WAYS OF EXPRESSING EVENT PLURALITY: CUMULATIVITY, PLURACTIONALITY AND DISTRIBUTIVITY IN KARITIANA

ANA MÜLLER
University of São Paulo

1 Introduction

Number marking on verbs hasn't been as much discussed as number marking on nouns in the linguistic literature. Traditional grammars do not dedicate special sections for verbal number as they do for nominal number. Verbs in Event Semantics have traditionally been assumed to denote sets of atomic events, in parallel to what is traditionally assumed for nouns, i.e., that they denote sets of atomic entities (see Parsons 1990).

The traditional account of nominal number is reflected in the quote below from the work by Corbett 2000:

> "The main part of the meaning of the singular is that it refers to one real world entity, while the plural refers to more than one distinct real world entity (Corbett 2000, p.4)."

This account seems to be inspired on the semantics of number morphology of referential Determiner Phrases (DPs) of Germanic and Romance languages. According to it, singular morphology refers to singular (atomic) entities, and plural morphology refers to two or more singular entities. The definition works well for definite referential Determiner Phrases (DPs) such as *the tree* vs. *the trees* in the English sentences in (1a-b) below. The singular DP *the tree* refers to an atomic (unique) tree; whereas the plural DP *the trees* refers to (a group of) two or more atomic (unique) trees.

(1) a. John planted **the tree**.
b. João planted **the trees**.

Nevertheless, the traditional definition won't work for other types of DPs even within Indo-European languages. Sentence (2) is true whether John planted one, two or any number of mango trees, which points to the known fact that plural Nouns and plural Noun Phrases have number-neutral denotations in many languages (Link 1985, Krifka 1992, among others). Bare Nouns are one of a number of cases where the traditional definition fails. Another case at hand is that of quantified DPs such as *each tree* in sentence (3). Formal semanticists have long known that it does not make sense to apply the concept of reference to quantified DPs. Still, if one tries to understand the singular marking of *each tree* in sentence (3) through the application of the traditional definition, the singular marking comes out contradictory with the fact that there must be at least two trees in order for the sentence to be true. Thus, there is much more to plurality, understood as denotations that encompass two or more events, than the traditional account claims.

(2) John planted **mango trees**. *one or more trees*
(3) John planted **each tree** with care. *more than one tree*

This paper focusses on the semantics of event plurality. It addresses the specific question of how Karitiana, a language which belongs to the Arikén family of the Tupi stock, expresses plural events. From a broader perspective, it addresses the more general question of what it means for a Verb (V) or for a Verbal Phrase (VP) to be plural.

This paper claims that the expression of event plurality is a result of different types of semantic phenomena, which are generated at distinct structural levels. The first level is the lexicon: verbal roots have number-neutral denotations. Next, in parallel with nominal number, comes pluractionality, which is number inflection marked on verbs: an operation that generates proper plural denotations, i.e., denotations that encompass sets of two or more events. These denotations are built by number operators over the verbal lexical head. Finally, plural events may be generated by distributive operators over VPs. These operators generate plural VP denotations.

The paper is structured as follows. In section 2, the theoretical background is briefly introduced. Section 3 describes the basics of Karitiana grammar. Section 4 argues for the number-neutrality of Karitiana verbs. In section 5, we claim that pluractionality is a proper plural operator over the V-head. Section 6 shows that distributive numerals in Karitiana are distributive operators that pluralize VPs. Finally, section 7 draws the final conclusions.

2 Theoretical Background

The paper is written within a neo-davidsonian event semantics, with the following assumptions:(i) VPs have an event argument (cf. Davidson 1967, Parsons 1990, Schein 1993, Lasersohn 1995, among others); (ii) The subject is not a lexical argument of the verb (Kratzer 1996); (iii) The object is an argument of the verb (Kratzer 2003). The paper also assumes that VP denotations are minimal (Kratzer 2003). A predicate like *lift (Nadia)(E)* means that *E* is an event in which nothing apart from lifting Nadia takes place. Nevertheless, *E* might have proper subevents in which a lifiting of Nadia takes place.

Denotations of all simple predicates in natural languages have been claimed to be number-neutral in that they include both the atoms and their sums by authors like Krifka 1992, Landmann 1996 and Kratzer 2003, among others. Number-neutral denotations are cumulative.

Cumulativity is a property that whenever a predicate applies to two individuals it also applies to their sum. In (4) and (5), illustrations of cumulative denotations for nouns and for transitive verbs are presented.

(4) $[[\sqrt{box}]] = \{box_1, box_2, box_3,\ldots, box_1+box_2, box_1+box_3,\ldots, box_1+box_2+box_3, \ldots\}$
(5) $[[\sqrt{lift}]] = \{< box_1, lifting_1>, < box_2, lifting_2>, <piano_1, lifting_3, \ldots, < box_1+box_3, lifting_4>\ldots, <box_1+box_2, lifting_1+ lifting_2>, \ldots, < box_1+box_2+box_3+piano_1, lifting_1+lifting_2+lifting_3+lifting_4>, ...\}$

3 The Karitiana Language

Karitiana is a native Brazilian language. It is the only surviving language of the Arikén family, Tupi stock. It is spoken by approximately 400 people. The Karitiana reservation is located in western Amazonia in the state of Rondônia. Karitiana is a verb second language in declarative main clauses as illustrated by sentences (6)-(7) below.[1]

(6) taso Ø-naka-'y-t boroja
man 3-DCL-eat-NFT snake
'Men ate snake(s).'
(7) myhim-t Ø-naka-'y-t boroja taso
one-ADV 3- DCL-eat-NFT snake man
'Men ate snakes (any number of times)'
'One man ate snakes (any number of times).'
'Men ate one snake (any number of times).'

The language follows an ergative-absolutive agreement pattern: intransitive verbs agree with their subjects; whereas transitive verbs agree with their direct objects (Storto 1999). In sentence (8) with the intransitive verb *tat* ('leave'), the verb agrees with its subject; whereas in sentence (9), with the transitive verb *oky* ('hurt') the verb agrees with its object.

(8) A-tat-a
2s-leave-IMP
'(you) Go away!'
(9) an y-ta-oky-t yn
2s 1s-DCL-hurt-NFT 1s
'You hurt me.'

[1] The data is presented as follows: 1st line: morphological segmentation; 4th line: morpheme by morpheme gloss; 5th line: translation. It is important to have in mind that the translations are the ones appropriate for a given context, and not the only possible ones.

The abbreviations used are: 3 = 3rd person; 1s,2s = 1st, 2nd person singular; ABS = absolutive; ADV= adverbializer; CAUS = causative; COP = copular verb; DCL = declarative; IMP = imperative; IMPFV = imperfective; NFT = non future; OBL = oblique; PART = participle; POS = postposition; RDPL = reduplication.

Karitiana has also a copula construction that, besides occurring with adjectives and nouns, also occurs with intransitive verbs as illustrated by sentence (10). This construction is default with intransitive verbs.

(10) Taso Ø-na-aka-t i-ka-t
man 3-DCL-cop-NFT PART-sleep-ABS
'The man slept.'

Unmodified Nouns and Verbs have number-neutral and therefore cumulative denotations in Karitiana. Depending on context the DPs/NPs *õwã* and *gooj* in sentence (11) may be interpreted as singular or plural and, for that matter, as definite or indefinite. The sentence is also unmarked for the number of events it denotes.

(11) õwã Ø-naka-m-'a-t gooj
child 3-DCL-CAUS-build-NFT canoe
'Children built canoes (any number of times).'
- ✓ The/A child built the/a canoe.
- ✓ (The) Children built (the/a) canoe(s).
- ✓ The/A child built canoes.
- ✓ Children built the/a canoe.

VPs are marked for person, agreement, tense and mood in Karitiana. Sentences (6)-(11) all illustrate that property. Sentence (12) has the aspectual imperfective marker *tyka*. This sentence also to illustrates the complement-head order ([[[verbal head] aspect] tense]), which is prevalent in the language.

(12) sypom-t.sypom-t Ø-naka-m-'a tyka-t gooj õwã
two-ADV-RDPL 3-DCL-CAUS-build IMPFV-NFT canoe child
'Every child built two canoes'/'Children built two canoes at a time.'

4 Number-Neutrality

This section focuses on the number-neutrality, and therefore cumulativity, of verbs in Karitiana. It claims that lexical number-neutrality and cumulativity by themselves are responsible for a vast array of plural event readings in the language. Lexical cumulativity accounts for readings that will be called cumulative readings, in the sense that they are generated by denotations that encompass atomic and plural events. Sentence (13) below has an array readings. These readings stem from the radically undefined nature of the denotation of its bare nouns and of its verb. The term cumulative is used here because these denotations encompass both atoms and their sums. The meaning of sentence (13) with its unmodified bare nouns and verb is totally neutral as to the number of events, children and canoes. The logical form in (14) expresses that.

(13) õwã Ø-naka-m-'a-t gooj
child 3-DCL-CAUS-build-NFT canoe
'Children built canoes.'

(14) ∃E∃X∃Y [**build** (Y) (E) & **agent**(X)(E) & **child**(X) & **canoe**(Y)]
'There is a possibly plural event in which an indefinite number of children built an indefinite number of canoes (an indefinite number of times).'

Thus sentence (13) is true of situations such as one child building one or many canoes any number of times, or many children building one or many canoes any number of times. Collective situations in which any number of children builds together one or many canoes any number of times are a subset of the possible situations covered by the logical form in (14). Finally, sentence (13) is also true of situations which could be called distributive, such as three children building a total of three canoes – one canoe each, or four children building four canoes (one each) … and so on. These kinds of distributive readings are again just a subset of the array of possible combinations generated by cumulativity.

5 Pluractionality

The focus of this section is pluractionality in Karitiana. Pluractionality in Karitiana subtracts atomic events from the number-neutral denotations of verbs (Müller & Sanchez-Mendes 2008). Pluractional languages are languages that mark their verbs or predicates for number. They morphologically mark that the number of the events denoted by their Verbs is plural. Nevertheless languages vary in the way their pluractional events may be individuated.

The literature traditionally attributes the following properties to pluractional morphemes:

i. They are verbal sufixes, mostly reduplicative (Lasersohn 1995, Xrakoskij 1997);
ii. They are derivational morphemes (Cusic 1981, Lasersohn 1995, Yu 2013);
iii. They do not combine with all kinds of Verbs (Cable 2012);
iv. Their semantic contribution is not always transparent - the resulting meanings tend to depend on the *aktionsart* of the verb (Haji-Abdolhosseini et al 2002, Yu 2013).
v. They are not compatible with exact cardinals (Hofherr & Laca 2012);
vi. They contribute the notion that the sentence describes a "large" number of events (Lasersohn 1995, Cable 2012).

Karitiana is a pluractional language as illustrated by the contrast between sentences (15) and (16). Pluractionality in the language is marked by the reduplication of the verbal root, as is the case of the verbal root *'y* ('eat') in sentence (16). There are, nevertheless a few suppletive cases. Table 1 below shows a list of regular pluractional verbs in the language, and Table 2 below presents some of the few suppletive verbs. I will consistently translate pluractional sentences by adding the adverbial 'repeatedly' to the translation of their non-pluractional version. This is an approximation (as are all translations) and the exact meaning of pluractional morphemes will be discussed below.

(15) taso Ø-naka-'y-t boroja
man 3-DCL-eat-NFT snake
'Men ate snakes.'

(16) taso Ø-naka-’y-’y-t boroja
man 3-DCL-eat-RDPL-NFT snake
‘Men ate snakes repeatedly.’

Table 1: Regular Pluractionals

Roots	**Pluractional Forms**	**Translations**	***Aktionsarten***
pon	pon.pon	shoot	achievement
pykyn	pykyn.pykyn	run	process
eje	eje.eje	paint	accomplishment
typ	typ.typ	discover	achievement
sikiy	sikiy.sikiy	want	state
pimbik	pimbik.pimbik	push	process
’oom	’oom’oom	draw	process
paradywy	paradywy.paradywy	loose	achievement
’ot	’ot.’ot	fall	achievement
kaj	kaj.kaj	dream	process

Table 2: Suppletive Pluractionals

Roots	**Pluractional forms**	**Translations**
oky	popi	kill
tat	hot	go
ot	piit	catch

Contrary to what is the case in other pluractional languages, such as Chechen (see Yu 2003), pluractionality is possible for all types of verbs in Karitiana. Nevertheless, its semantics is

always that of event repetition in time. Sentences (17) and (18) have achievement predicates, which as expected for this kind of verb when pluractionalized results in an event repetition in time reading.

(17) João Ø-na-aka-t i-otam-Ø ese.pihorop sok
João 3-DCL-COP-NFT PART-reach-ABS river.bottom POS
'João reached the bottom of the river.'
(18) João Ø-na-aka-t i-otam-otam-Ø ese.pihorop sok.
João 3-dcl-cop-nft PART-reach-RDPL-ABS river.bottom POS
'João reached the bottom of the river repeatedly.'

Sentences (19) and (20) illustrate the behavior of pluractionality with accomplishment predicates in Karitiana. In other languages such as Chechen (see Yu 2003), for example, accomplishment predicates, besides the event repetition in time reading, may also have durative readings. This is not so in Karitiana. In this language, accomplishment predicates have only an event repetition in time reading.

(19) João Ø-naka-eje-Ø iscola.
João 3-DCL-paint-NFT school
'João painted the school.'
(20) João Ø-naka-eje-eje-Ø iscola.
João 3-DCL-paint-RDPL-NFT school
'João painted the school repeatedly'
*'João painted the school for a long time.'

Activity predicates are known to generate durative readings when pluractionalized. This is the case for Chechen (see Yu 2003). Again, this is not so in Karitiana. In this language activity predicates only generate a repetition in time readings, which is llustrated by the pluractional version of sentence (21) in (22) with the activity ver *pykyn* ('run').

(21) João Ø-na-aka-t i-pykyn-t.
João 3-DCL-cop-NFT part-run-abs
'João ran.'
(22) João Ø-na-aka-t i-pykyn-pykyn-t.
João 3-DCL-cop-NFT PART-run-RDPL-ABS
'João ran for a long time'
*'João ran intensely.'

In many pluractional languages, it is not even possible to pluractionalize stative predicates. When it is, they get intensive or durative readings. This is not so in Karitiana, where states may be pluractionalized as long as event repetition in time readings are available. The pluractional version of sentence (23) in (24) with the stative predicate *aka osedn* ('be happy') illustrate this property.

(23) Inacio Ø-na-aka-t i-osedn-Ø.
Inacio 3-DCL-COP-NFT PART-happy-ABS
'Inacio was happy.'
(24) Inacio Ø-na-aka-t i-osedn-osedn-Ø.
Inacio 3-DCL-cop-NFT PART-happy-RDPL-ABS
'Inácio was happy repeatedly'
*'Inácio was happy for a long time'
*'Inácio was very happy.'

Also surprisingly and contrary to what is known of many pluractional languages such as Chechen (see Cabredo-Hofherr & Laca 2012), pluractionality in Karitiana is compatible with exact cardinality adverbials as shown by the grammaticality of sentences (25) and (26) with the adverbials *myjym* ('three times') and *sypom* ('twice'). These sentences also show that pluractionality in Karitiana may refer to two or more events, and not only to a "large" number of events.

(25) õwã Ø-na-kot-kot-a-t myjym-t opok.ako.sypi
child 3-DCL-break-RDPL-verb-NFT three-ADV egg
'Children broke eggs three times.'
(26) sypom-t Ø-na-pon-pon-Ø João sojxa kyyn
two-ADV 3-DCL-shoot-RDPL-NFT João boar POS
'João shot at boars twice.'

In order to account for these properties, Müller & Sanchez-Mendes 2008 claim that pluractionality in Karitiana is a plural inflectional operation on cumulative verbal denotations – it excludes atomic events from the denotation of verbal heads (see Müller & Sanchez-Mendes 2008), as formalized in (27a-b) for both intransitive (27a) and transitive (27b) verbs with the additional demand that the atomic events in the plurality must not overlap in time. The operation is illustrated for the transitive verb *kot* ('break') in (28a-b).

(27) a. PL = λP <s,t>λE [P(E) & non-atomic (E)]
b. PL = λP <e<s,t>>λX λE [P(X)(E) & non-atomic (E)] & $\forall e, e'[e, e' < E \rightarrow \sim\tau(e) \circ \tau(e')]$
where: E=variable over atomic and plural events; e,e'=variable over atomic events; P=variable over predicates; τ(e)=running time of e.
(28) a. [[break']] = {<egg_1,e_1>, <egg_2,e_2>,<egg_3+egg_4,e_3>, <leg_1,e_4>…, <egg_1+egg_2, e_1+e_2>, …, < egg_1+egg_2+egg_3+egg_4+leg_1, e_1+e_2+e_3,e_3> …}
b. PL ([[break']]) = <egg_1+egg_2, e_1+e_2>, …, <egg_1+egg_2+egg_3+egg_4+leg1, e_1+e_2+e_3+e_4>, …}

Besides being able to account for the facts listed above, an additional evidence for this account is the rather obvious property that sentences with singular objects of once-only verbs are not grammatical when pluractionalized, as shown by sentence (29). On the other hand, if the event can be repeated in time, pluractionality is always possible as illustrated by the pair of sentences (30)-(31).

(29) *õwã Ø-na-oky-oky-t myhin-t pikom.
child 3-DCL-kill-RDPL-NFTone-ADV monkey
'Children killed one monkey repeatedly.'

(30) Inácio Ø-na-manga-t Nádia ka'it
Inacio 3-DCL-lift-NFT Nadia today
'Inacio lifted Nadia repeatedly today.'

(31) Inácio Ø-na-manga-manga-t Nádia ka'it
Inacio 3-DCL-lift-RDPL- NFT Nadia today
'Inacio lifted Nadia repeatedly today.'

Pluractionality then equals cumulativity minus atomic events with the additional restriction that the events must be individuated by their running times. Pluractionality always yields a plurality of events (two or more events).

6 Distributivity

This section focusses on predicate or VP plurality. It claims that true distributivity requires VP plurality in Karitiana. VP-pluralization is syntactically built (see Kratzer 2007). It is a plural operation that has scope over the whole predicate. This operation accounts for truly distributive readings, i.e., readings in which the number of events and/or of entities denoted by the predicate is multiplied. An example is the distributive reading of a sentence like (32), which involves two events of eating three snakes (a total of 6 snakes). In that reading, the *eating.3.snakes* event has been multiplied by the number of atoms in the denotation of the subject, that is, by two.

(32) Lu and Le built three canoes.
Distributive reading: 'Lu built three canoes and Le built three canoes.'

In Karitiana, truly distributive readings are not possible in the absence of overt distributive operators. The corresponding translation for Karitiana of sentence (33) has only cumulative readings, that is, readings in which Lu and Le built a total of three canoes in any of their possible combinations as agents. For example, they may have built the three canoes together, or Lu may have built two and Lu and Le built the other one together, and so on, as long as a total of three canoes were built.

(33) Lu Le Ø-naka-m-'a-t myjym-t gooj
Lu Le 3-DCL-CAUS-make-NFT three-ADV canoe
'Luciana and Letícia built three canoes.'
✓ Collective/cumulative readings – *only three canoes*.
* Distributive readings – *three canoes for each of the girls, three canoes at a time*.

On the other hand, the same sentence in the presence of an overt distributive operator, such as the distributive numeral *myjym.myjym* ('threee.three') only gets truly distributive readings. Sentence (34) is only true either if each of the girls built three canoes, that is, a total of six canoes was built; or if the girls collectively built 3 canoes at a time, which results in a total of 6, 9, 12,… canoes built.

(34) Lu Le naka-m-'a-t myjym-t.myjym-t gooj
Lu Le DCL-CAUS-make-NFT three-ADV.RDP canoe
'Luciana and Letícia built two canoes each.'
'On every occasion, Lu and Le built two canoes.'

*Collective/cumulative readings - *only 3 canoes*.
Distributive readings - *three canoes per girl or three canoes per occasion*.

One must conclude then that the *building.3.canoes* event has been pluralized. Thus distributive numerals pluralize the VP. The logical form of sentence (33) in (35) expresses the existence of VP plurality in such cases, since the number of *eating.3.snakes event* is multiplied by the universal quantification over atomic subevents.

(35) ∃E∃Y [**agent**(Lu+Le)(E) & **build**(Y)(E) &
$[\forall e \leq E\ \exists y \leq Y\ [\text{atomic}(e) \rightarrow \textbf{build}(y)(e)\ \&\ \textbf{canoe}(y)\ \&\ |y| = 3]]]$;
where: E,Yas in (3); e=variable over atomic events; y=variable over singular & plural entities.

7 Conclusions

We have seen that the Karitiana language has (at least) three morphosyntactic means of generating plural event readings: (i) lexical meanings: the lexical denotation of verbs encompasses both atomic and plural events; (ii) pluractionality: the pluralization of the verbal head – singular events are removed from the lexical denotations of verbal heads; and finally (iii) distributive numerals: pluralization of the predicate (the VP) – the events denoted by the predicate are multiplied by the number of occasions or participants.

Thus event plurality is expressed by at least three distinct phenomena. Cross-linguistically one would expect that natural languages should be able to express these three types of event plurality, but not necessarily through the same means as Karitiana.

References

Cable, Seth. 2012. Distributivity, pluractionality and reciprocity across languages. Course handouts, available at http://people.umass.edu/scable/LING753-SP12/.

Chierchia, Gennaro. 1998. Reference to kinds across languages. *Natural Language Semantics* 6:339–405.

Cusic, David D. 1981. *Verbal plurality and aspect.* Phd dissertation, Stanford University.

Corbett, Greville. 2000. *Number.* Cambridge:University Press.

Davidson, Donald. 1967. The logical form of action sentences. In *The logic of decision and action*, ed. Nicholas Rescher, 81–95. Pittsburgh: University of Pittsburgh Press.

Cabredo-Hofherr, Patricia and Brenda Laca. 2012. Verbal plurality and distributivity. Berlin: de Gruyter.

Kratzer, Angelika. 1996. Severing the external argument from its verb. In *Phrase Structure and the Lexicon*, ed. Johan Rooryck and Laurie Zaring, 109–137. Dordrecht: Kluwer.

Kratzer, Angelika. 2003. *The event argument and the semantics of verbs*. http://semanticsarchive.net, accessed on May 5, 2008.

Kratzer, Angelika. 2007. On the plurality of verbs. In *Event Structures in Linguistic Form and Interpretation*, ed. J. Dölling, T. Heyde-Zybatow and M. Schäfer. Berlin, New York: Mouton de Gruyter.

Krifka, Manfred. 1992. Thematic relations as links between nominal reference and temporal constitution. In *Lexical Matter*, ed. Ivan Sag and A. Sazbpçsco, 29–53. Chicago: CSLI.

Lasersohn, Peter. 1995. *Plurality, Conjunction, and Events*. Dordrecht, Boston: Kluwer Academic Publishers.

Link, Godehard. 1983. The logical analysis of plurals and mass terms: a lattice-theoretical approach. In *Meaning, use and interpretation of language*, ed. R. Baeuerle et al., 302–323. Berlin, New York: de Gruyter.

Müller, Ana, Luciana Storto and Thiago Coutinho-Silva. 2006. Number and the count-mass distinction in Karitiana. In *UBCWPL 19: Proceedings of the Eleventh Workshop on Structure and Constituency in Languages of the Americas*, 122–135.

Müller, Ana, and Luciana Sanchez-Mendes. 2008. . Pluractionality in Karitiana. In *Proceedings of Sinn und Bedeutung 12*, 442–454. Oslo: Department of Literature, Area Studies and European Languages, University of Oslo.

Müller, Ana, and Esmeralda V. Negrão. 2012. On distributivity in Karitiana. In *Verbal plurality and distributivity*, ed. Patricia Cabredo-Hofherr and Brenda Laca, 159–184. Walter de Gruyter.

Parsons, Terence. 1990. *Events in the Semantics of English: A Study in Subatomic Semantics.* Cambridge, MA: MIT Press.

Schein, Barry. 1993. *Plural and Events*. Cambridge, MA: The MIT Press.

Storto, Luciana. 1999. *Aspects of Karitiana Grammar*. PhD dissertation, MIT.

Yu, Allan C.L. 2003. Puractionality in Chechen. *Natural Language Semantics* 11:289–321.

Xrakoskij, Viktor. 1997. Semantic Types of the plurality of situations and their natural classification. In *Typology of iterative constructions*, ed. V. Xrakovskij, 3–64. Munich, Newcastle: Lincom Europa.