta</em> ‘blood’; <em>ud</em> ‘oil’; <em>awila</em> ‘honey’; <em>yakuha</em> ‘porridge (Yudja’s traditional drink); <em>ikaha</em> ‘fat’</td>
</tr>
<tr>
<td>Nature substances</td>
<td><em>amana</em> ‘rain’; <em>eta</em> ‘sand, beach’</td>
</tr>
<tr>
<td>Grains</td>
<td><em>puju</em> ‘beans’; *awatxĩ‘i’ ‘rice’</td>
</tr>
<tr>
<td>Granulated substances</td>
<td><em>asa</em> ‘flour’; <em>yukidĩ</em> ‘salt’; <em>asuка</em> ‘sugar’</td>
</tr>
<tr>
<td>Massy substances</td>
<td><em>makuva</em> ‘cotton’</td>
</tr>
</tbody>
</table>
Results

Below I present the results for this questionnaire based on the consultants’ comments for the distribution of these morphemes with each of the nouns tested.

Atxa

According to the consultants, atxa is interpreted as a piece of something, mostly a round piece. In constructions with [+animal] nouns, only nouns that denote animals that can be eaten in the Yudja culture can be combined with this morpheme:

(39a) \textit{Ba’ï atxa} \hspace{1em} ‘round piece of paca (meat)’

(39b) \textit{ba’ï} atxa akiri bia

\hspace{1em} paca \hspace{1em} \textit{ROUND PIECE} \hspace{1em} cut \hspace{1em} someone

‘Someone cut a round piece of paca’

(40) \textit{Amï atxa} \hspace{1em} ‘round piece of monkey (meat)’

With [+object] nouns, one speaker accepted the combination of atxa with the nouns \textit{abeata} ‘clothes’ and \textit{wà’è} ‘ceramics/pan’:

(41) \textit{Abeata atxa} \hspace{1em} ‘piece of clothes, if clothes are ripped’

(42a) \textit{Wà’è atxa} \hspace{1em} ‘piece of ceramic’

(42b) \textit{Wà’è} atxa wà da

\hspace{1em} ceramics \hspace{1em} \textit{ROUND PIECE} \hspace{1em} get \hspace{1em} people

‘People got pieces of ceramics’
The morpheme \textit{atxa} cannot be combined with [+liquid] and [+granulated], [+massy], [+nature] and [+human] nouns such as \textit{uã} ‘oil’, \textit{asa} ‘flour’, \textit{makua} ‘cotton’, \textit{amana} ‘rain’ and \textit{ali} ‘child’ respectively. For [+liquid] nouns such as \textit{awïla} ‘honey’, one of the consultants said that it would only make sense to combine \textit{awïla} and \textit{atxa} if we were talking about honey wax, that is, if we were talking about a substance (honey) that is not in the liquid state:

\begin{quote}
(43) Una awïla kuasa atxa dju wî
\end{quote}

Is honey wax ROUND PIECE bring

‘I brought a round piece of honey wax’

One of the speakers accepted to combine the [+grain] noun \textit{puju} ‘beans’ with \textit{atxa}:

\begin{quote}
(44) Puju atxa ‘small piece of beans’
\end{quote}

To conclude, it is relevant to discuss the combination of [+human] nouns and \textit{atxa}. The consultant Tawaiku Juruna explained the reason why it is impossible to combine any [+human] noun with this morpheme:

‘\textit{Atxa} é um pedaço da beira, redondo. \textit{Akuata} é um pedaço comprido, mas não muito comprido. A gente só usaria \textit{akuata} com senahï (homem) ou \textit{iidja} (mulher) se acontecesse um acidente, se (o acidente) cortasse a pessoa em pedaço. Você perguntaria senahï akuata ne? iidja akuata ne?’
(...) *Atxa* não combina com *senahï* e *iidja* porque *atxa* fala da beiradinha... não do pedaço como *akuata*’

(*Atxa* is a piece of the border, a round one. *Akuata* is a long piece, but not too long. We only use *akuata* with *senahï* (man) or *iidja* (woman) if an accident had happened, if (the accident) cut a person in pieces. You would ask *senahï akuata ne? Iidja akuata ne?* (…) *Atxa* does not combine with *senahï* and *iidja* because *atxa* refers to the very edge of a piece ... not to a piece as *akuata’*)

The table below summarizes the results of the questionnaire for the morpheme *atxa* ‘round piece’:

Table 2.3: Distribution of the morpheme *atxa* in Yudja

Where: * = impossible combination; ✔ = possible combination; ? = one speaker rejected, one speaker accepted the construction with restrictions.

<table>
<thead>
<tr>
<th>Noun + <em>atxa</em> ‘round piece’</th>
<th>Consultants’ evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>[+ human]</td>
<td></td>
</tr>
<tr>
<td><em>Ali atxa</em> ‘child CL’</td>
<td>*</td>
</tr>
<tr>
<td><em>Senahï atxa</em> ‘man CL’</td>
<td>*</td>
</tr>
<tr>
<td>[+ animal]</td>
<td></td>
</tr>
<tr>
<td><em>Baï atxa</em> ‘paca CL’</td>
<td>✔</td>
</tr>
<tr>
<td><em>Amia atxa</em> ‘monkey CL’</td>
<td>✔</td>
</tr>
<tr>
<td><em>Api atxa</em> ‘dog CL’</td>
<td>?</td>
</tr>
<tr>
<td>[+ object]</td>
<td></td>
</tr>
<tr>
<td><em>Pïkaha atxa</em> ‘chair CL’</td>
<td>*</td>
</tr>
<tr>
<td>Word</td>
<td>Definition</td>
</tr>
<tr>
<td>--------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td>Abeata atxa</td>
<td>‘clothes CL’</td>
</tr>
<tr>
<td>Wā ’è atxa</td>
<td>‘pan CL’</td>
</tr>
<tr>
<td>[+] liquid</td>
<td></td>
</tr>
<tr>
<td>Iya atxa</td>
<td>‘water CL’</td>
</tr>
<tr>
<td>Apeta atxa</td>
<td>‘blood CL’</td>
</tr>
<tr>
<td>Uã atxa</td>
<td>‘oil CL’</td>
</tr>
<tr>
<td>Awila atxa</td>
<td>‘honey CL’</td>
</tr>
<tr>
<td>Yakuha atxa</td>
<td>‘porridge CL’</td>
</tr>
<tr>
<td>Ikaha atxa</td>
<td>‘fat CL’</td>
</tr>
<tr>
<td>[+] grain</td>
<td></td>
</tr>
<tr>
<td>Puju atxa</td>
<td>‘beans CL’</td>
</tr>
<tr>
<td>Awatxi’i atxa</td>
<td>‘rice CL’</td>
</tr>
<tr>
<td>[+] nature</td>
<td></td>
</tr>
<tr>
<td>Eta atxa</td>
<td>‘sand, beach CL’</td>
</tr>
<tr>
<td>Amana atxa</td>
<td>‘rain CL’</td>
</tr>
<tr>
<td>[+] granulated</td>
<td></td>
</tr>
<tr>
<td>Asa atxa</td>
<td>‘flour CL’</td>
</tr>
<tr>
<td>Yukïdï atxa</td>
<td>‘salt CL’</td>
</tr>
<tr>
<td>Asuka atxa</td>
<td>‘sugar CL’</td>
</tr>
<tr>
<td>[ + massy]</td>
<td></td>
</tr>
<tr>
<td>Makua atxa</td>
<td>‘cotton CL’</td>
</tr>
</tbody>
</table>

Akuata
Akuata is interpreted as a long, vertical piece of something. Given all the nouns in
the list, just two of them (pïkaha ‘chair’, abeata ‘clothes’) could be combined with this
morpheme according to only one speaker:

(45) Pïkaha akuata ‘someone cut a long piece of a chair’
(46) Abeata akuata ‘a piece of fabric’

Other than these cases, the only natural use of this morpheme documented so far
was with the name epa ‘tree’ (see 32c). The table below summarizes the distribution of
the morpheme akuata in Yudja:

Table 2.4: Distribution of the morpheme akuata in Yudja

Where: * = impossible combination; ✔ = possible combination; ? = one speaker refuted,
one speaker accepted with restrictions.

<table>
<thead>
<tr>
<th>Noun + atxa ‘round piece’</th>
<th>Consultants’ evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>[+ human]</td>
<td></td>
</tr>
<tr>
<td>Ali akuata ‘child CL’</td>
<td>?</td>
</tr>
<tr>
<td>Senahï akuata ‘man CL’</td>
<td>?</td>
</tr>
<tr>
<td>[+ animal]</td>
<td></td>
</tr>
<tr>
<td>Akuata ‘piece’</td>
<td></td>
</tr>
<tr>
<td>Ba’ï akuata ‘paca CL’</td>
<td>*</td>
</tr>
<tr>
<td>Amia akuata ‘monkey CL’</td>
<td>*</td>
</tr>
<tr>
<td>Akuata</td>
<td>Meaning</td>
</tr>
<tr>
<td>-----------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Apī akuata</td>
<td>‘dog CL’</td>
</tr>
<tr>
<td>[+] object</td>
<td></td>
</tr>
<tr>
<td>Pīkaha akuata</td>
<td>‘chair CL’</td>
</tr>
<tr>
<td>Abeata akuata</td>
<td>‘clothes CL’</td>
</tr>
<tr>
<td>Wāʾė akuata</td>
<td>‘pan CL’</td>
</tr>
<tr>
<td>[+] liquid</td>
<td></td>
</tr>
<tr>
<td>Iya akuata</td>
<td>‘water CL’</td>
</tr>
<tr>
<td>Apeta akuata</td>
<td>‘blood CL’</td>
</tr>
<tr>
<td>Uā akuata</td>
<td>‘oil CL’</td>
</tr>
<tr>
<td>Awīlā akuata</td>
<td>‘honey CL’</td>
</tr>
<tr>
<td>Yakuha akuata</td>
<td>‘porridge CL’</td>
</tr>
<tr>
<td>Ikahe akuata</td>
<td>‘fat CL’</td>
</tr>
<tr>
<td>[+] grain</td>
<td></td>
</tr>
<tr>
<td>Puju akuata</td>
<td>‘beans CL’</td>
</tr>
<tr>
<td>Awatxi’i akuata</td>
<td>‘rice CL’</td>
</tr>
<tr>
<td>[+] nature</td>
<td></td>
</tr>
<tr>
<td>Eta akuata</td>
<td>‘sand, beach CL’</td>
</tr>
<tr>
<td>Amana akuata</td>
<td>‘rain CL’</td>
</tr>
<tr>
<td>[+] granulated</td>
<td></td>
</tr>
<tr>
<td>Asa akuata</td>
<td>‘flour CL’</td>
</tr>
<tr>
<td>Yukîdi akuata</td>
<td>‘salt CL’</td>
</tr>
<tr>
<td>Asuka akuata</td>
<td>‘sugar CL’</td>
</tr>
<tr>
<td>[ + massy]</td>
<td></td>
</tr>
</tbody>
</table>
**Itxukĩ**

*Itxukĩ* refers to granulated portions of things. It can be combined with [+animal], [+grains], [+granulated] and [+massy] nouns, but not with [+liquid] and [+human] nouns. For [+ animal] nouns, one speaker accepted the combination of this morpheme with nouns that denote eatable animals in the Yudja culture such as *ba’ī ‘paca’* and *amī ‘monkey’*, but not with nouns that denote non-eatable animals such as *apī ‘dog’*:

(47) *Ba’ī itxukĩ* ‘granulated pieces of paca, for eating (ground paca, as in ground beef)’

(48) *Amī itxukĩ* ‘granulated pieces of monkey, for eating (ground monkey, as in ground beef)’

For [+ object] nouns, one consultant judged as possible the combination of two of the [+ object] nouns with the morpheme *itxukĩ*. Note that the consultant emphasized that this use would be rare (that is, he could infer a meaning from this combination, although this combination is uncommon in the daily conversations in the community):

(49) *Pīkaha itxukĩ* ‘someone sand a chair; the chair ‘dust’ resultant from this action could be named *pīkaha itxukĩ*’

(50) *Wā’ē itxukĩ* suggested interpretations: i) ‘someone sand a ceramic pan;
the ceramic ‘dust’ resultant from this action could be named wâ’ê itxukî; ii) ‘someone broke a ceramic pan and smashed it into pieces’.

[+Massy] nouns such as makua ‘cotton’ can be combined with the morpheme itxukî to refer to tiny portions of cotton, that is, we are referring to a particular state of the cotton. [+ grain] nouns can be combined with itxukî to make reference to the grains themselves (awatxi’i ‘rice’) or to a particular state of the grains (puju ‘beans’). The latter use is rare:

(51) Puju itxukî suggested interpretations: 1) ‘granulated beans [very rare combination]’; 2) ‘the leftover of cooked beans, very small, broken pieces’

(52) Awatxi’i itxukî suggested interpretations: 1) ‘small leftover amount of rice’; 2) ‘we may say that in order to refer to the grains of rice themselves, because they are already small (contrast with puju itxukî’).

[+Granulated] nouns and the [+nature] noun eta ‘sand’ can be combined with the morpheme itxukî in order to affirm that they are in a granulated state (in contrast to a porridge state, for example):

(53) Asa itxukî ‘flour (flour is granulated)’; ‘the bran of flour’
(54)  *ETA ITXUKI*  ‘sand (sand is granulated)’
(55)  *YUKI ITXUKI*  ‘salt (salt is granulated)’
(56)  *ASUKA ITXUKI*  ‘sugar (sugar is granulated)’

The table below summarizes the distribution of *itxuk* with the nouns presented in Table 2.5:

Table 2.5: Distribution of the morpheme *itxuk* in Yudja

Where: * = impossible combination; ✔ = possible combination; ? = one speaker refuted, one speaker accepted with restrictions.

<table>
<thead>
<tr>
<th>Noun + <em>itxuk</em> ‘round piece’</th>
<th>Consultants’ evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>[+ human]</td>
<td></td>
</tr>
<tr>
<td><em>Ali atxa</em>  ‘child CL’</td>
<td>*</td>
</tr>
<tr>
<td><em>Senahí atxa</em>  ‘man CL’</td>
<td>*</td>
</tr>
<tr>
<td>[+ animal]</td>
<td></td>
</tr>
<tr>
<td><em>Ba’i atxa</em>  ‘paca CL’</td>
<td>?</td>
</tr>
<tr>
<td><em>Amía atxa</em>  ‘monkey CL’</td>
<td>?</td>
</tr>
<tr>
<td><em>Api’ atxa</em>  ‘dog CL’</td>
<td>*</td>
</tr>
<tr>
<td>[+ object]</td>
<td></td>
</tr>
<tr>
<td><em>Píkaha atxa</em>  ‘chair CL’</td>
<td>?</td>
</tr>
<tr>
<td><em>Abeata atxa</em>  ‘clothes CL’</td>
<td>*</td>
</tr>
<tr>
<td><em>Wã’è atxa</em>  ‘pan CL’</td>
<td>✔</td>
</tr>
<tr>
<td>[+ liquid]</td>
<td>Itxukî ‘granulated’</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td><em>Iya atxa</em> ‘water CL’</td>
<td>*</td>
</tr>
<tr>
<td><em>Apeta atxa</em> ‘blood CL’</td>
<td>*</td>
</tr>
<tr>
<td><em>Uà atxa</em> ‘oil CL’</td>
<td>*</td>
</tr>
<tr>
<td><em>Awìla atxa</em> ‘honey CL’</td>
<td>*</td>
</tr>
<tr>
<td><em>Yakuha atxa</em> ‘porridge CL’</td>
<td>*</td>
</tr>
<tr>
<td><em>Ikaha atxa</em> ‘fat CL’</td>
<td>*</td>
</tr>
<tr>
<td>[+ grain]</td>
<td>Itxukî ‘granulated’</td>
</tr>
<tr>
<td><em>Puju atxa</em> ‘beans CL’</td>
<td>✓</td>
</tr>
<tr>
<td><em>Awatxi’i atxa</em> ‘rice CL’</td>
<td>✓</td>
</tr>
<tr>
<td>[+nature]</td>
<td>Itxukî ‘granulated’</td>
</tr>
<tr>
<td><em>Eta atxa</em> ‘sand, beach CL’</td>
<td>✓</td>
</tr>
<tr>
<td><em>Amana atxa</em> ‘rain CL’</td>
<td>*</td>
</tr>
<tr>
<td>[+ granulated]</td>
<td>Itxukî ‘granulated’</td>
</tr>
<tr>
<td><em>Asa atxa</em> ‘flour CL’</td>
<td>✓</td>
</tr>
<tr>
<td><em>Yukïdï atxa</em> ‘salt CL’</td>
<td>✓</td>
</tr>
<tr>
<td><em>Asuka atxa</em> ‘sugar CL’</td>
<td>✓</td>
</tr>
<tr>
<td>[+ massy]</td>
<td>Itxukî ‘granulated’</td>
</tr>
<tr>
<td><em>Makua atxa</em> ‘cotton CL’</td>
<td>✓</td>
</tr>
</tbody>
</table>

*Itxa*

*Itxa* denotes liquid portions and it is not compatible with [+human] nouns, as expected, because people are never found in a liquid state. This morpheme also cannot be
combined with [+ animal] nouns. For [+object] nouns, both speakers accepted the combination _abeata itxa_ (clothes LIQUID) and only one speaker accepted the combination (_pïkaha itxa_ (chair LIQUID) and _wã’ê_ (ceramics LIQUID):

(57) _Abeata itxa_ ‘clothes are wet’
(58) _Wã’ê itxa_ ‘if a ceramic piece is wet’
(59) _Pïkaha itxa_ ‘if for some reason there is water in a chair’

With [+liquid] nouns, speakers’ judgment varied. Both speakers rejected a phrase that included the nouns _y’a_ ‘water’ and _yakuha_ ‘traditional drink’ followed by _itxa_. They justify their judgment by saying that ‘liquids (_y’a, yakuha_) do not combine with liquids (_itxa_)’. However, both speakers agreed that the morpheme _itxa_ could be combined with the nouns _awïla_ ‘honey’ (to refer to a juice made of honey and water) and _amana_ ‘rain’ (to refer to portions of water resultant from a raining day):

(60) _Awïla itxa_ ‘juice made of honey and water’
(61) _Amana itxa_ ‘it rained and there is a liquid inside a pan or on the floor; a puddle of water’

Finally, one speaker accepted the combination of the [+liquid] nouns _apeta_ ‘blood’ and _û’â_ ‘oil’ with the morpheme _itxa_:

(62) _Apeta itxa_ ‘water inside blood; a mixture of water and blood’
(63)  Ū’ā itxa  ‘water inside the oil’; ‘if there is a spot of oil somewhere’

(64a)  Ikaha itxa  suggested interpretations: 1) ‘water inside the fat’; 2) ‘if there is a spot of fat somewhere, in a pan, for example:

(64b)  Ikaha itxa  wa’e he kara
Fat       CL: LIQUID   pan    in    pass
‘There is a spot of fat in the pan’

Itxa can also be combined with [+grain] nouns indicating a particular state of a substance:

(65)  Puju itxa  ‘broth of beans’

(66)  Awatxi’ itxa  ‘when you mix water and rice, for cooking’

Finally, itxa can be combined with [+granulated] nouns:

(67)  Asa itxa  ‘if you put water in the flour porridge’.

(68)  Yukōdi itxa  ‘when the salt dissolves in water and you get a liquid that is ‘ identical to water’

(69)  Acuca itxa  ‘when the sugar dissolves in water and you get a liquid that is identical to water’

The table below summarizes the distribution of the morpheme itxa with the nouns listed on Table 2.6:
Table 2.6: Distribution of the morpheme *itxa* in Yudja

Where: * = impossible combination; ✔ = possible combination; ? = one speaker refuted, one speaker accepted with restrictions.

<table>
<thead>
<tr>
<th>Noun + <em>itxa</em> ‘round piece’</th>
<th>Consultants’ evaluation</th>
</tr>
</thead>
<tbody>
<tr>
<td>[+ human]</td>
<td></td>
</tr>
<tr>
<td><em>Ali atxa</em> ‘child CL’</td>
<td>*</td>
</tr>
<tr>
<td><em>Senahë itxa</em> ‘man CL’</td>
<td>*</td>
</tr>
<tr>
<td>[+ animal]</td>
<td></td>
</tr>
<tr>
<td><em>Ba’ë itxa</em> ‘paca CL’</td>
<td>*</td>
</tr>
<tr>
<td><em>Amia itxa</em> ‘monkey CL’</td>
<td>*</td>
</tr>
<tr>
<td><em>Apì itxa</em> ‘dog CL’</td>
<td>*</td>
</tr>
<tr>
<td>[+ object]</td>
<td></td>
</tr>
<tr>
<td><em>Pïkaha itxa</em> ‘chair CL’</td>
<td>?</td>
</tr>
<tr>
<td>✔Abeata itxa* ‘clothes CL’</td>
<td>✔</td>
</tr>
<tr>
<td>?Wã’è itxa* ‘pan CL’</td>
<td>?</td>
</tr>
<tr>
<td>[+ liquid]</td>
<td></td>
</tr>
<tr>
<td><em>Iya itxa</em> ‘water CL’</td>
<td>*</td>
</tr>
<tr>
<td>?Apeta itxa* ‘blood CL’</td>
<td>?</td>
</tr>
<tr>
<td>?Uà itxa* ‘oil CL’</td>
<td>?</td>
</tr>
<tr>
<td>✔Awila itxa* ‘honey CL’</td>
<td>✔</td>
</tr>
<tr>
<td><em>Yakuha itxa</em> ‘porridge CL’</td>
<td>*</td>
</tr>
</tbody>
</table>
In sum, the morphemes *atxa* ‘round piece’, *akuata* ‘long piece’, *itxa* ‘liquid (portion)’ and *itxukī* ‘granulated (portion)’ refer to the shape or state of an object/substance and their distribution is restricted by the properties of each root noun meaning they are associated with. As described, [+human] nouns cannot be combined with the morphemes that refer to change of state (to liquid or granulated states), and only in very restricted scenarios (terrible accidents) they can be combined with the morphemes that refer to parts. The same holds for substances. While *awatxi’i* ‘rice’ can be combined with *itxa* to refer to cooked rice (rice in the water) and with *itxukī* to refer to a small leftover amount of rice or the grains themselves, it cannot be combined with *atxa* and
**akuata** because one cannot divide rice in other pieces. A comparative chart that presents the distribution of these four morphemes based on the 22 nouns tested is presented below:

Table 2.7: Comparative chart: distribution of the morphemes *itxa, atxa, akuata* and *itxukĩ* in Yudja

Where: * = impossible combination; ✔ = possible combination; ? = one speaker refuted, one speaker accepted with restrictions.

<table>
<thead>
<tr>
<th>Noun</th>
<th>Morphemes</th>
</tr>
</thead>
</table>
| *Ali atxa ‘child CL’* | ☒ | * | ✗ | *
| *Senahĩ atxa ‘man CL’* | ☒ | * | ✗ | *
| [+ animal]      | Atxa ‘piece’ | Itxa ‘liquid’ | Akuata ‘piece’ | Itxukĩ ‘granulated’ |
| *Baï atxa ‘paca CL’* | ☒ | * | ✗ | ?
| *Amia atxa ‘monkey CL’* | ☒ | * | ✗ | ?
| *Apì atxa ‘dog CL’* | ☒ | * | ? | *
| [+ object]      | Atxa ‘piece’ | Itxa ‘liquid’ | Akuata ‘piece’ | Itxukĩ ‘granulated’ |
| *Pïkaha atxa ‘chair CL’* | ☒ | * | ? | ?
| *Abêata atxa ‘clothes CL’* | ☒ | ? | ? | *
<table>
<thead>
<tr>
<th><em>Wañê atxa ‘pan CL’</em></th>
<th>☒</th>
<th>?</th>
<th>*</th>
<th>✗</th>
</tr>
</thead>
<tbody>
<tr>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td></td>
</tr>
<tr>
<td>Iya atxa ‘water CL’</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Apeta atxa ‘blood CL’</td>
<td>*</td>
<td>?</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Uā atxa ‘oil CL’</td>
<td>*</td>
<td>?</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Awila atxa ‘honey CL’</td>
<td>*</td>
<td>✔</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Yakuha atxa ‘porridge CL’</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Ikaha atxa ‘fat CL’</td>
<td>*</td>
<td>?</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>[+ grain]</td>
<td>Atxa ‘piece’</td>
<td>Itxa ‘liquid’</td>
<td>Akuata ‘piece’</td>
<td>Itxukĩ ‘granulated’</td>
</tr>
<tr>
<td>Puju atxa ‘beans CL’</td>
<td>*</td>
<td>✔</td>
<td>?</td>
<td>✔</td>
</tr>
<tr>
<td>Awatxi’i atxa ‘rice CL’</td>
<td>*</td>
<td>✔</td>
<td>*</td>
<td>✔</td>
</tr>
<tr>
<td>[+ nature]</td>
<td>Atxa ‘piece’</td>
<td>Itxa ‘liquid’</td>
<td>Akuata ‘piece’</td>
<td>Itxukĩ ‘granulated’</td>
</tr>
<tr>
<td>Eta atxa ‘sand, beach CL’</td>
<td>*</td>
<td>?</td>
<td>*</td>
<td>✔</td>
</tr>
<tr>
<td>Amana atxa ‘rain CL’</td>
<td>*</td>
<td>✔</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>[+ granulated]</td>
<td>Atxa ‘piece’</td>
<td>Itxa ‘liquid’</td>
<td>Akuata ‘piece’</td>
<td>Itxukĩ ‘granulated’</td>
</tr>
<tr>
<td>Asa atxa ‘flour CL’</td>
<td>*</td>
<td>✔</td>
<td>*</td>
<td>✔</td>
</tr>
<tr>
<td>Yukidî atxa ‘salt CL’</td>
<td>*</td>
<td>✔</td>
<td>*</td>
<td>✔</td>
</tr>
<tr>
<td>Asuka atxa ‘sugar CL’</td>
<td>*</td>
<td>✔</td>
<td>*</td>
<td>✔</td>
</tr>
</tbody>
</table>
In conclusion, the results from the questionnaire corroborate the original observation that these morphemes are uncommon in daily speech, as both or at least one of the consultants refuted most combinations. Furthermore, these morphemes are also rare in text transcriptions and narratives transcribed by other researchers (Fargetti 2001, Stolze-Lima 1995).

These facts suggest that either these morphemes are a vestige of a classifier system that is completely obsolete nowadays or that these morphemes are not a vestige of a classifier system because Yudja has never been a classifier language. One aspect of the distribution of these morphemes suggests that the second hypothesis is correct; the fact that these morphemes are obligatory with four nouns only (ahuanama itxa ‘(liquid portion of) milk’, kania atxa ‘(piece of) meat’, epa atxa/akuata/itxukī ‘(piece of) wood’, i’ãkua itxa ‘nasal liquid secretion’) and that they are not restricted to numeral constructions suggests that these morphemes are not classifiers. That is, in bona fide classifier languages, classifiers are required in constructions with numerals, but not in other constructions, such as kind-referring terms. Therefore, if these morphemes used to be classifiers, their distribution in contemporary Yudja suggests that they lost the properties that would characterize these morphemes as ‘legitimate’ classifiers, which consist of: 1) being obligatory with numerals for all nouns; 2) being illicit with kind-referring uses; 3) being productive and not restricted to four nouns.

<table>
<thead>
<tr>
<th>[ + massy]</th>
<th>Atxa</th>
<th>Itxa</th>
<th>Akuata</th>
<th>Itxukī</th>
</tr>
</thead>
<tbody>
<tr>
<td>‘piece’</td>
<td></td>
<td>‘liquid’</td>
<td>‘piece’</td>
<td>‘granulated’</td>
</tr>
</tbody>
</table>

*Makua atxa ‘cotton CL’*
Final remarks

The literature (notably Chierchia 1998b, 2010) shows that in most languages described so far, a container construction or classifier is required in constructions with numerals and nouns that denote substances. Yudja clearly does not present this requirement. In this chapter I have shown that all nouns in Yudja, including (notional) mass nouns, can be directly combined with numerals, without intervening classifiers or container phrases in conventional and unconventional contexts. This is strong evidence against the coercion hypothesis if we assume that the requirements for coercion are the same across languages (clearly individuated portions and standardized serving units/conventionalized containers).

Despite the similarities between Yudja and classifier languages (bare arguments, plural morpheme restricted to [+human] nouns), I have argued that Yudja has no classifier system at all. Certain nouns that appear to behave like classifiers differ in key ways from ordinary classifiers as they are not obligatory in constructions with numerals and they do not occur with most nouns in the language. As seen from the data from other Tupi languages, it can be the case that these are nouns that form other nouns by compounding. In that respect, they would not have the same function of determining the counting units as numeral classifiers have in constructions with mass nouns in classifier languages.

Thus, if all nouns can be directly combined with numerals, how do we define atoms for nouns that intuitively denote stuff? In Chapter 3, I propose that all nouns in
Yudja are count. I will explore the hypothesis that nominal roots denote a kind and nouns
denote the set of concrete portions of the kind denoted by their root together with their
mereological sums. This analysis is supported by the results of two experimental studies
with native Yudja speakers (children and adults) that will be presented in Chapters 3 and
5.
CHAPTER 3

INDIVIDUATION AND COUNTING IN YUDJA

In the previous chapter, I have shown that notionally mass nouns can be used in construction with numerals, and I have argued that this phenomenon is not a case of coercion, as numerals can be directly combined with notionally mass nouns even when a standard container is not available in the context. In this chapter, I propose that all nouns in Yudja are count. Nominal roots denote a kind and nouns denote the set of concrete portions of the kind denoted by their root together with their mereological sums. This analysis is supported by the results of experimental studies with native Yudja speakers (children and adults).

I argue that the concrete portions of a kind are atoms and that they can be counted properly, which explains why notional mass nouns can be used in construction with numerals in Yudja. Further consequences of the analysis are explored in Chapters 4 and 5.

This chapter is structured as follows. In Section 3.1, I introduce the notion of kinds, using examples from English, and I present Chierchia’s (1998) analysis of kind denotations. In Section 3.2, I show that bare NPs can denote kinds in Yudja. Following similar proposals that have been made for Chinese and English, I argue that non kind denotations are derived from kind denotations. I relate this proposal to the idea, common in Distributed Morphology, that lexical items are formed of category neutral roots that combine with functional heads that specify their category. In Section 3.3, I develop a formal analysis of kind denotations and count denotations. I add a truth-conditional
semantics to the morpho-syntactic analysis that was presented in the preceding section. Finally, in Section 3.4 I present the results of quantity judgment tasks (based on Barner and Snedeker 2005) with children and adults where I tested some predictions of the analysis presented in Section 3.3.

3.1 Kind denoting nouns

3.1.1 Kinds in English

In his seminal work on genericity, Carlson (1977) makes a distinction between DPs that denote or quantify over kinds and DPs that denote or quantify over objects. Examples of object denoting/quantifying DPs are the lion and gold in (1a) and (2a), both from Krifka et al. (1995). The DP the lion in (1a) denotes a particular lion. Likewise, the DP gold in (2a) quantifies over portions of gold. In contrast, the DPs the lion in (1b) and gold in (2b) – also from Krifka et al. (1995) – denote kinds, of which particular lions and portions of gold are instances.

(1a) The lion escaped yesterday from the Hellabrunn zoo
(1b) The lion is a predatory cat.
(Krifka et al. 1995; 5 – examples 7a and 5a, respectively)

(2a) Gold was stolen in yesterday’s bank robbery.
(2b) Gold is a precious metal.
(Krifka et al. 1995; 5 – examples 7b and 5c, respectively)

We have described the difference between kind denoting DPs and object denoting DPs in (1) and (2) at an ontological level: we suggested with Carlson that the DPs in the (a) sentences denote different sorts of entities from the DPs in the (b) sentences. Interestingly, Carlson (1977) showed that there are grammatical and lexical phenomena that are sensitive to this intuitive ontological distinction. Firstly, some predicates are only compatible with kind denoting DPs. An example is *become extinct*. The contrast between (3a) and (3b) shows that *become extinct* is compatible with a kind denoting subject but not with an object (specimen) denoting subject:

(3a)  The lion will become extinct soon.
(3b)  *Simba will become extinct soon.

(Krifka et al. 1995; 10 – example 23a)

Secondly, kind referring DPs must be “semantically connected to a well-established kind”, as illustrated in examples (4a) and (4b), which Carlson (1977) attributes to Partee (*apud* Krifka et al. 1995):

(4a)  The Coke bottle has a narrow neck.
(4b)  *The green bottle has a narrow neck.

(Krifka et al. 1995; 11 – examples 24a-b)
While (4a) is naturally understood as a claim about the kind Coke bottle, (4b) can only be interpreted as a claim about a particular green bottle – and therefore it is odd out of the blue, with no salient green bottle to serve as a referent. Carlson proposes that the relevant difference between the DPs the coke bottle and the green bottle is that the first one describes a well-established kind, while the second does not. In other words, as long as a DP is associated with a well-established kind, it can be a kind referring DP.

Chierchia (1998b) also explored this idea by arguing that kinds are ‘regularities that occur in nature’. As noted in Pires de Oliveira and Rothstein (2011), ‘nature’ is being used by Chierchia in a wide sense, given that not only ‘biological’ species, but also artifacts (‘chairs’, ‘cars’ (Chierchia 1998b; 348) and other complex individuals (‘intelligent students’, ‘spots of ink’ (Chierchia 1998b; 348)) qualify as kinds given their regular behavior (Chierchia 1998b, based on Carlson 1977; 26 and Krifka et al. 1995). Chierchia (1998b; 348) suggests that because kinds are not grammatically defined, they may vary to a certain extent (according to a context) and therefore some vagueness is expected when defining kinds.

These two constraints on which DPs can refer to kinds can be used as tests to diagnose kind denoting DPs. By using these diagnostics, we learn about a number of interesting properties of reference to kinds in English. Firstly, we observe that there are no count/mass restrictions on what can be a kind referring DP: as we observed already in (1) and (2), both count nouns and mass nouns can be used to refer to kinds. Secondly, we observe that there are restrictions on the kind of determiner that can be used to form a kind denoting DP. While definite DPs and bare plurals can be used to form kind denoting DPs, as illustrated in (5a) and (5b), (5c) shows that indefinite singular DPs resist this
interpretation. Nevertheless, singular indefinite DPs may be used to denote subkinds, i.e. to denote sub-species of the species that is described by their head noun. In (5d) for instance, the DP *a certain lion* is used to refer to a sub-species of lion. Krifka *et al.* (1995) call this a taxonomic interpretation. In this dissertation, I will say that such DPs refer to subkinds.

\[(5a)\] The lion will become extinct soon.

\[(5b)\] Lions will become extinct soon.

\[(5c)\] *A lion will become extinct soon. (non taxonomic reading)*

\[(5d)\] A certain lion (namely the Berber lion) will become extinct soon. (taxonomic reading)

(Krifka *et al.* 1995; 10 – examples 23a, 23b, 23d and 23e)

Finally, we observe that kind referring DPs can be specific or non specific, as illustrated below:

\[(6a)\] A lion (as in ‘I saw a lion at the zoo.’)

*Nonspecific and non kind referring*

\[(6b)\] Simba/a lion, namely Simba (as in ‘Simba stood in front of my tent’)

*Specific and non kind referring*
A cat (in the taxonomic reading, as in ‘A cat shows mutations when domesticated’)

Kind referring but nonspecific

The lion/a cat, namely the lion (taxonomic reading)

Kind referring and specific.

(Krifka et al. 1995; 15 – examples 31 a-d)

3.1.2 Analyzing kinds

In this subsection, I propose an analysis of kind denotations. Since the focus of this dissertation is not on the meaning of kinds, I will not discuss alternative analyses, but instead I will go straight to the theory that I will adopt. This theory is based on Chierchia’s (1998) proposal, which is in turn based on Carlson (1977) and Krifka et al. (1995).

Following Carlson (1977) and Krifka et al. (1995), I assume that kinds are individuals. DPs like the dodo in sentences like the dodo is extinct denote kinds. They are referential expressions, rather than quantifiers. This allows us to account for the restrictiveness of predicates like become extinct as a form of semantic selection: these predicates denote functions whose domain only includes kinds and whose value is not defined for any other type of argument. But what are kinds exactly? On the one hand, it

---

14Some authors have claimed that kind referring NPs are quantificational (Bacon 1973a, 1974, apud Krifka et al. 1995; 64) or intensions (Mayer 1980, Martion 1986 apud Krifka et al. 1995; 64). These proposals will not be discussed in this dissertation.
seems that reference to a kind should somehow relate to reference to actual specimens of that kind. Krifka et al. (1995) observe for instance that our theory of kind denotation should account for the fact that the truth of (7) depends on the arrival of actual rats in Australia in 1770 in the actual world:

(7) The rat reached Australia in 1770.

Krifka et al. (1995; 64)

On the other hand, as again observed by Krifka et al. (1995; 64), we want to be able to distinguish between kinds that have the same extension in the actual world, namely an empty extension: we acknowledge that the tyrannosaurus and the brontosaurus are two different kinds, although there are no specimens of any of these in the actual world anymore.

The theory of reference to kinds that is proposed by Chierchia (1998b) allows us to account for both requirements in a simple way. Kinds are analyzed as functions from possible worlds to individuals. More precisely, a kind $k$ is a function that maps a world $w$ to the plural individual that consists of the sum of all the specimens of $k$ in $w$. Thus, the kind of dogs is modeled as a function that maps any world $w$ to the sum of all individual dogs in $w$. We can therefore maintain that the tyrannosaurus and the brontosaurus are two different kinds, although they have the same extension in the actual world at the present time: they differ in intension. We can also account for the truth-conditions of sentence (7), provided we assume that the meaning of reached Australia in 1770 as a predicate of kinds is derived from its meaning as a predicate of individuals: we posit that
it denotes a function that maps a kind $k$ and a world $w$ to the truth value 1 if and only if some specimens of $k$ in $w$ reached Australia (in the regular non-kind meaning) in 1770. Chierchia’s proposal also allows us to establish a one-to-one relation between kinds and properties. To a given kind $k$, there corresponds a property $P$ which is defined as the function that maps any world $w$ to the set of individuals that are specimens of $k$ in $w$.

Kinds are therefore analyzed as individual concepts, but as Chierchia (1998b) points out – based on Krifka et al. (1995) and Carlson (1977) – not just any individual concept may be a kind. First of all, kinds correspond to well-established regularities; that is to say there are constraints on what kind of property can correspond to a kind. To some extent, these constraints are not linguistic. We have seen for instance that the Coke bottle (cf. example 4) may denote a kind, while the green bottle may not. In other words, one cannot manufacture a kind from the property of being a green bottle, and this has to do with world knowledge rather than with grammar. On the other hand, any lexical (i.e. non-complex) noun can be used to refer to a kind. Secondly, Chierchia points out that individual concepts that are necessarily instantiated by a single individual may not be kinds. This excludes proper names of persons as kinds: the name Lyn does not denote a kind.

In the rest of this chapter, I will refer to kinds in the metalanguage using capitalized nouns. For instance, DOG is the kind of dogs, i.e. a function from a world $w$ to the sum of all dog individuals in $w$. From a kind $k$, we can derive the set of individuals that are specimens of $k$ in a world $w$ as in (8), and we can derive the property of being a specimen of $k$ as in (9):
(8) \( \lambda x. x \leq \text{DOG}(w) \)

(9) \( \lambda x. \lambda w. x \leq \text{DOG}(w) \)

We have seen how to model kind denotations and object denotations (i.e. denotations of specimens of kinds) in our metalanguage, using Chierchia’s (1998) formalism. We still need to model what Krifka et al. (1995) call taxonomic uses of DPs, i.e. reference to subkinds. In (10), the DP *a dog* does not denote the kind DOG. If it did (10) would have to be interpreted as an identificational sentence. But in that case, (10) would be false, since the kind DOG is distinct from the kind GERMAN-SHEPHERD. The DP *a dog* does not denote the set of individual dogs in the world of evaluation, i.e. (8), neither does the DP denote the property of being an individual dog, i.e. (9), since both are true of individual dogs, and the subject of (10) denotes a kind. Rather, it seems that the DP *a dog* denotes the set of subkinds of DOG in the world of evaluation, or maybe the property of being a subkind of DOG.

(10) The German Shepherd is a dog.

How should we represent subkind denotations? Carlson (1977) and Chierchia (1998b) propose that kinds are a sort of individual. More precisely, a kind is an individual concept of type \( <s, e> \). Given a world \( w \) and a kind \( k \), \( k(w) \) is a member of the domain of individuals \( U \). Given this assumption, we may define the set of subkinds of the kind DOG in a world \( w \) as in (11). The domain of this function is the set of kinds. It maps a kind \( k \) to
the truth value 1 if and only if for all \( x \), if \( x \) is a specimen of \( k \) in \( w \), then \( x \) is a specimen of DOG in \( w \).

\[
\lambda k: k \in K. \forall x. x \leq k(w) \rightarrow x \leq \text{DOG}(w)
\]

(11) \( \lambda k: k \in K. \forall x. x \leq k(w) \rightarrow x \leq \text{DOG}(w) \)

Note that (11) characterizes the set of subkinds of the kind DOG in a world \( w \). This means that according to this definition, a kind \( k \) may well be a subkind of the kind DOG in some world \( w \), without being a subkind of DOG in some other world \( w' \).

This closes our introduction to the concepts of kinds and kind denotations. In the next section, I show that bare NPs in Yudja can denote kinds, and I argue that non-kind interpretations of NPs should be derived from their kind denotations.

3.2 Reference to kinds in Yudja

3.2.1 Reference to kinds with bare nouns

In this section, we will see that bare nouns in Yudja may refer to kinds or to subkinds. The use of a bare noun to refer to a kind is illustrated in (12). The bare noun \( \text{takū} \) (‘mutum’, also known as Red-knobbed Currassow, a bird) is used to denote a kind, since it occurs as the subject of the kind predicate \( \text{masehu txa} \) (‘become extinct’). That this predicate selects kind denoting subjects is confirmed by the fact that it is ungrammatical with proper names, as illustrated in (13), and with demonstrative phrases that refer to individuals, as in (14).
(12) Takũ masehu txa
mutum extinction go
‘The mutum will become extinct’

(13) *Karin masehu txa
Karin extinction go

(14) *Amĩ takũ masehu txa
this mutum extinction go

Example (15) shows that the bare noun takũ may denote individuals that are members of the kind ‘mutum’ or quantify over such individuals:

(15) Senahũ takũ ixu
man mutum eat
‘(A/the/some) man ate (a/the/some) mutum’

Sentences (16) and (17) illustrate that bare nouns can be used to refer to subkinds as well as kinds. Consider (16). On the one hand, the noun pitxa (‘fish’) is used to denote subkinds. Indeed, the DP yauda pitxa (‘two fish’) is used to count subkinds of fish. On the other hand, the names paria and kirita, while they denote subkinds of the kind FISH, are actually used to denote the kinds PARIA and KIRITA (kinds of fish). The same holds in (17) with a different kind of food (honey):
From these examples, we hypothesize that noun roots refer to kinds in Yudja. Two morphological operations may be used to map the denotation of a root noun to a property. First, a kind $k$ may be mapped to a number neutral property of atomic individuals and their sums who are members of $k$. Second, a kind $k$ may be mapped to a number neutral property of subkinds of $k$. No additional overt morphology is needed to license any of these three types of denotations. This raises the question how they are related to one another. Should we assume that bare nouns are lexically ambiguous? Or should we rather posit a basic denotation and derive from it the other two? In the rest of this section, I will argue in favor of the second answer. First, I will develop an analysis according to which reference to kinds is primitive and reference to subkinds or specimens is derived from it (cf. Krifka 1995, Kratzer 2007). Then, I will present empirical and conceptual arguments in favor of this analysis.
3.2.2 Deriving subkind and object denotations from kind denotations

In this subsection I show how to derive object and taxonomic interpretations of Yudja bare nouns from their kind interpretation. I take it that the basic denotation of the bare noun takũ (‘mutum’) is the kind MUTUM, as in (18), or equivalently (19):

\[(18) \quad [[\overline{\text{takũ}}]] = \lambda w. \text{MUTUM}(w)\]

\[(19) \quad [[\overline{\text{takũ}}]] = \text{MUTUM}\]

To turn the root takũ into a noun denoting a number neutral property of objects, we must map the kind MUTUM to a property that is true of atomic individuals and their sums. This property is represented in (20). I assume that we have access to a function AT* that maps an individual \(x\), a world \(w\) and a kind \(k\) to the truth value 1 if and only if \(x\) is the sum of atomic parts of \(k(w)\). Since any individual \(x\) is the sum of \(x\) and \(x\), AT* picks out those realizations of \(k(w)\) that are either atoms or sums of atoms. Such a function is defined in (21). Let us call it KO, for Kind to Object (cf. the realization function R in Krifka et al. 1995; 66). The result of applying KO to \([[\overline{\text{takũ}}]]\) in (19) is the property of being an atomic part of the kind MUTUM, as illustrated in (22):

\[(21) \quad \text{KO} = \lambda k: k \in K. \lambda x. \lambda w. \text{AT}^*(w)(x)(k)\]

\[(22) \quad \text{KO}([[\overline{\text{takũ}}]]) = \lambda x. \lambda w. \text{AT}^*(w)(x)(\text{MUTUM})\]
In sum, this operation gives us a number-neutral predicative interpretation. The result of applying KO to MUTUM is a property that is true of any individual that is a singular or plural realization of the kind MUTUM.

Next, we must show how to derive the taxonomic interpretation of bare nouns from their kind denotation. That is to say, we must define a function that maps the kind MUTUM in (19) to the property of subkinds of MUTUM in (23). This function is given in (24). Let us call it KS, for Kind to Subkinds (cf. the taxonomic function T in Krifka et al. 1995; 66). The result of applying KS to \([[[\text{etakū}]])\) in (19) is the property of being a subkind of MUTUM, as illustrated in (25), which is identical to (23):

(23) \( \lambda k: k \in K. \lambda w. \forall x. x \leq k(w) \rightarrow x \leq \text{MUTUM}(w) \)

(24) \( \text{KS} = \lambda k': k' \in K. \lambda k: k \in K. \lambda w. \forall x. x \leq k(w) \rightarrow x \leq k' (w) \)

(25) \( \text{KS}([[\text{etakū}]]) = \lambda k: k \in K^*. \lambda w. \forall x. x \leq k(w) \rightarrow x \leq \text{MUTUM}(w) \)

This shows that we can take kinds to be the basic denotations of bare nouns and derive from them number neutral properties of individuals and number neutral properties of subkinds. We must still clarify how these mappings are realized in actual sentences and how those properties are mapped to individuals. In this section I explore the first of these two questions and in Section 3.2.3 I discuss the second question.

One possibility to explain how these mappings are realized in actual sentences is that KO and KS are lexical operations, a form of type shifting that would not be
Another possibility is that KO and KS are denoted by silent functional heads. I suggest that the second possibility is the one that is attested in Yudja. I will first spell out the way I believe KO and KS are introduced in the morpho-syntax of bare nouns, and then I will discuss arguments in favor of this analysis.

I propose that bare nouns in Yudja are morphologically complex. Following much work in Distributed Morphology (Marantz 1995, Embick and Noyer 2007) I adopt the working hypothesis that all lexical items are formed by combining category neutral roots with category-defining functional heads. In the distributive morphology framework, roots will surface in the syntax as lexical categories (nouns, verbs, adjectives, etc.) only after being categorized. Therefore, lexical categories will always be syntactically complex. That is, nouns (and other lexical categories) are minimally formed by a root and an abstract morpheme as defined below:

“Abstract Morphemes: These are composed exclusively of non-phonetic features, such as [Past] or [pl], or features that make up the determiner node D of the English definite article eventuating as the.

Roots: These include items such as \( \sqrt{\text{CAT}} \), \( \sqrt{\text{OX}} \), or \( \sqrt{\text{SIT}} \), which are sequences of complexes of phonological features, along with, in some cases, non-phonological diacritic features. As a working hypothesis, we assume that the Roots do not contain or possess grammatical (syntactic-semantic) features.”

(Embick and Noyer 2007; 295)
In other words, the basic assumption of distributive morphology is that roots never appear bare, without being combined with a functional head. This idea is formalized by Marantz (1995) as the ‘categorization assumption’:

*Categorization assumption*: roots cannot appear without being categorized; Roots are categorized by combining with category-defining functional heads (Marantz 1995 *apud* Embick and Noyer 2007; 296)

Under this view, roots will be an open class of language-specific ‘combinations of sound and meaning’ (Embick and Noyer 2007). Cross-linguistically the roots that will become nouns in the syntax will vary for cultural reasons but “the features that make up abstract morphemes are universal” (Embick and Noyer 2007). Roots always will be categorized by functional heads, which are universal and are composed of non-phonetic features. Within this framework, in order to form the bare noun *takū*, one needs to combine the root √*takū* with the nominal functional head *n*, as illustrated in (26):

\[
\text{(26)} \quad [\text{nP } n \sqrt{\text{takū}}]
\]

Similarly to Kratzer’s (2007) proposal for English, I propose that category neutral roots like *takū* denote kinds. The functional head *n*, in addition to introducing a categorial feature in the morpho-syntactic representation, may map the kind denoted by the root to a number neutral property of objects or to a number neutral property of subkinds. This means that the functional head *n* is actually ambiguous in its semantics. I will represent
this ambiguity by adding to \( n \) a feature \(+KO\) or \(+KS\), written as a subscript, which determines its denotation in the following way:

\[
[[n_{+KO}]] = KO = \lambda k : k \in K. \lambda w. AT^*(w)(x)(k)
\]

\[
[[n_{+KS}]] = KS = \lambda k' : k' \in K. \lambda k : k \in K. \lambda w. \forall x. x \leq k(w) \rightarrow x \leq k'(w)
\]

Combining the root \( \sqrt{takū} \) with the head \( n_{+KO} \) will result in the object-denoting \( nP \) in \((29)\), while combining it with the head \( n_{+KS} \) will result in the taxonomic \( nP \) in \((30)\):

\[
[[n_{+KO} \sqrt{takū}]] = \lambda x. \lambda w. AT^*(w)(x)(MUTUM)
\]

\[
[[n_{+KS} \sqrt{takū}]] = \lambda k : k \in K. \lambda w. \forall x. x \leq k(w) \rightarrow x \leq MUTUM(w)
\]

What about kind denoting uses of \( takū \)? In this case, I assume that the functional head \( n \) is interpreted as an identity function, which maps a kind to itself. I call this function KK (Kind to Kind). It is defined in \((31)\). The corresponding functional head \( n_{+KK} \) is interpreted as in \((32)\):

\[
KK = \lambda k : k \in K. \lambda w. k
\]

\[
[[n_{+KK}]] = KK = \lambda k : k \in K. \lambda w. k
\]
In the next section I explore the process of mapping properties to individuals or generalized quantifiers.

### 3.2.3 The D layer: mapping properties to individuals or generalized quantifiers

In the previous subsection, it was argued that nominal roots denote kinds, and that a family of covert operations (KO, KS, KK) realized in the nominal head $n$ map the kind denoted by a root to a number neutral property of specimens of the kind, of subkinds or of the kind itself. However, when a noun phrase is used as the argument of a predicate, it must denote an individual or a generalized quantifier rather than a property (that is to say, assuming that a predicate combines with its argument by function application). In languages like English, it is the function of determiners to map the property denoted by a NP to an individual or to a generalized quantifier. In Yudja however, bare noun phrases can be used as arguments without overt determiners. To account for this fact, I will assume that bare noun phrases of Yudja are DPs with a covert D head. This head is interpreted as a function that maps the property denoted by its complement NP to an individual (type $e$) or generalized quantifier (type $<et,t>$).

I assume that a covert D head may denote at least the two functions in (35) and (36). The function SIGMA in (35) maps a property $P$ to the unique contextually salient singular or plural individual that is a member of $P$ and that satisfies the contextual restriction $C$. This is a partial function, which is undefined if there is more than one individual in the intersection of $P$ and $C$, or if this intersection is empty. It corresponds to
the SIGMA operator suggested by Link (1983). The function A in (34) is an existential quantifier.

\[
(33) \quad [[D_{\text{sigma}}]] = \text{SIGMA} = \lambda P. \sigma x.P(x) \& C(x)
\]

\[
(34) \quad [[D_{A}]] = A = \lambda P. \lambda Q. \exists x [ P(x) \& C(x) \& Q(x) ]
\]

The analysis presented in 3.2.2 and 3.2.3 accounts for the availability of kind interpretations, object interpretations and taxonomic interpretations of bare nouns in Yudja. In 3.2.4, I would like to present some empirical and conceptual arguments in favor of this analysis.

3.2.4 Motivating the analysis of bare nouns

Let us begin with the assumption that the basic denotation of a bare noun is a kind. A first piece of evidence in favor of this assumption is typological. It has been observed that in languages that license the use of bare nouns as arguments, bare nouns can be used to refer to kinds (Krifka 1995; 399; see also Chierchia 1998, Müller 2002, Pires de Oliveira and Rothstein 2011, among many others). In addition, in classifier languages (such as Mandarin Chinese), the use of a classifier is not required to refer to kinds but only to refer to objects and subkinds:

*Kind*

\[
(35a) \quad \text{xiong jue zhong le}
\]
bear  vanish  kind  ASP

‘The bear is extinct’

**Specimens**

(35b) san  zhi  xiong

three  CL  bear

‘Three bears’ (objects)

**Subspecies**

(35c) san  zhong  xiong

three  CL  bear

‘Three bears’ (species)

(Krifka 1995; 398-399 – examples 1a, 1d, 1e)

These two facts are expected if reference to kinds is primitive and reference to objects and subkinds is derived. From this point of view, reference to kinds is given for free, and additional semantic operations are required to get a noun to refer to objects and subkinds (cf. Krifka 1995, Kratzer 2007).

Another aspect of my proposal is that bare nouns are morphologically complex, being composed of a category-neutral root and a category-specifying functional head. Support for this claim comes from the analysis of another class of words in Yudja, namely verbs. Lima (2006, 2008) has shown that Yudja verbs are morphologically complex: to form a verb, a root must be combined with an overt functional head.
(‘verbalizer’) whose only function appears to be the marking of the stem as a verb. This functional head (that can be pronounced as $h, k, t, d, n$ or can be phonologically null) is followed by the $realis$ morpheme $-u$ as illustrated below:\(^{15}\):

\[(36a)\]

<table>
<thead>
<tr>
<th>Functional head</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>$-k$- (root+functional head+$realis$)</td>
<td>$Djidaku$ ‘hit’, $puduku$ ‘walk’, $pïdiku$ ‘fish’</td>
</tr>
<tr>
<td>$-t$- (root+functional head+$realis$)</td>
<td>$Biditu$ ‘fall’, $editu$/$yaditu$ ‘scare’</td>
</tr>
<tr>
<td>$-n$- (root+functional head+$realis$)</td>
<td>$Hunu$ ‘toast’, $ikupenu$ ‘close’</td>
</tr>
<tr>
<td>Phonological null (‘irregular’ verbs)</td>
<td>Lapa ‘spill’, awa ‘search’</td>
</tr>
</tbody>
</table>

More examples of this process of verb formation are given in (36b):

---

\(^{15}\) Prefixes to the root indicate transitive/intransitive alternation (cf. Lima 2008).
An important aspect of word formation in Yudja is that some of the roots that can also form verbs can form nouns if followed by the morpheme –a or zero morpheme. The root *eta* in *etahu* ‘swim’ can be associated with a zero morpheme and be interpreted as ‘beach’ or ‘sand’. If the verbalizer –h is used, the verb *etahu* ‘swim’ is formed. The same holds for the root *pi*. If it ends in –a, it can be interpreted as ‘comb’. If it ends in –u, it is interpreted as the verb ‘to comb’. The same holds in the contrast *kamena* ‘conversation’ and *kamenu* ‘talk’. The process of verb formation in Yudja finds a natural explanation in the assumption of Distributed Morphology that the category of lexical items is not determined lexically but is the result of combining category neutral roots with category specifying functional heads. Therefore, Yudja verb morphology brings indirect support to
the analysis of bare noun morphology that was presented in this section: the same process that we observe overtly with verbs is going on covertly with nouns\textsuperscript{16}.

In the next section, I discuss the notion of atomicity in more detail. I address the following questions. What counts as an atom in Yudja? Are there restrictions on the application of the function KO to kind denoting roots? To what extent does the derivation of count nouns differ in Yudja and English?

3.3 Atomicity

In Chapter 2, we showed that notional mass nouns can be combined with numerals in Yudja. We argued that this phenomenon is not due to coercion, since counting with notional mass nouns like \textit{apeta} (‘blood’) is possible even when the counting unit is not conventional, and even when the atoms that are being counted differ in shape and size. One way to account for this fact is to assume that the function KO can be applied to any nominal root. As a consequence, notionally mass nouns will have a count denotation, i.e. they will denote characteristic functions of sets of atoms. To illustrate, applying KO to the root \textit{apeta} (‘blood’) yields the characteristic function of the set of atoms of blood in the world of evaluation.

When the counting units of notional mass nouns in Yudja are not provided by conventions, what are these units? An examination of the counting units in non-

\textsuperscript{16} It is important to note that Yudja is not the only language where this operation will be covert: in English, as suggested by Kratzer (2007) lexical operations are needed in order to derive different interpretations of a noun (kinds, subkinds, objects). Kratzer (p.c.) argues that nouns in English have number neutral denotations and that number inflection creates a singular or plural denotation from the number neutral denotation.
conventional contexts in the examples discussed in Chapter 2 reveals a common feature: all portions that are treated as a unit are maximal connected portions of the kind denoted by the root. Consider example (31c) from Chapter 2, repeated here as (37):

CONTEXT: The children brought one bowl full of sand from the beach. While they walked, they dropped a little bit of sand near the school, and a little bit near the hospital (in the drawing the portions were different in size and form).

(37) Yauda ali eta apa~pa
two child sand drop~ RED

‘Children dropped two (portions of) sand(s)’

The two portions of sand that are treated as units in (37) differ in size and shape, and they are not individuated with respect to a container such as a bucket or a bag. Yet, they are both maximal self-connected portions of sand: each portion of sand is a self-connected whole and is not a proper part of any self-connected portion of sand. Other examples point to the same conclusion:

CONTEXT: Someone brought a container of water and let one drop fall near the school, another drop near the hospital and a last drop near the river (all drops are different in size and form).
(38a)  Txabīu  y’a  ipide  pe~pe~pe
three  water  on the floor  drip~RED
‘Three (drops of) water dripped on the floor’

(38b)  Txabīu  y’a  ipide  pe
three  water  on the floor  drip
‘Three (drops of) water dripped on the floor’

In the example (38a) – and its variation where the verb is not reduplicated in (38b) – the drops of water are of different sizes and forms. Nonetheless, as in the example (37) for eta ‘sand’, they are all maximal self-connected portions of water as each portion of water is a self-connected whole and is not a proper part of any self-connected portion of water. As expected, the same observation holds in scenarios where the maximal-self connected portions of a substance are identical, as exemplified below:

CONTEXT: Maria brought two bowls full of a traditional drink.

(39)  Maria  yauda  yakuha  dju wī
Maria  two  traditional drink  bring
‘Maria brought two (bowls/containers with) traditional drink’
In this section, I propose that atoms in the extension of Yudja nouns are maximal self-connected portions of the kind described by the root in the world of evaluation. I call such entities ‘concrete portions’ of (the extension of) a kind.

Let us first define the notion of connectedness. Following Casati and Varzi (1999), we will analyze part-whole relations using a mereotopological theory, which combines mereological and topological axioms\textsuperscript{17}. The mereological side of the theory is concerned with notions of parthood, while the topological side of the theory is concerned with notions of connectedness. We define our mereotopological theory by adding a parthood relation $\leq$, an overlap relation $O$, and a connectedness relation $C$ to the lambda calculus that we have been using so far. These two relations are formalized through a list of axioms that we take from Varzi (2007). All variables that appear to be free in the axioms are tacitly bound by wide scope universal quantifiers. The relation of parthood is required to be reflexive, transitive and antisymmetric:

\begin{enumerate}
\item $x \leq x$ (Reflexivity)
\item $x \leq y \land y \leq z \rightarrow x \leq z$ (Transitivity)
\item $x \leq y \land y \leq x \rightarrow x = y$ (Antisymmetry)
\end{enumerate}

The relations of proper parthood and overlap are defined from the relation of parthood as follows:

\textsuperscript{17}Grimm (2012) must be credited for bringing mereotopology to the attention of semanticists working on countability. In his dissertation, Grimm uses notions of mereotopology, notably connectedness, in order to provide an adequate model theoretic definition of aggregate nouns.
(41a) Proper parthood:
\[ x < y =_{\text{def}} x \leq y \& \exists z [ z \leq y \& \neg z \leq x ] \]

(41b) Overlap:
\[ O(x)(y) =_{\text{def}} \exists z [ z \leq x \& z \leq y ] \]

The relation of connectedness is required to be reflexive and symmetric:

(42) Connectedness:
1. \( C(x)(x) \) \hspace{5cm} \text{(Reflexivity)}
2. \( C(x)(y) \rightarrow C(y)(x) \) \hspace{5cm} \text{(Symmetry)}

The relations of parthood, overlap and connectedness interact in significant ways, which are captured by the following two axioms from Varzi (2007):

(43) Bridging Principles:
1. \( x \leq y \rightarrow C(x)(y) \) \hspace{5cm} \text{(Integrity)}
2. \( O(x)(y) \rightarrow C(x)(y) \) \hspace{5cm} \text{(Unity)}
3. \( x \leq y \rightarrow \forall z [ C(x)(z) \rightarrow C(z)(y) ] \) \hspace{5cm} \text{(Monotonicity)}
The first axiom states that every part of an entity is connected to that entity. The second axiom states that any two overlapping entities are connected. The last axiom states that if an entity is a part of another entity, every entity that is connected to the first is also connected to the second.

We can now define the property of self-connectedness SC, following Varzi (2007):

\[(44)\]
\[
\text{Self-connectedness:}
\]
\[
SC(x) = \text{def} \ \forall y \forall z \left[ \forall v \ [ O(v)(x) \iff (O(v)(y) \lor O(v)(z)) \rightarrow C(y)(z) \right]
\]

According to definition (44), saying that an entity is self-connected means that whenever we partition this entity in two parts, these two parts are connected to each other.

Finally, we define the notion of a maximal self-connected portion of a kind \(k\) in a world \(w\) as follows:

\[(45)\]
\[
\text{Maximal self-connected portion of a kind in a world of evaluation:}
\]
\[
MSC(x)(k)(w) = \text{def} \ SC(x) \land x \leq k(w) \land \neg \exists y \ [ x < y \land SC(y) \land y \leq k(w) ]
\]

Saying that an entity is a maximal self-connected portion of a kind \(k\) in a world \(w\) means that this entity is a self-connected portion of \(k\) in \(w\) that is not a proper part of any self-connected portion of \(k\) in \(w\).
We have defined what it means for an entity to be a concrete portion of a kind in a world of evaluation, i.e. a maximal self-connected portion. Our claim about atomicity in Yudja can now be made more precise as follows:

(46) Condition on atomicity:

An entity $x$ is an atomic portion of a kind $k$ in a world $w$ only if $x$ is a maximal self-connected part of $k(w)$.

The definition in (46) states that being a maximal self-connected part of a kind in a world of evaluation is a necessary condition of being an atomic portion of that kind in that world. This condition has two important consequences. First of all, for any kind $k$ and world $w$, the mereological fusion of two disconnected parts of $k(w)$ can never be treated as an atom of $k(w)$. To illustrate, in the scenario (28b) from Chapter 2, repeated here as (47), we predict that speakers will never count the three drops of blood as a single ‘blood’ or as two ‘bloods’.

**CONTEXT:** João cut his finger and three drops of blood fell on the floor: one near the river, one near the house and another near the school.

(47) Txabīu apeta pe~pe~pe

three blood drip~ RED

‘Three (drops of) blood dripped’
Secondly, a mereological part of a kind $k$ in a world $w$ will never be treated as an atom of $k(w)$ if it is a proper part of a self-connected part of $k(w)$. This means that in scenario (47), speakers will never count four ‘bloods’ by treating one of the drops as two ‘bloods’.

While (46) imposes a necessary condition on atomicity, it does not provide sufficient conditions. Why is that? Imagine that we just define atoms of a kind $k$ in $w$ as maximal self-connected parts of $k(w)$. This works just fine for portions of blood, but then we would be forced to count the severed arm of John as a man: if John is a man in $w$, then John is an atom of the kind MAN in $w$. Poor John lost his arm while chain-sawing a tree. John’s arm is a mereological part of John, and therefore by transitivity is it is a mereological part of MAN($w$). Furthermore, John’s severed arm is a maximal self-connected part of MAN($w$). Yet, John’s severed arm is not a man. This is also the case in Yudja. A part of a woman will not be called iidja ‘woman’ but a part of a woman (as discussed by one of the Yudja consultants in Chapter 2 when we elicited the meaning of the words atxa ‘round piece’ and akuata ‘long piece’).

Thus, what these examples show is that maximal self-connectedness is not a sufficient condition of atomicity. Some nouns, such as man and woman, impose further restrictions on what qualifies as an atom of the kind denoted by their roots. I propose that such restrictions are lexically encoded in the atomic function AT*. While AT($w$)(x)(BLOOD) in Yudja is true of any x that is a concrete portion of the kind BLOOD in $w$, AT($w$)(x)(MAN) is only true of concrete portions of the kind MAN in $w$ that also happen to be natural units of this kind. Assuming that this additional restriction is encoded directly in the relation AT* is tantamount to saying that any competent
speaker of Yudja knows that individual men (i.e. atoms of the kind MAN) satisfy criteria of individuation that are more stringent than maximal self-connectedness. This knowledge consists of both encyclopedic knowledge about men, and logical-grammatical knowledge about individuation. Since AT* relates kinds to atoms, it is the natural locus for such knowledge in the lexicon.

We are now in a position to compare Yudja to English. At a cognitive level, the behavior of speakers of the two languages is not so different at all. In both languages, speakers recognize that there is a difference between notional mass nouns like *apeta/blood*, and notional count nouns like *senahï/man*. In both languages, the criteria for individuating notional mass nouns are relatively flexible. In English, this is reflected by the diversity of container phrases and measure phrases that can be combined with mass nouns like *blood* or *sand*. In Yudja, this is reflected in the diversity of shapes and sizes of concrete portions of the corresponding kinds. In both languages, the criteria for individuating notional count nouns like *men* are more stringent. In English, this shows up in restrictions on the combination of measure phrases with count nouns: saying that there is 70 kilos of man sitting on the sofa is strange and when acceptable requires the extra effort of coercion. In Yudja, this shows up in criteria for individuation that are more restrictive than maximal self-connectedness.

In sum, we propose that Yudja is a language where all nouns can be construed as count nouns without coercion. This is possible because the grammar of the language allows its speakers to treat concrete portions of a kind as atoms, modulo additional restrictions with notionally count nouns.
If all nouns in Yudja indeed allow count denotations (expressing number-neutral properties of concrete portions of stuff), then when asked ‘who has more x?’ their answer should always be determined by the number of portions, not volume. This prediction of the hypothesis presented in this chapter is tested in quantity judgment studies presented as follows.

3.4 Quantity judgments in Yudja

Cross-linguistically, scholars have used quantity judgments in order to describe the properties of count and mass nouns in a language. Quantity judgments consist of visual tasks where speakers have to compare two quantities: one that is voluminous (henceforth ‘Volume’) and another that is numerous (henceforth ‘Number’). In English (Barner and Snedeker 2005) and Chinese (Li, Barner and Huang 2008), participants (16 adults and 16 4-year-olds in English and 56 adults in Chinese) presented different quantity judgments depending on the noun being used in the comparison of these quantities. Participants based their quantity judgments on ‘Volume’ significantly more when they evaluated mass nouns (such as toothpaste) and they based their quantity judgments significantly more on ‘Number’ when they evaluated count nouns (such as shoes) or object-mass nouns (such as furniture – in English only)18.

In this section I present the results of two quantity judgment studies in Yudja. The analysis of Yudja presented in the previous section predicts that concrete portions of a substance can be considered as atoms for the purposes of counting. We have proposed

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18 Object-mass nouns (a.k.a. fake mass nouns) are nouns that are ‘cognitively count’ (Chierchia 2010) but syntactically mass (cf. Chierchia 2010, Schwarzschild 2011, Grimm and Levin 2011).
that this is a consequence of the fact that all nouns have count denotations. Thus, if all nouns have count denotations, we would expect that in quantity judgments all nouns can be evaluated by the number of portions rather than by the volume of the portions (as mass nouns are evaluated in other languages such as English and Chinese). This prediction is tested in the following studies.

Study 1

Methods

Participants were 18 adults and 22 children (7, 2-to-5-year-olds; 15, 6-to-11-year-olds). Children were divided in two groups according to schooling: 6-to-11-year-olds start to learn Brazilian Portuguese in the school while younger children are monolingual or are in a very early stage as Brazilian Portuguese learners. In this study, on each trial, the participants saw two different drawings one with a big portion of x (Volume) and another with many different portions of x (Number). The target question was Ma de bitu x dju au? ‘Who has more x?’, as illustrated below:

(48a) Notional mass nouns (asa ‘flour’, y’a ‘water’, kania atxa ‘meat’):

Ma de bitu asa dju a’u?
who more flour have
‘Who has more flour?’
(48b) Notional count nouns (xa^a ‘bowl’, txarina ‘chicken’, karaxu ‘spoon’):

\[
\text{Ma de bitu xaa dju a’u?}
\]

who more bowl have

‘Who has more bowls?’

(48c) Aggregate nouns (abeata ‘clothes’, w^a’e ‘ceramic’):

\[
\text{Ma de bitu abeata dju a’u?}
\]

who more clothes have

‘Who has more clothes?’

As illustrated in 48a-48c, three notional classes of nouns (mass, count and aggregate nouns) were tested. Similar to the critical items used by Barner and Snedeker ‘the three objects had a smaller combined volume and surface area than the large object, allowing responses based on number to be distinguished from those based on mass or volume’ (Barner and Snedeker 2005; 50). All items presented the same syntactic and morphological properties, as none of these nouns can be pluralized (only [+human] nouns can be pluralized in Yudja, see Chapter 2).

Each participant answered 8 items in the same random order. Three items included notional count nouns (e.g. xaa ‘bowl’), three items included notional mass nouns (e.g. asa ‘flour’) and two items included aggregate nouns (e.g. abeata ‘clothes’). For all participants, the study took place in a room in the Yudja’s local central school in the Tuba Tuba village. A local teacher known by the children was present in order to facilitate all the tasks that involved children. I introduced the study by explaining that one
person owned the big portion of \( x \) and another person owned the three small portions of \( x \). Participants had to point to one of the drawings to answer the target question (‘who has more \( x \)?’).

**Results and discussion**

The results for Study 1 are presented in Table 3.1. The 2-to-5-year-old children performed at chance, the 6-to-11-year-old children based their quantity judgments on ‘Volume’ and the adults based their quantity judgments on ‘Number’:

Table 3.1: Results of Study 1 – presented in percentage of ‘Number’ responses

<table>
<thead>
<tr>
<th>Noun ‘category’</th>
<th>Adults</th>
<th>Children (2-5)</th>
<th>Children (6-11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notional mass nouns</td>
<td>85%</td>
<td>57%</td>
<td>33%</td>
</tr>
<tr>
<td>Notional count nouns</td>
<td>83%</td>
<td>60%</td>
<td>33%</td>
</tr>
<tr>
<td>Aggregate nouns</td>
<td>79%</td>
<td>71%</td>
<td>43%</td>
</tr>
</tbody>
</table>

The results support the hypothesis presented in this chapter in two ways. First, participants did not vary their quantity judgments according to (notional) noun types. That is, the same answer was consistently used across all (notional) noun types for the three groups of participants. Second, adults favored the ‘Number’ answer for all nouns,
which suggests a preference for count interpretation of nouns (including nouns that denote substances) as predicted by our analysis. Mixed effects modeling using Helmert contrasts confirmed that there was no effect of noun type. However, there was a significant effect of Age on proportion of number criterion responses (Wald’s $Z = 2.5$, $p = 0.01$, $\beta = 0.122$). In Study 1, one factor with three levels (‘count’, ‘mass’ and ‘aggregate’) was manipulated in two Helmert contrasts. In the first contrast, notional count nouns were contrasted with aggregate nouns. It was observed that aggregate nouns have a greater probability of ‘Number’ responses in comparison to notional count nouns, but the difference was not significant (Wald’s $Z = 0.9$, $p = 0.35$, $\beta = 0.208$). In the second contrast, notional mass nouns were contrasted with aggregate and notional count nouns (that is, notional count and aggregate nouns were considered a single category). It was observed that notional count/aggregate nouns are numerically more likely to give ‘Number’ responses in comparison to notional mass, but again the difference was not statistically significant (Wald’s $Z = -0.617$, $p = 0.53$, $\beta = -0.070$):

Table 3.2: Mixed effects modeling using Helmert contrasts – Results Study 1

|                       | Estimate $\beta$ (Standard error) | z value (Wald’s $Z$) | Pr(>|$z$|) |
|-----------------------|----------------------------------|----------------------|----------|
| Intercept             | -0.76421 (0.96600)               | -0.791               | 0.4289   |
| Age                   | 0.12246 (0.04801)                | 2.551                | 0.0107*  |
| First contrast (notional count nouns vs. aggregate nouns) | 0.20876 (0.22525)               | 0.927                | 0.3540   |
Second contrast (notional count nouns and aggregate nouns vs. notional mass nouns)

<table>
<thead>
<tr>
<th>Contrast</th>
<th>t-value</th>
<th>df</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate nouns vs. Notional mass nouns</td>
<td>-0.07007</td>
<td>(0.11363)</td>
<td>-0.617</td>
</tr>
</tbody>
</table>

†: p < .1, *: p < .05, **: p < .01, ***: p < .001

The results of Study 1 support the hypothesis that all nouns have count denotations, as speakers did not differentiate (notional) count from (notional) mass nouns in their quantity judgments. Thus, all nouns can be interpreted as count nouns, even nouns that denote substances. This fact can be observed by in the significant preference for ‘Number’ over ‘Volume’ by adults. The results from quantity judgments in Yudja are different from the same studies in other languages, such as English (Barner and Snedeker 2005), Chinese (Cheung, Li and Barner 2012) and Japanese (Inagaki and Barner 2009), where noun type affects speakers’ judgments and only objects (grammaticalized as count or fake mass nouns) were associated with ‘Number’, not substances (grammaticalized as mass nouns).

There is an explanation for this difference that was introduced in our discussion of the analysis. In languages like Yudja, different variations of concrete portions (that may vary in shape or size) can be an atom for a mass noun. For example, different types of concrete portions of water (bowls, drops, puddles) can be atoms and be counted. In languages like English, there are also a variety of concrete portions that may be considered for counting, but container or measure phrases restrict them. In languages like Chinese classifiers restrict them. Thus, the lack of the need for a container/measure
phrase (that will be explored in Chapter 4) or classifier is correlated with the fact that all nouns can be treated as count in languages like Yudja. Therefore, we expect under this analysis different results in quantity judgment tasks when we compare languages like Yudja to languages like English and Chinese.

Study 2

As introduced in the introduction of Section 3.4, in quantity judgment studies, English speakers based their quantity judgments on ‘Number’ when they were presented with target sentences that included count and aggregate nouns and on ‘Volume’ when the target sentences included mass nouns (Barner and Snedeker 2005). Barner and Snedeker (2005; 52) raised an issue concerning the experimental items in Study 1 for aggregate nouns (named in Barner and Snedeker as ‘object-mass nouns’ because in English they have the syntactic distribution of mass nouns, even though they refer to objects (cf. Chierchia 2010, Schwarzschild 2011). When presented with a big chair vs. three small chairs, and asked the question ‘Who has more furniture?’ participants could have been reanalyzing furniture as chair. That is, one could say that a single chair by itself could not represent the concept of furniture. Therefore, in their second study the authors included multiple individuals for both ‘Number’ and ‘Volume’ answers. In our studies for Yudja the issue raised by Barner and Snedeker could also apply for nouns like abeata ‘clothes’ and wa’ē ‘ceramics’. This possibility was tested in Study 2. A second motivation for Study 2 in Yudja was to test whether the results from Study 1 for adults and 2-to-5-year-
old children were just an effect of a strong visual preference (unrelated to the facts being tested in this dissertation) for many portions of $x$ over a single big portion of $x$.

**Methods**

Participants were the same 18 adults and 22 children (7, 2-to-5-year-olds; 15, 6-to-11-year-olds) that participated in Study 1. As in Study 1, Study 2 took place in one room of the local Yudja school in the Tuba Tuba village. A local teacher known by the children and their parents was present for all the tasks that involved children.

In this study, we asked the participants the same question that was asked in Study 1 (*Ma de bitu x dju a’u?* ‘who has more $x$?’) and presented two different drawings: one with two big portions of $x$ and another with many different portions of $x$, as illustrated below:

(49a) Notional mass noun (*asa* ‘flour’)

![Notional mass noun](image)

Ma de bitu asa dju a’u?

Who more flour have

‘Who has more flour?’

(49b) Notional count noun (*xaa* ‘bowl’)

![Notional count noun](image)

Ma de bitu xaa dju a’u?

who more bowl have
‘Who has more bowls?’

(49c) Aggregate noun (abeata ‘clothes’)

Ma de bitu abeata dju a’u?
who more clothes have

‘Who has more clothes?’

As illustrated in 49a-49c, three notional classes of nouns (mass, count and aggregate nouns) were tested. As in Study 1, all items exhibited the same syntactic and morphological properties.

Each participant answered 3 items in random order: one item that included a notional count noun (xaa ‘bowl’), one item that included a notional mass noun (asa ‘flour’) and one item that included an aggregate noun (abeata ‘clothes’). I introduced the study explaining that one person owned two big portions of \( x \) and another person owned the six small portions of \( x \). Participants had to point to one of the drawings to answer the target question (Ma de bitu x dju a’u? ‘who has more \( x \)?’).

Results and discussion

The results for Study 2 are presented in Table 3.3. All three groups tested maintained the same pattern displayed in Study 1:
Table 3.3: Results of study 2 – presented in percentage of ‘Number’ responses

<table>
<thead>
<tr>
<th>Noun ‘category’</th>
<th>Adults</th>
<th>Children (2-5)</th>
<th>Children (6-11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notional mass nouns</td>
<td>64%</td>
<td>57%</td>
<td>26%</td>
</tr>
<tr>
<td>Notional count nouns</td>
<td>76%</td>
<td>57%</td>
<td>20%</td>
</tr>
<tr>
<td>Aggregate nouns</td>
<td>76%</td>
<td>71%</td>
<td>26%</td>
</tr>
</tbody>
</table>

Adults favored the ‘Number’ answer for all nouns. 2-to-5-year-old children performed at chance level, while 6-to-11-year-old children favored the ‘Volume’ answer for all nouns. This can be explained by the prediction of our hypothesis that all nouns have count denotations and therefore all nouns can be associated with ‘Number’.

As in Study 1, we did not find a significant effect of noun type. Instead, mixed effects modeling using Age as a predictor confirmed that there was a significant effect of Age on proportion of number criterion responses (Wald’s $Z = 2.2; p = 0.02; \beta = 0.11$):

Table 3.4: Mixed effects modeling using Age as a predictor – Results Study 2

|            | Estimate $\beta$ (Standard error) | z value (Wald’s $Z$) | Pr(>|z|) |
|------------|----------------------------------|----------------------|---------|
| Intercept  | - 1.96037 (1.17413)              | - 1.670              | 0.0950  |
| Age        | 0.12643 (0.05525)                | 2.288                | 0.0221 *|

†: p < .1, *: p < .05, **: p < .01, ***: p < .001
Note that in the analysis for Study 2 we do not have noun contrasts in the model. We did not use Helmert contrasts because there was not enough data to fit the full model (given that each participant answered one question that included a notional count noun, one question that included a notional mass noun and one question that included an aggregate noun), and for that reason we removed the contrasts for noun type.

**General discussion**

Three important conclusions can be drawn from Studies 1 and 2. First, there is no evidence that the categories ‘Volume’ and ‘Number’ tested above are grammaticalized as a distinction between count and mass nouns in Yudja. Second, all nouns can indeed be interpreted as count nouns, since concrete portions that respect the condition of atomicity can be counted as atoms, as predicted by the hypothesis presented in this chapter. This is especially clear for adults who based their quantity judgments on ‘Number’ for the majority of trials. Third, (notional) noun type (count vs. mass) did not influence participants’ quantity judgments.

As mentioned previously, this task in other languages returned different results. In English, count and mass nouns have different grammatical properties (Chierchia 1998a, 1998b, 2010, cf. Chapter 1). In quantity judgment tasks, English speakers (16 adults and 16 children aged 4;1 – 4;6) ‘based their quantity judgments on the number of individuals significantly more for count and object-mass nouns compared to substance-mass nouns’ (Barner and Snedeker 2005; 50-52). Similarly, Li, Barner and Huang (2008), in a quantity judgment study in Mandarin (56 adult native speakers), observed a significant
difference across noun types: the participants ‘based their judgment almost exclusively on number for count nouns (99.1% of the time), even in absence of classifiers. In contrast, participants in the mass noun condition never quantified by number (0%)’ (Li, Barner and Huang 2008; 13).

In languages like English and Chinese, unlike Yudja, grammatical properties (quantifiers, distribution of plural morphology and measure phrases in English, and count-classifiers and mass-classifiers in Chinese (cf. Cheng and Sybesma 1999, Chierchia 1998a, 1998b and 2010) enforce a differentiation across noun types, which is reflected in quantity judgments. In addition, as mentioned previously in this chapter, the fundamental property that distinguishes languages like English and Chinese from Yudja is the requirement for classifiers or container phrases in order for a mass noun to interact with the counting system. Yudja does not present this requirement, and thus the difference in quantity judgments between the two types of languages it is predictable.

A question that will be left unanswered in this dissertation is why 6-to-11-year-olds present a very distinct pattern in comparison to the two other age groups. The graphs below show the probability of ‘Number’ responses across Age (Figures 3.1 and 3.2 for Study 1 and Figures 3.3 and 3.4 for Study 2). The circles correspond to individual responses. Different types of nouns are coded in different colors: notional count nouns are represented by black (circles); aggregate nouns are represented by red (circles); and notional mass nouns are represented by green (circles). The single black line indicates the overall probability of ‘Number’ responses across age for all nouns:
As presented in Tables 3.1 and 3.3, there is a concentration of ‘Volume’ responses in the group of 6-to-11-year-olds (Figures 3.1 and 3.3). This pattern changes as participants grow older (Graphs 3.2 and 3.4). One could hypothesize that the results for 6-to-11-year-olds can be explained as an effect of Brazilian Portuguese acquisition (L2) as in Brazilian Portuguese there is a grammatical distinction between count and mass nouns. The problem with this hypothesis is that Brazilian Portuguese speakers do not base their quantity judgment on ‘Volume’ for all nouns as 6-to-11-year-old Yudja
children do. Instead, Brazilian Portuguese speakers, in a control group with 10 Brazilian Portuguese adults, based their quantity judgments on ‘Number’ for count and aggregate nouns and on ‘Volume’ for mass nouns, just like English and Mandarin participants in the referred studies (Barner and Snedeker 2005, Li, Barner and Huang 2008). Therefore, acquisition of Brazilian Portuguese as a second language probably is not the explanation for the answers provided by 6-to-11-year-olds. This fact remains an open question that will be explored in follow-up studies.

As a final note, it is important to mention that bitu ‘more’ in a question such as ma de bitu asa dju a’u? (‘Who has more flour?’) can be used to describe scenarios where there are not multiple individuated portions of flour but just one large pile of flour. This was observed in a follow-up study with 20 Yudja adults where they saw a big pile of flour and a small pile of flour and were asked the question above. In this task, 88% of the answers were the big pile. That is, even though bitu ‘more’ could describe ‘Volume’ scenarios, in quantity judgments tasks (see results for Studies 1 and 2) speakers significantly prefer the Number answer if it is available (because all nouns can be used as count nouns, as predicted). The ambiguity of bitu ‘more’ is going to be explored in future studies.

In the next section, I present a follow-up study that tested whether Yudja speakers would maintain the pattern observed in Studies 1 and 2 when answering quantity judgments in a language where notional mass nouns cannot be directly combined with numerals, such as Brazilian Portuguese, which is the second language of bilingual adults in the community.
3.5 Quantity judgment studies in Brazilian Portuguese with Yudja bilingual adults

Brazilian Portuguese, similar to English, differentiates morphologically and syntactically count from mass nouns. In Brazilian Portuguese\(^\text{19}\) only count nouns can be pluralized (50 – 53) and only count nouns can be directly combined with a numeral without an intervening measure phrase (52 – 53):

\[(50a) \quad \text{cachorro} \quad (50b) \quad \text{cachorro-s} \quad (51a) \quad \text{menina} \quad (51b) \quad \text{menina-s}\]

\[\begin{array}{llll}
dog & \text{dog-PL} & \text{girl} & \text{girl- PL} \\
\end{array}\]

\[\begin{array}{llll}
\text{‘Dogs’} & \text{‘Girl’} & \text{‘Girls’} \\
\end{array}\]

\[(52a) \quad \text{ouro} \quad (52b) \quad *\text{ouro-s} \quad (53a) \quad \text{farinha} \quad (53b) \quad *\text{farinha-s}\]

\[\begin{array}{llll}
gold & \text{gold-PL} & \text{flour} & \text{flour-PL} \\
\end{array}\]

\[\begin{array}{llll}
\text{‘Gold’} & \text{‘Flour’} \\
\end{array}\]

\[(52) \quad \text{Eu comprei três maçãs}\]

\[1s \quad \text{buy} \quad \text{three apples}\]

\[\text{‘I bought three apples’}\]

\[(53a) \quad *\text{Eu comprei três ouro} \quad (53b) \quad \text{Eu comprei três barras de ouro}\]

\[\begin{array}{llll}
1s \quad \text{buy} \quad \text{three gold} & 1s \quad \text{buy} \quad \text{three pieces of gold} \\
\end{array}\]

\[\text{‘I bought three pieces of gold’}\]

\(^{19}\text{For an extended discussion on the count-mass distinction in Brazilian Portuguese cf. Paraguassu (2005) and Paraguassu (2010).}\)
In Yudja communities, most adults are bilinguals (Yudja and Brazilian Portuguese) or multilinguals (Yudja, Brazilian Portuguese and another indigenous language spoken in the Xingu Indigenous Territory, such as Kawaiwete (Tupi)). Two factors are important when we analyze the uses of Brazilian Portuguese in Yudja communities: gender and age. In a sociolinguistic analysis of the indigenous languages spoken in the lower Xingu (Lima and Santos 2008) – which includes all the six Yudja communities - it was observed that men consider themselves fluent bilinguals in speaking and comprehending Brazilian Portuguese and women do not. Given cultural constraints, women rarely speak in Brazilian Portuguese (even with non-Yudja people) unless it is absolutely necessary; young men, on the other hand, tend to only speak in Yudja with Yudja speakers, but speak in Portuguese with non-Yudja speakers. Apart from gender, age seems to be a significant factor correlating with Brazilian Portuguese proficiency in Yudja communities. The oldest members of the community are less proficient in Brazilian Portuguese in comparison to the younger generations. Over the years, the contact with outsiders intensified for many different reasons, such as political engagement, undergraduate programs for indigenous peoples outside the indigenous villages, courses for training of indigenous nurses, the presence of researchers (including myself) in the field, etc. These circumstances influenced the number of Yudja speakers who are fluent Brazilian Portuguese bilinguals.

In the quantity judgment study in Brazilian Portuguese with bilingual Yudja adults, the hypothesis being tested was whether grammar influences quantity judgments of the same individuals in two languages where the criteria to define what counts as atom for mass nouns is flexible, but reflected in two different ways: in Yudja
container/measure phrases are not required, and concrete portions can be counted as an atom. In Brazilian Portuguese container phrases are required and nouns cannot be directly combined with numerals and thus the definition of what counts as an atom for a mass noun depends on container or measure phrases.

The goal of this follow-up study is to test whether bilingual Yudja adults will be sensitive to the grammatical differences between Yudja and Brazilian Portuguese. If they were, they should present different quantity judgments in Yudja and Brazilian Portuguese and answer ‘Number’ significantly more for count nouns only (similarly to Brazilian Portuguese native speakers). If they are not sensitive to the grammatical distinction between count and mass nouns in Brazilian Portuguese, they would present the same quantity judgments in both languages (that is, they should answer ‘Number’ indistinctively for all noun types). The quantity judgments in Brazilian Portuguese were run one year after the same tasks in Yudja (presented in Section 3.4). This study was run along with studies on the interpretation of container nouns in Yudja (cf. Chapter 4) and a word matching task, which tested the interpretation of novel nouns by Yudja speakers.

Methods

Participants were 20 bilingual Yudja adults (9 men and 11 women). In this study, each participant saw two different drawings, one with a big portion of $x$ (‘Volume’) and another with many different portions of $x$ (‘Number’). The target question was *Quem tem mais $x$?* ‘Who has more $x$?’, as illustrated below:
Mass nouns (farinha ‘flour’, água ‘water’, carne ‘meat’):

Quem tem mais farinha
who have more flour

‘Who has more flour?’

Count nouns (cuia ‘bowl’, galinha ‘chicken’, colher ‘spoon’):

Quem tem mais cuia
who have more bowl

‘Who has more bowl?’

Aggregate nouns (roupa ‘clothes’, cerâmica ‘ceramic’):

Quem tem mais roupas
who have more clothes

‘Who has more cloth(es)?’

As illustrated in 54a-54c, three classes of nouns (mass, count and aggregate nouns) were tested. As in the quantity judgments in Yudja, all items presented the same syntactic and morphological properties. In all critical items, I used a mass syntax for all nouns, i.e., I did not pluralize nouns that could be used as singular or plural such as the nouns in 54b and 54c.20

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Each participant answered 8 items in random order: three items that included a notional count noun (\textit{cuia} ‘bowl’), three items that included a notional mass noun (\textit{farinha} ‘flour’) and two items that included an aggregate noun (\textit{roupa} ‘clothes’). Participants were tested individually. The study was introduced by explaining that one person owned the quantity of a substance $x$ in the right size and another person owned the quantity of a substance $x$ in the left size. Participants had to point to one of the drawings to answer the target question (‘who has more $x$?’).

\textit{Results and discussion}

The results for Study 3 are presented in Table 3.5. Bilingual Yudja speakers were sensitive to the grammatical distinction between count and mass nouns in Brazilian Portuguese. These results confirm that Yudja speakers present different quantity judgments depending on whether mass nouns have count denotations in a language or not:
Table 3.5: Results of Study 3 – presented in percentage of ‘Number’ responses

<table>
<thead>
<tr>
<th>Noun category</th>
<th>Answers</th>
<th>Answers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>(Brazilian</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Portuguese)</td>
</tr>
<tr>
<td>Mass (farinha ‘flour’, água ‘water’, carne ‘meat’)</td>
<td>55%</td>
<td>85%</td>
</tr>
<tr>
<td>Count (cuia ‘bowl’, galinha ‘chicken’, colher ‘spoon’)</td>
<td>63%</td>
<td>83%</td>
</tr>
<tr>
<td>Collective (roupa ‘clothes’, cerâmica ‘ceramic’)</td>
<td>65%</td>
<td>79%</td>
</tr>
</tbody>
</table>

Mixed effects modeling using Helmert contrasts confirmed that there was an effect of noun type when we contrasted count and mass nouns. In Study 3 one factor with three levels (‘count’, ‘mass’ and ‘aggregate’) was manipulated in two Helmert contrasts. In the first contrast, notional count nouns were contrasted with aggregate nouns. In the second contrast, notional mass nouns were contrasted with aggregate and notional count nouns (that is, in the second contrast notional count and aggregate nouns were considered a single category). It was observed that mass nouns are significantly less likely to be associated with ‘Number’ responses in comparison to count nouns (Wald’s $Z = -2.256; p = 0.02408; \beta = -0.48$). There was also a significant effect of Age in proportion of ‘Number’ responses as younger bilingual speakers tend to differentiate count from mass nouns in most trials in contrast to older bilingual speakers (Wald’s $Z = -2.33; p = 0.19; \beta = -0.21$). Study 1 (cf. Table 3.1, Figures 3.2 and 3.3) also shows a significant effect of Age, but not noun type in Yudja:
Table 3.6: Mixed effects modeling using Helmert contrasts – Results Study 3 in Brazilian Portuguese

| Estimate | (Standard error) | z value | Pr(>|z|) |
|----------|-----------------|---------|----------|
| Intercept| 6.91948         | 2.621   | 0.00877 ** |
| Age      | -0.21379        | -2.339  | 0.01935 * |
| First contrast (notional count nouns vs. aggregate nouns) | 0.33442 | 0.791 | 0.42876 |
| Second contrast (notional count nouns and aggregate nouns vs. notional mass nouns) | -0.48746 | -2.256 | 0.02408 * |

†: p < .1, *: p < .05, **: p < .01, ***: p < .001

The results of Study 3 are shown in detail in Figure 3.5. This graph presents the probability of ‘Number’ responses across Age. The circles correspond to individual responses. Different types of nouns are coded in different colors: count nouns are represented by black (circles and line); aggregate nouns are represented by red (circles and line); and mass nouns are represented by green (circles and line):
It is important to note that Yudja speakers are not performing as native speakers of Brazilian Portuguese would perform in this task. In Brazilian Portuguese, the ‘Number’ answer for mass nouns would be very unlikely, as observed for English and Chinese in Barner and Snedeker’s (2005) and Li, Barner and Huang’s (2008) studies. For Yudja speakers, the ‘Number’ answers decreased in comparison to their answers in the quantity judgments in Yudja for nouns like ‘water’, but they were not close to zero (cf. Table 3.5). Therefore, while their quantity judgments are different from Yudja, they do not perform as native speakers of Brazilian Portuguese in this task even though their answers are close to the answer of a native speaker of BP in this task.

A small group of participants (three female participants, age 44, 45 and 47) did not seem sensitive to a differentiation between count and mass nouns in Brazilian Portuguese as they did present different answers according to noun type. That may be explained by the fact that older speakers are less proficient speakers of Brazilian Portuguese. Note however that they do not reproduce their pattern in Yudja where there

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21 A control group of 38 L1 Brazilian Portuguese speakers (adults) participants based their quantity judgments on the number of individuals significantly more for count (86% ‘Number’ responses) and aggregate nouns (97% ‘Number’ responses) compared to substance-mass nouns (21% ‘Number’ responses).
was a clear and high probability of ‘Number’ answers across noun types for adults. The three speakers who did not differentiate noun type in quantity judgments preferred the ‘Volume’ answer indiscriminately for all nouns. The reason why the speakers of this age group preferred ‘Volume’ answers over ‘Number’ answers for all noun types in Brazilian Portuguese remains an open question.

**General discussion**

The results of Study 3 show that Yudja speakers present different quantity judgments in Yudja and Brazilian Portuguese. The differences observed when we compare the results in Brazilian Portuguese and Yudja are most likely a consequence of the fact that in Yudja mass nouns have count denotations and concrete portions can count as an atom, while in BP this is not possible. A container/measure phrase is required to define what counts as an atom in the denotation of a mass noun in order for it to interact with the counting system. Thus, these results are consistent with the hypothesis that all nouns have count denotations in Yudja and with the predictions that it makes for other languages as discussed in Section 3.3.

In this dissertation we will not provide a conclusive explanation for the pattern observed among female participants who based their quantity judgments on ‘Volume’ for all nouns in Study 3. In future developments of this research we will investigate whether the pattern observed here can be better understood if we examine other aspects of the acquisition of Brazilian Portuguese by bilingual Yudja speakers. Note that we found the same pattern among 6-to-11-year-olds in Studies 1 and 2; this age group is also starting to
learn Brazilian Portuguese at this age. Therefore, it may be the case that patterns of second language acquisition may be affecting the answers of these speakers in quantity judgment studies (Luiz Amaral p.c.), but to make such a statement we would have to pursue a detailed investigation of bilingualism within Yudja speakers. Therefore, this remains a question to be investigated in the continuation of these studies.
CHAPTER 4
CONTAINER CONSTRUCTIONS IN YUDJA

4.1 Introduction

Container nouns (such as ‘cup’, ‘bottles’) are a crucial piece in the discussion about the distinction between count and mass nouns across languages. In most of the non-classifier languages described in the literature, a measure or container phrase is required in order for a numeral to be directly combined with a mass noun:

(1a) * I bought three honeys
(1b) I bought three bottles of/containers of/liters of honey

In most languages, these phrases are required in order to define the concrete portion that is being counted in a particular context. Without them, sentences that include mass nouns and numerals are ungrammatical or reinterpreted by coercion.

In Chapters 2 and 3 it was shown that numerals can indeed be directly combined with notional mass nouns in Yudja even when coercion is not possible. A question that was left open in the previous chapters was the status of container phrases in this language. In Chapter 1 it was mentioned that container nouns are optional in constructions with numerals. When they do occur, they are followed by the postposition he ‘in’ (2b):
The existence of these optional container phrases in Yudja raises two important questions: 1) What is the interpretation of these phrases in constructions with numerals? 2) Do container phrases determine the counting units?

In order to answer these questions, I will present three experimental studies with children and adults in Yudja that tested the interpretation of container phrases in this language. Prior to the presentation of these studies, I will show the possible interpretations associated with container phrases in other languages such as Russian and English.

4.2 Container phrases in the literature

Container nouns (such as ‘cup’, ‘bucket’ or ‘bag’) are nouns that denote concrete objects that can be used as receptacles for substances. It has been argued that in constructions with numerals (as in ‘two glasses of water’), they can be interpreted in at
least two different ways (Selkirk 1977, Doetjes 1997, Landman 2004, Keizer 2007, Rothstein 2009, 2012, Partee and Borschev 2012). Firstly, a container noun can be used to denote actual containers filled with some substance; e.g. ‘glasses of water’ can denote actual glasses filled with some quantity of water. In this case, the numeral is used to count the number of these receptacles. Following Rothstein (2012), let us call this the individuation interpretation of container nouns. Secondly, a container noun can be used as the description of a unit of measurement. In this case, the numeral specifies a quantity on a scale whose units are described by the container noun. When interpreted as a measurement unit, the container noun does not denote the concrete objects that it describes under its receptacle reading; e.g. ‘glasses of water’ need not refer to actual glasses filled with water, but only to portions of water whose volume corresponds to the content of one glass. Let us call this the measurement interpretation of container nouns, again following Rothstein (2012). These two interpretations are illustrated in the following examples:

(3a) Mary, bring two glasses of water for our guests!

(individuation interpretation most salient)

(3b) Add two glasses of water to the soup!

(measurement interpretation most salient)

(Rothstein 2012; 4 – examples 15)
Whereas (3a) is used to refer to actual glasses filled with water, (3b) is used to refer to an amount of water equivalent to the contents of two glasses, and it is asserted that this amount of water must be added to the soup. Rothstein (2009, 2010b, 2012) has shown that the individuation interpretation and the measurement interpretation are associated with different grammatical properties in English. Firstly, when they describe units of measurement, container nouns can be suffixed with the morpheme –ful (4a/4b). Secondly, the distributive quantifier each can be combined with container nouns when they describe actual receptacles (i.e. in the individuation reading), but not when they describe measurement units (5a-5c):

(4a) Bring two glasses(#ful) of wine for our guests!
    (individuation reading)

(4b) Add two glasses(ful) of wine to the soup!
    (measure reading)

(5a) Two packs of flour cost 2 euros each.
    (individuation reading)

(5b) #Two kilos of flour cost 2 euros each.
    (individuation reading)

(5c) The two glasses of wine (#in this soup) cost 2 Euros each.
    (measurement reading)

(Rothstein 2012; 4 – examples 16 and 17)
Rothstein (2012) analyzes the individuation interpretation as a process of counting atomic individuals, whereas she analyzes the measurement interpretation as a process of measuring portions of stuff. The counting process is described as “putting atomic entities in one-to-one correlation with the natural numbers” (Rothstein 2012; 5). The measurement process is described as “giving a value to a quantity on a calibrated dimensional scale, as in ten kilos of flour/books”. An important semantic difference between these two processes is that counting presupposes individuation, i.e. the identification of a set of atomic entities that can be enumerated, while measuring doesn't (Rothstein 2012; 5).

Partee and Borschev (2012) also explored the distinction between the individuation and measuring interpretations of container phrases. The authors described four possible readings associated with container nouns in Russian: container + contents, concrete portion, ad hoc measure and standard measure. Partee and Borschev (2012) claim that these interpretations are derived by a series of lexical shifts going from the most concrete use of the container noun to the most abstract. The first reading on the derivational scale is the container + contents reading.

According to the authors, the container + contents reading (the individuation reading in Rothstein’s terms) is characterized by three grammatical features: 1) the container phrase is incompatible with fractional numbers; 2) the container phrase can refer to containers of different sizes; 3) the container phrase combines with verbs that apply to concrete objects. For example:
Partee and Borschev (2012) argue that the container phrase *jascik jablok* ‘box of apples’ has the *container + contents* interpretation. According to Partee and Borschev (2012) that is the case because of the verb *postavit’ put*, which is ‘restricted to things that are considered to stand where they are put; that holds of bottles and boxes but not of apples’ (Partee and Borschev 2012; 14). If we intended to refer only to the apples we would use instead *postavit’ v*, which is a verb followed by a preposition that is interpreted as ‘to set (something that stands) into’ (Partee and Borschev 2012; 14). Under this interpretation, the container phrase is incompatible with fractional numbers such as *half*, because there is no physical object such as a half-box filled with apples. For that reason, the container + contents reading is a reading that primarily refers to the container. When we say *jascik jablok* ‘box of apples’ in a sentence with the verb *postav’ put* the sentence is not ambiguous as it would be in English but instead we are primarily talking about the box, not the apples.

The second reading on the derivational scale is the concrete portion interpretation. The concrete portion ‘characterizes the substance in terms of its occupying (those) containers’ (Partee and Borschev 2012; 28). The concrete portion reading shares some grammatical properties with the container + contents reading, such as: 1) it requires the substance to be in a particular container (or containers); 2) it can refer to containers of
different sizes filled with the same substance and 3) fractional numerals are not compatible with this reading, as illustrated below:

(7) On svaril dve kastrjuli supa, bol’ˇsuju dlja nas
He cooked two pots-ACC soup-GEN big-ACC for us
i malen’kuju dlja koˇski.
and small-ACC for cat

‘He cooked two pots of soup, a big one for us and a small one for the cat.’

(Partee and Borschev, 2012; 28 – example 37)

The difference between the container + contents reading and the concrete portion reading lies in the fact that in the concrete portion interpretation the reference is the substance only, whereas in the container + contents reading the reference is the container (and its contents) (Partee and Borschev 2012; 32). In the example in (7), the concrete portion refers then to a substance (soup) that is in two particular containers (pots, for example). Thus, we are counting the number of containers filled with a substance $x$ and not the amounts of a substance $x$ in those containers.

When the container noun is used to refer to the amounts of a substance in $x$ it is being interpreted as a measurement unit. That is, a container noun is used as a measure unit when we count the number of times that a container (such as pot) would be filled by a particular substance. The measurement interpretation is manifested by either the ad hoc measure or standard measure in Partee and Borschev (2012)’s typology. Differently from the container + contents and the concrete portion readings, both measure readings are
characterized by the fact that the actual container being used for measurement need not be presented physically in a particular scenario:

(8) (Is there more soup?)

Da, v kastrjure esce tri tarelki supa ostalos’

yes, in pot still three bowls soup remained

‘Yes, there are still three bowls of soup left in the pot.’

In this example (8), the bowls need not to be in the pot. Instead, we are referring to a particular quantity of soup that is equivalent to bowls of soup (if we assume that the amount of soup that corresponds to a bowl is conventionalized among speakers in a particular scenario). A priori, any container noun can be conventionalized as a measurement unit, in a particular scenario. This interpretation is named in Partee and Borschev (2012) as the ad hoc measure reading.

Another type of measurement interpretation of container nouns described by Partee and Borschev (2012) is the standard measure reading, which refers to containers that are lexicalized as measurement units in a particular language (e.g. ‘cup’ in English). The ad hoc measure reading differs from the standard measure reading insofar as in the latter but not in the former the container noun is lexicalized as a measurement unit and has the semantic status of other non-container measure words such as liter. When a container noun is lexicalized as a standard measurement unit, there is no requirement that the particular container in question will be involved or appealed to. For example, in English ‘cup’ is a standardized measurement unit (‘two cups make a pint, two pints make
a quart’ (Partee and Borschev 2012; 25)) that can be used even when the cup-object is not salient in the context. Two grammatical properties characterize both the ad hoc and standard measure readings. First, when a container noun is used as a measurement unit, there is an expectation that the container will be full (Susan Rothstein, apud Partee and Borschev 2012; 16 – footnote 6). For example, if we are cooking and I say ‘add two cups of water to the soup’ we are expecting that two full cups of water will be added to the soup. Secondly, container nouns used as measurement units are compatible with fractional numbers. In the same cooking scenario, I could say ‘Add two and a half cups of water to the soup’.

The following table summarizes the grammatical properties associated with the different interpretations of container phrases under Partee and Borschev’s typology:

Table 4.1: Grammatical properties of interpretations of container nouns (Partee and Borschev 2012)

<table>
<thead>
<tr>
<th></th>
<th>Container contents</th>
<th>+Concrete Portion</th>
<th>Ad hoc Measure</th>
<th>Standard Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does it allow fractional numbers?</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Does it require the container to be full?</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Can it refer to containers of different sizes filled with the same substance?</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>
Based on the description of the possible interpretations that container phrases may carry across languages, in this chapter I present three experimental studies with Yudja children and adults in order to address the two questions presented in the introduction of this chapter. Crucially, the results of these studies will be used to show that container nouns in Yudja differ from their English and Russian counterparts insofar as they are syntactically and semantically indistinguishable from constructions with locative phrases. This will be apparent in the morpho-syntactic description of the grammatical properties of these constructions in Section 4.3, and it will be confirmed in three experimental studies in Section 4.4. Finally, in Section 4.5, I develop a compositional analysis of the locative interpretation of container phrases in Yudja.

4.3 Grammatical properties of container constructions in Yudja

Two grammatical properties characterize container phrases in Yudja: optionality and the fact that they are morpho-syntactically indistinguishable from locatives. These two properties are explored as follows.

Optionality the first property that is critical to the description of container phrases in Yudja is their optionality in constructions with numerals:

CONTEXT: The Yudja people are organizing a workshop in Tuba Tuba and they requested three bottles of honey in order to prepare juice. Anana brings three bottles of honey.
(9a) Anana txabîu awïla karaha he wî

Anana three honey bottle in bring

‘Anana brought three bottles of honey’

(9b) Anana txabîu awïla wî

Anana three honey bring

‘Anana brought three (bottles of) honey’

In (9b) speaker and listener share the knowledge that the concrete portion of honey that is being considered in the scenario is a bottle. When speaker and listener do not share a common knowledge about the concrete portion one is referring to, a container noun will most likely be included in the sentence (9a). This was tested in a production task based on Semanza et al. (1997; 673) as part of an elicitation session. In Semanza et al. (1997)’s study, a consultant had to build a sentence from a target noun (count or mass) and ‘a semantically associated noun’ (i.e. ship/sea, water/glass)’. In Yudja, two consultants had to construct a sentence using a target noun (a notional mass noun) and a numeral (yauda ‘two’ or txabîu ‘three’). The consultants had to build a total of ten sentences when given pairs of notional mass nouns and numerals. These sentences were later used in the construction of other stimuli. For all pairs of notional mass nouns and numerals, no context was provided. Some of the sentences produced are presented below:

Pair provided: txabîu ‘three’/ asa ‘flour’

Sentence produced:
(10) Txabïu asa wī he saku he au
three flour bank in bag in have
‘There are three bags of flour in the river’s bank’
Lit.: There are three (portions of) flour in (a/the/some) bag(s) in the river’s bank

Pair provided: txabïu ‘three’ / honey ‘awïla’

Sentence produced:

(11) Txabïu awïla papera akalikali he wī
three honey paper box in come
‘Three paper boxes of honey were brought (to the village)’
Lit.: Three (portions of) honey were brought to the village in (a/the/some) paper box(es)
Consultant’s comment: we could have a box with three bottles of honey inside it.

Pair provided: yauda ‘two’/ y’a ‘water’

Sentence produced:

(12) Yauda y’a wa’ê he txutxuka
two water pan in seat
‘There are two pans of water ‘seated’’
Lit.: There are two (portions of) water in (a/the/some) pan above a table or chair
Consultant’s comment: there are two pans of water located above a table or chair.

Pair provided: txabïu ‘three’/ apeta ‘blood’
Sentence produced:

(13) Txabïu apeta sedukaha ipakï he au
three blood bone syringe in have

‘(Someone) has three syringes of blood’

Lit.: Someone has three (portions of) blood in (a/the/some) syringe(s)

Pair provided: txabïu ‘three’/ũ ‘oil’

Sentence produced:

(14) Txabïu ũ’a karaha he au pïkaha txade
three oil bottle in have chair above

‘There are three bottles of oil above a chair’

Lit.: There are three (portions of) oil in (a/the/some) bottles above a chair

Pair provided: yauda ‘two’/awatxi’ i ‘rice’

Sentence produced:

(15) Yauda awatxi’i seradu he au
two rice package in have

‘(Someone) has two packages of rice’

Lit.: (Someone) has two (portions of) rice in (a/the/some) bag(s)

Pair provided: txabïu ‘three’/awatxi’ i ‘rice’

Sentence produced:

(16) Txabïu awatxi’i duyahã he au
three   rice   package   in   have

‘(Someone) has three packages of rice’

Lit.: (Someone) has two (portions of) rice in (a/the/some) package(s)

Pair provided: txabïu ‘three’/asuka ‘sugar’

Sentence produced:

(17)   Txabïu   karaxu   he   asuka   ameku   pe
       three   spoon   in   sugar   put   in

‘(Someone) put in three spoons of sugar’

All the sentences produced by the consultants in this contextless task included a container noun followed by the postposition he ‘in’. In a follow-up comprehension task with two Yudja consultants, we omitted the container phrases (container noun and the postposition he ‘in’) in the sentences created by the consultants and we asked whether the resultant sentence could be used to describe a particular context. The consultants accepted the manipulated sentences in the contexts created, as illustrated as follows:

CONTEXT: I entered Tamariku’s house and I saw that he has three packages of rice.

(18)   Txabïu   awatxî’i   au
       three   rice   have

‘(Someone) has three (packages of) rice’
CONTEXT: The nurses are doing blood examinations in a few patients. They collected three syringes of blood.

(19) Txabīu apeta au
    three blood have

‘(Someone) has three (syringes of) blood’

Thus, these facts corroborated our previous observation that container phrases can be included in constructions with numerals, but they are not obligatory.

**Locatives** The second property that characterizes container phrases is that container nouns in constructions with numerals are necessarily followed by the postposition he ‘in’ (examples 10 to 17). This property is what makes container phrases in constructions with numerals identical to locatives. Locatives in Yudja are formed of a location noun and the postposition he ‘in’:

(20) Una yukidī itxa Baha he
    1s salt buy Bang in

‘I bought salt in Bang (Bang = the name of a small town in Mato Grosso)’

(21) Izaku na yakare be iya he
    see 1s crocodile DAT river in

‘I saw the crocodile that was in the river’
The examples above illustrate the distribution of the locative postposition *he* ‘in’ in Yudja. As discussed by Fargetti (2001)\(^{22}\), this postposition can be used to indicate location in time and in space. The apparent similarity between locative phrases and constructions that include a container noun followed by a postposition (*he* ‘in’) is also observed at the syntactic level. Both in locative phrases and in container phrases the constituent [noun + postposition] can occur in virtually any position in the sentence. In locative phrases, the constituent [noun + postposition] cannot occur between the object and the verb (24d). In both cases, the noun (location or container) and the postposition cannot be discontinuous, as illustrated in (23f) and (24e):

Container phrases

Possible orders for ‘I brought three (portions of) honey in (a/the/some) bottle(s)’

(contAINER phrase: karaha ‘bottle’ and *he* ‘in’):

(23a) **Karaha** *he* una txabïu awïla wï

---

\(^{22}\) As described by Fargetti (2001), other locative postpositions in Yudja that have the same syntactic distribution as *he* ‘in’ are *txade* ‘above’, *uabiada* ‘below’, *kuzaibi* ‘behind’, *nade* ‘in front’, *kãli* ‘outside’, *dibi* ‘from’. The focus of this chapter will be on the postposition *he* ‘in’ as this is the only postposition that occurs consistently in constructions with numerals and mass nouns when a container noun is included in these sentences.
bottle in 1s three honey bring

(23b) Una karaha he txabiu awila wî
(23c) Una txabiu karaha he awila wî
(23d) Una txabiu awila karaha he wî
(23e) Una txabiu awila wî karaha he
(23f) * Una txabiu karaha awila he wî

Locative phrases

Possible orders for ‘I tied the dog in the house’ (locative phrase: aka ‘house’ and he ‘in’):

(24a) Aka he na apî apayû
       house in 1s dog tie
(24b) Una aka he apî maku
(24c) Una apî maku aka he
(24d) * Una apî aka he maku
(24e) * Aka na apî he maku

These two properties (being optional and identical to locatives) are crucial pieces of evidence in order to argue that container phrases in this language are in fact locative phrases. We will argue in this chapter that container phrases convey that the concrete portions of x in the extension of the NP to which they are adjoined are located in receptacles of the kind described by the locative noun. This hypothesis is consistent with the analysis presented in Chapter 3: if all nouns have count denotations, container phrases would not be required in constructions with numerals and notional mass nouns. Given
their morphosyntactic properties, container phrases in Yudja would primarily be interpreted as locatives, not as individuation/counting or measurement units (differently from container phrases in other languages such as English or Russian – Rothstein 2012, Partee and Borschev 2012, Section 4.2). In the next section I present three experimental studies that explored these two aspects: first, given that container constructions are identical to locative constructions in Yudja, could they be interpreted as simple locatives in constructions with numerals (i.e., just indicating the location of a substance)? Second, does the locative container phrase necessarily determine the units for counting?

4.4 Studies with container nouns in Yudja

4.4.1 Study 4: Photo/sentence matching

In the previous section I have shown that container nouns are necessarily followed by the postposition *he* ‘in’ and that container phrases are formally identical to locative phrases. The goal of the first study is to test whether container nouns can be interpreted as locatives – indicating the location of a concrete portion of a substance – in constructions with notional mass nouns and numerals.

Interpreted as locatives, container phrases would convey that some concrete portion of $x$ is located in a container $y$. Other parameters of interpretation such as the size of the container and the amount of the substance (i.e., whether the containers are completely full or half-full, etc) would not be determined by the container phrase itself.

The first study tested this hypothesis.
Materials and methods

The participants were 20 adults and 26 children (8, 4-to-6-year-old children; 18, 7-to-12-year-old children). They were shown 16 photos in random order: five photos represented containers of different sizes, filled with the exact same substance (c); five photos represented containers of the same size, but with different amounts of a given substance (a); and six photos represented containers of the same size that included small portions of a given substance (b) as illustrated below:

(25a) different quantities (25b) small quantities (25c) different size containers

Yauda uā karaha he Yauda puju xaa he Yauda awatxi'i xaa he
two oil bottle in two beans bowl in two rice bowl in

The study took place in a room in the central school of the Tuba Tuba village\(^{23}\). A local teacher known by the children and their parents accompanied all the tasks that

\(^{23}\) It is important to note that this study and the two other studies on container nouns were run along other studies on different topics such as order of constituents. The task of speakers in these other studies was also to evaluate whether the target sentence was a good description of a given picture. These items were used as fillers for Study 4, which allowed us to control that speakers who answered ‘yes’ to all questions in Study 4 were not solely answering positively for all items. The same will hold for Studies 5 and 6 presented below. All critical items and fillers are presented in Appendix 4.
involved children. Before the study began, we explained to the participants that they would see a photo and hear a sentence and they had to say whether the sentence matches the photo or not. The local teacher or I read the target sentence and showed the photo to the participants. As I will show below, there was no difference in the results based on who asked the target question.

Results

All of the 26 children agreed that all photos could be described by the target phrase, which included a numeral and a container noun followed by the postposition 'in'. 19 out of the 20 adults, i.e. all but one speaker, gave the same answer. This shows that in principle Yudja children and adults can interpret these phrases as locatives. Only one speaker (20-year-old adult, female) disagreed with this judgment. Her comments were: “because one is a half” (for similar containers with different quantities); “because the quantity is small” (for similar containers with small quantities of a given substance); and “because the quantities are different” (for containers of different sizes). At the end of the study, she explained that she expected that the containers would be full.

These results are also compatible with the container + contents and concrete portion readings described by Partee and Borschev (2012) given that two of the properties we manipulated are characteristic of these interpretations (containers can be of different sizes filled with the exact same interpretation and containers can be identical, but filled with different amounts of a substance). The crucial difference between a locative and a contents + contents/ concrete portion interpretation of container phrases is
that the locative interpretation is not related with determining the individuation/counting unit in any level. That is, in the locative interpretation, the container noun would indicate that a portion of a substance is placed in a receptacle, but it would not determine the counting unit. In the next study the goal is to investigate in more detail this piece of the puzzle: can container phrases in Yudja be interpreted as plain locatives and not determine the counting units?

4.4.2 Study 5: drawing/sentence matching

In this study we are testing whether these optional container nouns followed by the postposition *he* ‘in’ determines the unit of counting when included in a sentence. If that is not so, we will have a strong piece of evidence in order to argue that these phrases can be interpreted just as locatives in these sentences. In order to test whether these container phrases necessarily determine the individuation unit, we used a comprehension task (picture/sentence matching). Let us illustrate the logic of the test with an example. Consider (26). If the counting/individuation unit is not determined by the container phrase, speakers should judge (26) true in a scenario where the counting units are not receptacles of the type described by the container noun (*saku* ‘bag’). For instance, the speaker should judge (26) true in a scenario where there are three bowls of flour in a single bag. That is, in (26) the container phrase *saku he* ‘in bags’ would indicate the location of the substance while the counting unit is bowl.
(26) Txabîu asa saku he

Three flour bag in

‘There are three (bowls of) flour in bags’

However, if container phrases must be interpreted as the counting/individuation units when they are included in a sentence, then (26) would never be considered a good description for a scenario where saku he ‘in bags’ is not the counting/individuation units, but just a location. As a consequence, that would be a strong piece of evidence against the hypothesis that these phrases can be interpreted as locatives.

**Materials and methods**

Participants were the same 20 adults and 26 children (8, 4-to-6-year-old children; 18, 7- to 12-year-old children) that participated in Study 4. In this study, 12 critical items were counterbalanced in two lists (along with 10 fillers unrelated to the manipulation) consisting of a target sentence and a drawing. Each participant answered six critical items in random order. The participants had to decide whether the target sentence could describe the drawing that was shown to them. Six drawings represented the first type of scenario (27a/28a) and six drawings represented the second type of scenario (27b/28b). Two items from the study are presented below:

(27) Awîla ‘honey’

txabîu awîla wâ’ê he
three honey pan in

(27a)

*Counting unit*: pans

*Location of concrete portions*: pans.

(27b)

*Counting unit*: bottles.

*Location of concrete portions*: pan.

(28)  *asa* ‘flour’

Txabīu asa duyāhā he

Three flour package in

(28a)

*Counting unit*: bags.

*Location of concrete portions*: bags.

(28b)

*Counting unit*: bottles

*Location of concrete portions*: bag.
Two different drawings were shown to the participants, which represented two different types of scenarios. The control items were scenarios as in (27a) and (28a). In the control items, one type of container was represented in the picture and this container was also expressed in the sentence. For example, in (28a) the sentence was ‘There are three (portions of) flour in packages’ and that was exactly what the drawing represented. This scenario is compatible with all four interpretations described in Partee and Borschev (2012). A drawing as in (27a) could easily be described by an English speaker as ‘There are three pans of honey’ (or as ‘There are three portions of honey in pans’, which is closer to a translation of the Yudja container phrases).

The critical items were items such as (27b) and (28b). In the critical items, two containers were manipulated in the drawings: one indicated the concrete portions of $x$ and the other indicated the location of the concrete portions. In the target sentence only the location of the concrete portions were mentioned. For example, in (27b) the concrete portions (the atoms being considered for counting in this scenario) are bottles. The location is a pan (txabi‘u awi‘a wà’ê he ‘there are three (concrete portions) in pans’). If Yudja speakers judge these sentences felicitous in these scenarios, then when container phrases are included in a sentence they need not to be associated with the counting unit. Such a result would be a strong piece of evidence in favor of the analysis presented in Chapter 3: container phrases would not be needed because all nouns have count denotations. Furthermore, a “yes” answer from the Yudja speaker is incompatible with all the readings described in Partee and Borschev but it is compatible with a locative interpretation of container nouns.
Results

All participants answered that the target sentences could describe both types of scenarios. These results are crucial to support the hypothesis that the container phrases are not responsible for the mapping of kinds to concrete portions of x (atoms); container nouns followed by postpositions in Yudja may be interpreted as locatives and do not determine the individuation/counting units. Consequently, these facts rule out the hypothesis that in constructions where numerals are directly combined with mass nouns there is a hidden container phrase that could be optionally overt. If that were the case, scenarios such as (28b) would never be accepted by the Yudja speakers. Thus, what determines the unit for counting, as proposed in Chapter 3, is not the context or the container phrases that are optionally included in these constructions, but the concrete portions that exist in the actual world.

4.4.3 Study 6: Video/sentence matching

In Study 6 we tested the locative interpretation of container phrases in a different type of task. In this study, Yudja speakers had to provide the best description of a scenario presented in a short video.

Material and methods
The participants were the same 20 adults and 26 children (8, 4-to-6-year-old children; 18, 7- to 12-year-old children) that took part in Studies 4 and 5. In this study, 12 critical items were counterbalanced in two lists (list A and list B). In (29) we provide an example of the critical items used:

(29)

(29a) List A: A man emptied two identical packs of rice into a paper box (and in the end of the video, the empty packs are on the table, next to the paper box filled with rice)

(29b) List B: A man emptied two identical packs of rice into a paper box (and in the end of the video, the empty packs are not visible, we only see the paper box filled with rice)

(29c) Container phrase: Yauda awatxi’i papera akalikali he two rice box in ‘There are two (bags of) rice in the pan’

In this task, the participants watched a video where a man emptied two or three identical containers (in (29), packages of rice) into a different type of container (in (29), a
The videos in lists A and B presented the same actions; the only difference was whether the individuation units were visible in the end of the action or not (we were testing whether the visual presence of the counting units could affect the participants’ answers). The counting/individuation units (in (29), packages of rice) were always identical and were filled with the exact same amount of a substance $x$. Note that at the beginning of the video, the participants saw these containers on the table (before they were transferred to the recipient container) and they could see that they were identical. Their task was to judge whether a sentence as in (29c) could describe the result of the event and, if not, how they would describe it.

The target sentence provided by the experimenter in this study only included the location of the concrete portions (paper box) not the containers that corresponded to the counting/individuation units (bags). Prior to this experiment, the Yudja speakers were exposed to other tasks where they were presented to a sentence that was intentionally ungrammatical or odd and they received the same type of instruction (provide a better description for this visual stimuli, if any). Thus, they were familiar with this kind of methodology, given their participation in those pre-test tasks that explored different topics where they did correct the sentences whenever they judged the sentences as ungrammatical or odd.

Study 6 is different from Studies 4 and 5 in one fundamental way. In Studies 4 and 5 the participants saw a drawing or photo and heard a sentence (that described the photo/drawing) simultaneously. In Study 6, the participants only heard the target question in the end of the video and then they had to judge whether it could be used to describe the event presented in the video.
Results

None of the children (8 4- to 6-year-old children and 18 7- to 12-year-old children) provided a different description for the scenario they saw. They agreed that the target sentence provided by the experimenter could describe the videos presented (‘Yauda awatxi’i papera akalikali he’- lit.: there are two (portions of) rice in the paper box – (29c)). That is, children did not modify the target sentence, supporting the hypothesis that container phrases do not determine the counting/individuation units when included in the sentence; they may just be interpreted as locatives.

In the adults’ group (20 adults), eight speakers produced a sentence where two container phrases were verbalized: one that referred to the counting/individuation unit and another that referred to their location. The speakers mentioned that the container phrase that refers to the location of the substance (in this example wã’ẽ ‘pan’) is optional in these sentences:

(30a) Yauda awatxi’i seradu he yahã itutu (wã’ẽ he)

two rice package in PRED drop (pan in)

‘Two (portions of rice) in packages were dropped in the pan’

For the other 11 Yudja speakers, the sentence provided in (29c) could be used to describe the event. Five of these Yudja adult speakers added the verb etu ‘drop’ to the original target sentence but maintained the sentence identical to the one provided otherwise. Thus, for these speakers, the container noun that is used as the
counting/individuation unit does not have to be included in the sentence and the container phrase included in the sentence may be interpreted as a locative (paper box):

(30b) Yauda awatxi’i papera akalikali he etu

two rice paper box in fell

‘Two (portions of) rice fell in the paper box’

In sum, the results of Study 6 have shown that container nouns followed by the postposition he ‘in’ can be used to refer to the counting/individuation units (as illustrated in (30a) where seradu he ‘in packages’, the counting unit, was included in the sentence by some participants), but it does not need to be as shown by the critical items in Study 5 and by the fact that for half of the participants in Study 6 the container phrase expressed in the sentence can be interpreted as a locative (30b), not as the counting/individuation units.

General discussion

The three tasks presented above explored the possible interpretations of constructions with container nouns in Yudja. Study 4 confirmed that container nouns can be interpreted as locatives. Study 5 confirmed that when container phrases are included in a sentence, they do not necessarily determine the counting/individuation unit. These observations were also supported by the results of Study 6 as it was observed that container phrases can coincide with the counting/individuation unit (30a), but they do not
need to: they may be solely used to indicate the location of concrete portions of a substance (29c, 30b).

Crucially the results of these studies (and in particular the critical items in Study 5) invalidate a possible hypothesis that container phrases are covert in sentences where numerals are directly combined with notional mass nouns in Yudja. If that were the case, they would always coincide with the individuation/counting unit. The results of Studies 5 and 6 clearly showed that this is not the case.

4.5 Analysis

In the previous sections I have shown that container nouns in Yudja are syntactically identical to locative phrases, and can be interpreted as such. In this section, I propose that the locative interpretation of container phrases is the basic interpretation of these phrases in constructions with numerals.

Locative interpretation In Maienborn (2001)’s terms, a locative phrase denotes a two-place relation (named loc) ‘between a located entity x and a landmark y’, therefore stating where x is located. I propose that the bare NP in a container phrase is interpreted existentially. Therefore, in the locative interpretation of a container phrase, the PP headed by he denotes a property of entities that are located in some receptacles of the sort described by the locative NP. To illustrate, the locative PP saku he (‘in bags’) in (26) – repeated below as (31) – denotes a property of entities that are located in some bags. This property is intersected with the property of individuals or concrete portions of stuff that is
denoted by the modified NP. In (26/31), the NP *asa* ‘flour’ denotes a property of portions of flour, which is intersected with a property of entities that are located in some bags. The resulting NP denotes a property of concrete portions of flour that are located in some bags. This property is then intersected with the numeral head *txabiu* (‘three’). After existential closure, the whole DP denotes a quantifier over groups of three concrete portions of flour that are located in bags:

(31)  
\[
\text{Txabiu asa saku he} \\
\text{Three flour bag in} \\
\text{‘Three (bowls of) flour in bags’}
\]

(32)  
[DP [D A ][NumP [Num txabiu ][NP [NP asa ] [PP [DP saku ] [P he ] ] ]]]

(33)  
Locative interpretation of container phrases:

\[
[[\text{he}]]^W = \lambda y. \lambda x. \text{LOC}(x)(y)(w)
\]

\[
[[ [\text{PP [DP saku ] [P he ] ] } ]^W = \lambda y. \exists x. \text{AT}^*(w)(x)(\text{BAG}) \& \text{LOC}(x)(y)(w)
\]

\[
[[ [\text{NP asa} ] ]^W = \lambda x. \text{AT}^*(w)(x)(\text{FLOUR})
\]
\[[\text{NumP}]_w^W = \lambda y : |y| = 3 & \text{AT}^*(w)(y)(\text{FLOUR}) & \exists x. \text{AT}^*(w)(x)(\text{BAG}) & \text{LOC} (x)(y)(w)\]

\[[\text{A NumP}]_w^W = \lambda P : \exists y [ |y| = 3 & \text{AT}^*(w)(y)(\text{FLOUR}) & \exists x. \text{AT}^*(w)(x)(\text{BAG}) & \text{LOC} (x)(y)(w) & P(y)\]

The whole phrase denotes a function from a property of objects P to a proposition that is true in w if and only if there is a plural portion of flour x that is composed of three atomic portions, and there is a bag or plurality of bags y such that x is located in y, and x has property P. Note that this analysis presupposes that LOC is a cumulative relation, i.e. for any two pairs of objects (x,y) and (u,v), if LOC(x,y) and LOC(u,v), then LOC(x+y,u+v).

Thus, in their locative interpretation, container nouns denote the location of a substance. The locative interpretation of a container noun does not entail that the container is full, and if there are several containers, these containers may be of different sizes. This was shown in Study 4. In Study 4, some scenarios described containers of the same size, but with different amounts of a given substance or containers of the same size that included small portions of a given substance or containers of different sizes filled with the same substance (33a to 33c). In all contexts, container phrases can be used to describe these scenarios:

(33a) Yauda uã karaha he two oil bottle in
‘Two (portions of) oil in bottles’
In this chapter I have discussed the proprieties of container phrases in Yudja. Container phrases are optional in constructions with numerals and they are indeed interpreted as locatives. We have observed that they can coincide with the concrete portion that is being considered in a world of evaluation, but their primarily interpretation is of indicating the location of a concrete portion. In a series of three studies it was shown that when a container phrase is used in a construction with a numeral that modifies a notionally mass noun, the unit of counting may be different from the container that is described by the container phrase. This supports the hypothesis that all nouns have count denotations in Yudja and therefore container phrases are not required. Thus, as suggested in Chapter 3, it seems that this property of the Yudja language (optionality of container phrases) is correlated with the fact that all nouns have count denotations. Future
investigations of the same kind in other languages where notional mass nouns can be
directly combined with numerals (such as Kuikuro – Franchetto, Santos and Lima 2013)
will be informative for the discussion about the extension of this generalization for the
typology of count and mass nouns.

These facts can also be used to argue against an alternative analysis where a
covert/silent container phrase in constructions with numerals and notional mass nouns
would determine the counting units in a language like Yudja. This analysis would also be
implausible for other reasons beyond the results of the studies in this chapter. We saw in
Chapters 2 and 3 examples where no container phrases were even mentioned in the
scenario (the examples with the notional mass nouns eta ‘sand’) and nevertheless
notional mass nouns could be directly combined with mass nouns. Thus, all these facts
show that container phrases do not determine the counting units in Yudja.
5.1 Introduction

In Chapter 3 I argued that Yudja is a language where all nouns can be constructed as count nouns without coercion. This is possible because the grammar of the language allows its speakers to treat concrete portions of a kind (i.e., maximal self-connected portions of the kind described by the root in the world of evaluation) as atoms, as observed in constructions with numerals:

Asa ‘flour’

Context: Someone brought two bags full of flour.

(1) Yauda asa dju wï

Two flour bring

‘(Someone) brought two (bags of) flour’

Context: Someone dropped two bowls of flour and they formed one single pile of flour on the ground.
(2)  Yuada  asa  au

Two  flour  have

‘There are two (bowls of) flour (on the ground)’

Three predictions can be made based on this analysis. First, the answers of the Yudja speakers for the question ‘who has more x?’ can be determined by the number of portions, not volume, even for notional mass nouns. This prediction of the hypothesis presented in Chapter 3 was confirmed by the results of quantity judgment studies with children and adults (Chapter 3, Studies 1 and 2).

Second, when a notional mass noun such as y’a ‘water’ is combined with a count quantifier – such as itxïbi ‘many’ – it is expected that it will be interpreted as quantifying over the number of concrete portions of x. That is, this quantifier conveys that there are many portions of water (many bags, many piles, many pans, etc), not that there is a lot of water in a single container. This is different from a language like English, for example, where count-quantifiers only combine with count nouns. In languages like English, container/measure phrases are required in constructions with mass nouns and count-quantifiers:

(3a)  * I bought many water

(3b)  I bought many bottles/cups/liters of water

The distribution of mass nouns with count-quantifiers and numerals in English is similar: in both cases, we need to specify the concrete portions that are being counted or
quantified. Thus, container or measure phrases are required. We should expect the same parallelism in the domain of numerals and count-quantifiers in a language like Yudja: if all nouns can be directly combined with numerals, the same should hold for constructions with count-quantifiers.

The third prediction of the hypothesis presented in Chapter 3 is that when we combine notional mass nouns and size adjectives like *urahu* ‘big’ in Yudja, the adjective will introduce the property of being big to a concrete portion of $x$ (for nouns like *y’a* ‘water’) or to an individual (for nouns like *txarina* ‘chicken’).

On the basis of an experimental study with Yudja children and adults, this chapter tests the second and third predictions for the interpretation of two words: the count-quantifier *itxibï* ‘many’ and the size adjective *urahu* ‘big’.

### 5.2 Quantity judgment tasks

In Chapter 3 I presented two quantity judgment studies (based on Barner and Snedeker 2005) using the ambiguous quantifier – *bitu* ‘more’. In this section, I present a study using the same methodology that investigates the interpretation of the count-quantifier *itxibï* ‘many’ and the size adjective *urahu* ‘big’ when combined with mass nouns.

Before we move to the quantity judgment task *per se*, it is important to show the possible interpretations of sentences that include notional count/aggregate nouns and the count-quantifier *itxibï* ‘many’ or the size adjective *urahu* ‘big’. In an elicitation task
(‘give me a sentence and a context’ task\textsuperscript{24}) two Yudja speakers had two tasks. First, they had to create sentences given pairs of words that were provided to them (a noun and a count quantifier or a size adjective); second, they had to create a scenario where the sentence created by the other consultant could be used. From this task, it was observed that when combined with notional count nouns and aggregate nouns, the count-quantifier \textit{itxibì} ‘many’ always quantify over the number of individuals:

\textbf{PAIR PROVIDED: ali} ‘child’/ \textit{itxibì} ‘many’

\textbf{CONTEXT PROVIDED BY THE CONSULTANT:} A large group of children (more than 10, for example) took the canoe and paddled to the beach.

\begin{quote}
\textbf{(4) Itxibì ali eta be txa} \\
\textit{Many child beach to go} \\
‘Many children went to the beach’
\end{quote}

\textbf{PAIR PROVIDED: abeata} ‘clothes’ / \textit{itxibì} ‘many’

\textsuperscript{24} The sentences in this section were elicited in a ‘give me a sentence and a context’ task. In two one-to-one sessions, two Yudja consultants had to build sentences given pairs of words. The pair of words provided consisted of a target noun and the count-quantifier \textit{itxibì} ‘many’ or the size adjective \textit{urahu} ‘big’. After creating a sentence, Yudja speakers were asked to describe a scenario in which they would use this sentence. Speakers were encouraged to either verbally describe the scenario or to draw it (consultant A had to provide a scenario for a sentence produced by consultant B and vice versa). The goal of this task was to elicit sentences that Yudja speakers would use to describe common events in the village using a noun and the count-quantifier \textit{itxibì} ‘many’ or the size adjective \textit{urahu} ‘big’. Note that the participants did not receive any suggestions of scenarios or sentences in order to avoid biasing the sentences’ interpretations. The goal of this kind of elicitation task is to investigate the possible interpretations associated with \textit{itxibì} ‘many’ and \textit{urahu} ‘big’ using a methodology that avoids translation misinterpretations and that is based on the creativity of the participants.
CONTEXT PROVIDED BY THE CONSULTANT: You arrive in my house and you see a pile of new clothes.

(5) Una itxibī abeata wā
Is many clothes buy
‘I bought many pieces of clothing’

Object nouns

PAIR PROVIDED: pīkaha ‘chair’/ itxibī ‘many’

CONTEXT PROVIDED BY THE CONSULTANT: We will have an assembly in the village, with all the members of the community, and we put all the school chairs outside the classrooms, in front of the school.

(6) Pīkaha itxibī anu
chair many ASP
‘There are many chairs’

Conversely, when a notional count noun or an aggregate noun is combined with a size adjective such as urahu ‘big’ the adjective is always interpreted as modifying a noun and attributing the property of being a big individual, as illustrated below:

PAIR PROVIDED: ali ‘child’/ urahu ‘big’

CONTEXT PROVIDED BY THE CONSULTANT: A tall child ran to meet with her mother.
PAIR PROVIDED: *abeata* ‘clothes’ / *urahu* ‘big’

CONTEXT PROVIDED BY THE CONSULTANT: I went to Canarana (a town) and I bought an article of clothing that is too big for my own size.

PAIR PROVIDED: *pïkaha* ‘chair’ / *urahu* ‘big’

CONTEXT PROVIDED BY THE CONSULTANT: We are gathering chairs outside the school and we notice that there is a chair that is surprisingly big in comparison to the other ones.

If it is the case that all nouns have count denotations, the expectation is that the interpretation of *itxibî* ‘many’ with notional mass nouns will be parallel to the
interpretation of this quantifier with notional count and aggregate nouns: speakers will associate itxībī ‘many’ with a number interpretation and urahu ‘big’ with a volume interpretation. This prediction is tested in the quantity judgment task presented below.

*Materials and Methods*

Participants were the same 18 adults and 22 children (7 2-to-5-year-olds; 15 6-to-11-year-olds) that participated in the quantity judgment studies presented in Chapter 3 (Studies 1 and 2). In this study, the participants saw two different drawings in each trial: one of a big portion of $x$ (Volume) and another of many different portions of $x$ (Number). While the drawings were shown to them, the participants were asked to answer two questions. The order of questions was varied across two lists in a counterbalanced fashion:

Notional mass nouns (*asa* ‘flour’, *y’a* ‘water’, *kania atxa* ‘meat’):

![Image of flour](image)

‘Number’ question (Count-quantifier)

(10a) Ma de itxībī asa dju a’u?
who many flour have

‘Who has many portions of flour?’
‘Volume’ question (Adjective)

(10b) Ma de urahu asa dju a’u?

who big flour have

‘Who has a big portion of flour?’

Notional count nouns (xaa ‘bowl’, txarina ‘chicken’, karaxu ‘spoon’):

‘Number’ question (Quantifier)

(11a) Ma de itxibî xāā dju a’u?

who many bowl have

‘Who has many bowls?’

‘Volume’ question (Adjective)

(11b) Ma de urahu xāā dju a’u?

who big bowl have?

‘Who has a big bowl?’

Aggregate nouns (abeata ‘clothes’, wā’e ‘ceramic’):
‘Number’ question (Quantifier)

(12a) Ma de itxîbî abeata dju a’u?
who many clothes have

‘Who has many articles of clothing?’

‘Volume’ question (Adjective)

(12b) Ma de urahu abeata dju a’u?
who big clothes have?

‘Who has a big (article of) clothing?’

As illustrated in (10)-(12), three notional classes of nouns (mass, aggregate and count nouns) were tested. As in Study 1 (Chapter 3), following the methodology of Barner and Snedeker (2005) ‘the three objects had a smaller combined volume and surface area than the large object, allowing responses based on number to be distinguished from those based on mass or volume’ (Barner and Snedeker 2005; 50). All items had the same syntactic and morphological properties; in particular none of them could be pluralized (only [+ human] nouns can be pluralized in Yudja, see Chapter 2). Each participant answered 8 items in random order. Three items included notional count nouns (e.g. xaa ‘bowl’), three items included notional mass nouns (e.g. asa ‘flour’) and two items included aggregate nouns (e.g. abeata ‘clothes’). For all participants, the study took place in a room in the Yudja’s local central school in the Tuba Tuba village. A local professor known by the children and their parents accompanied all the tasks that involved children. Participants had to point to one of the drawings to answer the target question (‘who has a big x?’/ ‘who has many portions of x?’).
The control items for this study were the notional count nouns (xāā ‘bowl’) and aggregate nouns (abeata ‘clothes’). These nouns denote individuals that are stable across different worlds of evaluation. Thus, the expectation is that speakers will always choose the ‘number’ answer when the question is formed by the count-quantifier itxībī ‘many’ and count or aggregate nouns. Conversely, we expect that when the question includes the size adjective urahu ‘big’ the only possible interpretation is one associated with the size of the individual, not number of individuals. These results would corroborate the facts elicited in the ‘give me a sentence and a context’ task.

The critical items of this study are the ones that include notional mass nouns. If mass nouns have count denotations, they would be interpreted in constructions with count-quantifiers (e.g. itxībī ‘many’) as many concrete portions of x, not as a big portion of x. That is, if the constituent [count-quantifier + mass noun] is interpreted as many portions of x (Drawing A), then this would support our hypothesis that mass nouns in Yudja have count denotations as itxībī ‘many’ quantifies over concrete portions of x. However, if the constituent [count-quantifier + mass noun] is interpreted as a big portion of x (Drawing B), then this would disconfirm our hypothesis. It would instead suggest that notional mass nouns do not have count denotations, since their distribution would be different from other nouns that have count denotations such as txarina ‘chicken’.
In contrast with the predictions for the quantifier *itxibî* ‘many’, we expect that the adjective *urahu* ‘big’ can only be interpreted as referring to a big concrete portion, not to many portions of a substance *x*. If the constituent [adjective + mass noun] is interpreted as a big concrete portion of *x* (Drawing B), then this is compatible with our hypothesis that notional mass nouns in Yudja have count denotations. The predicted answers for this study given our analysis for nouns in Yudja are summarized in Table 1:

Table 5.1: Predictions of the hypothesis presented in Chapter 3 (all nouns have count denotations)

<table>
<thead>
<tr>
<th></th>
<th>Count-quantifier <em>itxibî</em> ‘many’</th>
<th>Volume adjective <em>urahu</em> ‘big’</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notional count nouns/Aggregates <em>(control)</em></td>
<td><img src="image" alt="Number" /></td>
<td><img src="image" alt="Volume" /></td>
</tr>
<tr>
<td>Notional mass nouns <em>(critical)</em></td>
<td><img src="image" alt="Number" /></td>
<td><img src="image" alt="Volume" /></td>
</tr>
</tbody>
</table>

If the predictions in Table 1 are confirmed, that would support the analysis in which all nouns have count denotations. As such, the analysis presented in Chapter 3 would not only explain the distribution of notional mass nouns with numerals but it would also account more broadly for other linguistic expressions that are associated with counting number of individuals or concrete portions in Yudja.
Results

The results of Study 7 are presented in Tables 2 and 3. The two predictions tested in this study were confirmed. First, as predicted by our analysis, all participants associated itxîbî ‘many’ with many concrete portions of $x$ (for notional mass nouns) or with many individuals (for notional count and aggregate nouns):

Table 5.2: Results for Study 7 itxîbî ‘many’ – presented in percentage of ‘Number’ responses

<table>
<thead>
<tr>
<th>‘Noun category’</th>
<th>Adults</th>
<th>Children (2 – 5)</th>
<th>Children (6 - 11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notional mass noun</td>
<td>100%</td>
<td>89 %</td>
<td>91 %</td>
</tr>
<tr>
<td>Notional count noun</td>
<td>100%</td>
<td>92 %</td>
<td>100 %</td>
</tr>
<tr>
<td>Aggregate noun</td>
<td>100%</td>
<td>85 %</td>
<td>93 %</td>
</tr>
</tbody>
</table>

The results of this study also confirmed that when a notional mass noun is in a construction with a size adjective such as urahu ‘big’, it can be interpreted as referring to a big concrete portion of $x$ or a big individual:
Table 5.3: Results for Study 7 *ura hu* ‘big’ – presented in percentage of ‘**Number**’ responses

<table>
<thead>
<tr>
<th>‘Noun category’</th>
<th>Adults</th>
<th>Children (2 - 5)</th>
<th>Children (6 -11)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Notional mass noun</td>
<td>0 %</td>
<td>28 %</td>
<td>33 %</td>
</tr>
<tr>
<td>Notional count noun</td>
<td>0 %</td>
<td>25 %</td>
<td>16 %</td>
</tr>
<tr>
<td>Aggregate noun</td>
<td>0 %</td>
<td>14 %</td>
<td>33 %</td>
</tr>
</tbody>
</table>

These results confirmed the two predictions made by the analysis presented in Chapter 3. First, count-quantifiers are interpreted as quantifying over the number of individuals/concrete portions of a particular kind when combined with notional count and notional mass nouns. Second, as predicted by our analysis, the adjective *ura hu* ‘big’ is necessarily interpreted relatively to the volume of a particular individual/concrete portion of *x* and it derives the same interpretation for all nouns regardless of their (notional) category.

5.3 Discussion

The data presented in this chapter supported the hypothesis that all nouns in Yudja can be directly combined with count-quantifiers such as *itxîbî* ‘many’ and they produce only ‘number’ interpretations. The data support the hypothesis that all nouns have count denotations in Yudja since this behavior is characteristic of count quantifiers across languages. In Yudja, this quantifier is used to talk about a large (but unspecified) number of individuals or concrete portions. I propose to analyze *itxîbî* NP as a generalized quantifier, as argued by Barwise and Cooper (1981) and much subsequent
work, including Higginbotham and May (1981), Westerståhl (1985), Keenan and Westerståhl (2011), Peters and Westerståhl (2006), Lappin (2000), Chierchia (1998a), and Takahashi (2006). More precisely, \textit{itxibś} denotes a relation between sets of entities that holds of two sets P and Q if and only if their intersection is larger than some contextually provided number n:

\[
\text{[[itxibś]]} = \lambda P \lambda Q \lambda w. |P(w) \cap Q(w)| > n, \text{ where } n \text{ is some large number.}
\]

(cf. Barwise and Cooper 1981)

This analysis requires a count denotation of all nouns in order to yield the result expected, which is provided by the analysis of nouns in Chapter 3.

As for the size adjective \textit{urahu} ‘big’, its distribution also supports the analysis presented in Chapter 3 since its interpretation is the same with both notional count and mass nouns: when combined with a noun, it is interpreted as a big concrete portion \(x\) or a big individual. The interpretation of \textit{urahu} ‘big’ is hypothesized to be the same as for \textit{big} in English in sentences like ‘I bought a big chair’. Thus, one possible analysis is that the size adjective \textit{urahu} ‘big’ is interpreted relative to the noun it modifies. In the examples with notional mass nouns, it is expected that the comparison is going to be with a set of a relevant set of individuals (Kamp 1975; Klein 1980; Kennedy 2007). In this case, the relevant set of individuals is the concrete portions of a particular substance in a particular world of evaluation. One way to account formally for this fact is to say that a size
adjective like *urahu* ‘big’ denotes a function from properties to properties as in (14) based on Kennedy’s proposed analysis for the adjective *tall*:

\[
\lambda P \lambda x. \text{size}(x) \geq \text{stnd}\{\text{size}(y) \mid P(y)\}
\]

(based on Kennedy 2012; 10)

Given an analysis for *big* using the standard “size”, *urahu* ‘big’ denotes a function from properties to properties where a size function is applied to the concrete portions/individuals in the denotation of the noun. Alternatively, the facts are also compatible with a degree analysis of the adjective *urahu* ‘big’ where it does not express a relation between properties, but rather a relation between properties and an abstract degree (e.g. Montague 1970, Kamp 1975, Cresswell 1976, Stechow 1984, Kennedy 1997, Heim 2000, Li 2008, among many others). Under this alternative analysis, the interpretation of an adjective such as *urahu* ‘big’ depends on a degree for size (based on Kennedy’s 2012 discussion on the adjective *tall*):

\[
\lambda d \lambda x. \text{size}(x) \geq d
\]

(based on Kennedy 2012; 10)

Both approaches are compatible with our analysis for the denotation of nouns in Yudja. The adjective *urahu* ‘big’ is interpreted relative to the size of a concrete portion of *x* (notional mass noun) or to an individual (notional count noun).
Summary

In this chapter, we have seen that the predictions made by the analysis in Chapter 3 are borne out: when notional mass nouns are directly combined with count-quantifiers in Yudja such as itxïbi ‘many’ the interpretation produced is a ‘number’ interpretation (as for all other nouns in the language). Conversely, when notional mass nouns such as urahu ‘big’ are combined with size adjectives, they are interpreted as referring to a big portion of x (again, as for all other nouns in the language). These facts are consistent with an analysis in which, because all nouns denote number neutral properties of concrete portions of stuff, we expect that all nouns can interact directly with the counting system without intervening container/measure phrases. Furthermore, the facts described in this chapter confirmed that there are no expressions that select only notional count nouns in language.
APPENDIX A

GLOSSING ABBREVIATIONS

1. first person
2. second person
3. third person

ADV. adverb/adverbializer
ASP. aspect
CAUS. causative
COL. collective
DAT. dative
DECL. declarative
HAB. habitual
IRR. irrealis
NEUT. neutral (verb form)
NFUT. non-future
OBL. oblique
RED. reduplication
REFL. reflexive
REL. relative
S. singular
PL. plural
T. transitivizer
APPENDIX B

COERCION QUESTIONNAIRE RESULTS

Apeta ‘blood’

CONVENTIONAL CONTEXT: a nurse from Diauarum brought 3 containers with blood to the Tuba Tuba village:

1a Txabīu uda apeta dju wī
three someone blood bring

‘Someone brought three (containers with) blood’

UNCONVENTIONAL CONTEXT: João cut his finger and 3 drops of blood fell on the floor: one near the river, one near the house and another near the school:

1b Txabīu apeta pe~pe~pe
three blood drip~RED

Literal: ‘Three (drops of) blood dripped (in different events)’

Y’a ‘water’

CONVENTIONAL CONTEXT: a woman brought three containers of water to the school:

2a Txabīu idja y’a dju wī

25 We emphasize ‘different events’ not because of the numerals, but because of the reduplicated verb.
three woman water bring

Literal: ‘A woman brought three (containers with) water’

CONVENTIONAL CONTEXT: a woman brought three containers with water. The containers fell at the same moment and made a single big puddle on the floor:

2b Txabîu y’a ipide l-apa
three water on the floor l-fall

Literal: ‘Three (containers with) waters fell on the floor’

UNCONVENTIONAL CONTEXT: someone brought a container of water and let a drop fall near the school, another drop near the hospital and a last drop near the river (all drops are different in size and form):

2c txabîu y’a ipide pe~pe~pe
three water on the floor drip~RED

Literal: ‘Three (drops of) water dripped on the floor (in different events)”

U’â ‘oil’

CONVENTIONAL CONTEXT: someone brought two containers full of oil:

3a Yauda u’â dju wî
two oil bring
‘(Someone) brought two (containers with) oil’

**Conventional context:** someone dropped two containers with oil and one puddle was formed on the floor:

3b Yauda u’ã l-apa
   Two oil l-fall
   ‘Two (containers with) oil fell (on the floor)’

**Unconventional context:** someone was walking with a bowl full of oil and in the way, two clearly individuated drops of oil fell, one near the school’s kitchen and another near the fire:

3c Yauda u’ã pe~pe~pe
   two oil dripped.red
   ‘Two (drops of) dripped (on the floor) (in different events)’

*Yakuha* ‘traditional drink’

**Conventional context:** María brought two bowls full of traditional drink:

4a María yauda yakuha xãa he dju wĩ
   María two traditional drink bowl in bring
‘Maria brought two bowls with (the) traditional drink’

CONVENTIONAL CONTEXT: Maria brought two bowls full of traditional drink:

4b  Maria yauda yakuha dju wï
Maria two traditional drink bring

‘Maria brought two (bowls/containers with) traditional drink’

CONVENTIONAL CONTEXT: someone dropped two bowls full of traditional drink and one big puddle was formed on the floor:

4c  Yauda yakuha l-apa
Two traditional drink l-fell

‘Two (bowls of) traditional drink fell down’

UNCONVENTIONAL CONTEXT: someone dropped two clearly individuated drops of traditional drink. One near the school, another near the health unit:

4d  Yauda yakuha pe–pe–pe
two traditional drink drip–RED

‘Two (drops of) traditional drink dripped (in different events)’

Awîla ‘honey’
CONVENTIONAL CONTEXT: someone brought two containers full of honey:

5a Yauda awîla xâa he dju wi
   Two honey bowl in bring
   ‘(Someone) brought two (bowls of) honey(s)’

CONVENTIONAL CONTEXT: someone dropped two containers with honey and one puddle was formed on the floor:

5b Yauda awîla l-apa
   two honey t-fall
   ‘Two (drops of) honey fall’

UNCONVENTIONAL CONTEXT: someone was carrying a container full of honey. On the way, one drop fell near the school and another near the health unit:

5c Yauda awîla pe~pe~pe
   two honey drip.red
   ‘Two (drops of) honey dripped (in different events)’

Non-liquid stuff nouns can also corroborate the hypothesis that coercion does not play a role in the combination of some mass nouns with numerals in Yudja:
**Eta** ‘sand’

Conventional context: the children went to the beach to play. When they returned they brought three containers filled with sand:

6a  Txabũ  ali  eta  awa~wa  
    three  child  sand  get.**RED**

‘The children got three (containers with) sand (from the beach)’

**CONVENTIONAL CONTEXT:** children lifted up three portions of sand:

6b  Ali  txabũ  eta  ilãu  
    child  three  sand  lift

‘Child(ren) lifted up three (portions of) sand’

**UNCONVENTIONAL CONTEXT:** the children brought one bowl full of sand from the beach. While they walked, they dropped a little bit of sand near the school, and a little bit near the hospital (in the drawing the drops were different in size and form):

6c  Yauda  ali  eta  apa~pa  
    two  child  sand  drop~**RED**

Literal: ‘Children dropped two (drops of) sand(s) (in different events)’
**Yukîdî** ‘salt’

**CONVENTIONAL CONTEXT**: someone brought two bowls full of salt:

7a Yauda yukîdî dju xāa he wî  
  two salt with bowl in bring  
  ‘Someone brought two bowls with salt’

**CONVENTIONAL CONTEXT**: someone brought two bowls full of salt:

7b Yauda yukîdî wî  
  two salt bring  
  ‘(Someone) brought two (containers with) salt’

**CONVENTIONAL CONTEXT**: someone dropped two bowls full of salt:

7c Yauda yukîdî l-apa  
  Two salt 1-fall  
  ‘Two (bowls of) salt fell’
CONVENTIONAL CONTEXT: Maria dropped two bowls (clearly individuated) of different sizes on the floor and they formed one single puddle of salt:

7d Maria yauda yukïdï apa
   Maria two salt fall
   ‘Maria dropped two (containers of) salt’

CONVENTIONAL CONTEXT: some children brought two bowls of salt to the table. They decided to play with salt and make an “X” with it:

8e Yauda ali yukïdï maku ebïkara hu
   Two child salt make cross
   ‘Children make a cross with two (containers with) salt’

UNCONVENTIONAL CONTEXT: someone was walking with a bowl and two small drops of salt fell: one near the school and another near the health unit:

8f Yauda yukïdï apa~pa
   two salt spill~RED
   Literal: ‘Someone spilled two (drops of) salt’

All the examples below corroborate that ‘stuff’ nouns (in these cases, non-liquid) can be combined with numerals without measure phrases:
Asuka ‘sugar’

CONVENTIONAL CONTEXT: someone brought two containers full of sugar:

9a Yuada asuka dju wi
   Two sugar bring
   ‘(Someone) brought two (containers of) sugar’

CONVENTIONAL CONTEXT: someone dropped two bowls and they formed one single puddle of sugar on the floor:

9b Yuada asuka au
   Two sugar have
   ‘There are two (bowls of) sugar (on the floor)’

CONVENTIONAL CONTEXT: someone dropped two bowls with sugar:

9c Yuada asuka l-apa
   Two sugar 1-drop
   ‘Someone dropped two (containers with) sugar’
**Conventional context:** children had two bowls of sugar on the table. They decided to play with salt and make an “X” with it:

9d Yauda ali asuka maku ebïkarahu
two child sugar make cross
‘Children make a cross with two (containers with) sugar’

**Unconventional context:** someone was walking with a bowl and two small drops of sugar fell: one near the school and another near the river:

9e Yauda asuka apa~pa
two sugar spill~RED
Literal: ‘Someone dropped two (drops of) sugar’ Ikaha ‘fat’

*Ikaha* ‘fat’

**Conventional context:** someone brought two containers full of fat:

10a Yauda ikaha dju wî
Two fat bring
‘Someone brought two (containers with) fat’

**Conventional context:** two bowls of fat fell and one puddle was formed on the floor:
10b Yauda ikaha l-apa
   Two fat INTR-fall
   ‘Two (containers with) fat fell’

UNCONVENTIONAL CONTEXT: someone brought one bowl with fat and two clearly
individuated drops of fat fell: one near the school and another near the river:

10c Yauda ikaha l-apa
   Two fat I-fell
   ‘Two (bowls with) fat(s) fell’

Puju ‘beans’

CONVENTIONAL CONTEXT: Someone brought two containers full of beans:

11a yauda puju dju wi
   two beans bring
   ‘(Someone) brought two (containers with) beans’

CONVENTIONAL CONTEXT: someone was carrying two bowls full with beans. At some
point the person dropped these two bowls, and one big puddle of beans was formed on
the floor:
11b yauda puju l-apa

two beans l-fall

‘Two (containers of) beans fell’

UNCONVENTIONAL CONTEXT: someone was carrying a bowl with cooked beans and two small portions of beans fell: one near the school and another near the health unit:

11c Yauda puju apa-pa

two beans drop~RED

Literal: ‘Someone dropped two (portions of) beans’

*Makua* ‘cotton’

CONVENTIONAL CONTEXT: someone brought two rolls full of cotton:

12a Yauda makua dju wî

Two cotton bring

‘(Someone) brought two (rolls of) cotton’

UNCONVENTIONAL CONTEXT: someone was carrying an amorphous amount of cotton and two clearly individuated balls of cotton fell on the floor, one near the school another near the river:
12b  Yauda makua bïdïtu
two  cotton  fall
‘Two (balls of) cotton fell’

*Awatxi’i* ‘rice’

**CONVENTIONAL CONTEXT:** Maria brought two bowls full of rice:

13a  Maria  yauda  awatxi’i  dju wï
Maria  two  rice  bring
‘Maria brought two (bowls with) rice’

**CONVENTIONAL CONTEXT:** someone dropped two bowls and they formed one puddle on the floor:

13b  Yauda  awatxi’i  l-apa
Two  rice  l-drop
‘I dropped two (bowls with) rice (on the floor)’

**UNCONVENTIONAL CONTEXT:** Maria was serving rice for the children and while she was doing that two small portions of rice fell over the chair:

13c  Yauda  awatxi’i  pïkaha  txade  l-apa
two  rice  chair  INT-drop
‘Two (small portions of) rice fell over the chair’
Asa ‘flour’

CONVENTIONAL CONTEXT: Maria brought two bowls with flour:

14a Maria yauda asa dju wî
   Maria two flour bring

‘Maria brought two (bowls with) flour’

CONVENTIONAL CONTEXT: children had two bowls of flour in the table. They decided to play with flour and make an “X” with it:

14b Yauda ali asa maku ebîkara hu
   two child flour make cross

‘Children made a cross with two (containers with) flour’

UNCONVENTIONAL CONTEXT: someone was walking with a bowl full of flour. On the way, two small drops of flour fell: one near the school and another near the health unit:

14c Yauda asa apa–pa
   two flour drop~RED

Literal: ‘Someone dropped two (drops of) flour (in different events)’

Amana ‘rain’
CONTEXT: there are three villages that are next to each other: Diauarum, Tuba Tuba and Paksamba. A person in Tuba Tuba looked to the left and saw that it was raining in Diauarum. The same person looked to the right and saw that it was raining in Paksamba. In this context, the person can say:

15 yauda amana ala
   two rain fall
   ‘Two rain(s) fell’

Ikuritxa ‘saliva’

CONTEXT: The dog left one drop of saliva fall near the hospital and another near the school:

16a Apï yauda ikuritxa pe~pe~pe
   dog two saliva drip~RED
   ‘The dog dripped two (drops of) saliva (in different events)’

CONTEXT: there are two clear individuated drops of saliva on the floor:

16b Yauda kuritxa anu
   Two saliva ASP
   ‘There are two saliva(s) over there’
I’ãkua itxa ‘nasal secretion’

CONTEXT: two clearly individuated portions of nasal secretion drop on the floor:

17a Yauda i’ãkua itxa pe–pe–pe
   Two nasal secretion drip–RED
   ‘Two drops of nasal secretion fell on the floor (in different events)’

CONTEXT: there are two drops of nasal secretions on the floor:

17b yauda iãkua itxa au
   two nasal secretion have
   ‘There are two (drops of) nasal secretion over there’

Ahuanama atxa ‘milk’

CONVENTIONAL CONTEXT: Anana carried two bowls with milk:

18a Anana yauda ahuanama atxa/itxa dju txa
   Anana two milk bring
   Literal: ‘Anana brought two containers/units with milk’
UNCONVENTIONAL CONTEXT: someone was carrying a bowl and dropped two drops of milk on the floor, one near the school and one near the health unit:

18b Yauda ahuanama itxa l-apa
    two milk i-drop
    ‘Someone dropped two (drops of) milk’

_Pitxa_ ‘fish’

CONVENTIONAL CONTEXT: Yaba cut a big fish in two pieces:

19a Yaba yauda pitxa akirí
    Yaba two fish cut
    Literal: ‘Yaba cut two (pieces of) fish’

UNCONVENTIONAL CONTEXT: during a party in the Tuba Tuba village, someone was eating a fish and let a piece fall near the fire and another piece fall near the river:

19b Yauda pitxa bōdītu
    Two fish fall
    ‘Two fishes (or big parts of fish) fell (on the floor)’
    # ‘Two small pieces of fish fell’
**Kania atxa** ‘meat’

**CONVENTIONAL CONTEXT:** Yaba cut a small paca in two pieces.

20a Yaba yauda kania atxa akīrī

Yaba two meat small piece cut

‘Yaba cut two pieces of meat’

**UNCONVENTIONAL CONTEXT:** during a party in Tuba Tuba, three pieces of meat fell on the floor: one near the school, another near the health unit and another near the river:

20b Txabīu kaniā atxa bīdītu

Three meat small piece fall

‘Three pieces of meat fell’
APPENDIX C

CONTAINER PHRASES (MATERIALS)

Study 4: Photo/sentence matching

_Different sizes_

Yauda y’a wâ’ê he
Two water pan in

_Different sizes_

Yauda awatxi’i xâa he
Two rice bowl in

_Different sizes_

Yauda ahuanama atxa karaha he
Two milk bottle in

_Different quantities_

Yauda uâ karaha he
Two oil bottle in

_Different quantities_

Yauda ahuanama itxa karaha he
Two milk bottle in

*Different quantities*
Yauda puju seradu he
Two beans package in

*Different quantities*
Yauda awatxi’i seradu he
Two rice package in

*Different quantities*
Yauda asa xāa he
Two flour bowl in

*Small quantities*
Yauda y’a kaneku he
Two water cup in

*Small quantities*
Yauda puju xāa he
Two beans bowl in
Small quantities
Yauda ahuanama atxa karaha he
Two milk bottle in

Different sizes
Yauda puju kaneku he
Two beans cup in

Small quantities
Yauda awatxi’i seradu he
Two rice package in

Small quantities
Yauda asa xââ he
Two flour bowl in

Small quantities
Yauda uâ kaneku he
Two oil cup in
Study 5: Photo/Sentence matching

*Awïla* ‘honey’  
List A

txabïu awïla wã’ê he

three honey pan in List B

Filler 1a: Bitïhu pitxa urahïhï senahïi pïdïdïku

*asa* ‘flour’

txabïu asa seradu he

Three flour package in

Filler 2: Senahï memeakï pinepakï bitïhu pïdïku

*apeta* ‘blood’

yauda apeta kaneku he

two blood cup in

Filler 3: Senahï memeakï bitïhu pitxa urahïhï metxuetxuku

*puju* ‘beans’

Yauda puju wã’ê he

Two beans pan in
Filler 4: Senahï pitxa bitïhu ipïdïdïku

_Yakuha_ ‘traditional drink’

Txabïu yakuha wâ’è he

three traditional drink pan in

Filler 5: iidja ali meme bitïhu nakuru wâse

_yukïdï_ ‘salt’

Txabïu yukïdï xåå he

Three salt bowl in

Filler 6: Uxixi epa txade bitïhu abïbïku

_ũ’a_ ‘oil’

yauda ũ’a xåå he

two oil bowl in

Filler 7: abïbïkãu uxixi epa txade

pïkaha ‘chair’

yauda pïkaha
two chair

Filler 8: abīkāu ana pīkaha senahī txade

wapa ‘drugs (for healing)’
yauda wapa kaneku he
two drug cup in

Filler 9: memese da iidja ali dapīkaha txade txutxutxuka

10 awatxī’i ‘rice’
yauda awatxī’i papera akalikali he
two rice paper box in

Filler 10: ali memeakī pīkaha abīkase txade

y’a ‘water’
yauda y’a xāā he
two water bowl in

pīza ‘canoe’
yauda pīza
two canoe
|   | Yauda | puju | wã’ẽ | he   |   
|---|-------|------|------|------|---
| 1 |       |      |      |      | Two beans   pan in
|   |       |      |      |      |   
| 2 | Txabïu | y’a | wã’ẽ | he   |   
|   |       |      |      |      | Three water pan in
|   |       |      |      |      |   
| 3 | Txabïu | asa | xàã | he   |   
|   |       |      |      |      | Three flour bowl in
|   |       |      |      |      |   
| 4 | Yauda uã | kaneku | he |   | Two oil cup in
|   |       |      |      |      |   
| 5 | Yauda | awatxi’i | papera akalikali | he |   
|   |       |      |      |      | Two rice box in
|   |       |      |      |      |   
| 6 | Txabïu | ahuana atxa | karaha | he | Three milk bottle in
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